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Analysis of a worker-based participatory action research approach to the identification of selected occupational health and safety problems in Canada using mapping

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ABSTRACT

There are limitations to conventional occupational health and safety research approaches and practices and numerous barriers to overcome in order to achieve progress. Occupational health and safety is impacted by the broader social-political environment. Corporatism affects the directions, ideas and practice of regulators, educators, the labour movement, scientists, medical professionals, and society as a whole, thus inhibiting workers' power to influence change. The thesis therefore explores both the wider influences and barriers to occupational health and safety advances, focusing particularly on the Canadian situation, through the general research questions: *What has influenced occupational health and safety policies and practices, especially in Canada? What are some of the limitations of conventional occupational health and safety research and practices? To what extent can participatory action research and mapping address identified limitations?* These questions are explored from the perspective of the population potentially at risk.

New theories and approaches to occupational health and safety research are then applied in this thesis in order to explore a more specific multi-part research question: *Can mapping within worker-based participatory action research be used to explore occupational health and safety conditions? In particular, can mapping contribute to occupational health and safety improvements at a local level and beyond; establish workers' previous exposures for compensation purposes; support efforts to bring about justice through compensation for workers affected by unsafe working conditions; and raise worker and public awareness of health and safety?* These questions are explored through two different case studies, which examine, in depth, occupational health and safety action and possible remedies. Casino gaming

workers in Windsor, Ontario, Canada undertook a collaborative study to investigate and improve current health and safety conditions. Former Holmes foundry and asbestos insulation workers in Sarnia, Ontario, Canada undertook a collaborative study to provide evidence of exposures and ensuing health problems to support claims for compensation.

The outcomes of the case studies shed light on the bigger Canadian health and safety picture and demonstrate that mapping as a data collection method used within a participatory action research approach can accomplish a broad range of objectives. Mapping can raise workers' awareness, facilitate communication, build solidarity and cohesiveness, foster community support, mobilise workers to take action to reduce hazards or win compensation, in turn influencing employers, the compensation board and government agencies. The case studies accomplished the shared objective of raising worker and public awareness. The casino workers also gained occupational health and safety improvements and the Holmes workers were successful in gaining compensation.

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The two case studies researched in the course of this dissertation were carried out using the principles of participatory action research (PAR) and, thus, were collaborative efforts. The author was the principal investigator and the principal author of two peer reviewed journal publications that were produced during the course of the research conducted for this dissertation (Keith et al. 2001a; Keith and Brophy, 2004). The methods adapted and presented by the author in this dissertation were also highlighted in a widely distributed International Labour Organisation publication (Keith et al., 2002) and other occupational health and safety publications (Keith, 2003a, 2003b).

The *casino gaming workers' research case study* (presented in Chapter 7) was conducted in two locations, Windsor, Ontario, and Winnipeg, Manitoba, Canada. It involved the Canadian Auto Workers (CAW) union, Manitoba Government Employees Union (MGEU), the Occupational Health Clinics for Ontario Workers (OHCOW) and related Windsor Occupational Health Information Service (WOHIS), and the Manitoba Federation of Labour Occupational Health Centre

(MFL OHC). In keeping with the principles of participatory action research, the casino workers were actively involved as co-researchers. The author of this dissertation coordinated the research activities in Windsor, Ontario; adapted mapping exercises for use as data-gathering tools; served as a liaison between the Windsor, Ontario research team and the coordinator of the Winnipeg, Manitoba research team; was a principal developer of the Focus Group Leaders' Guide used by all worker-researchers in Windsor, Ontario and Winnipeg, Manitoba *(see Appendix A);* trained the worker-researchers to facilitate focus groups; observed all focus groups held in Windsor, Ontario; coordinated the analysis and summarising of the data collected in Windsor, Ontario; co-produced a report of the Windsor, Ontario findings (Keith et al., 1997b); co-authored a joint report (Keith et al., 1998a) and summary document (Keith et al., 1998b) with the coordinator of the research in Winnipeg, Manitoba in consultation with other team members; conducted follow-up interviews with the union researchers; was spokesperson for the occupational health centre in Windsor, Ontario regarding the study; made numerous presentations regarding the study (Keith, 1999b, 1999c, 1999d, 1999e, 2000, 2003c; Keith and Brophy, 2000); authored summaries of the gaming worker research for occupational health and safety publications (Keith et al., 2002; Keith, 2003b); and was principal author of a peer-reviewed journal article regarding the study that was published in the American Journal of Industrial Medicine (Keith et al., 2001a). There were additional contributing authors, co-researchers, and consultants *(see Appendix B)*.

The gaming workers case study (Chapter 7) draws from the final reports (Keith et al., 1998a, 1998b), meeting minutes, study documents and published articles (Keith

et al., 2001a). The joint Windsor-Winnipeg findings are presented along with findings specific to each location. All study participants and focus group leaders signed consents acknowledging agreement to the study's publication *(Appendix C)*.

The *Holmes Foundry and Insulation complex case study* (presented in Chapter 8) took place in Sarnia, Ontario, Canada. It involved the Occupational Health Clinics for Ontario Workers (OHCOW), the related Windsor Occupational Health Information Service (WOHIS), and the Canadian Auto Workers (CAW) union. The Holmes workers were active co-researchers. As a participatory action research study, there were many contributors *(see Appendix D)*.

The author of this dissertation is principal author of an article accepted for publication in the International Journal for Occupational and Environmental Health, which was adapted from Chapter 8 of this dissertation (Keith and Brophy, 2004); and was author and co-author of summaries of the study for occupational health and safety publications and presentations (Keith, 2003b; Keith and Brophy, 2003a, 2003b). The author coordinated the initial hazard mapping activities; adapted body mapping for use as a data-gathering tool; coordinated the collection of body mapping data; participated in the editing of the retrospective exposure profile resulting from further detailed hazard mapping (Mayville and Gilroy, 1999); and participated in the editing of the report produced from archival government industrial hygiene documents (Brophy and Parent, 1999).

Letters from several key co-contributors to the case studies are included in the Appendix *(see Appendices E, F, G, H)*.

CHAPTER 1: INTRODUCTION

1.0 Introduction

This dissertation examines a range of influences on occupational health and safety in general and in Canada in particular. In the process it investigates the use of workplace mapping as a tool for workers conducting participatory action research on occupational health and safety. Mapping is used to identify and address *current* health and safety problems and to gather evidence and support for worker compensation claims for injuries, illness or death resulting from conditions, as they *previously existed.*

The dissertation employs a variety of methods. The need for considering the use of alternative methodological approaches to occupational health research is preceded by a review of the dominant practices and policies regarding occupational health and safety, particularly in Canada, but also within an international framework. This 'policy' analysis both underpins and directs the dissertation. Alternative research approaches are explored through a review of the literature regarding participatory action research and mapping. The literature review, of course, influenced the adaptation and development of customised techniques employed and evaluated in two research studies conducted in Canada.

1.1 Research questions

In general, the dissertation explores the questions:

What has influenced occupational health and safety policies and practices, especially in Canada? What are some of the limitations of conventional occupational health and safety research and practices? To what extent can

participatory action research and mapping address the identified limitations?

These questions are primarily explored from the perspective of the population potentially at risk.

This then leads to the more specific multi-part question explored through the case studies:

Can mapping within worker-based participatory action research be used to:

- *explore current occupational health and safety conditions?*
- *contribute to occupational health and safety improvements at a local level and beyond?*
- *establish workers' previous exposures for compensation purposes?*
- *support efforts to bring about justice through compensation for workers affected by unsafe working conditions?*
- *raise worker and public awareness of health and safety?*

1.2 Aims and objectives of the dissertation

The dissertation explores methods that may have policy and practice implications. The exploration of the methods follows an examination of the limitations of current approaches as catalysts for change in Canada. Conventional occupational health and safety research is demonstrated to have had limited success. There are practical limitations to the current institutional approaches to evaluating and improving occupational health and safety conditions. There are also shortcomings to the current institutional practices and policies that are used to establish and evaluate causality for compensation purposes.

Following the examination of limitations and barriers, is an exploration of the value of alternative research strategies. In particular, a worker-based participatory action research approach to occupational health and safety using mapping techniques is explored as a complementary or legitimate and effective alternative to conventional research.

1.3 Scope and trends in occupational disease, injury and death

This brief overview of the scope and trends in occupational disease, injury and death is included as evidence that a need exists for intervention, such as alternative participatory action research approaches and mapping.

1.3.1 Global occupational morbidity and mortality

The World Health Organization (WHO) estimates that each year 1.1 million people across the globe die from occupational injuries and diseases, a figure roughly equivalent to the number of deaths from malaria. There are approximately 160 million new cases of occupational disease and 250 million accidents resulting in 300,000 fatalities per year. It is estimated that the annual overall economic losses from work-related diseases and injuries are approximately 4% of the world's gross national product (World Health Organization, 1999).

1.3.2 Occupational morbidity and mortality in North America

Because of free trade and the prevalence of U.S. based multinational corporations throughout North America, the United States has a major influence on occupational health and safety in Canada. Few studies have been done on national incidence or prevalence of occupational disease and injury in the United States (Leigh et al.,

1997). It has been estimated that "deaths attributable to occupation [are] the 8th leading cause of death in the US…greater than the annual number of motor vehicle deaths per year" (Steenland et al., 2003, p 477).

After analysing information from various sources, researchers estimated that in a single year, "6,500 deaths from injury, 13.2 million non-fatal injuries, 60,300 deaths caused by [occupational] disease, and 857,500 illnesses resulted in estimated costs of $170.9 billion in 1992, roughly 3% of the gross domestic product." The researchers concluded:

> The costs of occupational injuries and illnesses are high, in sharp contrast to the limited public attention and societal resources devoted to their prevention and amelioration (Leigh et al, 1997, p 1557).

1.3.3 Occupational morbidity and mortality in Canada

In Canada during the period 1980 to 1999, an annual average of 8.82 per hundred workers suffered a work-related injury; 4.57 per hundred workers suffered time-loss injuries; and 7.48 per one hundred thousand workers were killed on the job (Human Resources Development Canada, 2003).

In 2001, Canada and Italy tied for the highest workplace *fatality* rates among the sixteen developed countries included in a Canadian study of labour market wellbeing (Osberg and Sharpe, 2003, p 29) *(see Table 1.1)*.

Table 1.1 Occupational fatality rates among developed countries

Country	Workplace fatalities per 100,000 workers
Canada	7.0
Italy	7.0
New Zealand	5.3
France	5.0
Australia	4.0
United States	4.0
Germany	3.1
Switzerland	2.3
Finland	2.1
Denmark	2.0
Norway	1.6
Sweden	1.5
UK	0.9

Source: Osberg and Sharpe, 2003

While there is evidence of a decline in incidence of *injuries* over the past two decades (Human Resources Development Canada, 2003) the improvement in Canada is much less than in other developed countries (Osberg and Sharpe, 2003, p 29) *(see Table 1.2).*

Table 1.2 Percentage decline in incidence of workplace injuries among developed countries between 1980 and 2001

Country	Percentage decline
Switzerland	39.3
Italy	35.0
United States	28.9
Germany	26.5
Belgium	19.8
Norway	19.0
Canada	18.3
United Kingdom	18.3
France	15.9
Finland	14.1
Denmark	8.4
Australia	6.4

Source: Osberg and Sharpe, 2003

Between 1980 and 2001, all countries for which data were available saw a falling fatality rate, with many countries enjoying large decreases. Canada showed the least improvement (Osberg and Sharpe, 2003, pp 29-30) *(see Table 1.3).*

Table 1.3 Percentage decline in fatality rates among developed countries between 1980 and 2001

Country	Percentage decline
New Zealand	68.1
Belgium	66.7
Finland	64.4
Italy	59.8
United Kingdom	57.1
France	55.4
Japan	50.0
Switzerland	47.7
Australia	42.9
Germany	39.8
Denmark	33.3
Netherlands	32.0
Canada	6.6

Source: Osberg and Sharpe, 2003

There are no reliable figures regarding the incidence of occupational disease in Canada, largely because of under-recognition and under-reporting (Kraut, 1994). However, it has been suggested that:

> Occupational disease-related morbidity and mortality contribute significantly to the total burden of disease in Canadian society. Increased recognition of the extent of occupational diseases should stimulate research into their identification, and ultimately help eliminate the exposures and conditions which lead to their causation (p 276).

Occupational disease incidence rates are not included in the comparative study of labour market wellbeing but it has been suggested that risks may be increasing (Osberg and Sharpe, 2003). There has been a decline in primary industry in Canada (Statistics Canada, 2003). This follows a trend observed by the World Health Organization regarding the changing nature of work. While this trend may eliminate jobs that have traditionally placed workers at a high risk for serious injury, it introduces additional occupational disease risks:

> Due to the changes in occupational distribution with development, many countries have experienced a shift from the hazards that characterize work in agriculture, mining and other primary industries, to those of manufacturing industries or service industries. Following such a shift, occupational injuries

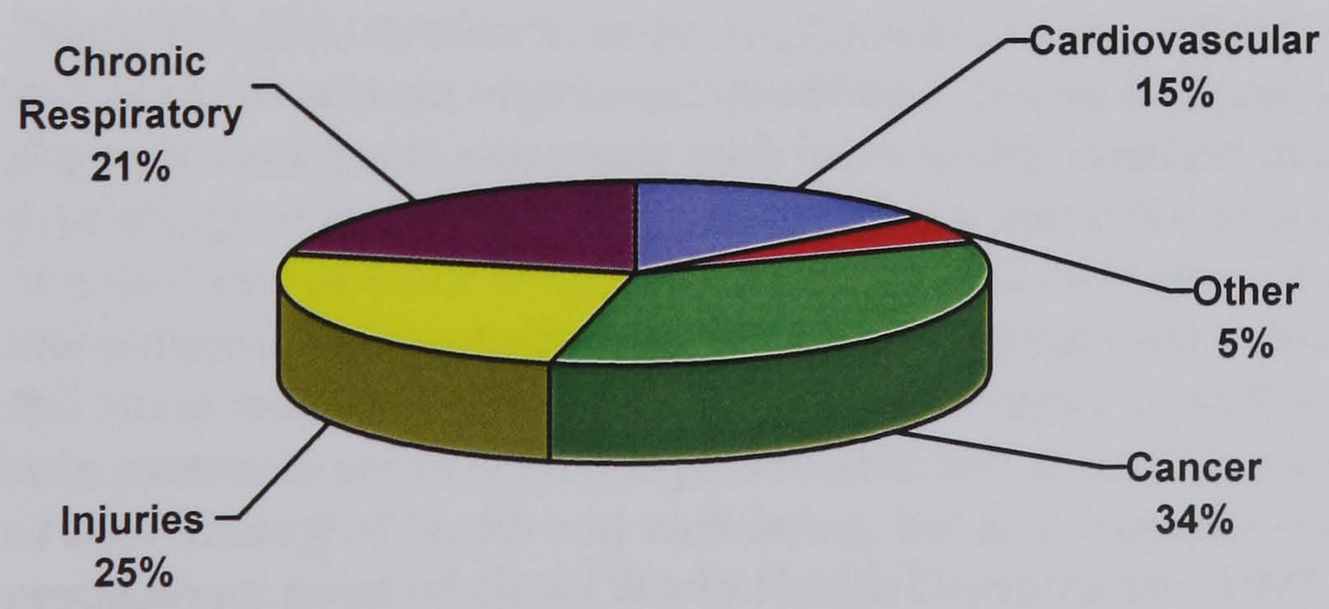
> and diseases could be expected to fall in number and the severity of those that do occur to be less. But, in fact, new occupational disease problems have emerged, leading to an increased incidence of reported occupational disease in certain developed countries (World Health Organization, 1997, np).

Canada's dismal record in terms of morbidity rates and minimal improvement points to the need for intervention to improve health and safety conditions beyond the current institutional practices and policy. The approaches discussed in this dissertation can contribute to this effort.

1.4 Attribution of occupational risk

Establishing the work-relatedness of disease, injury, or death can be challenging. Cancer, while but one of myriad occupationally-induced health problems (albeit the biggest workplace killer worldwide) *(see Figure 1.1),* illustrates the difficulties in establishing cause and effect. There are approximately 137,000 new cases of cancer diagnosed each year in Canada (National Cancer Institute of Canada, 2002).

Figure 1.1 Estimated Global Work- Related Mortality
1.1 million per year (based on 1990-95 data)



Other diseases include pneumoconiosis, nervous system and renal disorders
(Source: International Labour Organization, 1999)

There is a wide divergence of opinion regarding what proportion of cancers can be attributed specifically to occupational exposures ranging from 4 to 40 % (Epstein, 1998). The chemical industry, for example, has attempted to trivialise occupational risks, placing estimates of work-related cancers in men at only about 5% (Epstein, 1998). Infante (1995) estimates that occupation contributes to up to 40% of cancers among industrial workers. Public health institutions, workers' compensation boards, cancer agencies, and regulatory bodies have been criticised by community and workers' health advocates for downplaying the role of occupation and environment and for pointing the finger at personal lifestyle practices (Epstein, 1998; Steingraber, 1998; Firth et al., 1997; Brophy, 2004).

Cancer is only one of many diseases and injuries caused by work. Workers across the globe are subject to conditions which cause respiratory and cardiovascular diseases, hearing loss, musculoskeletal and reproductive disorders, mental and neurological illnesses, stress-induced disorders, violence-related injuries, chemical burns, communicable diseases, trauma – almost all manner of ill-health and injury (World Health Organization, 1999).

> About 100,000 chemicals, some 50 physical factors, 200 biological factors and some 20 adverse ergonomic conditions, and an identical number of physical work loads associated with incalculable numbers and types of psychological and social problems have been identified as hazardous factors or conditions of work which usually occur in combinations and have several interactions. They contribute to the risk of occupational injuries, diseases and stress reactions, job dissatisfaction and absence of wellbeing. Most of such problems are in principle preventable and should be prevented in view of both interest of health and well-being, but also from the economy and productivity point of view (World Health Organization, 1995, p 28).

The participatory mapping approaches analysed in this dissertation may prove to be a valuable alternative in the identification and prevention of some of the ill-health, injury and death that can result from the many and varied workplace hazards.

1.5 Workers need a voice

Karen Wilson (1992), at one time a runner and outdoor sports enthusiast, has had her lungs destroyed by isocyanates at a ceramics plant in Windsor, Ontario, Canada, and has undergone surgery for cancer. She now depends on a portable oxygen tank to keep her alive. She said:

> I think it's a sad day in Canada that a worker has to give up his health, his life, his family. So many are dying young – I don't know why we can't find a solution for a safer place so that workers wouldn't have to worry about going home and saying, 'Hon, I've got cancer. I'm not going to be here in three months to be with my family' (np).

Victims and potential victims have little voice (Keith et al., 2002) in the medical and scientific evaluation and policy-setting that determine the so-called "acceptable" level of risk or in deciding what constitutes a compensable disease or injury (this will be discussed further in the following chapters). This seems jarringly dissonant as the group with the greatest stake in proving the work-relatedness of disease and injury is the population-at-risk, that is, the workers facing risks and those who have already become injured or sick and are seeking compensation. It is hypothesised in this dissertation that, if the knowledge and collective influence of workers were tapped, the potential for health and safety improvements and justice for those already affected would be substantial.

As is demonstrated in this dissertation, mapping based on participatory action research may provide workers with a voice; it may empower them to challenge and

influence their employers, the government, compensation boards, their unions, and their communities.

1.6 Outline of the dissertation

The dissertation outlines some of the weaknesses of current occupational health and safety policies and practices and identifies some of the barriers to achieving occupational health and safety improvements. It then provides ideas for overcoming barriers and illustrates them in two case studies.

Chapter 2 analyses the difficulties presented by the nature of the corporatist culture, in particular: societal attitudes about occupational health and safety, the regulatory system, managerial practices, bipartism, information delivery systems, a weakened labour movement, and economic threats.

Chapter 3 explores the limitations of conventional scientific research models as catalysts for change. It establishes that there is a need for alternative research models, such as participatory action research, which can be used to address some of these barriers and limitations.

Chapter 4 examines participatory action research. In both ideology and practice, participatory action research represents a radical departure from the standard epidemiological, toxicological, biomedical and industrial hygiene approaches commonly used to research occupational health and safety. In most conventional research paradigms, the researchers are outside experts and the workers are passive subjects. In participatory action research, the subjects are actively involved in all stages of the research.

Chapter 5 examines visual mapping techniques in some depth. Its origins, applications, strengths and weaknesses are discussed. The use of mapping to gather data, much of it qualitative, is a fundamental departure from conventional approaches to occupational health and safety research, which are often quantitative, and in which purportedly "objective" numerical data are gathered through such standard techniques as air sampling, laboratory experiments, or medical health studies.

Chapter 6 sets the scene for how mapping and participatory action research are utilised in two different case studies to address the case study-related research question.

Chapter 7 presents a research study with casino gaming workers carried out to identify and address current occupational health and safety concerns (Keith et al., 1997b, 1998a, 1998b, 2001a, 2002).

Chapter 8 presents a research study with former foundry and asbestos insulation workers, which was undertaken to provide evidence of past exposures and to identify related health problems for compensation purposes (Keith and Brophy, 2003a, 2004).

Chapter 9 provides a detailed evaluation of the case studies in the context of both the policy critique and use of a new methodological approach to workplace hazards,

as well as their adherence to the principles of participatory action research, and their strengths and limitations.

Chapter 10 concludes the dissertation with an analysis of the utility and value of mapping within worker-based participatory action research and its potential to fulfil the goals set out in the research questions and beyond.

CHAPTER 2: OCCUPATIONAL HEALTH AND SAFETY IN A CORPORATIST ENVIRONMENT

2.0 Introduction

The chapter contextualises the central thesis by providing an overview of the social and political climate in which the alternative research approach, that is, mapping as a tool within participatory action research, has been developed and utilised. This is but a brief overview, as an in depth analysis of each of the societal factors that influences occupational health and safety is beyond the scope of this dissertation. As indicated in Chapter 1, many of these ideas are explored from the perspective of the populations potentially at risk. There are, of course, other points of view that run counter to these ideas.

The corporatist socio-economic environment in the Western world presents formidable obstacles to achieving occupational health and safety improvements. In the corporatist environment, societal institutions mandated to provide new knowledge, information, support, protection, or justice for individuals are influenced by corporate interests. Some of the policies and practices of the very institutions established to protect workers act as significant impediments to progressive change. The chapter analyses how industry domination of social thought, the regulatory process, information systems and, to an extent, the labour movement, serves to shape occupational health and safety in such a way as to curtail worker mobilisation for change.

The deficiencies of the current system discussed herein provide evidence of the need for the employment of alternative occupational health and safety approaches

that raise workers' consciousness, improve self-confidence, build solidarity, and promote activism. In other words, there is a need for an approach that challenges the fundamental power relations in our society. These ideas are explored first by analysing the issue of control, secondly by critiquing the regulatory policies and practices that govern occupational health and safety, thirdly by examining how corporatism influences the labour movement, and finally by making a case for alternative strategies.

2.1 The issue of control

As an entity, occupational health and safety is not easily defined or classified. While in this dissertation, it is discussed primarily in sociological terms, it has, in fact, many faces and can fit into a number of broad categories. For example, it may be considered by employers' organisations to constitute a labour relations or public relations issue; it has both medical and public health aspects; it has scientific and technical components; it is a social justice issue and a human rights issue; it is a legal, regulatory and legislative issue; it has insurance and liability implications; it is an economic issue for a range of parties: victims and their families, communities, society in general and, of course, for industry and government; it is also a very political issue, in other words, it is about power and ***control.***

2.1.1 Economic and political environment

The economic and political environment can strongly influence the chances of a successful campaign by workers to improve health and safety conditions. There has been a steady shift towards the right in Canada, and in the industrialised province of Ontario, in particular (Keith, 1996).

Corporatism, the dominant ideology of the modern developed world, has control of the citizenry very much at its centre. While the term "corporatism" has a variety of meanings, it is used in this dissertation to refer to the collaboration of institutions at a national and international level and to the integration of their shared priorities into society as a whole. An outspoken Canadian philosopher, John Ralston Saul (1995), employs the term corporatism to characterise the domination and control by large organisational structures, such as corporations, government, and union hierarchies, working together towards common cause to the detriment of democracy. Within this undemocratic, hierarchical structure, collective consciousness is stifled:

> The acceptance of corporatism causes us to deny and undermine the legitimacy of the individual as a citizen in a democracy. The result of such a denial is a growing imbalance which leads to our adoration of self-interest and our denial of the public good. Corporatism is an ideology which claims rationality as its central quality. The overall effects on the individual are passivity and conformity in those areas which matter and non-conformity in those which don't (Saul, 1995, p 2).

This has the effect of discouraging collective activities that may benefit the group while encouraging individual gratification. "'Shopping' has become a substitute for engagement" (Burke et al., 2003, p 30).

Chomsky (1987; 1988; 2002) theorises that the state-corporatist structure uses propaganda to indoctrinate the citizenry thereby gaining its acceptance and approval. The mass media, societal elites, and persons in positions of authority sell corporatist messages to the general public resulting in what Chomsky refers to as "manufactured consent." In other words, societal and personal decisions are made based on "filtered" information (1987; 1988; 2002). This theory has relevance to the issue of occupational health and safety…"; information regarding hazards and

related injury and disease has the potential to erode consent and thus upset the delicate balance of control that industry, employers and the state have achieved over workers and the population in general. Thus occupational health and safety, as a scientific or technical issue, is subject to control by corporate interests and is out of reach of most rank and file workers. (This concept will be further explored in Chapter 3 which examines the limitations of conventional science).

An intellectual elite in society helps to support the corporatist culture by bolstering the control held by industry and its partner, the state. Despite a moral responsibility "to speak the truth and to expose lies" of those in positions of power, the complicit intellectuals instead prop up those who are in power (Chomsky, 1987, p 60). These intellectuals, or "commissars," (Chomsky, 1992a; 1993; 1997) assist in the efforts of the state and capital to manage society by shaping the beliefs, values and actions of the populace. "When we consider the responsibility of intellectuals, our basic concern must be their role in the creation and analysis of ideology" (Chomsky, 1987, p 72). Chomsky contends that the messages provided by supposedly knowledgeable, wise persons in respected positions in society are often accepted without challenge. The alternative forms of gaining and sharing knowledge discussed in this dissertation can challenge and thereby provide some counterweight to these corporatist messengers.

2.1.2 Control of health and safety through state manipulation of social priorities

There is an increasing sophistication to the propaganda that those in power generate to shape public opinion regarding social and economic policies. Occupational health and safety can be driven to lower levels of social priority through real or

manufactured crises and resulting appeals to nationalism and populism. The September 11th attacks on the United States Pentagon and World Trade Centre in 2001, for example, elicited a widespread rally in support of the country and its allied military action. Domestic issues, such as public health, were effectively set aside as loyalty and patriotism were mustered in defence of the American way of life. The significant asbestos, lead, silica and other dust hazards faced by those working as rescuers, forensic examiners, and site clean-up crew (New York Committee for Occupational Safety and Health, 2001a) were downplayed (Sierra Club, 2003).

According to a report released by the inspector general of the Environmental Protection Agency (EPA), the EPA was ordered by the United States government in the early period of the World Trade Centre site restoration to mislead the public and to "add reassuring statements and delete cautionary ones" in its public statements regarding air quality at the site a week after the collapse (Tinsley, 2003, p 17). As a result, proper protective actions were not taken by many of the workers (p 42-43). Unprotected workers reported such health symptoms as "coughing, sore throat, nasal congestion, chest tightness, headaches, fatigue, dizziness, and sleep disturbances" (p 43). This phenomenon has been dubbed "World Trade Center syndrome" (France, 2003, np).

Thus, truth became another casualty of the terrorist attacks, as did the unprotected workers and residents who had placed their trust in the institutions that were supposed to protect them. A government spokesperson claimed that the truth was withheld "for national security reasons" (NY1 News, 2003).

When no obvious foreign enemy can be identified, domestic crises are substituted, as was done in the so-called United States "War on Cancer," which has turned out to be an enormous failure (Beardsley, 1994), and the ongoing "War on Drugs," which has been likewise unsuccessful (Chomsky, 1992b).

As the support and acceptance of the flag-waving citizenry is won over to such patriotic aims, there is a tendency for localised concerns and injustices, such as occupational health and safety, to be effectively deflected. Day-to-day injustices, such as work-related illnesses or injuries, are not viewed as crises and are not likely to elicit a collective social response.

When the Conservative government took power in the Canadian province of Ontario in 1995, it engendered widespread public anxiety regarding the provincial government deficit. This gave the conservatives the opportunity to strip hundreds of thousands of dollars and key personnel from the institutions that had been set up by previous governments to administer occupational health services. It put forward a number of recommendations to limit workers' right to refuse unsafe work, eliminated dozens of inspectors' jobs and occupational medical and technical services, and dismantled the quasi-governmental Health and Safety Agency which delivered training and information services. It closed the Occupational Disease Panel, whose mandate included conducting research, writing extensive literature reviews and reports, and advising the compensation board on the compensability of occupational diseases (Keith, 1996). Province-wide income tax rebates helped to sell the message.

The government made assurances that occupational health and safety was of the highest priority and the streamlining, that is, cuts, would improve services. The provincial legislation was revised to reflect the dismantling of the occupational health and safety agencies but added what was purported to be a new protective right for workers:

> Words in the law are not enough. Action in the workplace is needed. Recent amendments to the Act have placed more power and resources in the hands of those who are directly affected (Workplace Safety and Insurance Board, 1999, np).

The above statement refers to the very limited right afforded to some workers to shut down a job they believe might be harmful. Certified worker health and safety representatives were given the power, with the agreement of their employer counterpart, to declare a job unsafe. In reality, this legislation has not afforded workers any additional control as the certified management representative can simply disagree with the worker representative's opinion.

2.1.3 Social class bias in occupational health and safety

Society also turns a blind eye to the problems of certain sub-sections of the population *(see Chapter 3 for a critique of the limitations of conventional science in regards to occupational issues for women and racial minorities).* There is a strong social class element to the issue of occupational health and safety. Risks are not borne equally by all social classes or occupational groups (Infante, 1995). Manual and industrial workers, so-called "blue-collar workers", suffer a disproportionate share of diseases and injuries. Based on compensation data, job related injury and disease costs are highest among heavy truck drivers, labourers, machine operators,

janitors, nursing orderlies, assemblers, retail sales workers, and carpenters (Leigh and Millar, 1997).

> Certain kinds of cancers are highly related to class and highly related to the kinds of exposures that you receive in what's called a 'blue-collar' context on a production line, where one doesn't have the ultimate control about what one is exposed to... Also we know that lots of these illnesses are still related to the colour of one's skin (Gorey, 2000, np).

In questioning why work-related cancer among industrial workers has received so little institutional acknowledgement, it has been postulated that the issues of class bias and control act as barriers:

> I suggest disproportionate death from cancer among blue-collar workers is a social class issue and that the problem is neglected because it is a potentially explosive issue. It raises questions about the control of production and cost of production (Infante, 1995, p 57).

The policy implications for this are clearly enormous. An examination of the trends in occupational health and safety by the Ontario Public Service Employees Union (OPSEU) reveals that the broader public policy, which reinforces the general state of the economy and thus industry's economic wellbeing, dictates the degree to which the state will intercede to protect workers:

> I would go so far as to say that, in large part, government refusal to address these factors contributes to the failure to stem the rate of workplace injury and disease. Our first problem is that we fail to recognize that occupational disease and injury originate from the character of the social and economic structure of our society that have their origin in the power relationships in the production process (DeMatteo, 1994, p 18).

In Canada and the United States, there are institutions and authorities in place at a number of levels, each with a fiduciary duty to protect workers and community members. As described in the example of the Environmental Protection Agency's findings regarding air quality at the World Trade Centre site, these institutions cannot necessarily be relied upon to serve the best interests of the populations at

risk. In reality, they may be doing more to protect the interests of capitalism by supporting what Chomsky (1997) calls "private tyrannies."

Clearly, to succeed in any challenge to corporatist control over human health and wellbeing, occupational health and safety advocates will have to employ powerful and innovative local strategies for overcoming barriers. Worker demands for health and safety improvements are a declaration of the value of human life in all social strata. They challenge the authority of the corporatist structures that determine the acceptability of particular risks to human health and who, through cost-benefit analyses, weigh the benefits of protecting workers and their communities in relation to potential impacts on profits. The state and industry have the advantages of vast capital resources, institutionalised authority, and a powerful propaganda machine. The strategies outlined in the following chapters can be used to combat the pervasive corporatist messages that stifle progressive workers' occupational health and safety activity.

2.2 Occupational health and safety regulatory systems

The bureaucratic wheels of government can turn very slowly and not always in the direction promoted by community health and worker health and safety advocates. Recognition of the weaknesses of the overall regulatory system is important as it bolsters the case for undertaking action research methods that mobilise workers to apply pressure for more expeditious and meaningful change.

The occupational health and safety regulatory system, for purposes of this discussion, includes a broad range of institutions, such as the establishment and

enforcement of policy and legislation, the development and provision of information, and the compensation of injured workers.

The following is a brief discussion of ways in which the regulatory system is influenced by the corporatist environment which favours industry and the status quo. Economics and politics may in fact play a more influential role than science in the establishment of regulatory practices *(see Chapter 3 for a more in-depth analysis of the limitations of conventional scientific research as a catalyst for occupational health and safety change and policy setting).*

2.2.1 Industry control tactics

It is useful to understand the history of industry's control tactics in Canada as it helps to explain the need for worker-based approaches to occupational health and safety. A large body of literature exists on the subjects of Taylorism, Fordism and other management strategies (Braverman, 1994; Aitken, 1960; Palmer, 1992; Kelly, 1978; Drucker, 1999; Edwards, 1979; Zinn, 1995). This brief discussion, while incomplete, provides an indication of some of the barriers to worker empowerment that can be posed by management and that can potentially impact on workers' ability to influence occupational health and safety change.

Looking back over the last century, it is evident that, as the economy and cultural norms have changed, so has industry's approach to maintaining control. Collective worker-based occupational health and safety activity is discouraged through cooperative employer-worker schemes.

The Taylorist approach to control of production, which was widely adopted throughout industry during the early years of the 20th century, promoted an overtly dictatorial style of management (Braverman, 1974). This very influential management philosophy, referred to as "scientific management" (Palmer, 1992; Edwards, 1979) was embraced internationally and continues to influence today's management approaches (Drucker, 1999; Cooper and Taylor, 2000; Baldry et al., 1998). Ford Motor Company, for example, adopted a Taylorist approach that shaped its assembly line production (Braverman, 1974; Lewchuk and Robertson, 1999). During the period just before World War II, Ford Motor Company, sensing a coming revolt among its oppressed employees:

> ...mounted an extensive campaign to convince its largely male workers that repetitive and monotonous work, stripped of most decision-making authority and planning responsibility was still rewarding and manly (Lewchuk and Robertson, 1999, p 85)

This tyrannical approach, which introduced mass production, de-skilling, "wearying and exhausting" assembly line work, and high wages, was dubbed "Fordism" (Gramsci, ed. 1971, p 311; Adkin, 1998, p 5). It was designed to limit worker initiative. While appearing to be synonymous, "Fordism can best be understood as a production strategy (e.g. greater automation, assembly line procedures" while "Taylorism fit more directly into a productionist discourse" (Gottlieb, 2001, p 5) promoting deskilling and control of workers.

These management control tactics were not unique to industrial work. Office work was reorganised during the 1970s in a similar manner (Bain et al., 2002). Office work became more "factory-like"; employers began monitoring workers' performance by units of time and workers' control over their own time and work

was thus mitigated (Braverman, 1974, p. 347; Bain et al., 2003). The widespread introduction of computers has furthered the Orwellian monitoring of workers. In the burgeoning call centre industry, for example, not only time targets but other indicators of performance are monitored, measured, and assessed using electronic equipment (Taylor et al., 2000, 2002; Bain et al., 2003). There is also evidence that "Fordism" in the fast food industry presents health and safety risks to its "young temporary workers" (Mayhew and Quinlan, 2002).

However, following militant actions and growing social acceptance, the industrial unions gained strength in their struggles against oppression. By the 1970s occupational health and safety became an openly political issue in Canada -- one in which workers decried the asymmetrical human consequences of the unequal power relations in the workplace (Firth et al., 1998). Workers took to the streets, to the media, and to the community over health and safety issues. In Elliot Lake, Ontario, for example, a series of illegal strikes over occupational health and safety issues by uranium miners resulted in a Royal Commission (Ontario, 1976; Firth et al., 1998) and an institutionalised recognition of the precarious life and death reality of thousands of workers and their families. One of the key statements from the commission relates to workers' right to know:

> Workers have a right in natural justice to know about the risks, and the consequences of the risks, that they undertake at work (Ontario, 1976, p 249).

In the late 1970s, as workers gained the rights to refuse unsafe work and to know about the hazards they might face on the job, the labour movement turned much of its attention to the issue of health and safety training. The unions and labour

federations developed their own training programmes to empower their members. The Ontario Federation of Labour course promoted the concept that unions had the power and the duty to effect change. Workers were taught that:

> The main responsibility of union health and safety representatives, committee members, and indeed all workers in the field of health and safety is to ensure that employers meet their legal duty to protect their employees and provide a safe and healthful workplace. This means learning the law in order to see it is enforced. Union action can produce more change than the persuasion tactics of government (Ontario Federation of Labour, 1982, p 8).

Strategies such as collective bargaining, strikes, and political lobbying were openly discussed during health and safety training. The course produced an enthusiastic group of trained union health and safety representatives who returned to their workplaces with a newly developed political awareness, practical skills and strategic knowledge that they enthusiastically applied. With their newfound knowledge and self-confidence, graduates made demands for and won improvements (Firth et al., 1998; McArthur, 1992). A union health and safety representative at an underground salt mine reflects:

> I have a lot of good memories of that [course]. It sure pumped me up…There were twelve of us in the course…We went back to our respective workplaces and started to make some improvements (McArthur, 1992, np).

Besides learning about toxic chemicals, worker trainees learned "how to deal with the Ministry [of Labour inspectors]; how to deal with management and getting your concerns voiced and changes made" (McArthur, 1992, np).

Thus began a new wave of rank and file occupational health and safety activism in Ontario as workers across the province conducted their own lay investigations, confronted employers with evidence they had gathered, and demonstrated their

collective demands for safer workplaces. In response, industry devised new control tactics to address workers' demands for greater democracy in the workplace.

2.2.1.1 Industry backlash against renewed worker health and safety activism

A successful employer backlash was launched. Industry was eager to regain control of workers at the shop floor level and thus, overall control of production. They accomplished this in part through co-option schemes. Rank and file worker mobilisation ground to a halt as workers engaged in partnerships with their employers.

For example, in the 1980's, amidst a growing cry for democracy at work, industry responded to workers demands by instituting "Quality of Working Life" (QWL) programmes. QWL was purported to provide a forum for workers to contribute ideas and discuss problems but was, in reality, a scheme to soften the adversarial nature of labour relations (Parker, 1994). While workers were not afforded any substantial decision-making power through these programmes, many were seduced into believing they were part of a worker-management team with common interests striving to improve the products, services and overall success of the industry. These programmes, while giving the illusion that workers were gaining an element of power, proved instead to be vehicles of co-option, weakening the labour movement and "undermining union authority" (Palmer, 1992, p 407). In fact, in "one large Canadian chemical plant, the workers threw out their union after being introduced to the QWL system" (p 407). "Despite all the rhetoric to the contrary, many -- perhaps most -- employers have not given up on the maintenance of the hierarchical

workplace, with themselves at the top of the management chart" (Drache and Glasbeek, 1992, p 222).

Other schemes involved offering workers shares in company stock, thereby giving them an additional stake in the company's success. Some workers were given hazard pay to make up for the additional risks they faced on the job (Nelkin and Brown, 1984). In such an environment, there would be little incentive for workers to demand that money be spent on health and safety improvements or that they be given more freedom and flexibility on the job.

Raising worker consciousness of the workplace hierarchy, disguised by partnership schemes and rhetoric, is an important step in mobilising workers to fight for their own protection on the job. The process of conducting mapping-based worker-driven action research may assist in unveiling and challenging the unequal power relations in the workplace thereby thwarting industry's new management style, in other words, their consultative control tactics. This will be explored further in the following chapters.

2.2.1.2 Bipartism and internal responsibility system demobilises workers

The introduction of bipartism and the internal responsibility system can be seen as another means whereby industry has gained control. The term bipartism itself means simply a two-party collaboration; it can have many different applications. In the context of occupational health and safety in Canada, it refers to the legislated requirement that employers and workers collaborate through joint committees, training, and other activities, to solve their occupational health and safety conflicts

without the need for third party, in other words, government intervention. Therefore, in the dissertation 'bipartism' is used to describe the concept of employer-worker partnership.

Like the scientific management schemes, bipartism provides the illusion of an equal partnership between workers and their employers. An examination of the limited effectiveness of bipartism, however, to bring about occupational health and safety improvements reveals the need for alternative worker-driven occupational health and safety approaches such as those examined in this dissertation and illuminated by the case studies.

Bipartism was promoted as the way forward by the Royal Commission on the Health and Safety of Workers in Mines in Ontario presided by Justice Ham, which rejected the notion of an intrinsic conflict between the workplace parties "since both parties desire the good of the individual worker" (Ontario, 1976, p 105).

There is a continuing debate regarding whether occupational health and safety can best be advanced through the traditional adversarial relationship between workers and employers or whether a bipartite arrangement can in fact lead to non-conflictual resolution of issues (Sullivan, 2000).

When bipartism was first introduced in Ontario through Bill 208 in 1989, it was embraced by some labour health and safety staff and representatives, particularly within the union hierarchy, as a positive legislative achievement (Brophy, 1991). They were seduced by the talk of a common interest, of a joint stake in health and

safety. They were promised that if a spirit of co-operation were to replace the old adversarial nature of health and safety, it would advance it to a new level. Labour would now sit down with the employer, if not as equals, at least as recognized partners. There were sceptics in and around the labour movement, particularly in the public sector, who were less than enthusiastic. They feared that this new so-called partnership would stymie the activism that had proven to be so effective in politicising and mobilising the membership (Brophy, 1991). Their protestations were largely derided or ignored.

The Bill passed into law in 1990 with the support of the Ontario Federation of Labour and most of the private sector unions. Employers and employees were now required to work together to attempt to solve problems before government inspectors could be called in. Government and employer groups still stand firmly behind the concept. Some proponents argue that it is "significantly improving conditions in the workplace" (O'Grady, 2000, p 162). Others, such as Drache and Glasbeek (1992), claim that the internal responsibility system has turned out to be little more than a form of corporate self-regulation. In the direct experience of some workers, bipartism delivered less than it promised in terms of workers' control over their work environment:

> It still ultimately comes down that we can only recommend to a company or an employer certain things. We can recommend this, we can recommend that. But who has the ultimate say -- it still comes down to the employer really (McArthur, 1992, np).

The national health and safety director for the Canadian Union of Public Employees viewed the bipartite approach as a mechanism for inaction:

> The internal responsibility system is…used as an excuse not to do things…The normal course of action goes like this: 'Gee, you know we have

> a lot of smoke in that room over there and people are feeling sick'...The health and safety committee meet and management says, 'Yeah, we'll look into it and get back to you next month.' Next month there's nothing on the agenda so labour has to raise it again...And then they hire someone to prove that nothing's going on in there. And that takes another 3 to 4 months...They then call the inspector in, who then does exactly the same thing again. 'Gee, I'll have to look into this. I've got to get my hygienist to come in. We have to do air sampling'...If they do write orders, it's often in the form of recommendations that management doesn't have to carry out...And what happens is people get sick of this, they get fed up with all these technical reports...And internal responsibility becomes a circle. It goes around, around and around (Lambert, 1992, np).

This legislated partnership, or more correctly, junior partnership, in joint worker-management programmes has resulted in the workers and their unions making compromises that have effectively depoliticised and demobilised the workers' health and safety movement (Storey and Tucker, 2001). As Robert DeMatteo, an Ontario Public Service Employees Union staff person stated: "From the government's point of view, bipartism was meant to replace enforcement...They thought that they could implement a voluntary self-compliance system, which, in fact, failed to prevent injuries and disease" (Keith, 1996, p 19).

The widely adopted cooperative worker-management approach has failed to consistently and substantially improve workers' health and safety or to increase workers' sense of power at the shop floor level:

> ...it is assumed that health and safety are the employer's responsibility, unless this is altered by legislation or at the bargaining table. In the result, workers' ability to prevent harm depends on their ability to influence employers or governments. The legislation provides workers only with the right to be consulted. Everything depends, therefore on the government's willingness to enforce existing standards and listen to those workers' voices which demand newer and better standards (Glasbeek, 1997, p 3).

Workers' control over their work was the subject of a survey conducted in 1995 of 2,424 workers in four large automobile manufacturing plants in Canada (Lewchuk and Robertson, 1999). Included in the survey were questions that examined

"whether the work environment is conducive to workers' participating in decision-making, and provide indirect evidence of empowerment" (p 94). The authors concluded that, "overall there was little evidence that motor vehicle workers were empowered. The majority found it difficult to modify their jobs, vary their work pace, or leave their work station to attend to personal matters" (p 103).

Without true workplace democracy, the unequal power relations in the workplace destine bipartism to ultimate failure as a vehicle for change. Strategies are needed to enable workers to gain a voice and influence. The alternative action research approaches, as examined in the following chapters, can politicise, mobilise, and empower workers to demand and win improvements.

2.2.2 Limitations of industry-controlled occupational health and safety information delivery systems

Information can be a useful tool or a means of manipulation, depending on who is providing it and with what objectives and prejudices. The delivery of information to workers regarding occupational health and safety through bipartite training and meetings is another means by which industry controls workers' access to knowledge. The employers' presence discourages open sharing among workers and prevents strategic discussions (Brophy, 1991).

The alternative methods outlined in this dissertation are used for information sharing and strategic planning without the employers' presence thereby providing a counterweight to the industry controlled bipartite information delivery.

2.2.2.1 Corporate influence on information delivery

An examination of corporate influence on the provision of information is an important concept for this dissertation; occupational health and safety training and information sharing on an unequal playing field leaves the weaker partner, in this case the workers, with only a token voice and little practical influence. The bipartite approach to information delivery has a censoring effect. Often workers only learn what the employer permits them to learn.

Under the changes to Ontario's occupational health and safety legislation introduced through Bill 208 in 1990, bipartite health and safety training classes were established (Workplace Safety and Insurance Board, 1999). This legislation, while appearing on the surface to provide workers with greater democracy, effectively gives industry more control over workers' access to information because employers have the final say over the course material and share the classroom thus stifling open discourse.

In Ontario, under this legislation, the information delivery systems for occupational health and safety are controlled by employers in a round-about manner. The Workplace Safety and Insurance Board (WSIB) is funded by employer compensation premiums and thus is not a neutral body. The WSIB controls both workers' compensation and occupational health and safety training. The WSIB also funds the Safe Workplace Associations. These associations have been given the responsibility of delivering the bipartite training to workers and employers using materials approved by the WSIB, which strongly encourage the seeking of cooperative solutions. As the training material states:

> Workplace hazards can be systematically identified, assessed and controlled. But it takes a strong commitment by all workplace parties to get results (Workplace Safety and Insurance Board, 1999, np)

2.2.2.2 End to strategic discussions

When workers joined management in these legislated bipartite certification training classes, they no longer talked as they had a decade earlier in the labour-sponsored courses, about one of the root causes of health and safety problems, that is, the unequal power relations in the workplace. They no longer used the training classes to plan strategies for gaining power to improve occupational health and safety and they certainly did not sit in these joint worker-management training classes and talk about ways to mobilise the workforce or organise collective action around the issue of health and safety. The training material itself was neutralised and de-politicised:

> Workers, employers and government all have an interest in tackling these problems at their source. It is now clear that employers, who design and direct work, and their employees, who actually carry out the work, must be equally involved in finding solutions to eliminate all accidents in the workplace. This understanding has guided the evolution of Ontario's Occupational Health and Safety Act. The Act depends on the participation of both workplace parties to translate its principles into action. The joint participation of workers and employers with equal powers to act on health and safety matters is known as the internal responsibility system. (Workplace Safety and Insurance Board, 1999, np)

Course participants were taught that all the workplace parties had a common interest in health and safety and that the road to improvement lay in cooperative strategies.

2.2.2.3 Technicalisation

Worker health and safety representatives who graduated from these new bipartite courses knew about the principles of control and the definition of LD_{50} (the dose at which fifty percent of test animals perished when exposed to an agent). They could

read a material safety data sheet and knew the intricacies of the law regarding the role of joint workplace committees. They were left, however, without a vital piece of information – how to tap the potential of the union membership or the workers on the shop floor to translate their knowledge into action. Health and safety in Ontario was becoming increasingly represented as a technical issue.

Disputing the adage that "knowledge is power," Robert Sass (1982, np) contends that, "power is power." Information is not enough. Workers need an understanding and a critical analysis of the real causes of the ongoing occupational health crisis; they need to consider creative new approaches.

2.2.3 Workers' compensation

The workers' compensation system was set up in Canada nearly a century ago as an insurance scheme to provide financial redress for workers who were injured or killed on the job, as well as to protect employers from liability, as it precludes workers' right to sue (Reasons et al., 1981; Glasbeek, 1997). The compensation system is funded by employer premiums.

While the cause and effect relationship of many traumatic injuries is very straight forward, it can be extremely difficult to establish successful claims for chronic injuries, musculoskeletal disorders, and occupational diseases (this issue is explored further in Chapter 3). The incidence of occupationally-related disease cannot be determined by the number of accepted workers' compensation claims; claims are regularly rejected for lack of evidence deemed acceptable to the compensation boards (Reasons et al., 1981; Sass, 1986; Kohler, c 2003, np). Although the

compensation system is supposed to release workers from the burden of proof required under the judicial system, in reality they must make a convincing argument:

> Notionally, workers do not have to prove a causal relationship but, in practice, a great number of claims (especially relating to diseases) are denied because there is no "scientific" proof of a causal connection between work and the harm (Glasbeek, 1997, p 8).

Attributing risk and establishing causality are fundamental issues in occupational health and safety. They are debated among physicians and scientists and by compensation boards and governmental policy-makers who nervously contemplate the political and economic ramifications of proving, for example, that a particular work process causes excess disease. It is estimated that, in Ontario, 2,000 to 9,000 workers died of occupationally-related cancer in 1998 yet only 119 claims were accepted for compensation (Ontario Federation of Labour, 2000). The reticence on the part of the compensation board to recognise the work-relatedness of disease may be due in part to the fact that, besides having to make compensation payouts to workers or their survivors, under the compensation act the board is responsible for all related health care costs (Ontario Federation of Labour, 2000).

The group, however, with the largest stake in establishing the work-relatedness of disease and injury, is the population-at-risk, that is, the workers facing risks and those who have already become injured or sick and are seeking compensation or retribution. Victims and potential victims have little say in the medical and scientific evaluation and policy setting that determine the so-called *acceptable* level of risk or in deciding what constitutes a compensable disease or injury.

As will be examined in the following chapters (in particular the case study of the Holmes foundry complex presented in Chapter 8), worker-based participatory research utilising mapping may provide workers with a voice and influence the success of compensation claims.

2.3 Corporatist influence on labour movement occupational health and safety consciousness and organising activities

At almost every labour rally, union members in North America boldly raise their voices to declare in song, "In our hands is placed a power greater than their hoarded gold, for the union makes us strong!"[1] Why, then, has the labour movement not been successful in eradicating hazards from the workplace? This section will explore the influences that have limited the labour movement's effectiveness in bringing about meaningful, broad-based occupational health and safety improvements. It will discuss the tendency towards co-option with industry, decline in union membership and resulting weakening of the unions, hierarchical union structures, and worker demobilisation and isolation.

It is important to recognise that, despite its weaknesses, union membership does provide significant benefits to workers. There is evidence that unionised workplaces are safer than non-unionised (Watterson, 1999, p 112). Unions have indeed undertaken successful health and safety campaigns and have won improvements for workers in terms of pay, security and conditions of employment (Watterson, 1999). It might then be assumed that organised labour can be depended upon to be a vigorous proponent of health and safety. That is not always the case. Sometimes

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[1] "Solidarity Forever" is the most popular union song in North America. It was written in 1915 by Ralph Chaplin

labour unions can and do act as barriers. The following is an exploration and analysis of why and how this happens.

2.3.1 Co-option

Unions have largely become servicing organisations (Aronowitz, 1999). While recognizing the power of collective action, the labour movement serves also as a vehicle for integrating workers into the corporate capitalist system (Aronowitz, 1973). The labour movement does not challenge the rights of capital to control production, manage workers or make critical decisions regarding their overall wellbeing.

Unions have a growing relationship with industry and government. Alan Dalton (2000) described, through meeting minutes and agendas, a survey, and personal experience, the general failure of the consensus approach in the U.K. The trade unions are the new members of the tri-partite body, which includes their employers and the government Health and Safety Commission and Executive. The government's own admission of a plateaued injury and disease rate are evidence of the failure of consensus to bring about significant improvements. In a tri-partite forum the unions appear to lose much of their effectiveness. When describing what appears to be co-option of the trade unions around the issue of workplace health and safety, Dalton, himself a former health and safety coordinator for the Transport and General Workers Union in the U.K. and a committed trade unionist, borrowed the last lines of George Orwell's *Animal Farm*:

> The creatures outside looked from pig to man, and from man to pig, and from pig to man again: but it was already impossible to say which was which (Dalton, 2000, p 57).

The lines have indeed blurred as unions and industry work together for a common economic cause. "Ideological orientation" and a tendency to function as "centralized bureaucracies" can narrow the union's focus to economic considerations, thus curtailing its militancy around the issue of occupational health and safety (Storey and Tucker, 2001). Unions try to get a better deal for their members under the current system. This identification with capital serves to stifle critical thought and discourage rank and file demands and initiatives.

In a unionised workplace, workers' efforts to deal with health and safety concerns can be thwarted by their union's refusal to provide support. John West, a health and safety activist in an automotive feeder plant in Windsor, Ontario, sought the support of his local union in demanding that safety precautions be instituted to protect workers in and around solvent dip tanks. He remembered being told by his local union representative, "We're not going to get involved. You're dangerous because you're making health and safety a priority. You're getting the employees' backs up and we don't want this kind of problem in our plant, so you're on your own" (West, 1992, np). West ultimately sought other employment, disappointed and embittered towards his union.

One theory put forward twenty-five years ago regarding organised labour's reluctance to embrace health and safety is that, "Health and safety creates areas of potential conflict which can destroy a smooth relationship between management and the union" (Berman, 1978, p 171). It is at least in part, an issue of financial control at the local union level:

> One result is an inherent tendency on the part of top union leaders to favor money demands. Wage increases enable the organization to raise its dues without any corresponding increase in staff work. Similarly, increases in employer pension fund contributions give the union's leadership more financial power; depending on the degree of control union trustees have over the funds, leaders can raise their own salaries, and put more of their allies and relatives on the work payroll. By contrast, the occupational health and safety issue, confers no direct benefits on union officials. Instead it increases the staff workload without generating additional income to deal with the demands on staff time…Since safety is inherently a local issue, it shifts power to 'hotheads' who are the…natural enemies of the union official…(p 171).

This remains a problem twenty-five years later as unions struggle financially in the face of a declining membership and increased competition. Not only do occupational health and safety improvements reap no tangible financial benefits for the union, they may be viewed as a cost (Sass, 1986). At the bargaining table, successfully negotiating occupational health and safety improvements may diminish the unions' chances of negotiating job security and salary increases.

2.3.2 Decline of labour movement

The economic constraints of the unions are exacerbated by the dwindling membership. This is an important issue as it has contributed to the demobilisation of workers around the issue of occupational health and safety (Berman, 1983; Sullivan 2000) and points to the need for approaches that are designed to politicise and mobilise workers.

The decline in union membership in the United States can be partially attributed to the heavy anti-communist propaganda that followed the Second World War. As a result of the red scare, the labour movement was reshaped to conform to the "American way" of doing business (Chomsky, 2002):

> ...the leadership was right at the centre of the whole post-war destruction of the unions, internationally. In fact, if you look back at their records, which are very fascinating, one of the things that they were most afraid of when they helped to smash the Italian unions, for example, was that they were just too democratic – they wanted them to be more like American unions, and they said so (p 385).

The Canadian unions, while maintaining a higher rate of membership than the Americans, have also suffered declining numbers. In 2000, 29.9 percent of Canadian workers were unionised (Statistics Canada, 2001b) down from 37.2 percent in the 1970s (Riddell and Sharpe, 1998). In the 1970s, the rate of unionisation in the United States was similar to Canada's. It has dropped dramatically to just 13.5 percent in the year 2000 (Economic Policy Institute, 2001). While operating under less hostile conditions than unions in the United States, where right to work legislation destroys bargaining power, Canadian unions nonetheless face growing economic and political challenges as the trend towards neo-liberalism erodes workers rights through its cuts to basic social services and human rights, privatisation of once public institutions and industries, deregulation policies, and subordination to the market (Martinez and Garcia, 2001; Sullivan, 2000; Burke et al., 2002):

> Although unions in Ontario are operating under quite different circumstances than unions in the United States, the debate about what powers workers need to protect their lives and wellbeing transcend the border (Brophy, 1991, p 12).

The labour movement has also been weakened and its sense of universal solidarity eroded by internecine conflicts (Tucker and Storey, 2001). The increasingly competitive and ruthless nature of the economy has spread to the labour movement as unions compete with each other in organising campaigns and conduct raids of each other's existing memberships.

2.3.3 Changing nature of work

The nature of work in Canada, like other developed industrialised nations, is evolving quickly and dramatically. There is an increasing trend towards deindustrialisation, a move towards the higher technical, but lower skilled jobs. There is evidence that lean production manufacturing has added to the dangers of work:

> A review of 190 studies from 23 countries has led a team of Australian researchers to conclude: "Of those studies about 80 percent show a clear deterioration in occupational health and safety associated with downsizing, job insecurity, outsourcing, the use of temporary workers and those sorts of changes." ...the study showed that over the past 20 years the changing nature of the workforce has led to a more dangerous working environment (Hazards, 2003, p 6).

The service industry, which is generally lower paying than industrial jobs, has grown dramatically. In Ontario, between 1971 and 1981, "70% of all new additional jobs were created in business and personal services, trade, finance, insurance and real estate" (Drache and Glasbeek, 1992, p 6). There is an increasing reliance on non-union, contingency workers, part-time and home workers.

Workers have reduced security, reduced income and benefits and increasing threats of job loss in the face of chronic high-level unemployment (Sullivan, 2000). Workers are becoming more and more isolated from each other; there is less and less opportunity for collective action as unionisation declines and economic threats increase.

When the Free Trade Agreement was signed between Canada and the United States in 1988 (Adkin, 1998), it facilitated the flow of goods across the border. It was

followed in 1994, by the North American Free Trade Agreement (NAFTA), which included Mexico. Since the free trade agreements were signed:

> Successive waves of corporate restructuring -- bankruptcies, mergers, takeovers, and downsizing -- have been accompanied by public sector restructuring -- downsizing, deregulation, privatization, and offloading of state responsibilities. Public sector spending and employment have declined sharply, and publicly owned enterprises in strategic sectors such as energy and transportation have been transferred en masse to the private sector (Campbell, 2001, p 21).

Occupational health and safety is, in many ways, becoming a 'luxury' that many Canadian workers feel they cannot afford.

2.3.3.1 Threat of job loss

As Abraham Maslow [2] asserts, when one's ability to put food on the table is threatened, other priorities take a back seat. An injured worker in Windsor, Ontario, described this concept in terms of occupational health and safety in her workplace:

> They have a lot of women in there [Windsor Ceramics] that were there because they had to support their family, like myself, and they're afraid to say anything because, let's face it, with the economy the way it is today, they were afraid for their jobs (Wilson, 1992, np).

The fear of income loss through plant closure, outsourcing, or job elimination can have a very chilling effect on health and safety and environmental activism (Kazis and Grossman, 1982). Workers may feel economically compelled to strike a Faustian bargain choosing to risk their health in exchange for their livelihood:

> Short-term material security is ... typically pitted against occupational or public health and safety concerns. At the same time it is evident that these conflicts stem from a particular construction of the choices available to citizens-as-workers, one which imposes the costs of harmful industrial practices on wage earners either in the form of economic deprivation and insecurity, or in the form of the degradation of health and the quality of life.

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[2] Abraham Maslow (1968) established that there is a human "Hierarchy of Needs." Basic immediate physiological requirements must be met before moving up to the next set of needs, such as safety.

> This trade-off, although experienced by many as a "fact of life," is the outcome of existing relationships of power (Adkin, 1998, pp 12-13).

In Windsor, Ontario, as in many industrial communities, plants have closed down and jobs have been lost to the Southern United States or Mexico where health and safety regulations are much less protective of workers – an advantage for industry both in terms of economics and control:

> Many in Canada fear that labour standards are being pushed down to the United States levels, or else that continuing devaluation of the Canadian dollar is required in order to compete, and failing either, that the United States corporations are withdrawing from Canadian plants. In the United States many fear that the threat of relocation of corporate activities to Mexico is enough to resist higher wage claims and other union activity. In Mexico the lower wage maquila, export-oriented sector, increasingly sets the tone for labour relations and wages overall (Ng, 2000, np).

The global economy and free trade, have given industry a distinct advantage over the labour movement, which remains divided and competitive:

> The neo-conservative agenda to strengthen the power of multi-national corporations to exploit working people is alive and well in Canada. The January 1988 Free Trade Agreement with the United States was a major breakthrough for business interests. It weakened the ability of Canadian workers to defend themselves against corporate demands by making the threat of plant closure a very real possibility...During the first nine months of the Free Trade Agreement, there were 376 corporate takeovers worth $42.6 billion and costing 160,000 jobs (Brophy, 1991, p 12).

Workers may not feel free to exercise their rights under the law because, while in theory, they are protected, in reality they may be risking their own or their co-workers' income security. "This places an enormous burden on an individual worker who must decide whether or not to risk injury by continuing to work or seeing a number of their co-workers sent home without pay" (Ontario Federation of Labour, 1999, p 8).

Robert McArthur (1992), a heavy equipment mechanic in the Windsor rock salt mine, believes the threat of plant closure had an impact on his co-workers' and local union's reluctance to support demands for ventilation to reduce levels of diesel emissions in the underground mine. McArthur said that one of the supervisors openly threatened, "If you keep pushing that issue they're going to close this place." McArthur commented on the impossible bind that put the workers in; as he put it, "You're caught between a rock and a hard place." Unfortunately, the miners themselves were divided in their support of the issue. "The membership was split over the rumours going on – 'they're going to close this place if you guys keep doing this.' You start to question yourself – how far do we go with this?" (np).

Sometimes the threats are empty and are meant only to intimidate; too often they reflect reality. Russ Jackson was a union health and safety representative in a small foundry operation in Windsor, Ontario where he and his co-workers suffered unbearable heat, noise, silica dust, and smoke:

> There was that much dust, dirt and fumes in the plant, you couldn't see your hand...if the molten metal didn't glow, you'd have nothing to see by…it was like working in the dark, only knowing that you're breathing that in and it's not dark out…you were totally black from head to toe (Jackson, 1992, np).

Many of the workers were afraid to make demands, because, according to Jackson, "we had just come out of the recession…and so people were without jobs; people were losing their houses and they were just thankful to get into there because it was one of the few that were hiring (np)." Despite the fears, a work refusal by one of the workers prompted a visit from the Ministry of Labour, which then ordered the plant shut down until the company complied with a set of orders. Jackson was blamed by his co-workers. "I politically took a beating in the plant because… here

we were losing four days pay." The situation went from bad to worse. In an effort to improve air quality inside the foundry, the ventilation system was reconfigured to exhaust much of the particulate, including silica, into the general environment. The Ministry of the Environment then laid a series of charges. In 1990, citing financial problems, the foundry permanently closed its doors. In retrospect, Jackson sees that the situation was impossible. "The workers …were given the option. Either be exposed to the hazards or lose your job. There was basically no in-between" (np).

Once again, the issue of control emerges. Job blackmail can effectively thwart workers' occupational health and safety demands:

> Control over jobs gives employers the power to intimidate. They can close plants and offices, move to other countries and leave people without jobs. Intimidation by employers takes place outside the workplace as well. Communities are led to believe they must accommodate long lists of corporate demands to keep existing jobs in their area or to attract new jobs. The public is offered two options: to give corporations what they want or face higher unemployment (Kazis and Grossman, 1982, p ix).

Economic threats are among the most insidious. However, health and safety prevention and improvement efforts undertaken in an insecure economic environment can be somewhat buffered by using such tactics as eliciting broad community support, using the media, and lobbying government officials. There is some safety in numbers and an industry-wide campaign for improvements can eliminate the bull's eye from any one workplace.

2.3.3.2 Unions and global competition

The global economy has pitted workers in one country against workers in other countries as they compete for jobs. Industry is attracted to countries with weaker regulatory systems, less stringent enforcement, fewer worker demands and greater

employer control. This creates a disadvantage for all workers. It discourages occupational health and safety demands as they may be seen as creating an unfriendly business climate thereby encouraging industry to set up elsewhere.

> The globalisation of the world economy and the development of new technologies have created new challenges for occupational health and safety research. Global worker solidarity is needed to combat this dynamic. Many researchers now believe that it is necessary to extend the scope of this research and that traditional research models are no longer sufficient (Skiöld, 2000, np).

The new global economy may also necessitate a new international labour movement -- led by the union rank-and-file (Chomsky, 2002). Such a movement would be fundamentally different from the American style of unionism, in which labour leaders hold meetings with employers and government officials to make decisions with little or no consultation or involvement of the membership:

> …an international trade union movement, to really be successful, in my opinion, is … simply going to have to be started from the ground up and be run by its participants. And that kind of serious organizing is something that is very difficult to do. It's going to be particularly tricky in the United States – because the labor leadership here has traditionally been almost completely divorced from the workforce (p 384).

A top-down, bureaucratised labour movement cannot effectively reflect the needs of its membership. Furthermore, an alienated, disassociated membership will not have the sense of collective purpose or power that is needed to overcome barriers to health and safety improvements. As labour leaders struggle to run the unions as businesses, economic concerns take precedence over health and safety. The rank and file voice is effectively silenced and occupational health and safety takes a back seat to employment security:

> …most labour organizations function as "service agents," assisting members in the interpretation of legal rights, mediating during collective bargaining, and monitoring agreements. Rank-and-file education and grass-roots coalition-building are activities outside of these institutional priorities. The

> bureaucratic organization created to carry out these functions is characterized by hierarchical and representative, rather than by inclusive and participatory, structures. "Mobilization" increasingly comes to refer to recruiting picketers during strikes, rather than to an ongoing process of education, skill-developing, analysis, and empowerment (Adkin, 1998, p 19).

In the absence of interest in occupational health and safety from labour leaders, it may be necessary for the rank and file itself to organise a global occupational health and safety movement in order to influence the direction and priorities of the unions. The alternative approaches discussed in this dissertation, may provide some of the stepping-stones to achieving such broad-based mobilisation.

2.4 The need for strategies for change

Tackling any one of these barriers to improving health and safety is an enormous undertaking. How can workers and ordinary citizens ever hope to make any difference?

> We've got to stop saying, when people cross over the threshold of their workplace, they lose the same rights they have outside. In fact, people have a right to say we don't want another garbage dump in our area because it has the potential to make us sick...That right should not be taken away from workers simply because they step over that magical line of workplace versus public place (Lambert, 1992, np).

Working people and the general citizenry can feel like very small cogs in a very large wheel. Their sense of insignificance in the broader scheme of society, their own experiences and frustrations in trying to deal with bureaucracies, their financial insecurities in the face of a rapidly changing and impersonal economy, the inaccessibility of information and a growing sense of distrust of the professionals, all serve to stultify resistance.

A colourful collection of workers stories reveals the sense of powerlessness that may be the single most important barrier to improving occupational health and safety:

> Workers' sense of powerlessness in part reflected their lack of confidence in supervisory and management efforts to control workplace hazards. We heard complaints that managers poorly understood the realities of the shop floor, yet ignored the judgements of workers who were in a position to offer solid contributions. Resentful of a hierarchical system that discounted the validity of their experience, workers referred pejoratively to 'those educated men' or to 'those men behind the desk' (Nelkin and Brown, 1984, p 181).

Workers with occupational health and safety concerns face tremendous obstacles to effecting change. Their legitimate concerns may be dismissed as hysteria or ignorance, they may be placated by paternalistic authorities claiming to have the problems under control, or feel beleaguered by the constant challenges and corresponding drain on their personal energy and time. Some choose to ignore the risks. Some become fatalistic. Many feel defeated:

> There was still a high level of [working class culture] when I was growing up in the late 1930s. It took a long time to beat it out of workers' heads and turn them into passive tools; it took a long time to make people accept that this type of exploitation is the only alternative, so they better just forget about their rights and say, 'Okay, I'm degraded.' So the first thing that has to happen, I think, is we have to recover some of that old understanding. I mean, it all starts with cultural changes. We have to dismantle all of this stuff culturally; we've got to change people's minds, their spirits, and help them recover what was common understanding in a more civilized period (Chomsky, 2002, p 250).

2.5 Summary

To challenge corporatist control over human health and wellbeing, occupational health and safety advocates will have to employ powerful and innovative local strategies. New strategies need to take into account not only the importance of increasing workers' knowledge, but also of increasing their power to act on that knowledge:

> What is called for is a strategy that empowers workers, that extends democracy to the workplace and offers a different vision of how society can function with 'liberty and justice for all (Brophy, 1991, p 16).

By participating in research that affirms and values their own experiences, workers can take action together in their own defence and the defence of their co-workers.

The labour movement has tremendous potential to influence change. However, it needs to:

> ...strengthen its resolve to fight the anti-democratic trends in Canadian society. Occupational health and safety offers a strategic opportunity because health and safety in our society is perceived as a paramount value (Sass, 1986, p 580).

With the strategic use of a few new tools, such as worker-based research, perhaps workers can move further forward on occupational health and safety.

This brief analysis of some of the enormous barriers to bringing about occupational health and safety improvements in a corporatist environment demonstrates the need for new approaches. The following chapter will examine the limitations of *conventional research* to address occupational health and safety problems within the corporatist environment. It will further make a case for the adoption of alternative worker-based research such as participatory action research and mapping.

CHAPTER 3: CRITIQUE OF CONVENTIONAL OCCUPATIONAL HEALTH RESEARCH, MEDICAL, AND TECHNICAL PRACTICES

3.0 Introduction

This chapter analyses the limitations of the standard, broadly accepted top-down approaches to occupational health and safety research, medical, and technical practices.

It is argued that these conventional approaches, for a variety of reasons, are generally ineffective as catalysts for change. A case is made for the use of alternative approaches with an intrinsic advocacy element, such as worker-driven participatory action research and mapping. Such alternative approaches (which are described in detail in Chapters 4 and 5), can produce information that is generally unobtainable using conventional approaches and can provide opportunities for the promotion and support of change.

The chapter first analyses the limitations of conventional occupational health *research*. Secondly it explores the limitations of professional occupational health and safety practices under the categories of *occupational medicine, industrial hygiene* and *ergonomics*.

3.1 Limitations of conventional occupational health and safety research

Most occupational health and safety research is conducted using the positivist, quantitative paradigm employing such approaches as epidemiology, toxicology, and biomedicine. Because the issue of occupational health and safety represents social

and political as well as human health phenomena, traditional methods cannot adequately or accurately reflect all of its complexities (Keith et al, 2002).

While conventional scientific, medical and technical research has provided us with important new knowledge regarding occupational health and safety, the continuing human health problems associated with work and the environment described in the previous chapters attest to its limited effectiveness as a catalyst or agent for timely protective change.

This critique of conservative, objective, scientific research in the field of occupational health and safety does not reflect a blanket condemnation of science. Epidemiology, for example, despite its limitations (which are analysed later in the chapter), plays an important role in defining and understanding patterns and trends in mortality and morbidity and can identify risks to human health. Unfortunately, while providing evidence that can be used for regulatory decision-making, epidemiology and other 'hard' sciences do not include the advocacy element that may be required to effect the corresponding occupational health and safety policy or regulatory change (Watterson, 1994a).

Rigourous prior testing and approval often does not exist for environmental or workplace chemicals or processes (Ontario Federation of Labour, 1999c).

Overburdened conventional science has failed to cope with industrial development. In the competitive, market-driven global economy, there are economic and practical reasons for this laissez-faire approach. It would take decades -- possibly centuries -- for an army of scientists to evaluate every possible workplace health hazard:

About 100,000 different chemical products are in use in modern work environments and the number is growing. High exposures to chemical hazards are most prevalent in industries that process chemicals and metals, in the manufacture of certain consumer goods, in the production of textiles and artificial fibres, and in the construction industry. Chemicals are also increasingly used in virtually all types of work, including non-industrial activities such as hospital and office work, cleaning, and provision of cosmetic and beauty services (World Health Organization, 1997, np).

Of those 100,000 substances to which humans may be exposed in everyday and occupational settings, less than one percent has been fully tested for human health impacts (Firth et al., 1997). Lack of regulatory controls in the United States, for example, regularly permit untested new substances to be introduced:

> A more precise picture of human contamination with industrial chemicals, pollutants and pesticides is not possible because chemical companies are not required to tell EPA [Environmental Protection Agency] how their compounds are used or monitor where their products end up in the environment. Neither does U.S. law require chemical companies to conduct basic health and safety testing of their products either before or after they are commercialized. Eighty percent of all applications to produce a new chemical are approved by the U.S. EPA with no health and safety data. Eighty percent of these are approved in three weeks (Environmental Working Group, 2003).

By 2004, the International Agency for Research on Cancer (IARC) had evaluated only 880 substances and processes for their potential to cause cancer. Fewer than one in four of the synthetic chemicals produced in the U.S. has been tested for teratogenic potential (Steingraber, 2001). Their effects on human health are unknown:

> Most chemicals and other hazards have not had adequate long-term tests conducted to determine whether they can cause cancer, damage brain and nervous system function, lung function, immune and hormone systems function, reproductive system function or many other vital bodily functions (Senn Tarlau, 1991, p 72).

3.1.1 Corporatist influence on occupational health research

In a corporatist culture, the scientific community is pervasively influenced to conduct research that would serve the greatest public good as dictated by the industry-dominated state (Chomsky, 1987). If the hearts and minds of scientists cannot be won over, at the very least their activities can be controlled in a practical manner through the limiting of funding, publication, and career advancement opportunities:

> First and foremost, vested interests may use money to inhibit or stall sound science. The increasing role of industry-sponsored research, despite its many benefits, also raises concerns. At the extreme are instances in which an industry sponsors research with the direct goal of countering existing scientific opinion. Economic interests may adversely affect scientific integrity through the delaying of research results and by directly or indirectly influencing the contents of results (Rosenstock and Lee, 2002, p 15).

Conventional occupational health research is hindered by its relative paucity of funding. In the case of cancer, for example, the 1993 U.S. National Cancer Institute budget allocated $205 million to support existing prevention activities but failed to allocate any for research into potential occupational or environmental risk factors (Epstein, 1998).

Researchers who focus on occupational health are also accorded a lower status and fewer research opportunities than those in other health fields (Watterson, 1999, p 114). Only scientific pursuits that are acceptable to the corporatist culture may be deemed to be worthy of support. The "big bosses of medicine or science departments in the universities hold the discretionary powers of a feudal landlord in earlier times" (Gorz, 1980, p 276).

Not only ideological domination but intense competition for research funding and status add to the conservatism of science:

> [competition] leads to the most extreme forms of specialization…This can best be done by pushing research into the most hair splitting details of an otherwise trivial field…The extreme specialization of competing scientists is precisely what capital needed to make its own domination safe. Competing, over-specialized and hair splitting scientists are not likely to unite and translate knowledge into power (pp 276-277).

Fear of being discredited by competing researchers tends to stifle the reporting of less definitive research findings:

> Since scientists choose to be extremely cautious in the reporting of their results, decision makers are often in a difficult position. The information they need will almost always be incomplete…(Schettler et al., 1999, p 47).

In light of these drawbacks, occupational health and safety research may be a personally risky career choice for professionals without strong institutional support.

3.1.2 Quest for objectivity

The limited efficacy of conventional occupational health and safety research in bringing about change is also related to its quest to maintain objectivity and political neutrality. Its practitioners largely shun the advocacy role for fear of appearing non-objective or partisan:

> Like other professional groups, Occupational Safety and Health (OSH) professionals are continually admonished to not let 'politics' interfere with their work. 'Taking sides' in the labor-management struggles over workplace safety and health that continuously present themselves is taboo. Historical accounts of OSH professionals have identified many instances of professionals operating under the veneer of science and impartiality, while protecting the interests of companies employing or funding them (Lax, 2003, np).

There are numerous examples in which industry has been found to have biased scientific research in its favour through financial influence or gate-keeping of results (Center for Science in the Public Interest, 2003, np). Appropriately, those promoting the integrity of science decry such self-interested influence.

Unfortunately, advocacy by the populations-at-risk or their representatives is often perceived in the same negative light. In other words, when attempting to use scientific findings, especially those that are preliminary or inconclusive, to lobby for protective action, they are viewed as non-objective and self-serving. This may be an unfair characterisation, as the potentially at-risk communities do not generally have the degree of financial or institutional control enjoyed by industry and are unlikely to have much influence over research scientists.

The missing element of citizen advocacy may condemn occupational health research that has produced findings of value to the populations-at-risk to a state of limbo. This limitation helps to make the case for worker-involvement in occupational health research, despite the potential lack of objectivity. Community-based research, such as participatory action research, has an action/advocacy component. The various forms of alternative community-based research that are practiced, while differing somewhat in their approaches and theoretical outlooks, tend to share a common "critique of the 'objectivist', reductionist and quantitative paradigm in social sciences" (Loewenson, et al., 1994, p 8).

> Quantification brings credibility. But figures and tables can deceive, and numbers construct their own realities. What can be measured and manipulated statistically is then not only seen as real, it comes to be seen as the only or the whole reality (Chambers, 1997, p 42).

Some proponents of participatory action research contend that in reality there is no such thing as objective science; that research problems, questions and practices are influenced by personal, social, financial and political factors. The "objectivist paradigm ignores one of the basic epistemological questions on the relationship between the object and the subject in the process of generation of knowledge about society" (Loewenson at al., 1994, p 9). Furthermore, the tendency of science to reduce a problem to one or all of its components is destined to miss the bigger picture because the interactions and processes which give each of the pieces meaning are disregarded (Loewenson et al., 1994; Chambers, 1997). This critique of 'positivism' by some PAR proponents does not necessarily represent disapproval of the use of quantitative methods as questionnaires and surveys and other measurement tools are often used in participatory action research. *(This issue is further explored in later chapters)*

In analysing the ongoing environmental crisis, some blame professionals who "break reality down into a multitude of factors and then make decisions on the basis of one or two of these factors at a time, without asking the basic questions about the whole" (Saul, 2001, p. 45). The real challenge is to synthesise and integrate the successfully reduced components. Synthesised knowledge, like that produced by such scientists as Colborn et al. (1996), Steingraber (1998, 2001), and Epstein (1998) is generally dismissed as non-objective. Such maverick synthesising efforts generally must depend financially on philanthropic foundations or non-governmental organisations rather than academic, industry or state-governed research funding agencies.

Scientific philosophers have endlessly grappled with such concepts as the "objective" finding and scientific "truth". Scientism, relativism, realism and numerous other conflicting "isms" each purport to hold the keys to "truth". The positivist notions put forward by Comte and others have been challenged by such theorists as Kuhn who argues that in fact there are many truths. In the 1960s, Kuhn described the ever-changing, revolutionary progression of scientific thought; he observed that it advances from one paradigm to another, with new ideas developing after crises, in which new information produced in the context of contemporaneous terms of reference, renders old ideas invalid. He argued that this progression may never actually lead us to the absolute scientific truth (Kuhn, 1962).

Logical positivism, which was actively promoted in the early 1900s, contended that scientific statements could be proven correct only if they could be shown as verifiable using a specific set of universal rules and language (Hacohen, 1998). Karl Popper, on the other hand, promoted a fallibilist doctrine, which stated that the truth could only be revealed by attempting to disprove hypotheses (Hacohen, 1998; Rothman, 1988; Susser, 1988). However, the fallibilist or falsification theory cannot provide a guarantee of objective truth because:

> The fallibility of scientific knowledge about nature appears to be inherent in its dependence on observations, which are themselves fallible and the inescapable limitation that observations are finite, and thus cannot take into account the infinity of conceivable circumstances in which the laws of nature might be applied (Rothman, 1988, p 5).

Philosophy aside, the quest for scientific objectivity in occupational health research is a very political issue (Lax, 2002). The pursuit of the "objective finding" by "technical experts" in the field of occupational medicine may not be a fundamental

scientific aim, but rather largely intended to discredit and devalue workers' own history and experience. Rigid scientific method can, in fact, be applied in order ***not*** to find positive associations thereby reducing costs to industry of work-related illness and injury (Lax, 2002).

The approaches explored in this dissertation, such as worker-driven participatory action research and mapping, cannot specifically fill all the voids left by standard scientific research. However, as will be discussed, these alternative approaches, which focus instead on the experiential, subjective aspects of occupational health and safety, can provide valid and valuable "scientific" information that can complement and guide conventional approaches (Loewenson, 1995) as well as produce results that cannot generally be achieved using conventional research methods.

3.1.3 Access to information

Conventional research, unlike participatory research and mapping, tends to be generally inaccessible to workers. The language of science acts as a significant barrier to general comprehension. Scientists tend to communicate in a vocabulary that only their peers can understand (Suzuki, 2003).

This is particularly a problem for those workers whose literacy skills are weak. An international literacy survey conducted in twelve countries found that less than 25% of the respondents were functional at the level considered to be the minimum for coping with typical everyday demands of life and work (Human Resources Development Canada, 1995). The survey disclosed that one-third of Canadians are

only marginally literate; 49% to 59% of crafts and assembly line workers and 41% to 52% of workers in resource industries, transportation, trade and hospitality services fall into the lower levels of literacy (Forum File, 1996).

The language of science is among the highest levels of literacy and is increasingly inaccessible to the majority of people:

> Newspapers on average have a LEX [readability formula designed by sociologist, Donald Hayes] score of zero. Back in the 1940s, science journals also scored about zero. Today, these journals reach LEX scores well into the +30s and beyond, meaning they are very difficult to understand. In fact, journals today are often so loaded with jargon that scientists themselves have trouble reading them. This means there's a far greater chance that reporters and the public will misunderstand a story or never get the information at all (Suzuki, 2003, np).

Lack of scientific literacy can put workers at a distinct disadvantage when dealing with issues of health and safety. Most Material Safety Data Sheets (MSDS), which are workers' primary source of health and hazard data on workplace chemicals, are written at a college level of literacy making the information they contain largely inaccessible (Wallerstein, 1992).

Weak literacy skills or a poor grasp of the dominant language of the workplace can also contribute to the unequal power held by management versus workers on joint health and safety committees (Sass, 1993). For example, management may provide evidence in the form of scientific studies to support its position on a health and safety issue. Such studies may be beyond the workers' literacy skills and are therefore "interpreted" (or misinterpreted) for the workers by professionals working for management (Sass, 1993).

Further hampering accessibility, is the practice of publishing in academic journals, which are then housed in universities or research centres where they are not readily accessible to the average citizen (Merrifield, 1993). Some reports may never go beyond the academic or research setting, particularly if the research has been conducted to satisfy some esoteric scientific curiosity or there is political or economic motivation to censor the findings.

The Danish Institute of Occupational Health encourages scientists to begin to share their findings from occupational health research "... through close dialogue with unions and employers organisations, by training researchers to speak in front of public audiences and by working with journalist and communications consultants" (Skiöld, 2000).

Not all research, however, is left to gather dust. Politically motivated, flawed, and/or one-sided research may be used to further the ends of those with a stake in the findings (Merrifield, 1993; Center for Science in the Public Interest, 2003). For example, a series of epidemiological studies was conducted on lung, laryngeal and other cancers among nickel workers at the Inco nickel mine and sintering operation in Sudbury, Ontario. The studies, the findings of which were presented in 1994, all used a large cohort constructed by the Inco management. Years later, researchers discovered that the cohort included office workers, truck drivers, and other unexposed workers, thus diluting the cohort and biasing the studies' findings (Industrial Disease Standards Panel, 1996).

3.1.4 Information withheld

In corporatist economies, one of the tactics used to protect economic interests is to tightly control knowledge. Findings resulting from conventional research are the domain of the researchers or their sponsors. It is possible, therefore, that findings may be intentionally withheld:

> They may believe that the citizens will not be able properly to understand and evaluate the information. They may be afraid that it will be used in a partisan cause and so threaten their own scientific reputation for objectivity. They may also be instructed by their superiors to avoid public comment. Such instances are common among citizens struggling with environmental and occupational health matters (Merrifield, 1993, p 73).

For example, in 1998, Health Canada, Canada's federal Health Ministry, produced a series of reports on the health of communities in seventeen "areas of concern" in the Great Lakes Region of Ontario (Health Canada, 1998). After hearing of the existence of the reports a year after they were produced, the director of the workers' occupational health clinic in Windsor, Ontario requested copies. He was told by a government official that the reports were not being released to the public because they might "create hysteria" (Brophy, 2001). The reports were not made public until a television news reporter, who had been provided with copies by an anonymous source, confronted a government spokesperson with one of the reports on camera (Gilbertson and Brophy, 2001). The interviewee was caught off guard by the reporter's question regarding the government's suppression of the reports. He was seen on camera nervously removing his microphone. He left to make a telephone call and then returned to the interview whereupon he answered the question, admitting that Health Canada had suppressed the reports because they were concerned about public reaction to the findings (Canadian Broadcasting Corporation, 1999). It is believed that:

> This reluctance to release the reports was because of the responses from environmental agencies concerned about costs of clean-up, the reactions of the medical officers of health to the widespread dissemination of uninterpreted data and statistics, and the potential liabilities of governments for exposures of communities to pollutants and for any remedial actions (Gilbertson and Brophy, 2001, p 828).

There may be personal repercussions for those releasing information without their employer's permission, especially if it implicates industry or its products (Adkin, 1998). This control tactic can further inhibit public access to information creating a dangerous situation for workers who need such information to help guide their actions regarding workplace health and safety issues.

There are reported cases of "whistle-blowers" who were reprimanded, lost their jobs, or were discredited for speaking out. Jeffery Wigand, a researcher with Brown and Williamson tobacco company, exposed his employer's practice of increasing the addictive nature of tobacco. The practice, which was publicly denied by the tobacco company, involved "enhancing the effect of the nicotine through the use of chemical additives like ammonia" (Wallace, 1996). Wigand was particularly disturbed by his discovery that the tobacco contained *coumarin*, a known cancer-causing agent:

> I could not in conscience continue with coumarin in a product that we now know, have documentation, is a lung-specific carcinogen…I was told that we would continue working on a substitute and we weren't going to remove it because it would impact sales... I felt an obligation to tell the truth. There were things I observed that I felt needed to be told...(Wigand, 1996, np).

The scandal was exposed on a widely watched national U.S. television programme:

> The man they set out to destroy is Dr. Jeffrey Wigand, their former three-hundred-thousand-dollar-a-year director of research. They employed prestigious law firms to sue him, a high-powered investigation firm to probe

> every nook and cranny of his life. And they hired a big-time public relations consultant to help them plant damaging stories about him in the Washington Post, the Wall Street Journal, and others...(Mike Wallace, 1996, np).

Although legislation does exist to protect against such retribution, power inequalities, economic reality and distrust in the justice system can make whistle-blowing a frightening and risky prospect (Adkin, 1998). Such censorship of knowledge through intimidation has serious implications for workers who may likewise be denied access to important information or who are afraid to share information they have obtained with others.

As will be shown, information obtained through participatory action research and mapping is much less constrained than that achieved through conventional academic or industry-controlled research. The data and findings belong to the worker-researchers and any collaborating parties and are therefore theirs to disseminate or make public. As will be discussed in Chapters 4 and 5, the collective nature and solidarity-enhancing character of participatory action research and mapping reduce the risk of retribution by an offended employer, industry or agency.

3.1.5 Policy setting

There are weaknesses in the process of decision-making that influences policy-setting and regulation. The pursuit of knowledge regarding the links between chemicals and disease is not a priority for policy-makers, nor even a sought-after goal because of its economic implications:

> Even where specific cancer-causing materials have been clearly identified, developing and implementing social policies to reduce exposures and avoid cancer present some bewildering social challenges. Consider how long modern societies debated whether to take any decisive actions to discourage cigarette smoking...In this regard, the struggles over tobacco control provide

> an unfortunate paradigm that is relevant to any attempt to reduce exposures to known or suspected cancer-causing materials, which are also key materials in commerce (Davis and Muir, 1995, p 305).

Scientific determinations are not automatically translated into policy. For example, one of the functions of the U.S. Department of Health and Human Services is to issue reports on carcinogens. These reports are used by employers, suppliers and government agencies as the basis for making decisions regarding restriction of occupational exposures to carcinogens.

The 9th Report on Carcinogens (RoC) (United States Department of Health and Human Services, 2001) lists 218 substances or processes that are "known to be human carcinogens" or are "reasonably anticipated to be human carcinogens."

The process by which a substance is considered for listing has limitations. For example, some substances are included following listing by other agencies, such as the International Agency for Research on Cancer (IARC). Others are considered through nominations from the public, from National Toxicology Program member agencies, and from published literature. A peer review process determines whether a nomination "warrants formal consideration" and a further screening process follows. Throughout the years, entries have been added and others have been dropped or reclassified. For example, saccharin, which had been classified since 1981 as "reasonably anticipated to be a human carcinogen," was removed from the 9th edition after it was determined that the particular rodent data used was not applicable to humans. There were 14 new entries as well. While components of tobacco smoke had been previously listed, it was not until the 9th report that

environmental tobacco smoke, tobacco smoking and smokeless tobacco were added following "the 1996 revision of the review process that allows for the review and listing of exposure circumstances in the RoC".

The list continues to evolve in its less than systematic and comprehensive manner:

> Such advisory agencies may have little power to influence the regulatory process. The U.S. advisory agency, for example, states that the listing of a substance is "not a regulatory action, but listing may prompt regulatory agencies to consider limiting exposures or uses of a substance" (United States Department of Health and Human Services, 2001, np).

In fact, the setting of policy and regulations can be a tortuous process with no guarantees that protection of public health will be the paramount priority. It involves a complex interplay between "experts" and "policy-makers" (Millstone, 2003):

> When it comes to deciding what the goals of policy are, it is not something you can either just give to policy-makers or give to the experts, because the kinds of judgements that need to be made are intrinsically hybrid and involve integrating technical and political judgements. Therefore the role of evidence gets terribly complicated (np).

The decision-making process for the protection of the environment from persistent toxic chemicals is a case in point. Legislation has been established in the United States and Canada to regulate the discharge of such toxic substances into the ecosystem. However, the administrative process attached to the legislation is complex, time-consuming, and fraught with barriers (Gilbertson, 1992).

The flow diagram shown in Figure 3.1 illustrates the complexity of the process. "The process itself, because of its complexity and burden of proof, can be a barrier in its own right" (p 5).

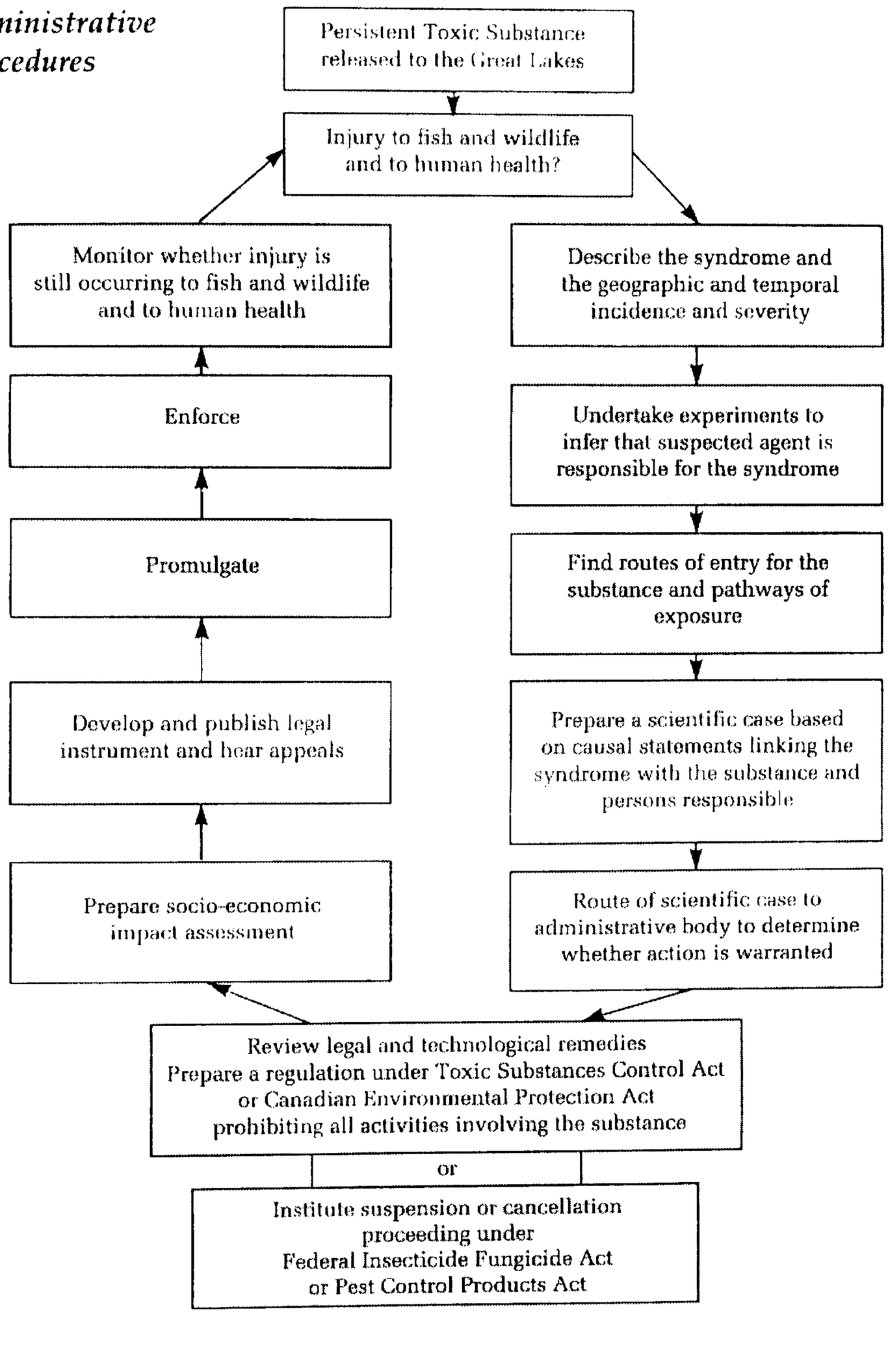
Besides scientific uncertainties, economic costs can be barriers to the implementation of preventative measures: "The policy-maker is constantly trying to balance the severity or stringency of the regulations against the costs of losing a valuable natural resource or causing impaired human health or development" (p 7).

> In the end, we must recognize that while science can inform us in many ways, science cannot itself make decisions for us. Science is a tool. When it is used appropriately, it can provide some of the information we need to make decisions likely to protect health (Schettler et al., 1999, p 48).

Science alone cannot prioritise workers' health and safety in relation to corporate profit and regulatory freedom.

Figure 3.1

Responsibilities of Regulatory Agency when Injury has been caused by Persistent Toxic Substances.



Source: Gilbertson, 1992, p 4

3.1.5.1 Need for Precautionary Principle in occupational health and safety

There has been a movement afoot since the 1970s advocating for the adoption of the *Precautionary Principle* (Kriebel et al., 2001). It promotes the notion that questions should be asked and answered first about the safety of a particular process or substance before it is introduced into the work or general environment (Grandjean et al., 2004). The Precautionary Principle stipulates:

> We must act on facts, and on the most accurate interpretation of them, using the best scientific information. That does not mean we must sit back until we have 100% evidence about everything. Where the state of the health of the people is at stake, the risks can be so high and the costs of corrective action so great, that prevention is better than cure. We must analyse the possible benefits and costs of action and inaction. Where there are significant risks of damage to the public health, we should be prepared to take action to diminish those risks even when the scientific knowledge is not conclusive, if the balance of likely costs and benefits justifies it (Horton, 1998, p 251).

Employers, government institutions, and the medical community often demand an impossibly high standard of proof before they are prepared to act on occupational or environmental health and safety. Study after study is carried out, often with the conclusions of one being disproved by the next, only to be reversed again by the next (Watterson, 1994b). While debates continue about how to interpret contradictory findings, and then to determine that the scientific evidence is sufficiently convincing to declare a substance or a condition to be hazardous, people continue to be exposed. Whether struggling with the scientific uncertainty regarding the safety of foods, or a particular industrial process, there is a range of factors involved in the regulatory decision-making process that goes beyond the advice scientists can confer:

> The relationship between science and policy is neither politicians telling the scientists what their goals should be, or the scientists telling the politicians what the goals should be, but a much richer exchange whereby the policy-

> makers articulate the range of options available and under consideration and the experts can then gather the evidence, review it and deliberate and make informed judgements about what is known and not known about the consequences of following, or failing to follow, a range of different options (Millstone, 2003, np).

Unfortunately, the coincidence of corporatism and scepticism can undermine such rational moral decision-making.

Dr. John Snow, a historical figure, is known not only for employing what might now be considered an action research approach to a public health problem *(see Chapter 4)*, but also for demonstrating that we need not wait until we have reached absolute certainty before corrective steps are taken. Although his record regarding the identification of workplace-induced disease has been criticised (Sandler, 2000; Lilienfied, 2000; Vandenbrouke, 2000), Snow is credited with having advanced disease prevention strategies in the area of community health (Paci, 1996). Snow worked among Irish immigrants who lived in the inner city of London, England during the 1840s. During a ten-day period, 500 people in a single London neighbourhood died from cholera. Snow observed that most of these people drew their water from the same community pump. On his own initiative, Snow removed the handle from the pump and new cholera cases dropped dramatically. Although Dr. Snow never knew the precise cause of the cholera outbreak, he had found a life-saving solution. It was to be another 30 years before the medical community learned that cholera was caused by bacteria, often transmitted through contaminated water.

This story illustrates that, while a full understanding of a cause and effect relationship may require that information be systematically gathered and analysed, we need not wait until we have irrefutable evidence before we act to eliminate a likely hazard (Paci, 1996).

Workers, community members and health professionals living in exposed communities often know, at some level, what it is that is hurting them. Like Snow, they may not know the exact physiological or biological mechanisms at play, but their own experience is a powerful source of information and knowledge and should not be disregarded. No one knows the environment better than those who work or live in it and even a strong hunch may be enough to act upon.

3.1.5.2 Burden of proof

The usual practice of considering a substance or process, old or new, to be innocent until proven guilty has been widely condoned and tolerated by policy-makers, the public health community, employers and regulators (Montague, 1995). Chemicals and industrial processes are introduced with a minimum of scientific testing and a lack of certainty regarding their potential for harm to the environment or human health. The onus probandi (burden of proof) lies not with the producers of chemicals but with injured workers, consumers and bystanders downstream, who are at a disadvantage when it comes to establishing harm. This is particularly so in a judicial context because of the limitations of science in determining cause and effect with a high degree of scientific certainty:

> Where there is insufficient evidence for the plaintiff to demonstrate on a balance of probabilities that a toxic defendant's negligence caused a preponderance of the global risk factors (i.e. 51%), the plaintiff will fail on a

traditional causation analysis (Collins, 2001, p 106).

Synthetic pesticides provide an illustrative example of the tendency towards denial of potential harm. In the mid 1940's, dichloro-diphenyl-trichloroethane (DDT) was introduced into extensive use on all manner of crops in North America for insect control and even more widely for mosquito control (Carson, 1962). Warnings went unheeded (Carson, 1962) and human exposures were widespread, ranging from chemical workers producing the pesticide products, farm workers who were spraying or working in the fields and orchards, by-standers in the vicinity, and consumers of contaminated food and water. What was not known at the time DDT was introduced, was its teratogenic and anti-androgenic potential (Kelse et al., 1995). DDT residues and metabolites are still found in North America, almost three decades after it was banned. It is present in soil, water, wildlife, human tissue, and breast milk. There are detectable levels in every human being in the U.S. (Steingraber, 1998). In a 1999 study of chemical contaminants in human amniotic fluid, one third of the thirty samples examined had measurable amounts of organochlorine pesticides, including DDT (Steingraber, 2001, p 75). Acting on early knowledge, though incomplete, may have prevented contamination that will remain for generations.

3.1.5.3 Precautionary Principle in occupational health and safety

A classic example in the realm of occupational health and safety of the failure to act when evidence was adequate to raise alarm, is that of asbestos. There were reports of disease within twenty years of the beginning of asbestos mining (Gee and Greenberg, 2001). Yet it would be many decades before substantial action was

taken to protect workers and its use continues in many countries, despite overwhelming evidence that it causes cancer, asbestosis, mesothelioma and other diseases (Firth et al. 1998; Gee and Greenberg, 2001). As discussed later in the chapter, the failure to act on evidence was largely due to the interference of the asbestos industry (Gee and Greenberg, 2001).

Interestingly, an admonishment to act on uncertain scientific knowledge for the protection of human health was issued forty years ago by Sir Bradford Hill, who is perhaps best known for his criteria for determining causality. His guidelines require that certain conditions be met before one can claim cause and effect. The criteria are essentially: "strength of association;" "consistency;" "specificity;" "temporality;" "biological gradient;" "biological plausibility;" "coherence;" "experiment;" and "analogy" (Industrial Disease Standards Panel, 1994, np). The Industrial Disease Standards Panel (IDSP) in Ontario used the Hill criteria in its determination of work-relatedness of disease:

> An industrial disease can be identified when there is established evidence of a "probable connection" between a disease and an industrial process or a connection to a toxic agent or carcinogen. The evidence that the IDSP weighs to find a "probable connection" is scientific and medical in nature. Specifically, the IDSP considers epidemiological studies, hygiene information about workplace exposures, toxicological evidence about the identified contaminants and alternative causes of lung cancer, in particular smoking. When evaluating this evidence, the IDSP continues to be aided by the work of Sir Austin Bradford Hill (Industrial Disease Standards Panel, 1994, np).

While practical "for retrospective analysis," Hill's criteria may be "less appropriate for new problems or other prospective decision situations" (International Joint Commission, 1995). For example, the use of the criteria may not be fitting where a potentially immediate disease risk exists as a result of the introduction of a new

process or substance or for the determination of occupational disease causality where timely action may be needed for the protection of human health. However, even Hill stresses that his criteria are meant only as guidelines and that it is important to act upon even preliminary knowledge as scientific work is never complete (Hill, 1965).

As is discussed in Chapter 4, participatory action research shares elements in common with the Precautionary Principle. The wellbeing of the subject community is of the foremost importance. Participatory action research, as its name implies, has a strong action orientation; in fact, corrective action is the raison d'être for the research.

3.1.6 Statistical significance

While scientific rigour is commendable, efforts to provide adequate evidence of the need for preventative or corrective action in occupational health and safety can be thwarted by the rigidity of scientific approaches. Standard research protocols and statistical testing can be so rigid that many associations between occupational exposures and the occurrence of disease cannot be readily demonstrated scientifically.

Achieving high statistical significance is a standard goal of scientists and statisticians. The fear of making false *positive* errors, in other words finding an association where none exists, is deeply entrenched in the scientific community. By insuring that such "mistakes" do not happen, scientists and statisticians have created another more troubling menace, the possibility of making false *negative* errors, in

other words failing to identify an association where one actually exists (Brown and Mikkelson, 1990). To publish a false positive association is considered worse from the standpoint of career and credibility than to make a false negative association.

When studying occupational disease, it may not be possible to collect data of adequate quality and quantity to achieve scientifically defensible results or statistical significance:

> In these gray areas, status quo activities that potentially threaten human health and environmental health are often allowed to continue because the norms of traditional science demand high confidence in order to reject the null hypothesis, and so to detect harmful effects…This scientific conservatism is often interpreted as favouring promoters of a potentially harmful technology or activity when the science does not produce overwhelming evidence of harm (Kriebel et al., 2001, p 875).

This raises the fundamental and troubling question of whether lack of evidence should be accepted as the same as absence of harm (Altman and Bland, 1995; Tickner, 1997). "The Type II error, which fails to detect something which actually does exist, is by convention set at 20%…Twenty percent of the time, a real phenomenon will be missed because the data were not strong enough to convincingly demonstrate its existence" (Kriebel et al., 2001, p 873). Such false negative errors, spawned by the conservativism of science, can put workers' health in jeopardy:

> In other words, in order for scientists to accept that the new restaurant design causes problems for waitresses, a study must establish the hurtful effects 'at the 5 percent level.' This means that even if the researchers would have only two chances in 20 of being wrong if they concluded there was a risk, the study is considered to be 'negative' -- that is, no risk has been demonstrated (Messing, 1998, p 76).

The demand for such statistical certainty has been used by industry as an excuse for inaction:

> ...even when the evidence has become clear they try to roadblock implementation of controls by arguing economic or technical feasibility. The corporations have even committed job blackmail by threatening job loss if protective requirements are made mandatory. They have twisted a research principle and use it as a weapon when health and safety or community activists are arguing that a chemical or process being used may be dangerous and are demanding that precautions be taken (Ontario Federation of Labour, 2000, pp 29-30).

3.1.7 Bias

Conservative empirical research, with its criteria and protocols, is proposed as the pathway to scientific truths. Action researchers Greenwood and Levin (1998) are not convinced -- research is fraught with unscientific and even subjective characteristics and biases. Decisions regarding what research problems are to be studied and what approaches to take can be based on personal interests or influenced by the previous experience of the researchers, or by curiosity regarding a question raised by previous study, or by such purely practical issues as access to technology, equipment, or funds. Decisions throughout the research process are made by the research team, who use subjective gate-keeping (Greenwood and Levin, 1998; Schettler et al., 1999).

Research is essentially a collective activity. A community of scientists generates literature upon which knowledge is derived and decisions are made; the research institution and researchers form a "complex, dynamic social system of people acting on phenomena and sharing their thoughts within the pragmatic limitations set by the availability of key resources and the dynamics of the human relationships involved" (Greenwood and Levin, 1998, p. 64).

"Scientific research is, of course, socially constructed through policy decisions on funding, support for one approach or theory over another and so on" (Watterson, 1994b, p 272). It follows that, if occupational health issues are not high on the priority list for researchers or funding institutions, they are not likely to be studied by the scientific community.

The lack of scientific literature on a given topic can also influence the prospects for further study (Messing, 1998). Scientists have a tendency to study, down to the most minute detail, substances that have been previously studied and have been identified as hazardous to human health. For example, the health effects of exposure to such occupational hazards as asbestos, lead and polychlorinated biphenyls have been scientifically scrutinised while other toxicants are ignored (Kriebel et al., 2001).

As is discussed in Chapters 4 and 5, unlike conventional research, participatory action research and mapping not are not generally circumscribed by rigidly dictated protocols. While conventional tools and methods may be applied in participatory action research, alternative qualitative methods are frequently substituted. The primary difference, however, is not in the methods or tools, but in the overall approach and philosophy (Merrifield, 1997). The choices of issues to be researched, for example, are determined by the populations potentially at risk, in other words, the 'community', versus the priorities set by researchers or their sponsors. Participatory action research and mapping are often unapologetically subjective. Action can take place at any stage of the research as determined by the

researchers and subject community following a collective or consensus decision-making process that is unconstrained by scientific red-tape.

3.1.8 Cluster investigations

Occupational and environmental disease clusters pose a particular challenge for conventional science. A cluster is defined as "an unusual aggregation, real or perceived, of health events that are grouped together in time and space…" (Agency for Toxic Substances and Disease Registry, 2003, np). Of 108 cancer cluster studies conducted by the U.S. Centres for Disease Control, not one was able to establish cause (Caldwell, 1990).

Traditional epidemiology may simply be too crude a tool for cluster investigations (Legator, 1993). The number of cases is usually too small to meet conventional criteria. In fact, the insensitivity of standard epidemiology can be used to intentionally ***not*** find problems when a positive study would be inconvenient to corporate or government interests (Legator, 1993). As scientific certainty cannot be achieved through the conventional epidemiological methods applied, a convenient escape hatch is provided for those with a stake in denying the hazards.

The following example of cancer among a cluster of telephone company employees illustrates this phenomenon: When five cases of breast cancer, along with cancers of the colon, brain and uterus, were diagnosed among a workforce of fifty employees on a single floor of the Bell Canada office in Hamilton, Ontario, scientific experts pronounced that the cancers had no relationship to the women`s jobs (Firth et al., 1997). Despite the fact that the breast cancer incidence was ten

times what would be expected in the general population, Dr. Gilles Theriault from McGill University in Quebec proclaimed that, "it had all the characteristics of a classical cluster which has happened by chance" (Globe & Mail, 1996). Robert Park, an epidemiologist from the United Auto Workers, disagreed: "The five cases [of breast cancer], representing a ten-fold increased incidence, of course could be a random cluster; this is always the default conclusion when a plausible exposure cannot be identified. However statistically this cluster was quite unlikely" (Park, 1996, np). The Communications, Energy and Paperworkers Union, which represents the Bell workers, suspected that high levels of electromagnetic fields emanating from the electronic equipment in the building were a factor in the development of the cancers and they filed compensation claims on behalf of the stricken workers. All of the claims were denied. Two of the women with breast cancer have since died.

Participatory action research and mapping can be used to investigate occupational health problems, such as cluster investigations, that do not lend themselves well to standard epidemiological studies *(see Chapter 8, case study of Holmes foundry workers)*.

3.1.9 Women and minorities

The need for *prior* study and publication to elicit *further* study is an issue for occupational groups that have been largely unstudied, such as gaming workers (Keith et al., 2001), waitresses, bank workers, cleaners, and for all segments of the working population, for instance, women or racial minorities, who have been systematically eliminated from much of the occupational health research (Zahm et

al., 1994; Zahm and Blair, 2003; Messing, 1998; Messing et al., 2003).

Furthermore, because women and racial minorities often make up a smaller percentage of many industrial workforces, the size of the resulting cohorts may not provide adequate statistical power to produce meaningful results using conventional epidemiological research.

This does not mean that women cannot be studied. It simply means that non-traditional approaches may be required. There is a need to "gather information relevant to women's occupational health and analyze it in such a way that the health problems and their sources become visible" (Messing, 1998, p 173).

Results of studies carried out on men are not necessarily transferable to women nor can they accurately reflect the hazards facing women workers. Differences between genders, such as body size, amount of adipose tissue, reproductive organs, hormonal make-up, heart function, and others can impact the effects of toxic agents on the body (Firth et al., 1997; Messing et al., 2003). Moreover, some diseases are only relevant physiologically for women, such as ovarian, breast and uterine cancer, endometriosis, and issues related to pregnancy.

The incidence of breast cancer, for example, has risen steadily in the second half of the past century -- the same time frame that saw women entering the workforce in record numbers. It also coincides with increasing exposures to agricultural and environmental industrial chemical pollutants. The incidence of breast cancer cases diagnosed in Ontario increased by seventeen percent from 1971 to 1996 (Cancer Care Ontario, 2000). There has been much speculation regarding the reasons for the

increase, such as greater longevity and improved diagnostic procedures. But these explanations do not hold up under scrutiny and they do not explain the escalating breast cancer incidence among younger women (Epstein and Steinman, 1997; Firth et al., 1997 p. 60).

There is increasing evidence about the risks of exogenous chemical exposures. Of particular concern is the family of synthetic substances that "mimic" estrogens -- xenoestrogens. It has been suggested that they have the ability to disrupt the endocrine system and contribute to the cancer process, particularly from prenatal exposures. This group includes organochlorine pesticides, polycyclic aromatic hydrocarbons, organic solvents and plastics (Degan and Bolt, 2000, Birbaum and Fenton, 2003, Firth et al., 1997).

The few women's occupational health studies that have been done using conventional research suggest an increased breast cancer risk for electrical workers (Loomis et al., 1994; Epstein and Steinman, 1997), hairdressers and beauticians, workers in the petrochemical industry, pharmaceutical workers, radiation workers, metal workers, teachers, telephone operators, nurses, and secretaries, among others (Epstein and Steinman, 1997). This suggests that further exploration is needed, perhaps using both traditional and alternative approaches.

As will be discussed in the chapters to follow, participatory action research and mapping may help to overcome some of the biases inherent in conventional research by involving women and focussing on the issues that may be particularly relevant to them. The case study of casino gaming workers, for example, which is described in

Chapter 7, was largely led by women and care was taken to ensure that women were equally represented as participants (Messing et al., 2003).

3.1.10 Inconsistencies, contradictions and fraud

Scientific research has produced so many conflicting reports that the public has become disillusioned and distrustful. This is an important issue for this dissertation; participatory action research and mapping, in contrast to conventional research approaches, serve to provide the community and workers with a sense of control, ownership and trust (as further explored in the chapters to follow).

3.1.10.1 Conflicting reports

The public is inundated with conflicting reports on health effects related to issues of diet, alcohol use and radiation exposure and on the effectiveness of some medical and pharmaceutical treatments (Watterson, 1994b). Many chemicals that were once promoted as perfectly safe have since been revealed to have disastrous human health effects. The prescribing of such teratogenic pharmaceuticals as diethylstilbestrol and thalidomide during pregnancy has made consumers understandably wary and distrustful of science and medicine (Colborn et al., 1996; Steingraber, 2001). Upon review, *safe* exposure limits for many chemicals have been lowered after new findings proved the old limits to be inadequate to protect health. Unfortunately, some exposure limits are regularly exceeded in the course of daily living. Dioxin, for example, is ingested by Americans at 2 to 100 times the level considered to be "safe" with breast-feeding supplying some of the highest doses (Schettler, 2000). Resulting adverse human health impacts are predicted, yet preventative action is slow to come.

3.1.10.2 Discrediting of science that does not favour industry

Defensive corporations may attempt to discredit research that calls the safety of their products and practices into question, describing it as "junk science" (Ong and Glantz, 2001; Huber, 1991). A pro industry web site defines junk science as "faulty scientific data and analysis used to further a special agenda" (JunkScience.com, 2002, np). The site offers a number of examples of groups that might be interested in faulty science: "Social activists, such as the 'food police,' environmental extremists, and gun-control advocates, may use junk science to achieve social and political change." Such terms as "special interest groups" are used to raise suspicion about researchers' integrity and objectivity.

The economic and political influences on scientific integrity and disinformation have been described as "greenwashing," a public relations (PR) effort to which industry allots significant financial resources:

> Greenwashing deals with PR, not production of new knowledge. Large efforts are made in order to prevent research that might result in bad news for industry – the less research alarms the better. If it is not possible to prevent such research it must be discredited. That is the task for researchers involved in greenwashing (Walhjalt, 2002, p 74).

Such political interference can put workers' health and safety in jeopardy if it results in suppression of information regarding potential hazards.

3.1.10.3 Industry bias

Corporate-sponsored research is not immune to influence from its own particular special interests (Hazards, 2001). The chemical industry was successful in its efforts to keep such dangerous products as atrazine, alachlor, perchloroethylene and

formaldehyde on the market (Fagin and Lavelle, 1996). Although all are categorised by the Environmental Protection Agency as either possible or probable human carcinogens, their widespread use continues. The failure to protect human health is a direct result of industry's intrusion into the regulatory process (Montague, 1997).

Research results may reflect the sponsors' biases:

> … studies have found a strong association between author's opinions and their financial affiliations. A review of studies on selected chemicals (alachlor, atrazine, formaldehyde, and perchloroethylene) found that 60% of studies conducted by non-industry researchers found these chemicals hazardous, while only 14% of industry-sponsored studies did so (Rosenstock and Lee, 2002, p 15).

The asbestos industry provides another example of industry-bias in science. For decades, the asbestos industry staunchly defended the safety of its products despite ever-growing evidence of its deadly nature. The industry was caught lying about what and when it knew of the hazards of asbestos during legal proceedings. Inter-managerial memos revealed that, in fact, industry officials had known of the hazards of asbestos for years but had suppressed the evidence. The cover-up:

> …shaped and distorted scientific research and public policy on the issue. The result has been needless loss of tens of thousands of lives over several decades, with many thousands more expected, as well as profound human suffering by the victims of asbestos diseases and their families (Kotelchuk, 1987, p 192).

It is estimated that more than 100,000 workers die each year globally from asbestos exposure (International Labour Organization, 1999). Peto et al. (1999) predict from 5,000 to 9,000 deaths each year among men in Western Europe by 2018 from asbestos-induced mesothelioma alone.

Science can also be distorted or discredited by corporate interests through the use of rhetoric and media manipulation which serve to:

> ...confuse and mislead the public on the importance of the environmental situation, they are being adopted and used as a basis for critical policy decisions – often without careful examination of potential consequences for those decisions (Ehrlich and Ehrlich, 1996, p 201).

3.1.10.4 Industry distortion

One tactic used in industry-sponsored studies is to downplay the potential harm of synthetic chemicals by comparing them to naturally occurring toxins:

> The chemical industry argues that its products pose no cause for concern...The industry frequently points out that plants create toxins to ward off pests and natural predators. The amount of these natural cancer-causing chemicals in the daily diet is 10,000 times greater than the residue of pesticides and pollutants created by man, according to a 1996 study by the National Academy of Sciences. The study was financed partly by the federal government and partly by a group of pesticide and food companies that included Ciba-Geigy, Dow, and Monsanto (Fagin and Lavelle, 1999, p 2).

Such assurances can lull the consumer into a false sense of security. Synthetic toxins may in fact be much more hazardous than natural toxins to human health: "Humans have had millions of years to evolve ways of metabolizing naturally occurring toxins. We are badly overmatched by synthetic chemicals that typically are only a generation or two old" (Fagin and Lavelle, 1999, p 3).

3.1.10.5 Threat of retribution and professional discrediting

The threat of retribution is an effective corporate silencing tactic. For example, the practice of discrediting science and professionals who do not present industry in a favourable light has had a chilling effect on expert testimony in judicial hearings.

Efforts by defendants to discredit expert witnesses can damage their professional reputations (Scientific Knowledge and Public Policy, 2003).

One environmental scientist expressed his dismay regarding the reticence of scientists to openly communicate their findings or concerns for fear of reprisal or harm to their professional reputations:

> The scientists alleging this damage to health are fearful for their reputations in case, in the process of trying to prove the case in court, the lawyers and judges reject the allegations and destroy their credibility. I have been doing this research or involved in regulations for more than thirty-five years. As a scientist, I was initially baffled by the degree of scepticism that my findings ran into, even with my fellow scientists, and particularly with policy makers. As a humanist and ecologist, I have been concerned that this extreme scepticism was leading to continued damage to people, and destruction to a wide array of natural resources (Gilbertson, 2001, np).

This is not a new phenomenon. In 1633, in order to save his life, Galileo was forced to recant his purportedly heretical heliocentric theory about the relative motion of the earth to the sun (Rosenstock and Lee, 2002).

A classic example in occupational health is that of Dr. William Hueper who observed a high rate of bladder cancer among beta-Naphthylamine exposed workers at du Pont (Agran, 1977). He was fired by du Pont for speaking out (Garrett, 2001) but in the end it was revealed that he was right:

> The du Pont Company recently admitted that 339 of its 2,000 workers exposed to beta-Naphthylamine (BNA) during the years 1919-1955 fell victim to bladder cancer. Although du Pont knew BNA was an incredibly potent human carcinogen as early as 1938, the company didn't eliminate the substance from its dyestuffs operations until 1955 (np).

Another well-known figure in the occupational health community, Alice Stewart, was the first to call into question the safety of radiation exposure for pregnant women after she observed elevated rates of leukaemia among their offspring. Attempts were made to discredit her for making this unpopular observation. She was also the first to put forward the unpopular theory of the "healthy worker effect." She essentially argued that industrial workers, because their jobs demanded a high degree of strength and vigour, were less likely to present symptoms or succumb to disease because they were generally healthier than the population at large. Once again, she was discredited and her findings dismissed (Fuller, 2000). We now know that she was quite right about the hazards associated with prenatal exposure to radiation and *healthy worker effect* is now an accepted epidemiological phenomenon (Fuller, 2000).

3.1.10.6 Valuable but vulnerable

Of course not all conventional research is corrupt -- far from it -- but the point is that it is vulnerable to abuse:

> These criticisms do not question the power, relevance and utility of science, measurements and mathematics in many domains. The point is that their proven utility and the reverence attached to them also enable them to be misused and to mislead (Chambers, 1997, p 42).

By contrast, as outlined in Chapters 4 and 5 and shown in the case studies in Chapters 7 and 8, the process and results of participatory action research and mapping are not as readily subjected to potential corporate manipulation, distortion or manufactured inaccessibility.

3.1.11 A need for both conventional and participatory action research?

There are obvious contradictions to this critique of conventional occupational health and safety research. It should not be seen as a wholesale rejection or condemnation of positivist, empirical research. Health and safety advocates are eager for relevant, accessible, well-constructed, "objective" empirical research that can be presented as evidence to demonstrate the need for improvements and for establishing associations for compensation purposes.

The major criticism of conventional research is its inability to bring about change in such areas as: improving regulation and enforcement, influencing workplace improvements, raising community awareness, informing the population at risk, promoting prevention strategies, and influencing policy changes. In fact, it has the potential to adversely influence policy:

> As government agencies, academic centres and their researchers increasingly provide the science base for policy decisions, they are also subject to forces that seek to politicise or silence objective, scientific research. We refer not to the honest differences and conflicts that arise in response to scientific uncertainty, but to the pressure to use science to justify policy (even when the data are inadequate) as well as the vested interests that exploit scientific uncertainty to deflect attention from what is known and from the actions that would credibly follow that knowledge (Rosenstock and Lee, 2002, p 14).

The use of qualitative research methods is encouraged to reflect the knowledge, experiences and concerns of the population at risk (Brown, 2003). Researchers should ask, "'What's it like?' rather than 'How many?' or 'How much?'" thereby providing more meaningful and relevant information (Skiöld, 2000, np). In fact, the research process may be every bit as meaningful as the results (as is further elaborated in Chapters 4 through 9):

> The current, dominant experimental paradigm in the occupational health research establishment, with its emphasis on identifying causal connections. focuses attention on outcome at the expense of process (Griffiths, 1999, p 589).

Based on the limitations of conventional research that have been outlined in this chapter, workers and community members should consider the following questions when evaluating an occupational health and safety research study:

- Is the methodology appropriate for studying occupational health and, in particular, undertaking cluster investigations?
- Who will set the research priorities and on what basis?
- Who will make the decisions about the implications of the research; will it be simply academic?
- Will the research truly be conducted in as unbiased a manner as claimed?
- Will women and minorities be included, if applicable?
- Will workers and community members have input into the research process; in other words, will they be included in decision-making and will their experiences, knowledge and concerns be taken into account?
- Will the findings be accessible? How will they be communicated?
- How might the results be used? Is there potential for effecting change, if indicated by the findings?

These topics will be addressed in the following chapters in the discussion of the merits of worker-driven participatory action research and mapping.

3.2 Limitations of occupational health and safety professional practices

Two decades ago a labour theorist from the University of Saskatchewan expressed, in no uncertain terms, how he felt about occupational health professionals:

> I have no confidence that the middle class movement or the professions, whether it be the medical profession, the hygienists or any other social do-gooders will bring about the necessary reforms regarding occupational health and the quality of our life. I don't see that. I have no confidence whatsoever in these groups and I don't think anyone should when you look at their history. These professions, when you really think about it on the whole, have been the hostages of 'capital' (Sass, 1982, np).

While this may seem to be a harsh criticism, there are limitations to the practices of occupational health and safety professionals in terms of their effectiveness as agents of change. The following is a brief analysis of some of the limitations.

3.3 Limitations of the medical model in occupational health and safety

General practitioners, accident and emergency room physicians and specialists are often the first and last point of contact for victims of occupational disease and injury. As many physicians are ill equipped to diagnose work-related diseases (Lax, 1998), many victims remain unacknowledged and uncompensated. The conditions which caused the diseases and injuries are therefore likely to remain uncorrected.

Physicians have an important role to play in treating and supporting injured and diseased workers and in establishing work-relatedness on a patient-by-patient basis. However, many are unable to make accurate diagnoses of work-relatedness (Lax, 1998) and generally have limited influence in terms of changing conditions in the workplace. As will be discussed in the following chapters, and in particular in the foundry workers' case study in Chapter 8, participatory action research and mapping can contribute to the effectiveness of occupational medical practices. The

practical value of conventional medical knowledge is enhanced through such participatory enquiry and action (Reason and Bradbury, 2001).

Lack of funding and time act as barriers to the effectiveness of occupational and environmental clinical medicine (Lax, 2000). So too, do the roles, as defined by our culture, of the clinician as "expert" and the worker or lay community member as a passive recipient of medical diagnosis and care. The issue of social class bias once again emerges as medical professionals, who are out of touch with the realities of the industrial working world, presume that the workers or lay persons have nothing of value to contribute to the understanding of the aetiology of disease (Lax, 1996, 2000).

Most physicians receive a negligible amount of occupational medicine training and most are unfamiliar with working conditions, particularly in industrial workplaces (Ontario Federation of Labour, 1982). One of the most valuable, but seldom tapped, sources of information that a physician has at his or her disposal is the patient's own knowledge. The importance of workers' knowledge was recognised over three centuries ago. Dr. Bernardino Ramazzini, considered to be the founder of occupational medicine, saw the value in making inquiries regarding a patient's occupation (Franco, 1999; Lax, 2000). Unfortunately, very few contemporary physicians ask about their patients' work.

That lack of information regarding patients' exposures may hamper physicians' ability to diagnose occupational diseases, thus dangerously delaying patient treatment or removal from exacerbating conditions (Lax, 1998).

For example, Mary Girard (1992) recalls the frustration of trying to learn what was wrong with her 28-year-old husband, a worker in a tool fabrication plant in Windsor, Ontario:

> He was coughing up blood and was very tired and short of breath…the respirologist said that he had asthma and gave him a lot of the ventilators…they weren't doing anything; they weren't helping at all so we knew for sure it wasn't asthma…We went to another doctor and pleaded with that doctor to send him to another specialist… (Girard, 1992, np).

A collaborative effort by a group of Valenite workers and occupational health centre staff gathered evidence of Girard's exposures and the potential health hazards. Armed with this information, and frantic for appropriate treatment, the couple sought an accurate diagnosis. "We ended up going to London [Ontario] and that's where the doctor diagnosed that it was hard metals disease [a serious fibrotic condition caused by the powder-like hard metal dust]". Unfortunately the initial misdiagnoses had delayed appropriate treatment allowing the fibrosis to worsen to the point where Girard permanently lost a significant portion of his lung capacity. This example demonstrates how essential it is that physicians understand occupational hazards; it also illustrates the important contribution that can be made by worker initiatives in relation to medical diagnosis.

Occupational history-taking is also fundamental to understanding the conditions patients' are experiencing on the job. Most physicians, however, do not collect this vital information and are therefore less likely to make work-disease associations (Lax, et al., 1998).

The value of taking occupational histories has been demonstrated by the Occupational Health Clinics for Ontario Workers (OHCOW). The worker-centred occupational health clinics, which operate in five centres in Ontario, have made an important contribution to the recognition of a diversity of occupational diseases (Occupational Health Clinics for Ontario Workers, 2003c). The compensation board has approved claims for such previously unrecognised associations as oesophageal cancer and metal-working fluids based upon evidence provided by OHCOW physicians. Unfortunately, there are very few such workers' clinics in Canada. Besides OHCOW, only three others are listed as members of the North American Association of Occupational and Environmental Clinics (AOEC) (2003).

In the absence of regular, systematic occupational-history taking, worker-driven participatory action research and mapping efforts can provide documentation regarding workplace exposures and resulting health impacts that can assist in establishing the work-relatedness of certain diseases or conditions *(see Holmes foundry workers case study in Chapter 8).*

3.3.1 Medical objectivity

Medical opinion, like objective science, has subjective elements and can be influenced by the context in which one works (Lax, 2000). A medical clinician representing a worker in a compensation hearing, may provide his or her best "objective" opinion regarding the work-relatedness the patient's condition, only to be countered by an opposite "objective" opinion by the representative of an insurance carrier who is attempting to establish that no link exists.

Corporate physicians, also known as *company doctors*, face contradictions that challenge them as medical professionals (Walsh, 1987). "Industry money and influence pervade every aspect of occupational medicine" (LaDou, 2002, p 291) making it difficult for company doctors to provide an unbiased view of workers' occupational health concerns. Physicians who work for industry, even on a contract basis, serve two masters; they are obligated to follow the Hippocratic Oath, which mandates them to serve the patient's best interest, while earning a paycheque from an employer who is likely averse to having work-related injuries or illnesses diagnosed or unsafe conditions revealed. This dual obligation puts company doctors in a difficult position when it comes to advocating for occupational health and safety improvements.

"Occupational health professionals may also work within a personnel structure in which concerns such as resource management and day-to-day industrial relations are given greater priority than occupational diseases" (Watterson, 1999, p. 115). Workers' wellbeing is not likely to be well represented; "…In this financially charged environment, it is difficult to find an occupational physician with the temerity to speak out on behalf of workers" (LaDou, 2002, p 291).

Workers' occupational health clinic staff in Sarnia witnessed examples of patients being declared well by their family physicians or company doctors, only to have the clinic physicians find the patients to be suffering from asbestosis, pleural plaques, and other ailments (Occupational Health Clinics for Ontario Workers, 2002). There are examples on the public record of such malpractice. Cases of intentional misdiagnosis were documented in the asbestos industry in Quebec (Tataryn, 1979).

Jean-Baptiste Fortin, through gasps of air from his oxygen tank, related his personal experience:

> "Every year we went for tests at the company's clinic," he says. "I was always Class A until 1971 when I went to Montreal to get another opinion on asbestosis. There they decided to re-class me. The first time I went to Montreal they declared me 50 per cent incapacitated. In 1972, they declared me 100 per cent incapacitated. That's why I say the clinic was working for the companies, not for us" (p 26).

The intentional or unintentional under-diagnosis by occupational physicians of work-relatedness is important in terms of this dissertation because it explains in part the under-estimates of occupational disease and injury and resulting lack of appropriate corrective response. Participatory action research and mapping can begin to address such inaction, as will be discussed in the following chapters.

3.3.2 Lack of data

Lack of data can also inhibit the realisation of an objective finding. The lack of definitive published literature does not necessarily mean that an illness is not work-related, only that it may not have been studied in terms of potential work-relatedness (Lax, 2000). Without literature to which to refer, it is difficult for a physician to provide a scientific, professional opinion regarding work-relatedness that is acceptable to employers or compensation boards.

The same problem may apply in terms of exposure data. Without evidence of exposure, such as dependable air sampling reports, one cannot prove that an exposure actually occurred. The so-called "objective" finding may, therefore, be that no association exists, when in fact, no such conclusion can be made. "Lack of the 'objective' is equated with lack of proof, which in turn is equated with lack of

existence" (Lax, 2000, p 238). In other words, without evidence of exposure, it is simply not possible, using the criterion of requiring objective data, to establish an association even though one may exist.

Investigations into workers' illnesses are also hampered by the tendency of scientists and medical practitioners towards reductionism (Lax, 2000). "Reductionism is reducing the complex and varied to the simple and standard. Its method is often to focus on parts instead of wholes" (Chambers, 1997, p 42). By focusing on individual symptoms or disease manifestations, the complexity and interrelatedness of workplace exposures cannot be understood or assessed. Lax cites the example of the coal companies in the United States who attempted to limit the number of cases of diagnosed pneumoconiosis by relying solely on chest x-rays for signs of disease. The workers' symptoms, such as shortness of breath, were disregarded. Based strictly on the x-rays, much of the coal-induced lung disease went unrecognised (Derickson, 1998).

Dependency on existing literature for information is, unfortunately, a common limitation faced by physicians in clinical settings where patients are generally seen on an individual basis. Such a piecemeal approach does not provide the clinician with the opportunity for a broader understanding of the conditions which may have led to the specific patient's disorder or the prevalence of that disorder among similarly exposed workers. The study of a larger, homogeneous group would provide a more accurate basis upon which to make a determination of probable cause:

> With occupational diseases the cause-effect relation is mostly not to be seen in a mechanical-deterministic way but in a probabilistic way. It is therefore,

> important to consider (homogeneous) groups of workers instead of individual clients asking for medical help (Wintersberger, 1985, p 20).

The barriers to occupational physician effectiveness created by lack of published information can be somewhat overcome through participatory action research and mapping, as will be described in the following chapters.

3.3.3 Lack of systematic data collection

Contributing to the unavailability of occupational health information is the lack of any systematic occupational medical data collection in Canada that might assist in establishing work-relatedness of disease and injuries.

Such data gathering programmes have been implemented in other countries. For example, physicians are involved in surveillance projects in the U.K. established to record and track occupational diseases (McDonald et al., 2001). In 1996, the Occupational Physicians Reporting Activity (OPRA) was set up to record work-related diseases of any type diagnosed by occupational physicians. An analysis was done of the first four years of the OPRA data, which included over 44,000 records. It provides "a clear picture of the relative frequency of various kinds of disease by age, diagnosis, industry, occupation and suspected cause." The project is limited, however, by the fact that the data reflects primarily industries that employ occupational physicians (metal, petrochemical, and automotive industries and the health and social services). It is also limited in that "no reliable denominators exist on the number and type of employees for whom they are responsible" (McDonald et al., 2001). No such occupational health and safety data collection schemes currently exist in Canada.

The medical profession itself cannot be fully relied upon to comprehend the complexities of occupational health and safety issues. However, if the knowledge, insights and experience of workers and community members are combined with physicians' knowledge of medicine, a more meaningful and practical understanding can be achieved. This can be accomplished in part through the use of participatory action research and mapping, as will be explored in the chapters to follow.

3.4 Limitations of industrial hygiene and ergonomic practices

Industrial hygienists and ergonomists are front line technical occupational health and safety professionals. Although the technical methods they apply can add to our understanding of how particular hazards might impact on the health and wellbeing of workers, they are prone to misuse and have limitations. With a few ill-timed sniffs of a *dräger pump*[1] and ill-considered measurements with a *goniometer*[2], the dry coughs and aching shoulders of a department full of production workers might be summarily dismissed. "The majority of industrial hygienists work for corporations either directly or as hired consultants" (Senn Tarlau, 1991, p 73). They, like company doctors, can be influenced by their employers' wishes.

This is an important issue for this study because it sheds further light on the inadequacies of conventional approaches. It makes a case for the use of worker-driven participatory action research using mapping for data collection which is, by contrast, not as readily influenced by industry and is non-technical.

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[1] Device sometimes used by industrial hygienists to measure specific air contaminants
[2] Device sometimes used by ergonomists to measures degrees of movement.

3.4.1 Industrial hygiene

"Industrial hygienists use environmental monitoring and analytical methods to detect the extent of worker exposure and employ engineering, work practice controls, and other methods to control potential health hazards" (Occupational Safety and Health Administration, 1998b, np). The traditional tools for assessing health and safety problems in the workplace include such procedures as air sampling and testing, collection of dust or biological samples, measuring noise levels, radiation monitoring, personal sampling, and visual inspections.

One striking flaw is that hygiene investigations often occur without workers' direct participation and may not reflect conditions as they normally exist. Air sampling, for instance, may take place after some of the machines have been be shut off, or a bay door has been left open. Without worker input, these irregularities may not be noted (Keith et al., 2002). An industrial worker in Windsor, Ontario remembers an incident in which a government inspector and an industrial hygienist conducted air sampling at his worksite using a dräger pump:

> He took a sample over the machine and I believe the…threshold limit value for that chemical was 350 parts per million that you could be exposed to over an eight hour day…The supervisor said that I had only worked there for maybe an hour to two hours a day and I said I worked there for 4 hours a day. The health and safety inspector wrote down exactly what the supervisor said as an accurate account of my exposure and completely neglected what I was telling him (West, 1992, np).

Air testing alone can seldom provide the full picture. Testing is often done for a limited number of substances, rather than the full range of possible exposures (Senn Tarlau, 1991). Air testing may miss the risks faced by workers who are exposed other than through respiration, such as transdermally or by ingestion -- routes of

entry that are generally not well-documented in hygiene reports. Moreover, such testing does not generally explore the combined effects of different exposures. As a result, the overall toxic burden is not reflected in the results, which are "hard to dispute because it appears to be quantitative and scientific" (p. 72).

3.4.1.1 Exposure Limits

Industrial hygiene practices depend heavily on achieving exposures less than the legally allowable limits. Unfortunately, the allowed "threshold limits" are often too high to protect workers' health (Ontario Federation of Labour, 2000). This concept is important to the dissertation because it suggests that the adoption of an alternative means of determining risk would be prudent in order to protect workers' health.

One of the official functions of industrial hygiene is to provide exposure limits for toxic substances, which are then adopted by governmental bodies as safe levels for workers' exposure. The American Conference of Governmental Hygienists (ACGIH) plays this role in the United States. Canada relies heavily on the U.S. limits with some provinces adopting them outright (Hamm, 1990; Ontario Federation of Labour, 2000). There is much controversy, however, concerning their validity:

> The very concept of "safe" exposures to any chemical is inherently unscientific. Indeed, the term "threshold limit" embodies this unproven and probably unprovable concept that there is some known level of exposure which does not adversely affect the organism. Discarding the term "threshold limit" is a necessary first step in correcting this false ideology of the past (Castleman and Ziem, 1988, p 556).

Deciding whether or not a substance poses a human health risk is not a strictly scientific or technical question, but is also determined by economics and politics

(DeMatteo, 1994). Corporations have had a disproportionate influence in determining at what levels the threshold limits are set (Glasbeek, 1997; Castleman and Ziem, 1988). The setting of threshold limits may have more to do with what is deemed technically and economically achievable by industry rather than the protection of workers' health:

> Our conclusion is that TLVs [threshold limit values] for chemical substances is a compromise between health-based considerations and strictly practical industrial considerations, with the balance seeming to strongly favour the latter (Roach and Rappaport, 1990, p 741).

Researchers have found that chemical producers often have a major role in setting the legal limits for toxic substances their own companies produce. In some cases, the recommended limits are worse than those used by a company in its in-house production of the substance (Roach and Rappaport, 1990). Upon researching the validity of the threshold limit values using exposure and health effects data from 1976 to 1986, Roach and Rappaport found that, out of 158 examples, "where the exposure was at or below the threshold limit value, only a minority of studies showed no adverse effects (11 instances) and the remainder indicated that up to 100% of those exposed had been affected (8 instances of 100%)" (p 727).

Despite its questionable accuracy, vulnerability to corporate interference, and reliance on threshold limits, industrial hygiene is still one of the most common approaches for evaluating workplace hazards:

> Industrial hygienists can be extremely helpful to workers by identifying, evaluating and recommending controls for health hazards on the job. Experience has shown, however, that industrial hygienists' personal exposure monitoring and exposure limits have been used to 'scientifically prove' that working conditions are 'safe' when they were not, even when workers were getting sick (Senn, 1991, p 72).

Unfortunately, "workers have been ill served by having critical decisions about their health delegated to engineers carrying TLV books" (Ziem and Castleman, 1990, p 917).

In the context of this study, it is important to be aware of industry's influence over the setting of threshold limit values, which are a standard tool for industrial hygiene professionals. It is also important to recognise that hygiene results, due to lack of worker involvement, imprecise technology, and lack of information may not reflect conditions as they normally exist in the workplace. This provides further argument for the adoption by workers of their own methods of determining risk, safe from corporate influence.

3.4.2 Ergonomics

The field of ergonomics is closely aligned to industrial hygiene and is still relatively new. However, it is more focused on musculoskeletal injury prevention. "The science of ergonomics studies and evaluates a full range of tasks including, but not limited to, lifting, holding, pushing, walking, and reaching (Occupational Safety and Health Administration, 1998b, np). As will be shown, ergonomics is an important area in the case study on casino gaming workers.

Criteria, checklists and guidelines have been developed by ergonomists and related specialists for the prevention of musculoskeletal injuries, such as back strain, and repetitive strain injuries (RSI). While providing a valuable preventative function, criteria for establishing risks can also be used to workers' detriment, particularly if

they have not been sufficiently tested and validated to provide adequate protection (Ebbens, 1999). Preliminary or incomplete criteria can also limit a worker's ability to obtain compensation for a repetitive strain injury. A dealer from the casino in Windsor, Ontario, for example, was denied compensation based on such criteria. Equations were used by ergonomic experts working on behalf of the compensation board, to assess the degree of strain caused by the act of dealing cards. They calculated the number of repetitions in a given period of time, the degree of various angles of movement and the amount of force or pull and determined that the factors did not add up to a hazardous condition (Occupational Health Clinics for Ontario Workers, 1999).

There is much that is not yet not understood about risk factors for repetitive strain injuries:

> The consistently positive findings from a large number of cross-sectional studies, strengthened by the limited number of prospective studies, provides strong evidence… for increased risk of work-related MSDs [musculoskeletal disorders] for some body parts…For some body parts and risk factors there is some epidemiologic evidence … For still other body parts and risk factors, there is either an insufficient number of studies from which to draw conclusions or the overall conclusion from the studies is equivocal (National Institute for Occupational Safety and Health, 1997, np).

Current criteria fall short of assessing the bigger picture. The Revised National Institute for Occupational Safety and Health (NIOSH) Lifting Equation (1994), for example, does not take into account individual differences, such as a worker's size and strength or overall health, nor does it consider such contributing factors as the ambient indoor air temperature:

> The RWL [recommended weight limit] is defined for a specific set of task conditions as the weight of the load that nearly all healthy workers could perform over a substantial period of time (e.g., up to 8 hours) without an increased risk of developing lifting-related LBP [low back pain]. By healthy

> workers, we mean workers who are free of adverse health conditions that would increase their risk of musculoskeletal injury (National Institute for Occupational Safety and Health, 1994, np).

Stress and job satisfaction are not considered in assessment criteria, although pressures on both the mind and body are believed to contribute to repetitive strain injuries (Canaan, 1999).

Such scientific shortcomings can hamper an injured worker's ability to successfully establish a compensation claim. The union representing the gaming workers in Windsor, Ontario recognises this obstacle:

> We want to encourage our members to make application for Comp [compensation] even though at the present time the Compensation Board will in all probability deny your claim. I guess until they admit there is a problem, we will continue to push both the Casino and the Comp Board to recognize the fact that dealers are acquiring repetitive strain injuries performing their duties as dealers (Parent, 2001, np).

The field of ergonomics, like industrial hygiene, can be readily subjected to corporate influence. U.S. government hearings were held to develop an ergonomics regulation. The committee was chaired by Dr. Robert McCunney, who represented the medical community as president of the American College of Occupational and Environmental Medicine. McCunney had worked for industry until 1994 where he authored and edited publications on the issue of ergonomics. Many of his opinions were sympathetic to employers. For example, he expressed concern with the proposed requirement that an employer conduct a full assessment following a single ergonomics-related injury (Occupational Safety and Health Administration, 2001). Industry sympathisers from the conservative Cato Institute characterised the proposed legislation as:

> ...the most costly and intrusive regulation in its history. The agency's "ergonomics" rule would require businesses to slow the pace of production, hire more workers, increase rest periods and redesign workstations or even entire operations...Under the proposed rule, employers' obligations would be triggered by "symptoms" of musculoskeletal disorders, which OSHA defines to include "pain," "numbness" and "tingling." When those symptoms occur, employers are to determine whether the jobs in question are "reasonably likely" to be ergonomically hazardous. If they are, employers are to implement draconian abatement measures, such as reducing assembly line speeds and redesigning equipment, until the "hazard" is gone (Scalia, 2000, np).

The final regulation was watered-down. For example, the requirement for a full assessment following a single incident was amended. However, industry still opposed the regulation and it was repealed in 2001 shortly after the industry-friendly Republican party was elected into power (Hazards, 2001; AFL-CIO, 2002). The corporations had finally won:

> When faced with the demands of the big business community, the President's claims of 'compassionate conservatism' become farcical ...This is a prime example of how dangerous the growing political power of corporations has become when critical health and safety needs of workers can be so summarily dismissed by the Congress (Nader, 2001, np).

Canada does not fair much better than the U.S. Ergonomics standards exist in only a few provincial jurisdictions: British Columbia requires employer consultation with joint health and safety committees and some related training; Saskatchewan has similar regulations but much less stringent enforcement; and Ontario has limited regulatory protection only for health care workers (Workers Health and Safety Centre, 2003a).

Like industrial hygiene, ergonomics is guided by a system for determining risk that may not reflect workers' own reality. It too may be more responsive to the

economic demands of industry than to workers' health and safety protection needs, thus pointing to the need for alternative, worker-driven research approaches.

3.5 Summary

This chapter reveals that conventional science cannot, on its own, provide adequate protection to human health. Occupational health and safety approaches that are free from the influences of corporatist culture are also needed. Conventional top-down, "expert" dominated scientific, medical and technical approaches are inadequate and often irrelevant, reflecting the economic wellbeing of industry, rather than the health and safety of workers. Prevention is not afforded the priority status it warrants:

> Western science, as it presently exists, is inadequate to all these tasks. It does not offer us the intellectual and material tools to exercise self-determination, self-administration, self-rule, in any field. It is an expert science, monopolized by the professionals and estranged from the people. And this situation after all is not surprising – Western science was never intended for the people. Its main relevance, from the beginning, was to machinery that was meant to dominate workers, not to make them free (Gorz, 1980, p. 272).

As the current approaches to occupational health and safety are not infallible, there are potential benefits to the exploration of alternative models:

> The globalisation of the world economy and the development of new technologies are changing the face of the workplace. This has created new challenges for occupational health and safety research. Many researchers now believe that it is necessary to extend the scope of this research and that traditional research models are no longer sufficient (Skiöld, 2000, np).

What is needed is a "socioparticipative" rather than "scientism" approach "which recognises from the outset that science has limits. The model tends to be more

democratic and open on questions of decision-making and less expertist" (Watterson, 1999b, p 120).

The following chapters will critically examine participatory, worker-driven research alternatives that address some of the inadequacies of conventional scientific, medical and technical approaches. Such alternative approaches have their own research value, as well as playing a role in improving the efficacy and relevance of conventional research and medical and technical practices in the area of occupational health and safety. Furthermore, unlike conventional research, they are oriented towards action.

CHAPTER 4: PARTICIPATORY ACTION RESEARCH AS AN ALTERNATIVE APPROACH TO IMPROVING OCCUPATIONAL HEALTH AND SAFETY

4.0 Introduction

This chapter provides an exploration of participatory action research (PAR), as a research method informed by methodological writings and applications over a number of decades, with reference to the existing literature. The review serves to meet the research objective of exploring the value of participatory action research, particularly in terms of its utility as an approach to occupational health and safety research and to organising and empowering workers.

The exploration of participatory action research also informs the discussion regarding the use of mapping tools as outlined in Chapter 5. Participatory action research directly influenced the conceptualisation of and approach to the case studies presented in Chapters 7 and 8. This review provides a basis for their evaluation.

The chapter begins by documenting the lessons of participatory action research *in general* through an examination of its origins, basic characteristics, various tendencies, and collaborative approaches. Secondly its applications in *occupational health and safety* and its various tendencies are explored. Thirdly the collaborative aspects of PAR are discussed. Fourthly PAR is evaluated in terms of its scientific validity. Fifthly the strengths and limitations of participatory action research as a catalyst for occupational health and safety change are analysed. Finally participatory action research is compared to conventional research.

4.1 Existing participatory action research literature

There is a significant body of published literature describing participatory action research as an approach, as well as many research studies that illustrate its use in a broad range of fields of sociological interest. Participatory action research has been widely used in: *community and organisational development* (Selener, 1997), *education* (Hugentobler et al., 1992; Israel et al., 1992; Wallerstein and Duran, 2002; Selener, 1997); *public health* (Cornwall and Jewkes, 1995; Mavalankar et al., 1996; de Koning and Martin, 1996; Israel et al., 1998; Watterson and Watterson, 2003); and in *rural community development,* where it is commonly referred to by such terms as *rural rapid appraisal*, *participatory rural appraisal* or *farmer participatory research* (Chambers, 1985, 1994, 1997; Mascarenhas, 1992; Selener, 1997; Cornwall, 1996).

There are fewer publications regarding the use of participatory action research in *occupational health and safety*. In June, 2003, the author conducted a free text search of the peer-reviewed biomedical journals indexed on Medline (U.S. National Library of Medicine) for *occupational health* and *safety* studies using *participatory*, *action*, or *lay research* approaches. Occupational and environmental health journals are included in the Medline life sciences and medical literature. Table 4.1 provides a brief summary of the peer-reviewed articles appearing in Medline indexed journals from 1983 to 2003 (this is also discussed later in the chapter under the sub-heading, *Scientific rigour and validity).*

Table 4.1: Summary of occupational health and safety action research articles indexed on Medline, 1983-2003

Author(s)	Year	Focus of Article	Country
Acury et al.	2001	Agricultural pesticide poisoning among farm workers	USA
Bohr et al.	1997	Participatory ergonomic teams with health care workers	USA
Chatterjee	1993	Self-employed women workers	India
Ebeltoft	1987	Psychosocial problems addressed using work conferences	Norway
Hugentobler et al.	1992	Joint university, union and management study in auto parts plant	USA
Israel et al.	1989	Joint university, union and management study in auto parts plant	USA
Kawakami and Khai	1997	Local shift to market economy; more efficient and safer work practices	Re: Mekong Delta, Vietnam
Kawakami et al.	1999	Advocating use in ergonomics	Japan
Keith et al.	2001	Casino gaming workers health and safety	Canada
Koch et al.	2002	Prevention of workplace violence in health care	South Australia
Johansson and Partanen	2002	Use with unions to offset impact of globalisation	Denmark and Finland
Kogi	2002	Advocating its use in risk management	Japan
Kogi	1998	"Collaborative field research in occupational health and ergonomics"	Japan
Laurell et al.	1992	Comprehensive questionnaire and validation study in steel plant	Latin America
Lee and Krause	2002	Workload study by unionised hotel workers in collaboration with labour, academics and public health representatives	USA
Loewenson et al.	1995	A review of participatory occupational health research	Zimbabwe
London	1998	Use with agricultural workers in South Africa	South Africa
McQuiston	2000	Review article re: value of participatory evaluation and training; participatory education	USA
Mergler	1987	Formal joint union – academic research	Canada (Quebec)
Moir et al.	2003	Taxonomy for construction research	USA
Moore and Garg	1996	Participatory ergonomic teams in pork slaughtering plant	USA
Nash and Kirsch	1986	Environmental and occupational health in community re: PCB problems related to General Electric (local industry)	USA
Peltomaki et al.	2003	"Pre-assessment of feasibility of workplace health promotion" with 16 workplaces in 5 countries	Re: Costa Rica, Finland, Germany, Spain, Sweden
Pena et al.	1994	Health and safety in mining and community	Nicaragua
Robertson et al.	2002	Computer ergonomics research with college students	USA
Rosecrance and Cook	2000	Participatory ergonomics in newspaper industry	USA
Shurman	1996	Joint worker-management research on health and safety	USA
Watterson	1994	Use of lay epidemiology in occupational and environmental health research	England

Source: M Keith

The author acknowledges that this search likely missed some relevant citations, such as those using other terms for related paradigms, as discussed in the previous

chapter. However, this small exercise does provide some indication that there is a limited number of peer-reviewed articles on occupational health and safety research using participatory action research approaches published in the medical-scientific journals.

Moreover, not all of the references cited in the table meet the general criteria for participatory action research; some better fit the definition of worker education or training rather than research, such as McQuiston (2000), for example. Some articles, such as Moir et al. (2003), describe what is defined as an intervention research approach, whereby changes are evaluated through the research process (Needleman and Needleman, 1996; Goldenhar and Shulte, 1996; Levenstein, 1996; Lipsey, 1996; Rosentock, 1996; Shulte et al., 1996). The primary focus of some of the articles is the participatory research *approach* itself rather than a detailed report of a *research study* that used a participatory approach, for example, Loewenson et al. (1995); however, most articles do include examples.

The fact that there are relatively few published articles does not necessarily mean that the approach is not used in occupational health and safety. It may simply be the case that the more political, empowering, worker-based research is not systematically written up for publication because its primary goals are empowerment and local action, rather than peer-reviewed academic or scientific publication.

4.2 Participatory action research defined

While practical and theoretical differences do exist, there are three elements generally understood to be common to participatory action research-related approaches: *research, participation,* and *action* (Greenwood and Levin, 1998, p 7). These elements are key to overcoming the barriers outlined in the previous chapter. They are also integral to the case studies presented in Chapters 7 and 8.

The fundamental characteristics of participatory action research are described in the published literature. Contemporary proponents and practitioners of participatory action research have reviewed and evaluated the work of founders and theorists, further developing the fundamental theories for their own areas of interest and providing contemporary analyses.

The terms *participatory action research*, *participatory research*, and *action research* share similar characteristics and are often used interchangeably (Minkler et al., 2002, p 28; Israel et al., 1992). They do differ, however, "in the degree of participant influence over the research process and in the emphasis on action relative to research and theory building" (Israel et al., 1992, p 75). *Participatory research (PR)* stresses community participation; *action research (AR)* stresses action and reflection throughout the research process; *participatory action research (PAR)* contains elements of both (Loewenson et al., 1995a, 1995b; Barnsley and Ellis, 1992, p 9). Other related terms as presented in Table 4.2 that are rooted in particular practical experiences.

Table 4.2 Approaches related to participatory action research

Term	Characteristics	Reference
Co-generative research	Emphasises collective, democratic nature	Greenwood and Levin (1998, p 113)
Cooperative experiential inquiry; cooperative inquiry	Recognises importance of participant experience	Reasons (1993, p 1254); Reasons and Heron (1999)
Barefoot research	Research conducted by lay community members, often with few resources and little or no involvement by professional researchers	Keith et al., (2002).
Lay epidemiology	Similar concept described as having "important community, individual, political and social elements"; "participative; non-expertist; subjective; and collective in nature"	Watterson and Watterson (2003, p 44); Watterson (1994b, p 271).
Rapid appraisal	Related, but in some respects, less participatory form of public health research that encourages community empowerment at decision-making levels	Watterson and Watterson, (2003, pp 42-43).
Community-based research	Can also incorporate participatory action elements into "collaboration between community groups and researchers for the purpose of creating new knowledge or understanding about a practical community issue in order to bring about change"	Hills and Mullett (2000, p 2)

Source: M Keith

Chisholm and Elden (1993) documented and analysed several variations of action research using case studies; they identified several elements that could be used to compare action research efforts, such as the complexity and difficulty of the research purposes and goals, the degree of involvement of the researchers, and the openness of the research process. Ritchie (1996) identified that the main difference between *action research (AR)* and *participatory research (PR)*:

> …lies in the description of the relationship between the instigating researcher and the other participants. In action research with teachers and managers the instigator is most likely to be one of their own kind, with shared values and similar use of language. In participatory research, the instigator may be from a different sub-culture if that person is better resourced and more highly educated than the participants (p 207).

No single, universally accepted definition of *participatory action research* has been established (Loewenson et al., 1995a, 1995b). What is perhaps most relevant for this dissertation is that most proponents and practitioners of participatory action research agree that it is an egalitarian, community-rooted, collective process with change as the primary goal.

4.3 Basic principles of participatory action research

Participatory action research is not "applied research" (Greenwood and Levin, 1996, p 6.); nor is it a research method, but rather "an approach to research and to learning that may use different methods" (Merrifield, 1997, p 3). The methods chosen must lend themselves to the transformative, problem-solving focus characteristic of participatory action research. It has been proposed that a "participatory paradigm" should now be added to the other accepted "worldviews of research -- positivist, post-positivist, critical, and constructivist" (Hills and Mullett, 2000, pp 5-6).

Methods that "separate researcher and researched" or that "are beyond the technical and material resources of the people involved in the research" are not suitable for participatory research (Sohng, 1995, p 7).

Participatory action research often uses qualitative methods (Fals-Borda, 1991; Loewenson, 1995b) rendering it more accessible. These can include such techniques as observation (Watterson and Watterson, 2003, p 45; Keith et al., 2002); open-ended survey questions and panels (Sadhra et al., 2001; Oranga and Norberg, 1996; Iavicoli et al., 2001); "interviewing, journal writing, taped interactions,

critical incidents, narrative accounts and focus groups" (Hills and Mullett, 2000, p 12).

Quantitative methods, such as questionnaires have also been effectively used within participatory action research projects (Keith et al., 2002). While similar methods may be used in both participatory and more standard research approaches, the research process of participatory research is quite different in that the community is involved in every stage and the research is "geared to community needs and not academic or scientific objectives" (Watterson, 1994b, pp 26-27). From the very first conceptualising stages, there should be a clear understanding that the purpose of the research is to bring about change (Keith et al., 2002; Selener, 1997, p 19).

In 1981, Budd Hall, an adult education specialist, put forward a set of criteria for participatory research that illustrate its basic principles:

- The "problem" originates within the community or workplace itself.
- The research goal is to fundamentally improve the lives of those involved, through structural transformation.
- The people in the community or workplace are involved in controlling the entire research process.
- The focus of PAR is on oppressed groups whose issues include among others: inaccessibility, colonization, marginalization, exploitation, racism, sexism, cultural disaffection.
- Participatory research plays a role in enabling by strengthening people's awareness of their own capabilities.
- The people themselves are researchers, as are those who have specialized research training.
- The researchers with specialized training may be outsiders to the community, but are committed learners in a process that leads to militancy (fighting for change) rather than detachment.

(Hagey, 1991, pp 1-2)

The case studies presented in Chapters 7 and 8 are evaluated in Chapter 9 in relation to the above criteria, as well as by the degree of success in achieving their specific goals.

The collaborative, mutually respectful and beneficial approach is another cornerstone of participatory action research. Workers and researchers are on an "equal footing" (Mergler, 1987, p 151).

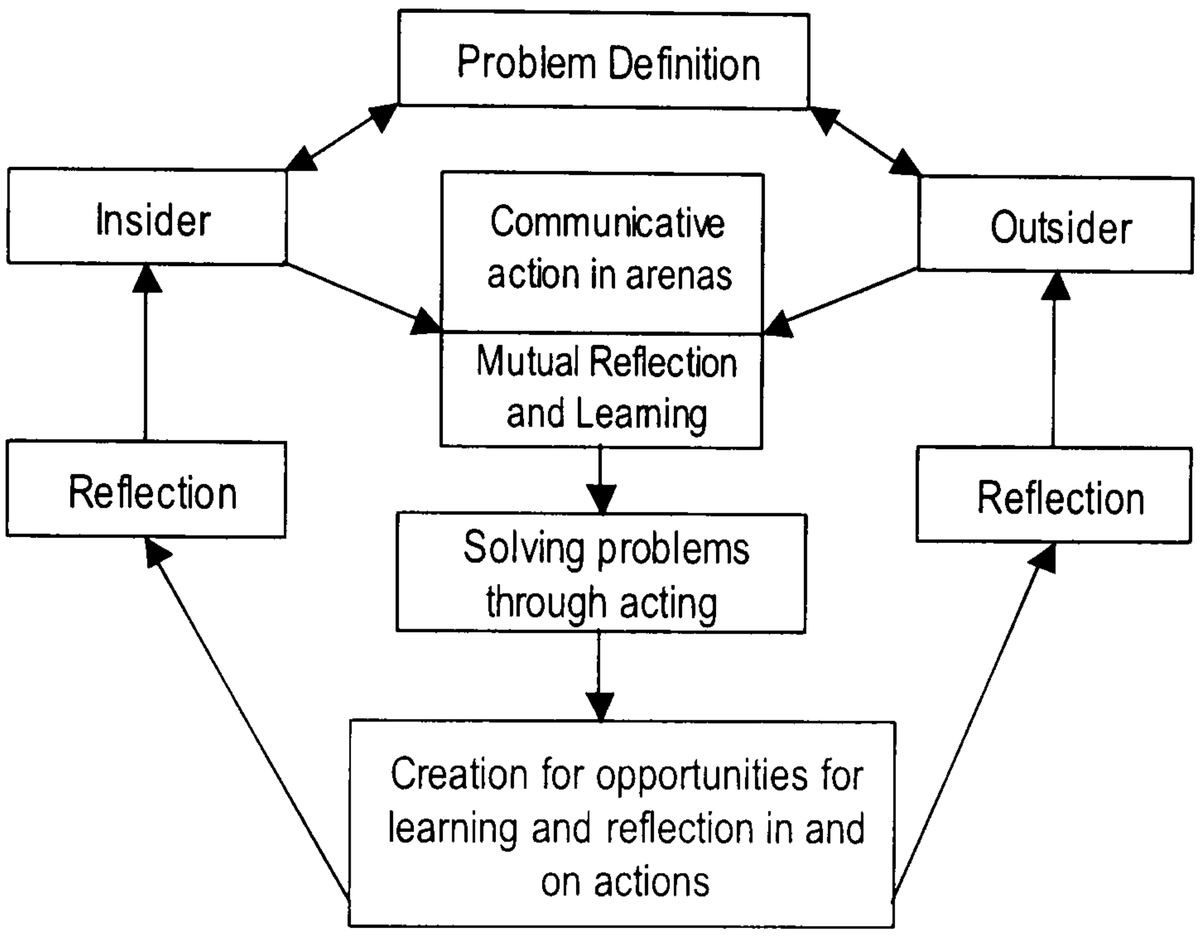
Action research, as a praxis, involves an interaction between theory and action in order to bring about change (Gustavsen, 2001). It is understood that, in this case, change refers to improvements from the point of view of the subject community. It is also recognised among action researchers that "theory alone has little power to create change and that there is a need for a more complex interplay between theory and practice" (p 17).

The cycling of *action* and *reflection* by the inquiry group is needed in order to find a balance and to avoid excessive "theorizing" or unfocused "activism" (Reason and Heron, 1999). It is also said to increase rigour as "the interpretations developed in the early cycles can be tested and challenged and refined" through the action-reflection cycles (Dick, 2000, p 2).

Figure 4.1 is included to better understand the ongoing, cyclical, evolutionary nature of the participatory action research process. While the figure illustrates "co-generative action research" it effectively characterises the PAR process. As the diagram shows, first the problem is defined by the insiders (community/workers)

and by the outsiders (collaborators/professionals); this leads to communication, mutual reflection and learning; this then results in action then to the creation of new opportunities for learning and action; then researchers undergo another period of reflection and a re-defining of the problem if so indicated (Greenwood and Levin, 1996, p 116).

Figure 4.1 Co-generative action research model



Source: Greenwood DJ and Levin M. (1998). *Introduction to Action Research*. Thousand Oaks, London, New Delhi: Sage.

The approaches taken in the case studies presented in Chapters 7 and 8 largely reflect the model illustrated in Figure 4.1. Each of the elements exists to some degree and, in general, follows the prescribed order. As will be seen, the casino gaming study presented in Chapter 7 has a somewhat more formal structure than the Holmes foundry case study presented in Chapter 8.

4.4 Origins of participatory action research

Understanding of the concept of participatory action research can be further enhanced by considering its origins. They shed additional light on its focus on change and its organising potential, issues which are key to workers' efforts to effect occupational health and safety improvements.

While participatory action research is relatively new to the field of occupational health and safety, its history demonstrates that it has always focussed on liberation for the oppressed, a definition which can be used to describe workers facing life-threatening conditions in a work environment where they have little control.

The literature is somewhat inconsistent in its identification of the exact historical roots of participatory action research. In fact, there appear to be several parallel trends that led to its emergence (Tandon, 1996). The first trend is the age-old and ongoing epistemological debate amongst philosophers and social scientists about what constitutes knowledge. The second trend, which emerged in the "South" (developing nations) in the 1970s, sought to lessen the distancing effect between researchers/trainers and the subjects/learners. The third trend came from the work of Paulo Freire and Ivan Illich who, during the 1960s to 1980s, promoted popular education as an alternative pedagogy to that being used in the school system. A fourth trend, introduced the action component to research through the ideas of Kurt Lewin. A fifth trend emerged from the "phenomenologists" who "legitimated experience as a basis of knowing". The final trend in the late 1970's promoted the full participation of the particular community involved (Tandon, 1996, pp 20-21).

There does, however, appear to be widespread agreement that participatory action research is rooted in adult popular education (Hurst, 1995; Merrifield, 1997).

Participatory action research likely has its most "immediate and deepest roots in Latin America where it developed into its present form and where its principal tenets evolved in the early 1960s" (Selener, 1998, p 14). Related movements of "liberation theology" and the "sociology of liberation" sought to empower and liberate the poor (p 14). Many credit Paulo Freire with its fundamental development (Selener, 1998; de Koning and Martin, 1996; Cornwall, 1996). Freire's work in adult education and empowerment with oppressed villagers in Brazil and other South American countries has become legendary. He recognised that the success of a grass-roots movement depended on collective awareness, knowledge-building, empowerment and action:

> Who are better prepared than the oppressed to understand the terrible significance of the oppressive society? Who suffer the effects of oppression more than the oppressed? Who can better understand the necessity of liberation? They will not gain this liberation by chance but through a praxis of their quest for it, through their recognition of the necessity to fight for it (Freire, 1970, p 29).

The use of approaches with characteristics of participatory action research can be traced back approximately one hundred years. Table 4.3 provides a brief listing and summary of some of the international uses of participatory action research and related approaches.

Table 4.3 Some historical uses of participatory action research and related approaches

Where/Who	Contribution	References
Moreno, a physician in Vienna	Used related approach to carry out community-based research with prostitutes in early 1900s	Grbich (1999)
Kurt Lewin, American psychologist in North America	Introduced the term *action research* in 1940s	Wallerstein and Duran (2002); Masters (1995); Kock et al. (1997); Karlsen (1991); Eden and Huxham (1996); Tandon (1996); Gustavsen (1999); Grbich (1999).
Tavistock Institute of Human Relations, U.K.	A form of action research was reportedly used to address battle-related "sociological and psychological disorders" following World War II	Kock et al. (1997); Karlsen (1991, p 143.)
Tanzania	Participatory action research was first articulated 1970s	Hurst (1995)
Society for Asia Participatory Research in SPRIA, New Delhi	Further developed and promoted in 1970s	Hurst (1995)
India, South Africa, Australia, Zimbabwe, United Kingdom, Bolivia, Uganda, U.K., Bolivia, Bangladesh	Public health research	Kanani (1996); George (1996); SEWA-Rural Team (1996); Khanna (1996); Reston-Whyte and Dalrymple (1960); Ritchie (1996); Marindo-Ranganai (1996); Laurell et al., (1993); Dockery (1996); Howard-Graham (1996); Okurut et al. (1996), Dockery (1996); Howard-Graham (1996); Bloem et al. (1996)
Norway in the 1960s followed by Sweden, Denmark and Germany	Emergence and active use of action research	Gustavsen (1999)
Finland by the end of the 1970s	Use of action research	Palmu (1999)
Over forty countries to date (1994)	Use of participatory rural appraisal	Chambers (1994)
Over 20 countries	University faculty have shown an interest	Chambers (1994)
Highlander Centre, Appalachian Mountain area of Tennessee, U.S.	Participatory action research and popular education for organising and mobilising disenfranchised workers and their coal mining communities	Greenwood and Levin (1998); Chambers (1997)
Reinharz and others	Feminist participatory research adapted to counter male bias and "androcentric filter." Usually led by women, it empowers and liberates	Reinharz (1983, 1992); Martin (1996); George (1996); Gatenby and Humphries (2000); Maguire (1996)

Source: M Keith

Participatory research was internationally promoted in the 1970s by Budd Hall (1979) who believed that it could begin to address the fundamental imbalance in the production of new knowledge. He queried:

> Have we created a structure for the production of knowledge that has nearly ensured that it is impossible for a farmer living in Bwakira Chini, a Tanzanian village, to contribute to the world's store of information? The standard for research that is put forth by the various influential academic societies and intellectuals has been shaped necessarily by the need the State has for research. We have created a set of requirements in terms of techniques and style that requires years of specialized training, most likely a Ph.D., to achieve. In practice, this has resulted in a situation where [a] few persons of bourgeois class positions are working on the theoretical and practical academic discussions, [and] are creating knowledge, about the entire universe of people and problems (Hall, 1979, p 397).

Hall was also among the first to promote the use of participatory action research to develop health programmes (de Koning and Martin, 1996).

Participatory action research continues to evolve. Originally developed and propagated in developing countries, it is gaining acceptance in the developed world. The next section explores its use in occupational health and safety research *(see also Table 4.1)*.

4.5 Participatory action research in occupational health and safety

The basic principles of participatory action research as it is utilised in occupational health and safety are in keeping with its use in general. It is essential that it include the following elements:

- Workers should have input into the research questions to be asked;
- The results and their implications should be made accessible to groups affected by exposures;
- There should be increased worker participation in the research process; and
- There should be greater accuracy of data, taking account of workers' experiences and subjective symptoms (Hazards Magazine, 2000, pp 16-17).

These elements help to distinguish participatory action research from conventional approaches to occupational health and safety research. One premise driving conventional institutional occupational health and safety programmes is that workers are largely responsible for their own illness and accidents (Sass and Butler, 1977; Larsson, 1999; Workers Health International Newsletter, 1998; Culvenor, 1996). Participatory action research differs from conventional health and safety programmes that focus on altering worker behaviour; PAR promotes "system development" rather than "individual behaviour change" (Shurman, 1996, p375). Rather than simply blaming workers, it searches out systemic causes of worker ill health and injury.

4.5.1 Models of participatory action research in occupational health and safety

There are several historic models of "participatory" and/or "action" research in occupational health and safety. Two emerged almost simultaneously in the 1960s: the *Italian Workers Model,* a worker-driven model, characterised by conflict between unions and management, with some involvement of open-minded health professionals; and the *Swedish Model*, which involved partnerships and consensus between a strong union movement, management and a social democratic government. There has also been fairly extensive use of participatory action research in *Latin America* that is worker-driven but has a strong collaborative relationship with academics and professionals (Loewenson et al., 1995). A similar approach has been used effectively in Zimbabwe (Loewenson et al., 1995b; Laurell, et al., 1992).

The following discussion of the different historical models is included in this dissertation as it provides a basis for assessing the more contemporary occupational health and safety PAR studies, including the case studies presented in Chapters 7 and 8.

4.5.1.1 Italian Model

The Italian roots of participatory action research in occupational health and safety are often traced to a worker-driven project in a Fiat factory in Turin, Italy in the 1960s (Loewenson et al., 1994). The process and results of the participatory occupational health research project, using what was called the "Italian Workers' Model", or "Union Model" were published by the Italian metalworkers' union in 1969 (Loewenson et al., 1995a, 1995b). Many other studies using the participatory model were also carried out in Italy in that era but were not published; instead they were "used in collective bargaining or as background documentation for local action" (Loewenson et al., 1995b, p 124). The model valued workers' knowledge (Misiti and Bagnara, 1985). A "collective questionnaire" was utilised in 1967 to survey 366 workplaces using group discussion (Loewenson et al., 1995b, p 123). The information was validated by the workers themselves through a process called "consensual validation" in which workers, within homogeneous discussion groups, agreed that the information provided was accurate according to their collective experience (Misiti and Bagnara, 1985, p 37). The worker mobilisation promoted through these worker-research efforts in Italy "produced ideological changes in the nation's occupational health system, institutional changes in universities and governments, and legislative changes at national and local levels" (Reich and Goldman, 1984, p 1031). The participatory action research model that emerged in

Italy had its foundations in a widespread union-based movement involving direct worker participation to improve working conditions; it was grounded in "industrial conflict" (Wintersberger, 1985, pp 24-25). The process served to strengthen the unions giving them the power to influence change; it resulted in "internal organisational reforms as well as external substantive reform projects concerning industrial relations, economic, social and health policy" (Wintersberger, 1985, pp 24-25). Over time, however, the aggressive tactics of the unions that had won them improvements at the shop floor level, eventually gave way to a redefinition and institutionalisation of the concepts serving ultimately to "restrict worker participation and promote expert intervention" (Reich and Goldman, 1984, p 1031).

As discussed in the following chapters, the conflictual and union-building aspects of the Italian Model can be seen in the casino gaming workers case study presented in Chapter 7. Consensual validation was used in both case studies, albeit using mapping rather than a questionnaire (Chapters 7 and 8). In both case studies workers were empowered and achieved gains.

4.5.1.2 Swedish Model

In the same timeframe, a less conflictual effort to improve working conditions was taking place in the Scandinavian countries; it also involved direct worker participation. The Scandinavian approach, also called the Swedish Model, differed from the Italian model in that it was more consensus-based (Wintersberger, 1985, p 25). This was possible because the political and economic climate of the Scandinavian countries was relatively socially oriented.

One of the earliest examples of successful participatory research was a national survey carried out by the Swedish Trade Union Congress to investigate physical work hazards in the 1970s (Loewenson et al., 1994). Results revealed numerous health problems related to chemical and physical hazards and led to "both trade union and party political programmes" of corrective action (p 39). Several years later another survey research study was carried out regarding psychosocial hazards. Results showed evidence of stress and mental strain and a connection to absenteeism (p 40). Union demands were put forward and many were implemented.

In Norway, "conferences" were held involving workplace parties permitting a process of "democratic dialogue" which encouraged participation, discussion, information-sharing, planning and negotiation on a relatively equal footing (Gustavsen, 2001). Management and workers, with minimal involvement of external researchers, "promote[d] testing out of people's theories towards a commonly agreed upon understanding of causal relations and remedies" (Ebeltoft, 1987, p 55). Several factors are considered to have led to the stability and success of the consensus-oriented Scandinavian approach: "a mature labour movement, an enlightened management, an open-minded bureaucracy and a progressive intelligentsia" (Wintersberger, 1985, p 25).

The case studies presented in this dissertation had little in common with the Swedish model. There was no direct involvement by employers, government, or compensation board officials. The Swedish model depends on a more socially democratic political structure than exists in Ontario where the case studies took place. Bipartism has generally failed workers seeking significant occupational

health and safety improvements because of inherent power inequalities *(see Chapter 2)*.

4.5.1.3 Latin American experience

The Latin American experience with participatory occupational health and safety is more recent than the Italian and Swedish experiences, having emerged in the early 1980s. Studies, which are often collaborative efforts between workers and academics, have brought to light the heavy burden of disease experienced by industrial workers in Latin America. The studies strengthened union participation in occupational health and safety and the results served as "bargaining tools"; they also led to the establishment of educational centres, which have direct union involvement, in Brazil, Columbia and Venezuela (Loewenson et al., 1995b, p 125).

One study that proved to be influential was conducted in the steel industry in Mexico in the 1980s. The Mexican Mine and Metal Workers Union, responding to a growing concern among rank and file workers over health problems, developed a collaborative relationship with university researchers. The union and researchers agreed upon a three-step process that involved a collective comprehensive questionnaire, like that used in the Italian Model (Laurell et al., 1992), the creation of risk maps *(see Chapter 5 regarding mapping)*, and individual questionnaires and medical tests to quantify the health problems and validate the results. The union published the results and utilised its findings to structure a series of health and safety demands. This process built awareness of the ill health caused by the work process and influenced many other unions. It also demonstrated the significant role

played by work in producing diseases that are not normally recognised as work-related (Loewenson et al., 1993; Keith et al., 2002).

The case studies presented in Chapters 7 and 8 have characteristics in common with the Latin American model. They were collaborative, involving both workers and worker-friendly occupational health clinic staff. They raised awareness, empowered workers and achieved their goals. This is explored further in Chapter 9.

The overall political and economic environment can influence the 'model' of participatory action research workers choose to follow. There may be other influences as well, such as the desired outcomes, the culture of the community or organisation within the larger political-economic environment, the orientation of the leaders, and the perceived advantages and disadvantages of pursuing one approach versus another.

There are now reports of participatory occupational health and safety research activities across the world. Besides the examples given of the ground-breaking research that emerged in Italy, Sweden, Latin America, and Zimbabwe (Loewenson et al., 1995b), there are publications reporting its use in: Germany (Wilkening, 1990); Japan (Kawakami et al., 1999; Kogi, 1998, 2002); Canada (Mergler, 1997; Keith et al., 2001a); Australia (Ritchie, 1996); Norway (Elden, 1983); as well as in "Costa Rica, Denmark, France, Mexico, Quebec, the United States, South Africa, and other countries" (Mergler, 1987, p 151) *(see also Table 4.1)*.

4.5.2 Tendencies within participatory action research and their relevance to occupational health and safety

There are essentially two poles or "strands" of participatory action research (Loewenson et al., 1995, p 122). Both are seen in the published occupational health and safety PAR literature. The case studies presented in Chapters 7 and 8 of the dissertation contain elements of each.

The two dominant tendencies within action research have been described as: 1) "expert-dominated" or "weak," and 2) egalitarian and participatory or "strong" (Landsbergis et al., 1993, p 45). The following section discusses the "weak" tendency under the sub-heading of *reformist tendency* and the "strong" tendency under the sub-heading of *political empowerment tendency*.

4.5.2.1 Reformist tendency

In the North (essentially the more developed nations), participatory action research falls most often into the "reformist" tendency, which sees value in the knowledge-building and empowerment potential of action research for mobilising local people for social change within existing structures (Greenwood and Levin, 1998, p 223). In other words, the established order is generally accepted but there is recognition that reform is needed to bring about a greater degree of justice.

Participatory action research, in this vein, has been embraced by educators and community organisers and a broad range of professionals including "sociologists, architects, engineers, economists, and psychologists" (Karlsen, 1991, p 143). While its goal is community development and liberation of the oppressed, it is often initiated by professional or community development advocates (Selener, 1997). An

occupational health and safety participatory action research project, for example, may be initiated by a "researcher, the organisation, representative groups such as unions or associations, or perhaps a statutory body" (Dollard et al., 1997, p 58).

The Scandinavian model of participatory occupational health and safety research might be considered "reformist". This approach was used in the United States following the Second World War (Loewenson et al., 1995b). The following is an example of this "utilitarian" approach (p 122).

The Union of Needletrades, Industrial and Textile Employees (UNITE), the union representing 200 workers at a textile sequins manufacturing plant in New York City responded to workers' concerns about ergonomic problems by collaborating with the employer and outside experts to undertake a study. The union began by circulating a confidential health symptoms survey. The results were analysed with the help of staff at the Mount Sinai Centre for Occupational Health. The survey showed a high number of injuries among those rolling sequins onto a spool with a manual crank. Almost seventy-five percent of the workers were experiencing serious pain of one form or another. The union took the results of the survey to management and they began a joint investigation to evaluate the various workstations. With the workers' permission, the union video taped individual jobs to document awkward postures and difficult motions. A number of workstations were then ergonomically re-designed, including the spooling machine, which was retrofitted with a foot pedal. Padded, adjustable chairs were purchased. Jobs were rotated. The union directed an educational programme involving workers and managers to heighten awareness about prevention strategies for repetitive strain

injuries. The year before the programme was initiated there had been eighteen cases of carpal tunnel syndrome. In the following year, after implementing many of the recommendations from the research, there were only five compensation cases, none of which were for carpal tunnel syndrome. Plant management reported that, due to this joint undertaking, its compensation costs were cut in half. More importantly, workers' risk of injury was greatly reduced (Occupational Safety and Health Administration, 1998a; Keith et al., 2002).

While the study in the above example resulted in improvements, there are potential weaknesses to the reformist approach. Participatory action research is designed to bring equality to all partners; the "subjects" are, in fact, equal partners. As such, it might be assumed that they are less vulnerable to exploitation than they might be in conventional research. In fact, "to dupe them in any way would be to undermine the very processes one wants to examine" (Punch, 1998, p 169). There is a danger that a cooperative, collaborative process may be heavily weighted on the side of the more powerful or dominant partner, which can exert undue influence on the process thereby defeating the objectives of producing democratically-derived change (Hagey, 1997).

Chapter 9 will explore what characteristics the case studies presented in Chapters 7 and 8 hold in common with the above described *reformist tendency*.

4.5.2.2. Political empowerment tendency

Adult education and its offshoot, action research, emerged in the South from grinding poverty, violence and political oppression. Adult educators and action

research practitioners, such as Paulo Freire, Orlando Fals-Borda, and Budd Hall, were influenced by Marxist philosophy that contends social change can only occur by overcoming the oppressive political structures that are responsible for societal ills (Greenwood and Levin, 1998, pp 220-221). The choice to use participatory action research, as it was originally conceived, is "inherently political" (Cornwall and Jewkes, 1995, p 1667).

Participatory research is a "bottom-up" approach, the assumption being that the research process and results will generate "knowledge for action" and effect change (Cornwall and Jewkes, 1995, p 1667). It is therefore useful in advancing understanding of problems important to less powerful groups in society (Dollard et al., 1997). Intrinsic to participatory action research, is social and political activism. In its more political form, its purpose is to:

> …identify and challenge power structures that exist within institutions and economic systems. It is about understanding, analysing, involving, empowering, and taking action in ways that may challenge those very structures. It is often about taking sides and challenging dominant ideologies. The action component can be troubling and even threatening for potential allies in academia and in professions which are financially dependent on the good will of the very institutions and existing economic structures being challenged through the research (Keith et al., 2002, pp 69-70).

The previously outlined Italian Model of occupational health and safety research, which was grounded in conflict (Wintersberger, 1985; Reich and Goldman, 1984), might be considered to belong to this more political tendency as it challenges the power structures that control working conditions.

It can be argued there are political aspects to all social science research (Selener, 1997). The biases of the sponsors and/or the researchers are likely to make their way into the process, findings, and such broader outcomes as recommendations either for change or a bolstering of the status quo. In other words, research "has the potential to affect the distribution of power in society. Research can serve to either maintain or to challenge society's existing power relations" (Selener, 1997, p 24).

Popular education, which is at the foundation of participatory action research, challenges the notion of what constitutes knowledge; it promotes democracy and equality and validates personal experience (Hurst, 1995). Knowledge is understood to be more than just facts; it is created through the integration of "thinking, feeling and acting" (Selener. 1997, p 32). It "involves the whole conscious self, feelings, emotions, memory" (Freire, 1998, p 92).

Like popular education, participatory action research is a step in a process of discovery whose true end point is change. Freire believed it was not productive for victims to simply commiserate about their problems as this would result in a sense of defeat and inertia. The process, in order to result in change, would require a political analysis and "must always involve a political project with the objective of dismantling oppressive structures and mechanisms (Macedo and Freire, 1998, p xiv).

While a goal of the more pragmatic reformist participatory action research may simply be to "sensitise [researchers] to the needs of the community" in its more political and empowering form, participatory action research may be employed as

"an integrated part of the process towards empowerment and emancipation" (DeKoning and Martin, 1996, p 3).

Chapter 9 will explore what characteristics the case studies presented in Chapters 7 and 8 hold in common with the above described political *empowerment tendency*.

4.5.3 Sub-streams of participatory action research

As the previous discussion reveals, at one end of the PAR continuum, is the more pragmatic tendency, which is most often dominated by the experts or those who are at a higher level within the institutional hierarchy; at the other end is the more community-driven, politically challenging tendency, which is oriented towards empowerment of those who are at the lower levels of the social hierarchy (Loewenson et al., 1995; De Koning and Martin, 1996).

However, along the continuum between the two poles, several sub-streams of action research have also been described (Grbich, 1999). In the area of health research, four general types have been identified, ranging from the expert science-based to the action-oriented and political. They are: 1) *experimental*, which involves scientific experimentation or intervention; 2) *organisational*, which involves working with management with perhaps some involvement of workers; 3) *professionalising*, which is designed to enhance professional skills of practitioners; and 4) *empowering*, which is co-researcher collaboration aimed at change (Grbich, 1999, p 204).

The literature suggests that participatory action research conducted in occupational health and safety in the industrialised world has characteristics of both the *organisational* and *empowering* sub-streams. As mentioned, most of the published occupational health and safety research that utilises a participatory action research approach involves external researchers; it most closely fits the definition of "organisational". Such research tends not to challenge the general socio-political framework in which industry thrives. Worker practitioners bring about local improvements through negotiated agreements with the employer, facilitated by the empowering process of participatory action research. The organisational approach can benefit the employer as well as workers. For example, joint worker-management participatory action research has been promoted as having "the potential to redesign work organisations to improve performance while also improving health and safety" (Shurman, 1996, p 373).

Participatory action research proponents counsel occupational health and safety professionals not to use participatory approaches with the goal of improving worker productivity rather than worker health and safety (Rest, 1996) as this defeats the very purpose of PAR, which is empowerment of the subject community.

Cohen-Rosenthal (1991) promotes joint worker-management participatory research to overcome ineffective occupational health and safety programmes. Citing the limited success of management-initiated safety campaigns, education efforts, committees, suggestion boxes, or "technocratic formulas", he suggests that a joint effort between union and management would lead to "common strategy and new commitment" (p 5) to improving occupational health and safety.

One example of this *organisational*, joint worker-management approach is a participatory action research project in a pork slaughtering plant in Texas (U.S.) in the early 1990s. The research team included workers, academic investigators, a corporate ergonomics coordinator and engineers. Information was gathered through meetings, interviews, observation, existing records and previous survey data. Brainstorming was used to explore solutions and the industrial engineer was given the responsibility of implementing resulting recommendations (Moore and Garg, 1996).

There are arguments for and against such joint worker-management research undertakings. On one hand, if the process is democratic and decisions regarding the goals and direction have been fully agreed upon, it can provide workers with an opportunity to voice concerns. On the other hand, workers may feel insecure about expressing their real opinions or providing information if employer representatives are present or will be privy to personally identifiable data. As previously indicated, the Scandinavian experience demonstrates such joint undertakings can be effective when there is a "mature" union presence and an "enlightened" management (Wintersberger, 1985, p 25).

However, a risk exists for participatory researchers who are involved in top-down projects; they may be used as "pawn[s] for the bureaucracy or company that merely infiltrates the community to get the community to comply with its interests" (Hagey, 1997, p 3). There is a danger that the research process may be abused to prove that nothing is wrong and then claim that the participants endorsed the

process. In the case of occupational health and safety, such manipulation might take the form of an employer-initiated and controlled project; such a project may be dubbed "participatory" but is, in reality, intended to bring workers around to the employer's way of thinking, which may have more to do with production than workers' wellbeing.

There is significant evidence of such corporate influence on research (as discussed in Chapter 3). Such influence and manipulation is in direct contradiction to the principles of participatory action research. It is significant that the case studies presented in Chapters 7 and 8 did not involve employers or their agents and were therefore much less vulnerable to their influence.

4.6 Collaboration in participatory action research

As discussed, participatory action research may involve a collaborative partnership between the inside community and outside "experts" such as professionals or academics. As its name suggests, participation by the community is a key element to participatory action research. The "community" may be a workplace, a rural village, a housing development or a group of individuals with some common characteristic or need. The focus of the research is the need or needs defined by the community. A fundamental principle is that all key aspects of the research are under the control of the community involved in the study rather than scientific experts:

> ...the grassroots and their cadres are able to participate in the research process from the very beginning, that is, from the moment it is decided what the subject of research will be. They remain involved at every step of the process until the publication of results and the various forms of returning the knowledge to the people are completed (Fals-Borda, 1991, p 7).

Unlike the standard scientific approach whereby an outside researcher investigates the subjects, in participatory action research the subjects themselves are also researchers (Hagey, 1997; Hall, 1981). "Rather than treating people as the subjects of study by a detached and neutral researcher, participatory action research engages researchers and subjects in a collaborative partnership" (Keith et al., 2002, p 69). "Participation should genuinely be empowering and not just a situation where local people work with a researcher for the latter's convenience" (De Koning and Martin, 1996, p 3).

Feminist researcher, Reinharz (1983), uses the term "experiential analysis" to describe the participatory process whereby the aims and outcomes of the research are of importance and relevance to both the researcher and the participants (Martin, 1996). In a successful collaboration, the community and outsiders have a mutual interest in the process and the outcomes are relevant to all involved (Reinharz, 1983; Selener, 1997). The external researcher, or "friendly outsider" (Greenwood and Levin, 1998, p 104) respects the needs of the community and will gain knowledge and understanding through the process (Selener, 1997).

It is important that external researchers attempt to set aside their preconceptions, opinions and cultural values and open their minds to the process of co-discovery with the participant community (de Koning and Martin, 1996). While Hall suggests that the issues to be addressed through participatory action research originate within the community, such as the workplace (Hagey, 1997), the overall literature suggests that the majority of participatory projects are actually initiated by

outside academic or professional researchers. It is therefore, critical that local workplace concerns be central to the research.

There is an inherent "distrust of experts" experienced by many workers (Loewenson et al., 1995a, p 268) that can be somewhat overcome by the participation of worker-friendly, respectful external researchers. Effective participatory action research collaborators lend support and guidance, without usurping the leadership role of the worker-researchers (Keith et al., 2002; Mergler, 1987). External researchers have a particular responsibility to adhere to the fundamental principles of participatory action research; they must carefully avoid taking control, thereby disempowering the participant community, that is, their co-researchers (Moller, 1998; Keith et al., 2002; Mergler, 1987).

Carl and Kemmis (1986) warn that insensitive outside researchers can undermine "the groups' common responsibility for the process" (Moller, 1998, p 80). There is the potential for an even more malignant threat to inequality within the collaboration process; private business is emerging in which participatory action research facilitation services are provided for hire. This raises the possibility that "the principal investigator can passively be an agent for powers interested in managing the community" (Hagey, 1997, p 3). As the original intent of participatory action research is to empower and emancipate, the use of participatory action research to deceive or manipulate unsuspecting subjects, is an ethical breach (Hagey, 1997).

Formalised agreements between academics and worker organisations can pave the way to a more equal footing. In Canada, an institutional agreement has been struck between university-based scientists at the University of Quebec in Montreal and two major unions (Mergler, 1987; Keith et al., 2002). Worker-scientist interaction takes place at all stages of the research -- the defining of the project, establishing of aims, data collection methods, analysis, interpretation and writing of conclusions and recommendations. This "rapprochement" has resulted in a number of successful research projects. For example, the union representing bank tellers in Quebec, carried out a study in collaboration with the researchers from the University of Quebec. The union was directly involved in selecting a representative team of bank tellers who would work with the researchers as well as determine the research priorities. The union identified their most important concerns as prolonged *standing, bank robberies and pressure to sell bank services*. Once the research plan was in place, the union negotiated with the employers to give the researchers access to the workplace for observation and interviews. The researchers spent over ninety hours in six branches observing the bank tellers' work. They conducted interviews with tellers and supervisors regarding their problems and opinions. This information provided the basis for a questionnaire that was administered to 305 tellers. The researchers prepared a detailed report based on the data. The report was then condensed for wider distribution and the research findings were reported to a general assembly of the bank tellers. The report's recommendations were incorporated into the union's negotiating strategy, which was successful in improving the bank tellers' working conditions (Seifert et al., 1997; Messing, 1998; Keith et al., 2000). Other successful collaborative research projects included a study of health and safety hazards in slaughterhouses (Mergler et al., 1983) and a

study of women's health in the fish-processing industry (Messing and Reveret, 1983).

Similar collaborative arrangements between academics and workers have been made in other countries. In the UK, for example, a research study was collaboratively undertaken to explore apparent occupational disease amongst former Vinatex workers (Watterson et al., 2000). In 2000, a survey was developed through a partnership between a support group of former Vinatex workers in Britain and university-based researchers. Two hundred and twenty-nine former Vinatex workers were identified and contact was made with as many as possible. One hundred and sixty-two workers ultimately participated in the research. A questionnaire, which was sent out by mail, explored the employees' work history. Once the questionnaires had been returned, an interview was arranged to document the health status of the participants. The research resulted in some interesting findings. Incidence of breathing difficulties among the former Vinatex workers was found to be much higher than those reported in the general Health Survey for England. The former Vinatex workers also revealed greater problems than expected with concentration, state of mind, irritability and various cognitive processes. These findings were very close to results obtained from workers exposed to occupational solvents. When the researchers examined the existing literature, they discovered that respiratory and cognitive impairment are, in fact, consistent with studies involving workers exposed to vinyl chloride. The workers' support group demanded that the British government play an active role in formally documenting the health problems of the former Vinatex workers through a registry and that the workers have a direct role in the process (Watterson et al., 2000; Keith et al., 2002).

Health and safety practitioners, such as industrial hygienists, ergonomists, union health and safety representatives, medical professionals, and others in the occupational health field, may also play a role in promoting and facilitating occupational health and safety participatory research approaches. Watterson (2003) recommends that occupational health and safety practitioners adopt a charter that includes the use of lay and worker or community-based research "along the lines of the WHO European Charter on Environment and Health" thus ensuring that "employers draw on the skills and knowledge of employees to identify hazards and explore means to remove hazards. In this context the health and safety practitioner may be the facilitator of progress and the champion of change" (Watterson, 2003 pp 232-233). Collaboration with occupational health professionals who are truly committed to a democratic and egalitarian process, may give workers critical support for influencing change.

4.7 Scientific rigour and validity

Central to this dissertation is the argument that the corporatist criteria for determining rigour and validity *(see Chapter 3)* are not necessarily applicable or useful for participatory action research. There is considerable debate regarding claims and assumptions made by participatory action researchers and their detractors who dismiss it as unscientific and lacking rigour. Action research "has been the target of severe criticisms from positivists, who typically view experimental and survey research as the only 'valid' modes of scientific inquiry" (Kock et al., 1997, p 3). PAR has been criticised as "biased, impressionistic and unreliable" (Cornwall and Jewkes, 1995, p 1667). (Note: the term 'scientism' might

better reflect the target of criticism of participatory action research proponents than the term 'positivism')

Conventional occupational health and safety research is seldom done using qualitative methods (Needleman and Needleman, 1996). Because participatory action research is often conducted using so-called "soft" qualitative, rather than "hard" quantitative methods, it is disdained by conventional scientific researchers (Cornwall and Jewkes, 1995, p 1667). Participatory action research is said to lack objectivity and does not follow accepted rules for establishing validity and rigour (Eden and Huxham, 1996) thereby producing results considered by mainstream researchers to be less meaningful than those arrived at by positivist approaches (Barnsley and Ellis, 1992; Hagey, 1997; Kock et al., 1997; Keith et al., 2002).

This view is countered by participatory action research proponents who argue that, in fact, it is a, "more scientific method in that community participation in the research process facilitates a more accurate and authentic analysis of social reality" (Selener, 1997, p 20). It has also been shown to have validity using positivist terms of reference. For example, in the previously described collaborative participatory research study conducted in the steel industry in Mexico, a collective "comprehensive questionnaire" was used to gather information about physical, chemical, physiological and psychological hazards and health impacts (Laurell et al., 1992). Like the Italian Model, it used "homogeneous groups" and consensual validation (p 604). Questionnaire results were also validated using conventional tools: an individual questionnaire and medical testing. The validation showed considerable agreement with the results of the collective questionnaire, especially in

terms of "important explanatory elements" regarding work-related pathology; the results were "very similar":

> In view of these findings it is concluded that the participatory methodology has some important advantages over traditional methodologies since it provides qualitative information on the labour process, a precise picture of the main risks and how they are produced and semi-quantitative data on health damage, and at the same time, generates a process of consciousness and organization among workers that enables them to promote health-oriented action (Laurell et al., 1992, p 603).

Rigour is judged in positivist terms by adherence to strict protocols and measurements. It "seeks accuracy to achieve a close correspondence between data and physical or social reality, minimising personal judgment" (Chambers, 1997, p 158). In order to deflect some of the criticism, it has been suggested that the terms "validity" and "reliability" be avoided in the context of qualitative participatory research and replaced with such terms as "trustworthiness" and "credibility" (de Koning and Martin, 1996, p 2). In participatory rural appraisal, for example, "rigour [is] based on two sets of criteria: trustworthiness and relevance. Trustworthiness is the quality of being believable as a representation of a reality; relevance refers to practical utility for learning and action" (Chambers, 1997, p 158).

Qualitative research, which is often the approach of choice in participatory action research, may be similarly maligned as lacking rigour using the terms of reference for quantitative research. Scientific rigour, as it is generally understood, is a concept related to quantitative research and is largely irrelevant to qualitative enquiry (Needleman and Needleman, 1996). The purpose of qualitative research is not so much to pursue objective "truth" but rather to interpret the truth "in order to

gain useful insight into the meaning of the situation" (p 335). This is an important concept in occupational health and safety. It involves much more than a quantifiable set of technical-medical factors. Its complex social and human dynamics are more effectively explored using qualitative methods.

While the lack of objectivity common to participatory action research is a target for detractors, this characteristic may be one of its greatest strengths (Keith et al., 2002, p 8). Participatory action research explores the community's knowledge through the richness and complexity of people's own experience and knowledge. The nature of the hazards, personal concerns, self-perceived health problems and social dynamics existing in their own workplaces may be the very data being sought.

Subjectively derived findings may have more "relevance" for workers themselves (Loewenson, 1996, pp 5-6). In this regard, participatory action research provides an advantage over conventional reductionist scientific approaches (Chambers, 1997, p 158). Standard survey research, for example, is based on a narrow definition of "knowledge" that "oversimplifies social reality" (Hall, 1979, p 401):

> A research process that extracts information from individuals in isolation from one another and aggregates this into a single set of figures does so at the expense of reducing the complexity and richness of human experience" (Hall, 1979, p 401).

"Experiential knowing" (Hills and Mullett, 2000, p 7) is based on knowledge derived from personal lived experience in relationship to others. Proponents of participatory action research believe that, in research that is oriented towards subjective truths and experiential analysis, bias should not be seen as a negative characteristic:

Bias is defined as "distortion of results by a neglected factor." Often the "factor" people neglect is the researcher's point of view. Pretending that people can put their opinions or feelings aside means ignoring an important factor in the research process. If researchers don't acknowledge their views, they are more likely to produce research that is biased. Declaring up front what the researchers believe about the issue is a way to guard against bias." (Barnsley and Ellis, 1992, p 13)

While, it may be argued that worker-researchers lack the impartiality so highly valued in standard research protocols, it can also be argued that no researcher comes without a series of biases (as discussed in Chapter 3). Recognition and management of those biases is critical for both conventional and participatory action researchers. Moreover, the potential scientific "weakness" of bias among the worker-researchers can be out-weighed by the value of their subjective knowledge of the work environment.

Hills and Mullett (2000) endorse a "subjective-objective ontology" in which subjective experience interacts with one's knowledge of the world, that is, "investigating people's understandings and meaning as they experience them in the world" (p 6). Evidence is produced through several different ways of knowing (Reason and Heron, 1999):

- *Practical* "how to" knowing (Reason, 1993, p 1259); it is "knowledge in action" (Hills and Mullett, 2000, p 7).
- *Propositional* knowing is "knowing about" (Reason, 1993, p 1259); unlike "empirical knowing" which is "expressed in statements, facts, or theories" proposition knowing is "seen as interdependent with the other three ways of knowing" (Hills and Mullett, 2000, p 7).

- *Presentational* knowing is represented "through spatio-temporal images" (Hills and Mullett, 2000, p 7) and is "expressed in images and stories" (Reason, 1993, p 1259), which is relevant to the mapping methods explored in the dissertation.
- *Experiential* knowing, the form most relevant to participatory action research, is based on "direct encounters with persons, places and things" (Hills and Mullett, 2000, p 7) or "knowing through encounter" (Reason, 1993, p 1259).

In terms of occupational health and safety, participatory action research values workers' knowledge of their own workplaces, lived experiences, concerns, health issues, as well as their understanding of some of the barriers to change:

> The primacy of experiential knowing in participatory action research is in direct contradiction to the dominant, prejudiced opinion that occupational health and safety is the domain of trade union representatives or professionals such as technicians, engineers, and other educated professionals (Wintersberger, 1985, p 19).

The notion of professional superiority in research promotes "the view of occupational health as the province of technical experts; the campaign for the 'objective' finding silences workers as unqualified to comment" (Lax, 2000, p 237).

Proponents of participatory action research consider that researchers who rely on standard, accepted scientific approaches face a significant barrier to achieving full, meaningful and comprehensive results; they lack the intimate knowledge and understanding of the complexities of the workplace under study (Loewenson et al., 1995a, 1995b). Workers, by contrast, know their own workplaces most intimately;

they are the experts when it comes to their own jobs (Lindqvist, 1982; Loewenson, 1995b). Workers "know where the problems are and can often suggest creative and effective solutions" (Rest, 1996, p 223). In 1952, Downing wrote that, "Workers frequently know the hazards of their occupations long before their employers recognise or accept them" (as cited in Abrams, 1983, p 762). Even conventional researchers are encouraged to consult with workers about their workplaces as they can provide "a more complete, accurate, and balanced assessment of past occupational exposures" than might be derived from information provided by employers (Egilman, 2000, p 668). "Whether it's pesticides, chemicals, strain injuries, heavy metals or solvents, you can bet workers spotted the problem before anyone else cottoned on…" (Hazards, 2000, centrepages). The consultation process and the valuing of workers' knowledge are intrinsic aspects of worker-driven participatory action research.

Participatory action research is also criticised as lacking the rigid record-keeping and documentation protocols typical of conventional research thus making it "difficult for others to criticise the results which are claimed" (Møller, 1998, p 71). This lack of documentation may also render it unsuitable for peer-review scientific publication. Participatory action research in occupational health is under-represented in the medical-scientific literature. Table 4.1 (presented earlier in the chapter) demonstrates that the body of published occupational PAR literature is limited.

The apparent under-representation of participatory action research in the peer-reviewed occupational health literature is not necessarily a result of an institutional

rejection of the approach. Participatory action research projects are undertaken to empower local people and to create change; therefore, as mentioned at the beginning of this chapter, peer-reviewed publication, may not be a priority for the researchers (Keith et al., 2002, p 8).

4.8 Limitations and strengths and of participatory action research

There are disadvantages and advantages to using participatory action research. Its limitations and strengths are discussed in the following sections, particularly in terms of occupational health and safety research.

4.8.1 Limitations of participatory action research

While participatory action research has been shown in many cases to be effective in successfully bringing about new knowledge and social change, practitioners and proponents recognise its limitations. For example, Watterson (1999b) recognises that participatory action research may "mean no precise quantification of a particular problem occurs" and may "provide inaccurate perspectives" (p 6).

Laurell et al. (1992), having successfully validated the findings of a participatory approach in a Mexican steel plant (as discussed previously), contend that the approach "has the same probatory value as a classic epidemiological study" but they caution that "…it is probable that such an argument would not be legally accepted" (p 612). As few examples of occupational health and safety participatory studies have been published to date, it remains to be seen whether findings will result in structural systemic change. There is however, evidence that participatory action research can effect local change, that is, within the workplaces involved in the

research, as described by Hugentobler et al. (1992), Kawakami and Khai (1997), Israel et al. (1992), Keith et al. (2001a) and others. The focus on *local* improvements is in keeping with the fundamental objectives of participatory action research.

Lack of generalisability is another potential limitation. Because participatory action research usually has a local focus and is aimed at changing local conditions, it is not readily generalisable. Its generalisability is also limited by its frequently small sample size, although it can provide "analytical generalisability of concepts and insights of qualitative paradigms" (Watterson and Watterson, 2003, pp 45-46.)

There are exceptions regarding the limits of generalisability. The casino gaming study presented in detail in Chapter 7, showed evidence of generalisability (Keith et al., 2001a). The results of another worker-based participatory action research study, called the "Housekeeping Study", in which unionised workers collaborated with academics and public health representatives to explore the issue of workload among hotel workers, was considered by its authors to be generalisable to other hotel cleaners across the United States (Lee and Krause, 2002).

Another potential problem with participatory action research is the difficult task of satisfying the interests of all collaborating parties; it is "complicated to design and conduct research in concert with outsiders who lack expertise in scientific methods and have subjective, vested interests in the direction and the results of the research" (Moir and Buchholz, 1996). It can be challenging for workers seeking collaborative arrangements to find willing and trustworthy professional researchers. Outsiders can

be reticent to participate in a study that they do not fully control or one that has the potential to challenge dominant ideologies; in other words, it may be too political for comfort. Moreover, because publication is important for their career advancement, potential academic collaborators may be deterred by the more limited publishing opportunities afforded to participatory action researchers (Seifer, 2003).

From the point of view of a professional external researcher, three main "threats" are seen as inherent to participatory action research: "uncontrollability," "contingency," and "subjectivity" (Kock, 2002, p 6). The uncontrollability threat refers to the researcher's inability to control the subjects or the process. The contingency threat refers to the lack of generalisability of the results; they are said to lack "external validity". Subjectivity may be seen as a limitation because "personal involvement" is believed to bias outcomes (Kock, 2002, pp 7-9).

Conventional researchers are accustomed to the usually stringent protocols for data collection rather than the subjective or self-reported nature of data collection common in participatory approaches.

The idea of participatory action research may be unfamiliar to workers or community members. Research is something that is ordinarily considered to be the domain of professionals and academics. Worker and community education regarding the merits of PAR may be necessary prerequisites. The intervention of a worker-friendly collaborator may be necessary in some cases in order for workers or other community members to feel comfortable conducting their own research.

If open sharing is to take place, the anonymity and confidentiality of participants cannot be guaranteed (Williamson and Prosser, 2002). This is particularly true of group discussion or focus group methodology.

When compared to other approaches, participatory action research can be time-consuming (and therefore costly) for the researchers and participants (Greenwood and Levin, 1998, p 114). For example, a six-year participatory action research occupational stress study was conducted by university-based researchers in collaboration with workers, union and management in a U.S. automotive parts plant in Michigan during the 1980s and early 1990s (Hugentobler et al., 1992; Israel et al., 1989, 1992). One of the criteria for the study was that it be "an empowering process" that would contribute to workers' "influence and control over their own lives" (Israel et al., 1992, p 155). The project involved the use of individual interviews, focus group interviews, field notes, and surveys (Hugentobler et al., 1992). Recommendations resulting from the early steps of the research process were not "implemented until the plant leadership became directly involved in the committee itself" (p 162.) The union leadership played an important role and supported the process. Modest improvements resulted, including "higher levels of trust in and influence over the committee process" and "increases in participation, perceived climate and co-worker support" for those involved in the process (Landsbergis, 1993, p 46). The amount of data collected through both qualitative and quantitative methods presented practical difficulties and the researchers fear they "were not really able to do it justice" (Hugentobler et al., 1992, p 73). The researchers were also aware that the success of the project was limited by the fact that they initiated it (Israel et al., 1992, p 162).

Mergler (1987) observed that follow-up by collaborating partners cannot necessarily be guaranteed. In a session with unionised workers following a collaborative study in the slaughterhouse industry, she discovered that, in slaughterhouses where initial worker participation in the research had been high, there were reported "local improvements and winning of compensation claims". However, "half the representatives present at the educational workshop had never seen the report of the study, even though their union had participated," a problem she attributes to considerable union executive turnover and the lack of planning for follow-up at the outset of the research (p 165).

4.8.2 Strengths of participatory action research

Fear of job loss, plant closure, employer reprisal and even retaliation from co-workers, can impede workers' health and safety efforts (Keith et al., 2002, p 5). One of the barriers to achieving meaningful change is the paralysis or inertia that many workers feel when it comes to tackling an overwhelming problem. Participatory action research can help to overcome worker inertia. Several factors contribute to its power to mobilise workers to act:

- The participatory, collective element of the research process empowers the participants (Keith et al., 2002, p 2).
- Because it is local or site specific, it produces information that is difficult for employers, inspectors or enforcement representatives to ignore (Keith et al., 2002, p 62).

- It provides some protection against reprisal, as it is much more difficult to discredit or rebuke a group of workers or an entire workforce than it is a few isolated individuals (Keith et al., 2002, p 2).
- It validates workers' concerns and creates a "buy in" or a sense of ownership in the process, results, and proposed action (Keith et al., 2002, p 2; Robertson et al., 2002).
- Putting issues into a more public arena creates a protective effect; retaliatory action against workers who are promoting health and safety does not make for good public relations (Keith el al., 2002, p 2). The involvement of outside collaborators may also provide some protection because of their connections with established institutions.
- It can open up communication thereby uncovering problems that are more widespread than individually perceived; isolated individual cases become part of a bigger picture (Wilkening, 1990).
- The cohesiveness from a participatory effort can enhance the solidarity required to successfully negotiate improvements (Mergler, 1987; Keith et al., 2002).

The final point regarding enhanced solidarity is key to the effectiveness of participatory action research as a catalyst for change. Workers in the modern workplace tend to be isolated or divided by hierarchies and employer-created divisions. Such environments do not readily encourage the sharing of concerns or ideas among workers. Concerns are often borne in silence or reported "in isolation from each other, one or two at a time;" as a result, the degree and scope of suffering are not collectively known (Keith et al., 2002, p 9).

The value of participatory action research in helping to overcome such divisions is illustrated in two successful collaborative action research projects focussed on stress that were conducted in Germany in the 1980s. One study involved unionised metal parts manufacturing workers and the other unionised white collar [office] workers in the computer industry. Survey results, based on self-reported data, "shocked" the workers. The studies demonstrate that: "breaking the anonymity of such enlightening news can be the first impulse to rediscover solidarity, mutual social support and collective action in the workplace" (Wilkening, 1990, p 51). As a result of the studies, health and safety improvements were made in the case of the metal industry and plans were made to address the findings among the computer company employees.

4.9 Conventional versus participatory action research approaches

The author recognises that epidemiological, biochemical, toxicological, mechanical, psychosocial, technical, medical, and sociological research make significant contributions to our overall understanding of occupational health and safety. However, as discussed in the previous chapters, the historical record shows that rigourously conducted scientific studies, even those that clearly establish a link between work and disease, provide no guarantee of remedial action.

There is a broad spectrum of socio-political barriers to societal and regulatory response to findings, especially those implicating industry as a source of human ill health. Therefore, alternative or complementary forms of research are needed.

Participatory action research, with its intrinsic change element, is designed to overcome some of the barriers to social change entrenched in the corporatist culture.

This chapter reveals that there are fundamental differences between conventional and participatory action research *in general*. Table 4.4 compares and contrasts the two approaches.

Table 4.4 - Participatory and conventional research: a comparison of process

	PR	**Conventional research**
What is the research for?	Action	Understanding with perhaps action later
Who is the research for?	Local people	Institutional, personal and professional interests
Whose knowledge counts?	Local people's	Scientists'
Topic choice influenced by?	Local priorities	Funding priorities, institutional agendas, professional interests
Methodology chosen for?	Empowerment, mutual learning	Disciplinary conventions, 'objectivity' and 'truth'
Who takes part in the stages of the research process?		
Problem identification	Local people	Researcher
Data collection	Local people	Researcher, enumerator
Interpretation	Local concepts and frameworks	Disciplinary concepts and frameworks
Analysis	Local people	Researcher
Presentation of findings	Locally accessible and useful	By researcher to other academics or funding body
Action on findings	Integral to the process	Separate and may not happen
Who takes action?	Local people, with/without external support	External agencies
Who owns the results?	Shared	The researcher
What is emphasised	Process	Outcomes

Source: Cornwall A and Jewkes R (1995). What is Participatory Research? Social Science and Medicine, 41(12):1667-1676.

The differences between conventional and participatory action research in *occupational health and safety* can essentially be described as follows:

- Conventional research is a *top-down* (professional-led) approach; participatory action research is a *bottom-up* (worker-led) approach.
- The focus of conventional research is determined by academics, industry, employers or other authorities and is generally fixed from start to finish; the

focus of participatory action research is determined by the workers in collaboration with outside researchers and is re-evaluated throughout the process in action-reflection cycles.

- The primary goal of conventional research is the creation of new knowledge; the primary goal of participatory action research is the improvement of conditions for the protection of workers' health and safety.
- Conventional research relies on such experts as academics, epidemiologists, physicians, industrial hygienists and technicians, thereby disempowering workers; participatory action research considers workers to be experts, thereby empowering them.
- Conventional research treats workers as subjects; participatory action research treats workers as co-researchers.
- Much conventional occupational health and safety research is quantitative and uses "objective" measurements; much of the participatory action research is qualitative and subjective, reflecting workers' experience and knowledge.
- Conventional research is designed to prove there is no problem; it defends the null hypothesis; participatory research is designed to reveal problems according to the workers' own experience, without the need to provide *proof.*
- The process of conventional research does nothing to bring workers together to pursue a common set of goals; the process of participatory action research builds worker solidarity and collective commitment to influence change.
- Conventional research conceals its biases behind its claims of scientific rigour; participatory action research acknowledges its biases and recognises the value of workers' subjective knowledge.

- Conventional researchers or their sponsors own the data; knowledge generated through participatory action research either belongs to the workers or is shared with collaborators.
- Conventional research reports on its findings; participatory action research acts on its findings.

Perhaps the most significant element that sets participatory action research apart from conventional scientific occupational health and safety research is the fact that it has as its primary goal the improvement of working conditions rather than simply being an academic exercise motivated by the pursuit of so-called new knowledge.

As discussed, conventional researchers are cautious not to appear to be advocates for change for fear of appearing biased, and thereby jeopardising the credibility of their findings. They are to appear detached, objective and neutral, regardless of their opinions or convictions. This safeguarding of scientific integrity may have merit but it fails on a practical, immediate level and to bring about occupational health and safety improvements.

> Community based participatory research tells us as scholars and researchers that the ideas of poor women, indigenous peoples, workers in hotels, and the homeless in Michigan count. These ideas remind us as scholars as researchers to be more modest and more humble in how we label the world (Hall, 2003, p xiv).

Participatory action research is a pragmatic research approach (Watterson and Watterson, 2003); it has an intrinsic advocacy component. Metaphorically-speaking, participatory action research is "research with legs". It has the capacity

for "liberating human potential" (Greenwood and Levin, 1998, p 129) and for bringing about societal change (Selener, 1997).

Occupational health and safety is a deeply political issue. Participatory action research can be a very political approach. Participatory action research challenges workplace power relations; it strives to democratise the workplace, thus granting workers more control over working conditions, at the expense of the employer (Watterson and Watterson, 2003, p 41).

The use of participatory action research to conduct occupational health and safety research has the potential to create significant discomfort among the corporatist scientific community. While there may be attempts by employers or regulators to discredit the ***results*** of participatory action research-based studies, the solidarity, empowerment and knowledge gained by the participants during the research ***process*** cannot be so summarily dismissed. In fact, the sense of ownership over the process and results (Robertson et al., 2002) and the element of control experienced by participants in the participatory action research process can, in itself, be health-enhancing (Israel et al., 1992). Due to the participatory nature of the process, by the time the actual research has been completed, the process of translating the research into action will already have begun (Keith et al., 2002, p 55).

4.10 Summary

Action research "can help build us a better and freer society, but we also believe that many social forces are arrayed against [action research] and its democratising agenda" (Greenwood and Levin, 1998, p 253).

> Participatory action research is no enchanted magic wand that can be waved over the culture of silence, suddenly restoring the desperately needed voice that has been forbidden to rise and to be heard. They know that the silence is not a genetically or ontologically determined condition of these women and men but the expression of perverted social, economic, and political structures, which can be transformed. In the participatory research propounded here, the silenced are not just incidental to the curiosity of the researcher but are the masters of inquiry into the underlying causes of the events in their world. In this context research becomes a means of moving them beyond silence into a quest to proclaim the world (Freire, 1993, pp ix-x).

This concept of empowerment and transformation through process is explored further in the case studies presented in Chapters 7 and 8; casino gaming and foundry workers used participatory action research approaches to explore their own occupational health and safety issues with change very much as their central aims.

While participatory action research influenced the approach taken in the case studies, the principal focus of this dissertation is the use of ***mapping*** as a research tool within worker-based, participatory action research of occupational health and safety. The existing mapping-related literature, though much less extensive than the literature regarding participatory action research, is examined in the following chapter.

The concluding chapter (Chapter 10) will explore how participatory action research paired with mapping as a research tool can begin to overcome some of the barriers to effective occupational health and safety change outlined in Chapters 2 and 3.

CHAPTER 5: MAPPING AS AN ALTERNATIVE OCCUPATIONAL HEALTH AND SAFETY RESEARCH TOOL

5.0 Introduction

> *Like the universal fascination with moving water, or the dance of a fire's flame, maps hold some primal attraction for the human animal. For some, it is the memory of a treasure map followed in youth. For others, it is an almost magical chance to see what otherwise is hidden...maps are powerful talismans that add form to our individual and social reality (Aberley, 1983, p 1).*

This chapter explores, with reference to existing literature, the use of workplace mapping as an occupational health and safety research tool using a participatory action research (PAR) approach. Many of the methods employed in conventional research are also used in participatory action research; it is the overall approach -- the general philosophy -- that differs most dramatically. This chapter, however, analyses a tool not commonly found in conventional research. It examines if and how mapping can be used for data collection, worker enlightenment, empowerment, and mobilisation when following the principles of participatory action research. Thus it is shown to have the potential to overcome some of the barriers to change in occupational health and safety examined in earlier chapters. The case studies presented in Chapters 7 and 8 provide further in-depth examples of its use and efficacy.

There is a considerable body of published literature regarding participatory action research but significantly less regarding its application for occupational health and safety research. There are even fewer publications regarding the use of mapping as a research tool, particularly in the area of occupational health and safety.

Based on the modest existing literature, this chapter explores the value of using visual communication tools; secondly it defines mapping and examines its history; thirdly it explores the adoption of mapping by organised labour and some applications in occupational health and safety participatory action research; fourthly it defines and discusses various mapping techniques; and finally it discusses the strengths and limitations of PAR-based mapping, as these elements are central to the case studies.

5.1 Why is visual communication effective?

> The use of visualization methods, such as drawings, charts, maps and drama, can be a powerful strategy to come to a shared analysis of, and critical reflection on, a situation (de Koning and Martin, 1996, p 11).

Humans rely heavily on sight to understand both their environment and their relationship to it. An infant's first understanding is based on sights and smells and feelings rather than actual words. “This seeing, which comes before words…can never be quite covered by them" (Berger, 1972, p 8). The mind processes visual images at a more fundamental level than words. In fact, the act of rendering images into words may result in details and accuracy being lost in translation. The Sensualist philosophers urge us to consider that "nothing is in the intellect which was not previously in the senses" (Arnheim, 1989, p 2). Yet we are most often asked to communicate through words the sights, sounds, smells and other sensory feelings related to our experiences.

Mathematical linear thought is usually represented by words and numbers (McKim, 1978, p 61). However, Einstein admitted that he seldom thought in words but rather in visual images (Centre for the Communication of Science, 2000). On a

day-to-day practical level, visual cues can replace wordy descriptions and provide clearer messages.

> The language of drawing, which can record what we see, either in reality or in our mind's eye, [is] in a way not totally dissimilar to the way we record our thoughts and ideas in words. Drawings, like words, have meaning -- often beyond the power of words to express, but nonetheless invaluable in making the chaos of our sensory impressions comprehensible (Edwards, 1986, pxiii).

The human brain is divided between the more verbal, rational, analytical, linear-thinking left brain (which is the mode used most often in conventional research) and the more creative, intuitive, subjective, visually oriented right brain (Edwards, 1979; 1986). The right brain is credited with providing us with our revelations and "leaps of insight" (1979, p 35). These thoughts are better suited to imagery. Despite its widespread use, the value of imagery is not well understood by western civilisations. In fact, educational systems tend to steer children away from the use of images, replacing them almost entirely with words and numbers after the primary grades (Arnheim, 1989, pp 2-3). Roger Sperry, a psychobiologist who pioneered the split brain theory, observed that "...our educational system, as well as science in general, tends to neglect the non-verbal form of intellect.

The process of mapping, which is essentially the creation of visual representations of experiences, draws on the right brain function. The process of drawing produces a "mental shift to a different mode of information processing -- the slightly altered state of consciousness -- that enables you to see well" (Edwards, 1979, p 5). This function is ideally suited to the goals of workplace mapping as it generates insights and subjective understanding among participants and encourages a creative, free

thinking, problem-solving process. "Seeing" what the problems are is a first step towards understanding what needs to be done to overcome them.

5.2 What is mapping?

This section provides a few insights into the origins of mapping and some of the more current examples of its use as an organising tool.

Not to be confused with cartography or geographical information systems (GIS), workplace mapping, as it is used for occupational health and safety research activities, is essentially a visual data gathering and reporting technique as well as a tool for developing collective analyses and action plans.

Picasso said, "painting is just another way of keeping a diary" (Cameron, 1992, p 17). Mapping, in general, is the process of documenting and communicating through the drawing and organising of symbols and pictures. It can be used exclusively or in conjunction with written words. Mapping is not a new concept. Thousands of years ago, humans recorded events through cave drawings and carvings. Five thousand years ago, the ancient people of North America etched pictures into rock, creating petroglyphs for "recording important events, depicting sacred ceremonies, and emphasising the importance of animals and hunting" (Minnesota Historical Society, 2000). Such pictorial representations provide a richness of detail that can defy verbal or written description. "No other kind of relic or text from the past can offer such direct testimony about the world which surrounded other people at other times. In this respect images are more precise than literature" (Berger, 1972, p10).

Not unlike the ancient pictograms, participatory mapping in various forms is used in modern times for communication and story telling. It is a tool commonly used for popular education and community organising, especially in the developing countries. Mapping has been conducted in India, for example, in participatory "rapid rural appraisal" projects to explore issues regarding land use, agriculture, watersheds, and other issues of health and economic concern to villagers (Mascarenhas and Kumar, 1991). Mapping in this context can be done using a variety of techniques: simply drawing with sticks on the ground and adding stones or other available items to represent features being discussed (Mikkelsen, 1995; Mascarenhas and Kumar, 1991); using paper and markers or coloured paper cut into various shapes to represent features; or creating three dimensional models collectively assembled using simple materials (Mascarenhas and Kumar, 1991).

The act of creating the maps facilitates discussion and collective planning around issues of community concern. For example, people can use "village social mapping" to indicate caste distribution, wealth ranking, malnourishment and other health problems. They can use "village/watershed mapping" to represent the physical and geographical features related to agriculture, water resources and land planning (p12). "Here both villagers and 'outsiders'/planners can sit together to discuss the village and its resources using the map as the focal point" (p 16).

Mapping has advantages over the spoken word in these settings. Conversation is subject to misinterpretation and may be an uncomfortable means of communication regarding sensitive subjects:

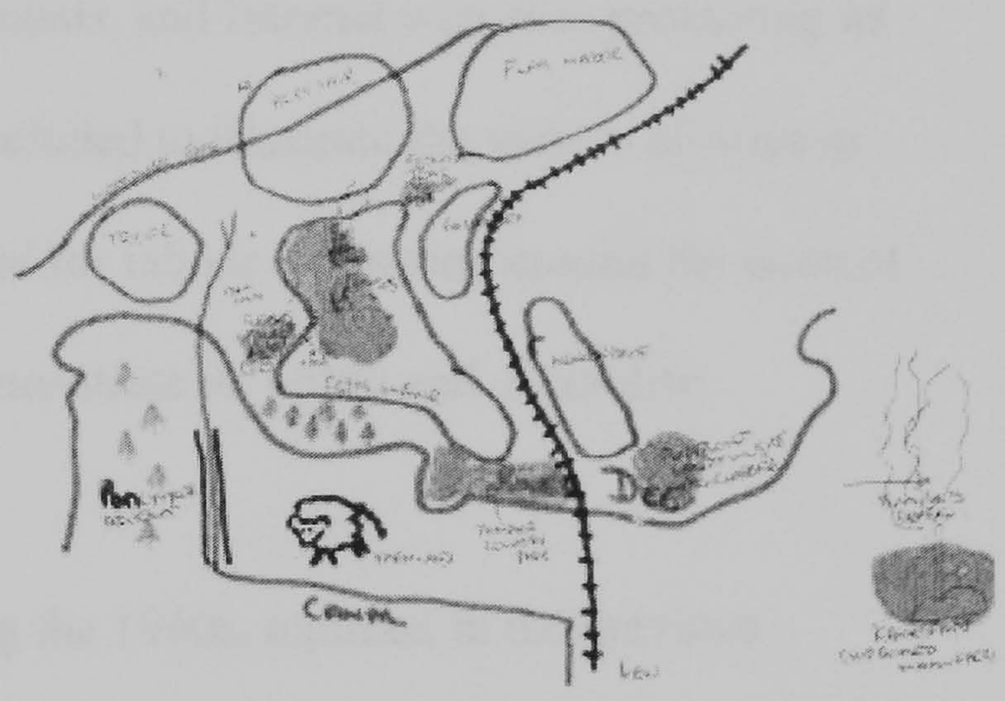
> The ephemeral nature of the spoken word limits the potential for analysis in these settings. The principle of visualisation is to offer a means by which

> information is not only collectively produced but represented in a form that remains open to collective reference, both for cross-checking and analysis…The process of constructing a visual representation is in itself an analytic act (Cornwall, 1996, p 97).

This concept of providing a tangible yet flexible focal point for discussion and analysis is also particularly relevant for occupational health and safety research as it can entail complex and evolving issues.

Community-based mapping projects have been carried out in the developed world, as well. For example, the Women's Environmental Network (WEN) used mapping in an investigation into breast cancer in the UK, which has high rates of breast cancer mortality in comparison with the rest of the world (Watterson, 1999b). The "Putting Breast Cancer on the Map" project began after it was discovered that the East of England had some of the highest breast cancer mortality rates in the country, especially for women in younger age groups. As there was very little official reaction to these findings, the women's network organised its own investigation. WEN questioned what role environmental factors might be playing in the disease and why so little data were available regarding environmental risks. Using a variety of means, WEN launched a nation-wide research and awareness-raising campaign. It held community meetings, employed questionnaires and used mapping to facilitate discussions. The total number of respondents at the close of the project

Figure 5.1 – Putting Breast Cancer on the Map



Source: Women's Environmental Network (1999). Putting Breast Cancer on the Map

was over 1000, ranging in ages from early 20s to late 80s. The findings were published in a booklet that contains reproductions of the maps; it also summarises the issues that were identified during the sessions *(see example in Figure 5.1)*. The Women's Environmental Network succeeded in shedding light on the possible causes of breast cancer, gave voice to the women at risk and put pressure on the institutional health community to take the issue more seriously (Women's Environmental Network, 1999; Watterson, 1999b; Keith et al., 2002).

5.3 Organised labour adopts workplace mapping

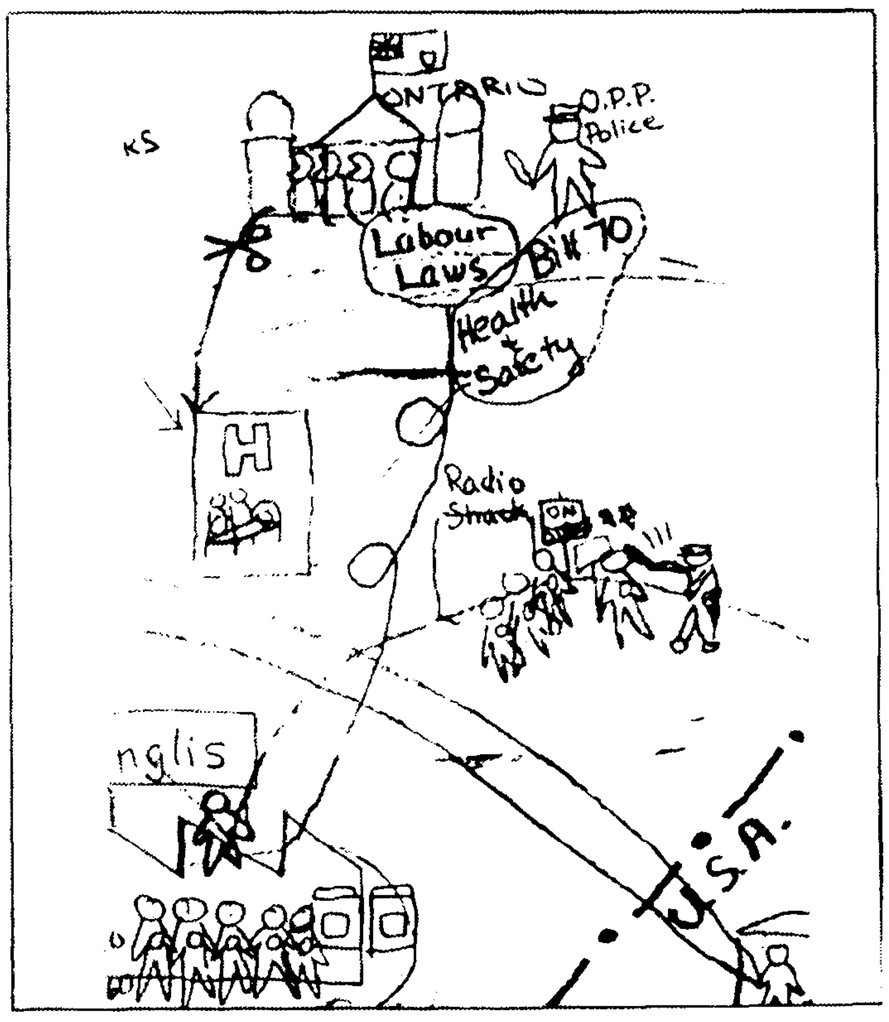
While there are very few peer-reviewed publications that describe mapping for occupational health and safety research, there is a growing abundance of labour publications, training classes, how-to manuals, and Internet web sites promoting its adoption. The following examples are included to illustrate the variety of ways in which mapping techniques have been used for labour organising around the issue of occupational health and safety and to demonstrate its utility and versatility.

The study at the Fiat plant in Turin during the 1960s, outlined in the previous chapter, is one of the earliest recorded examples of worker-driven occupational health and safety research using mapping (Reich and Goldman, 1984). Workers used colours and symbols on blueprint drawings of the workplace to locate and identify hazards (Mujica, 1992; Firth, et al., 1997). Outside experts subsequently verified the problems identified by the workers. "Without complicated instruments, those workers had pointed out the presence, intensity, harmfulness and frequency of the main hazards in their workplace" (Mujica, 1992, pp 767-8).

One of the first recorded Canadian proponents of a process similar to workplace mapping is GATT-Fly, an ecumenical church-based organisation in Toronto, Ontario, dedicated to global economic and social justice. GATT-Fly developed a method in the 1970s they called, "Ah-Hah!" after the exclamation made when one has a sudden insight or revelation (a right-brained concept described earlier in the chapter).

Ah-Hah is a participatory method based on Paulo Freire's principles of collective learning. The method makes extensive use of drawings and discussion to assist group participants in developing a social analysis. GATT-Fly has used its method with native Canadians, steelworkers, immigrant workers and others to explore issues related to the economy, food industry, land use, unemployment, globalisation, wages and other labour issues (GATT-Fly, 1983).

Figure 5.2 - Ah-Hah drawing



Source: GATT-Fly (1983). Ah-Hah!, p. 66

Figure 5.2 depicts a labour dispute with Radio Shack created during an Ah-Hah session with union members; the drawing shows occupational health and safety to be one of the strike issues. The Ah-Hah method was subsequently adopted by other groups, including the Nicaraguan Sandinista Defence Committees and the Association of Rural Workers in the early 1980s. There it was called "memoria grafica" and was used to explore "the structure of corn production and marketing" (pp 95-96). The method stresses the idea of putting oneself into the picture, that is,

the participants draw themselves into the graphic representation of the economic or political issue being explored.

In the past decade, workplace mapping in various forms has been adopted for training or research purposes by numerous occupational health and safety organisations in the United States, such as: the New York Committee for Occupational Safety and Health (NYCOSH) (2001b); the Labor Occupational Safety and Health Program at the University of California, Los Angeles (UCLA-LOSH) (1996); the Work Environment Department of the University of Massachusetts, Lowell (Moir et al., 1998); the National Institute for Occupational Safety and Health (Habes and Wigmore, 1998); among others.

During the 1990s, Canadian labour organisations began to explore the use of mapping for health and safety education, organising and research and many have introduced mapping in conferences and training courses, such as the Canadian Labour Congress (1999); Ontario Federation of Labour (1999a, 1999b); Canadian Auto Workers (1996); United Steelworkers of America (Keith, 1999b, 1999e); Communications, Energy and Paperworkers Union of Canada (1996); United Food and Commercial Workers (1999). Most of these labour organisations are now actively promoting mapping on their websites and in educational materials.

Mapping dominated the agenda of the 1997 national health and safety conference of the largest union in Canada, the Canadian Union of Public Employees (CUPE) (Keith et al., 1997a). In 2001, when CUPE revamped its worker health and safety training programme, it made extensive use of popular education techniques to raise

workers' consciousness of the systemic roots of health and safety problems and the political, economic and social dynamics of the issue. The new course teaches workers how to conduct their own workplace health and safety studies using principles of participatory action research and promotes the use of mapping to gather information, raise awareness and facilitate communication (Keith et al., 2001b). As the preface reads:

> This course is part of a movement to bring health and safety full circle – back to its political beginnings. It is part of CUPE's renewed effort to "organize the organized', using the power, knowledge and spirit of the membership to transform our workplaces into safe environments… (Keith et al., 2001b).

When the health and safety instructors were first introduced to the new material, they initially communicated some resistance. Familiar with the traditional way of discussing and investigating workplace hazards, some expressed concern that mapping might be too simple to be effective. By the end of the week-long training session, and after they themselves had participated in a series of mapping exercises, the instructors had been won over. Anthony Pizzino, national director for CUPE's health and safety branch, who strongly supported the introduction of mapping in the national conference and health and safety course, said, "We have put a lot of effort into promoting the use of mapping and we want our members to use it... Mapping substantiates workers' front-line perspective on health and safety. It is a direct link between workers' knowledge, experiences and concerns and today's health and safety issues" (Keith, 2003a, p 15).

In 2003, the Ontario Workers Health and Safety Centre, a province-wide labour-sponsored training organisation, issued a special fact sheet for International

Repetitive Strain Injury Prevention Day that promoted body and hazard mapping. It highlights the success of the casino gaming study presented in Chapter 7.

Mapping was promoted to the labour movement in the UK as a tool for occupational health and safety research at the *Hazards* conference in 2000 (Keith and Brophy, 2000a). The trade union movement in the UK influenced the Health and Safety Executive (HSE) to recommend mapping as an assessment tool. In its *Report and Recommendations on Improving Access to Occupational Health Support*, the Health and Safety Executive states:

> 24.5 It is important that workers are not simply consulted but are also given the opportunity to contribute proactively to management of health risks. Based on their intimate knowledge of their jobs, workers can play an essential role in risk identification, particularly if they have the opportunity to pool their knowledge with other workers. Ways of encouraging this include focus groups to e.g. identify the risks associated with particular tasks and methods of overcoming them and risk audit questionnaires. Other more innovative techniques include "body" or "risk mapping" (Health and Safety Executive, 2000).

In 2001, the Trades Union Congress (TUC) in the UK announced a massive worker-based mapping initiative among its twenty million members (Trades Union Congress, 2001; Keith et al., 2002). The TUC received funding for the project development from the Health and Safety Executive (Trades Union Congress, 2001). The TUC developed a course and instruction manual based largely on material from the Canadian Union of Public Employees (Keith et al., 1997a, 2001b). After 215 safety representatives were trained in its use, they returned to their workplaces where they used mapping to survey a broad range of workers' concerns. Many reported that the process and its findings resulted in corrective action and improved dialogue. As a result, it was recommended that mapping be included as part of

required risk assessments, such as the display screen equipment assessment process, to "take into account workers' views" (Kirby, 2001).

In 2002, the GMB, Britain's general union, used European Health and Safety Week to promote mapping encouraging all representatives "to organise an event during the week including a body mapping session" (GMB, 2002).

Occupational health and safety mapping is now being utilised in countries across the globe. For example:

- The Australian Manufacturing Workers Union (AMWU) included a chapter on mapping in its Occupational Health & Safety Manual (2002).
- The Victorian Trades Hall Council in Australia has produced an online mapping guide with links to interactive tools at the Hazards Magazine's website in the United Kingdom (Victoria Trades Hall Council, c. 2003; Hazards, c. 2003).
- New Zealand's largest trade union, Amalgamated Engineering, Printing and Manufacturing Union (EPMU), has trained union representatives in the use of mapping techniques (Hazards, c. 2003).
- The Asian Labour Update (2002) reported that a campaign conducted in Thailand in 2002 included body mapping training for workers.

The Transnationals Information Exchange (TIE), an international organisation of union activists, is actively promoting health and safety mapping projects in Brazil, Germany, Austria and beyond. Dr. Heiner Koehnen (2002) from TIE applauds its ease of use and the fact that it is a multi purpose tool that "combines education,

research and organisation." Mapping's democratic, non-hierarchical nature is the basis of its effectiveness: "Workers are not made 'objects'; their experience is validated. They are the owners of the problem; they define it … At the same time, it gives workers the idea that their problem is really a collective problem." He also praises its ease of use. In areas, such as the countryside in Brazil, it can be readily adopted and used by agricultural workers for whom literacy may be a problem. In a wide-scale worker-based research project being launched in 2003, "Mapping will be one of the key tools used in the development of worker research in the food industry in Brazil" (Koehnen, 2002, np).

This worker-driven initiative is in direct contrast to the employer-controlled risk mapping that emerged in Brazil when a government-mandated programme was launched in the 1990s following a lobbying campaign by the unions. Unfortunately, according to Walter Tsunaki of the Chemical, Pharmaceutical and Plastic Industry Workers Union:

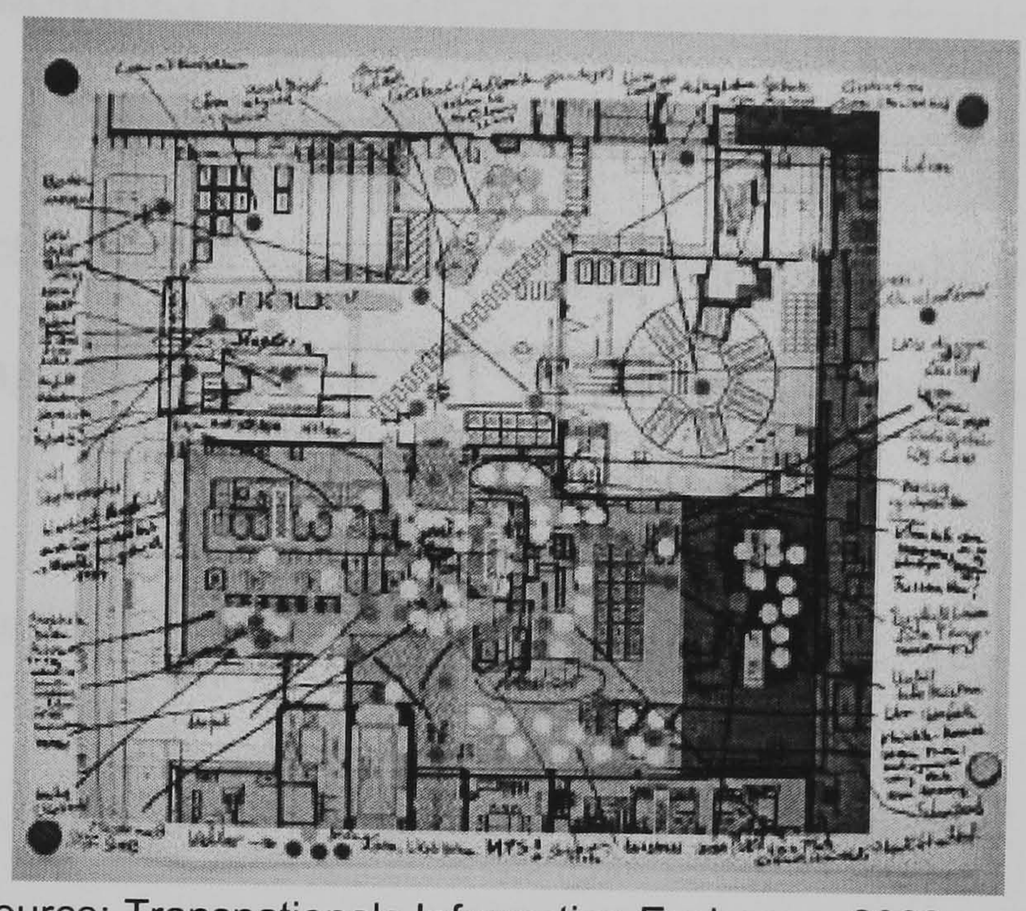
> …the institutionalisation of this instrument of trade union struggles had the effect of distorting its use. The principles of risk mapping and the basic premise of worker involvement and participation in health and safety were sidelined. Since the law has been passed most risk assessments using the risk mapping methodology are carried out by health experts and engineers who are contracted specifically for that task. It is very rare for the experiences of the workers to be taken into consideration (Workers Health International Newsletter, 1998, p 18).

Despite these problems, Tsunaki still asserts that risk mapping can be an effective tool for change if "worker involvement is respected" (p 18).

In another worker-based effort supported by the Transnationals Information Exchange (TIE), workers at a German automobile manufacturing plant took on the

process of mapping their health problems, hazards, related psychosocial issues, and ideas for action *(this four step mapping process is described in detail later in the chapter).*

Figure 5.3 German auto plant hazard map



Source: Transnationals Information Exchange, 2003

It is a large undertaking that will ultimately involve workers from a number of related plants (Transnationals Information Exchange, 2003). Figure 5.3 shows a hazard map created by workers from an area where aluminium parts are washed and then brought to the welding department.

While the above examples provide evidence that organised labour is beginning to accept mapping as an occupational health and safety tool, the adoption of mapping by labour is not universal nor is it always being used to its full advantage. Mapping, if used to enlighten, empower and mobilise workers, can be a very political alternative to the standard occupational health and safety approaches widely taught to and used by worker health and safety representatives (as discussed in Chapter 2). Rather than focussing on technical issues, mapping permits workers to see the bigger picture, such as: who is in control of the workplace; who and what is really responsible for occupational disease and injury; what impact work has on workers' lives, and so on.

5.4 Workplace mapping as a participatory action research tool in occupational health and safety

Mapping is a powerful tool for both lay and collaborative participatory action research. Through the creation of workplace maps, workers can record, in a detailed visual form, their health problems, current and past work environment, and impacts on their personal lives. Mapping can produce valid and valuable data or be used to help validate or supplement existing data derived through conventional approaches.

5.4.1 Value of mapping for worker-based occupational health and safety research and organising

The power of mapping lies, in part, in its versatility and its range of potential uses. Mapping can be used to: identify problem areas and workers' concerns; raise awareness of occupational health and safety; investigate and demonstrate the need for workplace improvements, training, communication, policies, organisation; assist in the detection of symptoms of progressive morbidity, thereby preventing or halting disease and disability; assist in medical diagnosis of occupational disease or injury for compensation purposes; address research gaps; evaluate existing health and safety programmes; provide evidence of hazardous conditions for compensation purposes; produce historical, current and/or ongoing records of workplace hazards and health impacts; and create an opportunity for collective and creative development of improvement strategies (Keith, 2003a).

Mapping is also a flexible tool. It can be used collectively within a focus group setting, in large assemblies, or individually as a survey instrument; it can be used to investigate the health problems of a department or occupational group, an entire workforce or potentially an entire industry. Mapping can be as simple as marking

X's on hand-drawn images or as sophisticated as colour-coding and labelling health problems by particular occupational groups or by body systems accompanied by the recording and analysis of related discussion (Keith, 2003a).

Because it is relatively easy to do, mapping is a practical and accessible means of conducting occupational health and safety research. It uses inexpensive and widely available materials and it is adaptable to all manner of workplaces. Resulting visual data displays can provide immediate graphic indicators of health and safety problems requiring investigation. Mapping can even capture information regarding non-physical problems, such as discrimination, harassment, symptoms of stress and depression (Keith, 2003a).

A "four-step mapping" series (Keith, 2003b, p 31) has been used successfully to explore a broad range of health and safety concerns and to develop plans for tackling those identified as high priority. The series includes: *1) Body Mapping, 2) Hazard Mapping, 3) Life Mapping; 4) Prioritising and Action Planning*. The series is ideally suited to participatory action research and has recently been promoted by the International Labour Organisation as a method of conducting worker-based occupational health and safety investigations (Keith, et al., 2002). There is a logical flow from exercise to exercise *(this four step process is discussed in detail later in the chapter)*. The mapping exercises are effective for collectively exploring a broad range of issues and result in an agreed-upon action plan (Keith et al., 2001; Keith et al., 2002; Keith, 2003b). Each mapping exercise can be modified and adapted to suit specific needs.

5.4.2 Planning and ethical considerations when undertaking mapping

The first step in mapping, as in any participatory action research project, is to clearly define the purpose and intended use for the information generated, such as the identification of problem areas, awareness-raising, gathering of evidence, and so on. All parties involved should be in agreement. Advanced planning should include assignment of specific roles and responsibilities for each step in the mapping process. A process of informed consent consistent with ethical research practice should be followed. Before conducting any mapping exercises, there should be full disclosure of the nature of the data to be collected and the intended use for the data. Who will collect the information? What will be recorded? With whom will the data be shared? Will the maps, data or summaries be published in any way? (Keith, 2003b).

Information of a personal nature is gathered during mapping exercises. In order for participants to be forthcoming, they must feel safe and comfortable that the information they share cannot be used against them in any way; they must feel secure that their confidentiality, personal interests and security will be protected (Keith, 2003b). As a rule, no names or any other identifiers are recorded on maps or written logs. Participants should not feel obligated to disclose any information they are uncomfortable sharing. Their participation should be voluntary. All of the participants should also agree they will not reveal to anyone outside of the group any personal information provided by other participants (Keith, 2003b).

When mapping is carried out in focus groups the exercises and discussions are led by a facilitator who is a co-researcher. The facilitator can be either a trained worker

researcher or a trusted outsider. The facilitator must be familiar with the techniques and be able to conduct the exercises in such a manner as not to influence or bias the responses (Keith, 2003b). There are advantages to using peer facilitators. The familiarity may provide a comfort level that might not exist with an outsider. In the experience of the Trades Union Congress in the UK, "body mapping works best when it is facilitated by the union safety rep as a collective exercise with a small group of members/workers" (Kirby, 2001). The disadvantage of peer facilitation is that a facilitator who has a stake in the outcome may unintentionally bias the group. This problem can be minimised with training and a predetermined "script" or set of instructions *(see casino gaming workers Focus Group Leaders' Guide, Appendix M)*.

It is important that a recorder be present to document discussion that is generated by the mapping in focus group settings. The maps themselves will provide basic data but the more in-depth analyses and details will require additional documentation (Keith et al. 2001, 2002; Keith, 2003b). A designated recorder can make detailed notes of the information displayed on the maps along with relevant verbal comments. The participants should be fully informed that the mapped, written, and verbal data provided during the session will be recorded. Participants should be instructed to let the recorder know if they have said anything they would prefer not to have documented. Similarly, if audiotaping, videotaping or photography is to be done, participants must be fully informed and in full agreement. The intended use of such recorded materials must be revealed and agreed upon.

Mapping need not be done in a focus group setting. For example, maps may be posted in a common area, such as a lunchroom setting to be completed by workers at their convenience over several shifts. In this case, clear written instructions to participants should be posted beside the maps. Using this approach, however, it is more difficult to maintain rigour, as the process is unattended. Moreover, workers with lower levels of literacy may be unable to comprehend written instructions. It also reduces the opportunity for participation interaction and there is no lasting record of related comments. The advantages include ease of application and broad visibility.

5.5 Body mapping

Body mapping is essentially a *health* survey instrument that uses graphic images, coloured marking pens and/or stickers to elicit and record responses (Keith, 2003b). Body mapping, as an occupational health and safety tool, was first used to identify repetitive strain injuries and ergonomic issues (Corlett and Bishop, 1976; Moir et al., 1998). It is now being used to collect all manner of work-related injury and disease data (Keith et al., 2002; Hazards, 1998).

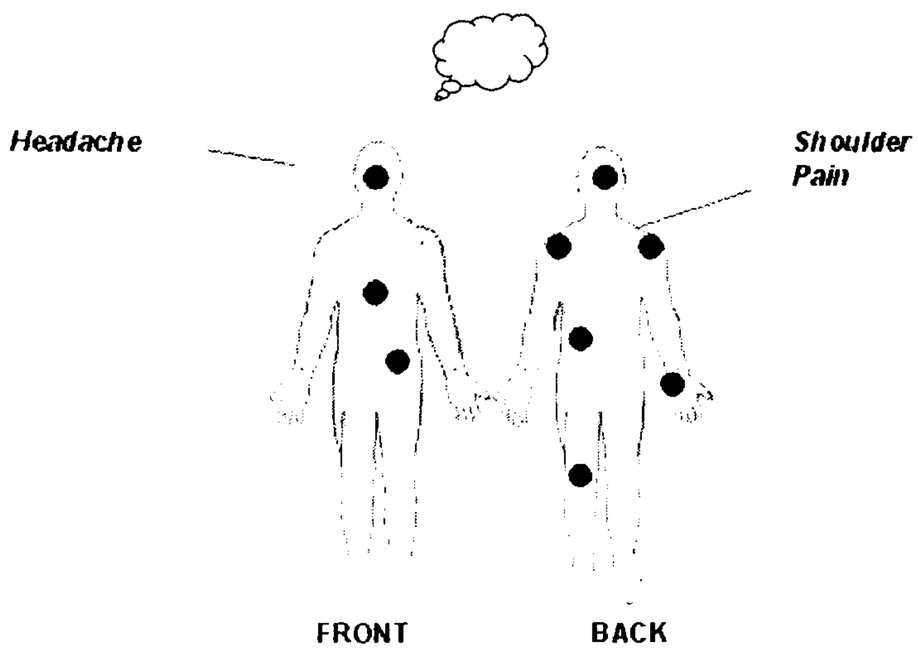
Used with the principles of participatory action research, *body mapping* may prove to be a revolutionary research and organising tool. Body mapping is not exclusively an occupational health and safety tool; it has been used in a variety of ways to communicate about health issues. For example, it has been used in Jamaica to facilitate communication among local women and health care professionals about sexual practices and family planning (de Koning and Martin, 1996).

5.5.1 How body mapping is done

Body mapping can be done individually, in small focus groups, or with large assemblies. It can be done by participants themselves or by a facilitator. The body mapping process can be used to facilitate discussion or it can be used simply as a recording and reporting procedure. Body maps produced by individuals or small groups can be used to create composite maps. Each of these approaches has its applications, advantages and disadvantages.

Body mapping is usually done using large outlines of the human body drawn on sheets of paper posted on a wall *(see Figure 5.4)*. The separate images are labelled, "Front" and "Back" (Keith, 2003b; Keith et al., 2001, 2002; Hazards, 1998; Kirby, 2001). Optionally, a cloud can be drawn over one of the heads to represent mental or emotional issues, such as stress symptoms or worry.

Figure 5.4 - Body map



Source: Keith (1999a). A Picture's Worth a Thousand Words. Canada: WOHIS

The "research question" determines the scope of the data collection. For example, the *time frame* for the development of health problems may be circumscribed. In some studies all health problems may be of interest; other studies may include only health problems experienced since participants began working at their current workplace, or in their current occupation, or after a particular process, chemical or piece of equipment was introduced into the workplace.

Similarly, data collection may be restricted to a particular *category* of health problem. Body mapping is particularly well suited to the study of ergonomics. It can be used to record and identify symptoms of repetitive strain or other musculoskeletal injuries.

For example, in a lay worker-based study conducted in Canada, a United Food and Communications Workers union representative used body mapping to investigate repetitive strain injuries among her members. The resulting maps were shown to the joint worker-management health and safety committee and then posted in the cafeteria where they spawned a sharing of concerns. "Before they simply suffered in silence. Of equal importance, workers are [now] more inclined to discuss their concerns with supervisors which has led to workstation design changes including the height of work platforms allowing for more ease of movement" (Workers Health and Safety Centre, 2003b).

Body mapping has also been used in collaborative research, involving workers and academics, to explore ergonomic issues. For example, researchers from the National Institute for Occupational Safety and Health (NIOSH) were asked by the union representing workers at the Aurora Casket Company in Indiana, United States, to investigate strains, sprains, cumulative trauma disorder and stress symptoms. The ensuing investigation included the use of videotaped observation and the administration of a symptoms questionnaire, which included individual body maps. Workers were asked to mark areas on the body map where they were experiencing pain and to rate each pain symptom on a scale of 1 to 5. Researchers then created

aggregate maps for each department and included visual coding for degrees of pain. Following an analysis of the videotapes, questionnaire and body mapping results, a series of recommendations was made which included: providing the option of sitting, material handling equipment, anti-fatigue mats, better designed work-stations and tools, and addressing the issue of stress (Habes and Wigmore, 1998).

Body mapping is also an effective method for exploring a *full range* of health problems, such as chronic illnesses, aches and pains, reproductive problems, injuries, stress symptoms, sleeping difficulties, anxiety or fatigue (Keith, 2003a) as is illustrated in the case studies in Chapters 7 and 8.

Body mapping is a very adaptable tool with almost unlimited potential variations. Maggie Robbins used a more free-form body mapping method to assist the workforce of the Hesperian Foundation, a not-for-profit publishing company in California (Robbins, 2002). Robbins prefers that participants simply use coloured markers to draw health problems, believing that this method provides more flexibility than coloured stickers. She claims that "the emotion shown via the colours, density, arrows, amount of extras (like the arrows, smile, big eyes, etc.) make them expressive in a way the perfect outline and dots can never do…The great thing about the workshops was we've actually fixed many of the problems we found" (np).

In another variation of body mapping, workers themselves are the body maps. Rather than using outlines of the body on paper, Diane Factor has workers put "ouch stickers" on the body area of a "worker/model" to represent areas of pain the

workers are personally experiencing (Workers Health International Newsletter, 1998; Communications, Energy and Paperworkers Union of Canada, c. 1997). Jennifer Penney uses a similar process but with arrows made of masking tape (Communications, Energy and Paperworkers Union of Canada, c. 1997).

5.5.1.1 Body mapping in the four-step process

Body mapping in a focus group environment is effective when there is an anticipated advantage to interaction among participants. Focus groups are normally aimed at collecting qualitative data, which is "especially useful for exploration and discovery…encouraging participants to investigate the ways they are both similar to and different from each other" (Morgan, 1998, p 12). Homogeneous groups can be organised according to department, occupation or some other common characteristic. Optionally, participants can code their data using a colour or shape that represents their occupation, department, age, gender, seniority or some other demographic category. This approach was used in the casino gaming workers study presented in Chapter 7 (Keith et al., 2001).

A focus group facilitator directs participants to indicate their own symptoms or health problems by placing self-sticking dots or by drawing marks on the applicable area of the body (Keith et al., 2001, 2002; Keith, 2003b; Robbins, 2002; Hazards, 1998; Kirby, 2001). Depending on the size of the group and the space available, participants can either engage in body mapping all at the same time or one at a time. Participants are informed that they can stay after the session ends to add any information they may not wish to openly discuss within the group. After the participants have finished applying stickers or drawing marks, they describe, one at

a time, what health problems their stickers represent. The facilitator makes a notation of the nature of the health problem, as reported by the participant, beside the relevant sticker or symbol. Once all participants have provided their input, the facilitator asks the participants for any observations they have regarding patterns or clusters and any revelations. "Workers should talk through the findings. Have any new problems been identified? Are known problems more extensive than previously thought?" (Hazards, 1998). The results of a collective body map can be revealing and politicising. "When one person has an ache, it's an ache. When everyone has it, it is almost certain it's an occupational health problem" (Hazards, 2000).

According to Peter Kirby (2001), health and safety consultant with the Trades Union Congress, the wide-scale body mapping pilot project launched in 2001 resulted in actions in a number of workplaces, including such improvements as the acquisition of new chairs to deal with back pain, changes in procedures, requests for new risk assessments, and redesigning of work areas. In one example, a safety representative in a bakery used body mapping to find out about workers' health and safety concerns and to solicit their ideas for improvements. The results were presented to management who subsequently reduced the size of baskets and introduced the recommended job rotation and task variations (Kirby, 2001; Keith 2003).

5.5.1.2 Interview or questionnaire-based body mapping

As illustrated in the previously mentioned Aurora Casket ergonomics study (Habes and Wigmore, 1998), composite body maps can be created from the data extracted from small individual body maps. Composite body mapping can also be done with

health data derived from individual interviews, questionnaires, or medical records obtained through informed consent. The resulting body maps can provide graphic aids for focusing group discussion and planning.

This particular application of body mapping was used to record and display the health problems of construction workers in two Canadian cities. In October 1999, unionised building trades workers in Sarnia, Ontario were invited to attend a union-sponsored intake session to report their health problems. More than 275 workers attended (Lawlor, 1999). In February, 2000, a similar session was held for building trades workers in Hamilton, Ontario, attracting approximately 300 workers (Elliott, 2000). Volunteers from trade unions, compensation advocacy organisations, and staff from the Occupational Health Clinics for Ontario Workers interviewed each of the attendees. Volunteers and staff created separate sets of body maps for each location (under the direction of the author of this dissertation). The workers' symptoms or diagnosed health problems were coded according to the legend shown in Table 5.1.

Table 5.1 Body mapping legend

Cancer	Large Yellow Circle
Respiratory (e.g. asthma, emphysema, lung disorders, etc.)	Orange Circle
Cardiovascular (e.g. circulatory, stroke, heart, hypertension, etc.)	Light Green Circle
Psychological (e.g. mental, psychosocial problems, etc.)	Red Rectangle
Neurological, (nervous system disorders, e.g. hand-arm vibration syndrome, tingling, eye sight, hearing, etc.)	Large Blue Circle
Musculoskeletal (e.g. repetitive strain injuries, strains, back pain, etc.)	Large Red Circle
Dermatological (e.g. skin rashes, etc)	Dark Green Circle
Digestive (gastrointestinal, e.g. nausea, etc.)	Light Green Rectangle
Traumatic Injuries (e.g. fractures, cuts, burns, etc.)	Very Small Green Dot
Genitourinary and Reproductive	Blue Rectangle
Blood Diseases (e.g. anaemia, etc.)	White Rectangle
Endocrine System Problems (e.g. thyroid, etc.)	Very Small Red Dot
Ill-Defined Problems (e.g. sleep disorders, etc.)	Large White Circle

Source: M Keith

The resulting maps, which were produced several months apart in the two separate cities, showed almost identical patterns of injury and disease.

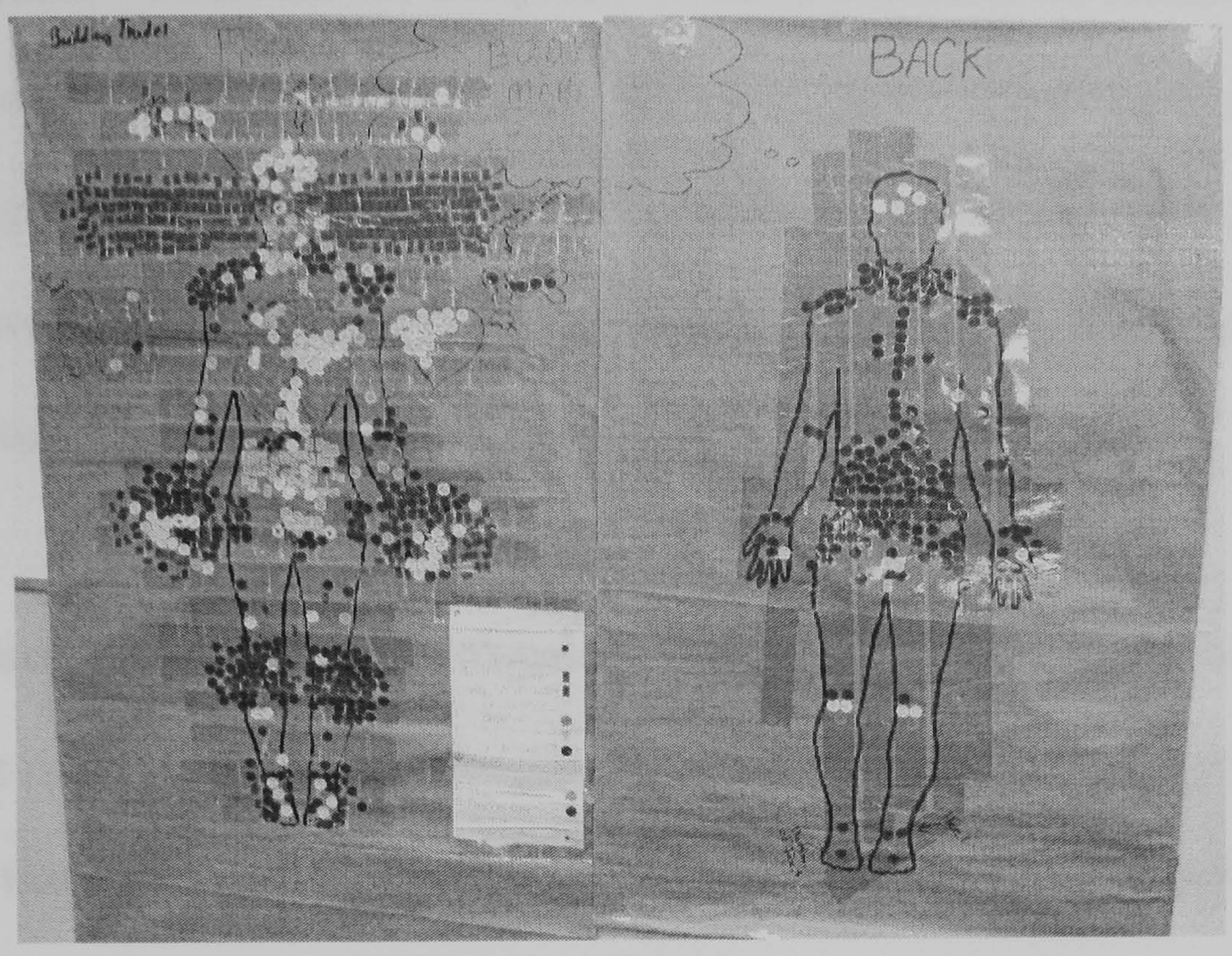
The maps displayed large clusters of red stickers, which represented musculoskeletal problems in the lower back, knees, elbows and shoulders. Blue stickers, representing neurological problems, were clustered in the hand, finger and wrist areas indicating possible hand-arm vibration syndrome and in the ear area indicating hearing loss. Concentrations of orange and light green stickers filled the heart and lung areas, indicating widespread cardiovascular and respiratory problems. Yellow stickers representing cancers were scattered throughout the lungs, bladder, colon, and a number of other sites.

The completed body maps tell a story as no words can. The maps present, for all to see, the collective havoc that a lifetime of construction work can inflict on the human body *(See Figures 5.5 and 5.6)*.

The dramatic results were reported by the print, radio and television media in both communities. The local newspaper in Hamilton ran a photograph of the body mapping in progress and wrote:

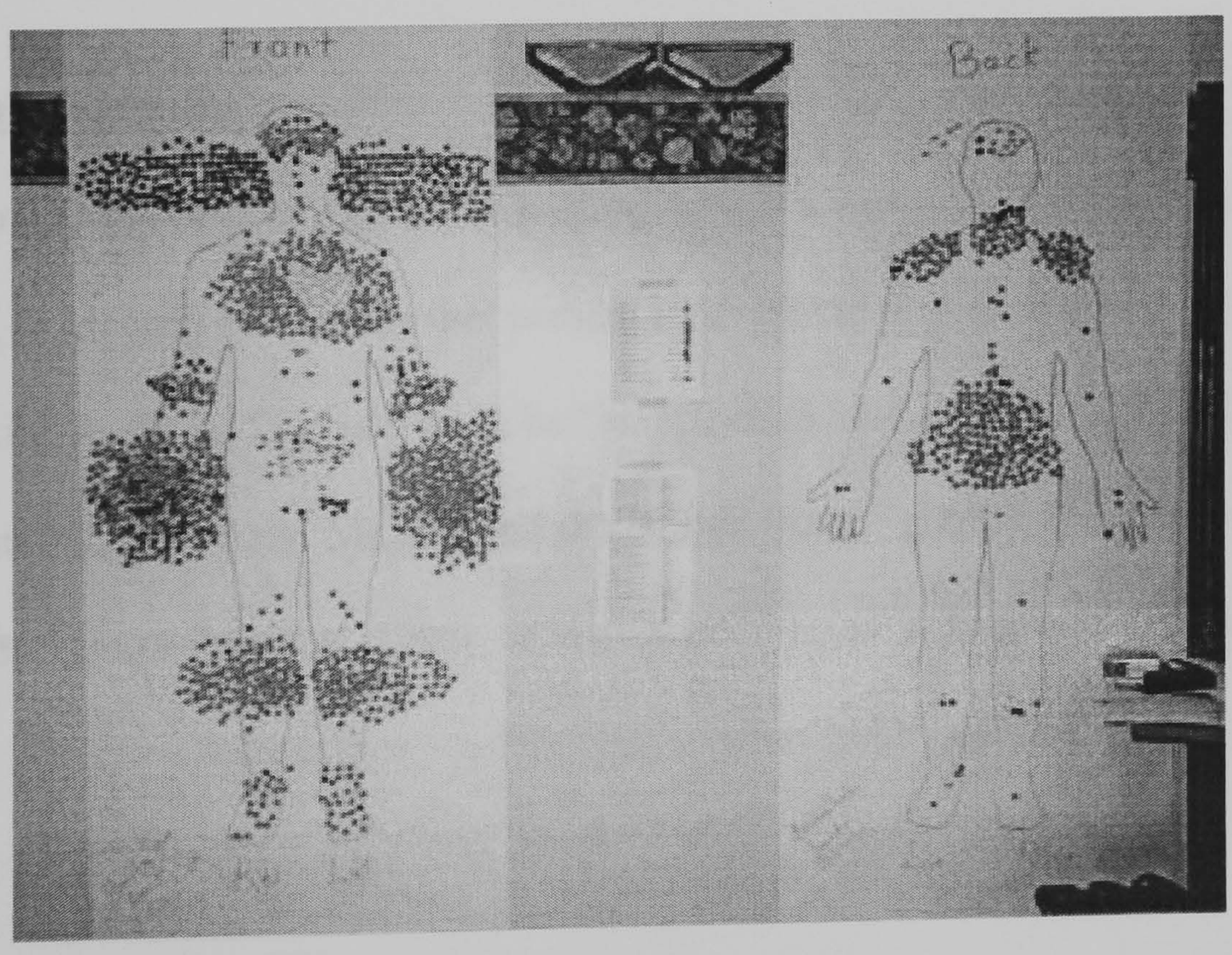
> It's only 11:30 in the morning. The clinic still has seven hours to run, yet the body maps -- one front and one rear view -- already contain alarming clusters of dots and squares. They chart the decline of boilermakers, bricklayers, millwrights, steamfitters and 21 other construction industry trades. There are so many ailments that the dots flow out from both ears in blue rivers. The joints, elbows, knees and wrists are swarmed with blue and red dots -- the wear and tear of hammering and wrestling big power tools. There's an unsettling collection of orange and yellow around the lungs and heart, disturbing evidence of the effect of toxic substances. The lower back and shoulders are thick with blue and red dots. And still they come -- the lame and halt, middle-aged and older (Elliott, 2000).

Figure 5.5 – Sarnia building trades body maps



Source: Photographed by M Keith

Figure 5.6 – Hamilton building trades body maps



Source: Photographed by M Keith

The union and occupational health clinic subsequently dedicated considerable resources to the process of filing compensation claims on behalf of the ailing building trades workers and the compensation board prioritised the incoming claims (Occupational Health Clinics for Ontario Workers, 2000b). This process served to bring to light the widespread incidence of occupational disease and injury among a group of workers that was previously unrecognised by the union, the compensation board, or the general public.

As discussed, body mapping can reveal the scope and range of workers' health problems; it can provide a focus for discussion and planning; and it can provide evidence that hazards exist. Body mapping alone, however, cannot pinpoint the actual conditions causing the injuries or illnesses. It provides evidence only of the effects of hazards. Additional tools are needed to explore the other elements of the *cause and effect* relationship.

5.6 Hazard mapping

Hazard mapping, also known as "risk mapping", is a data collection method designed to identify conditions that present risks to workers' mental and physical health. Risk mapping first proved to be "an effective tool in improving health and safety conditions in Italy, Mexico and the United States" (Labor Occupational Safety and Health Program, 1996). It is now being used in countries across the globe.

5.6.1 How hazard mapping is done

By drawing simple diagrams of the workplace, enhanced with labelling and hazard categorisation, workers can describe and report their experiences, concerns, and opinions regarding potential causes of disease and injury (Keith, 2003a; Keith et al., 2002). Through the use of colours, shapes and drawings, hazard mapping helps participants to visualise their workplace and the hazards that *currently* exist (Keith, 2003a; Keith et al., 2003a; Mujica, 1992; Hazards, 1997).

Hazard mapping can also be used to produce *retrospective* exposure profiles. That is, a group of workers can collectively draw from memory the workplace or a particular department as it existed years before. The collective memory of workers is a rich resource that can be mined to gather a wealth of data. Workers may recall products that were being produced and materials that were being used during a point in history that may explain the appearance of diseases with a latency period. They may be able to describe sights and smells, thereby providing an experiential surrogate for air quality reports. They can describe their recollections of work processes, machinery, and whether any personal protective equipment was used. Creating retrospective exposure profiles through the use of hazard mapping can be particularly valuable for establishing evidence for compensation purposes. Results can provide insight into the past exposures or conditions that are responsible for current health problems (Keith, 2003a; Keith et al., 2002) *(see also Chapter 8 regarding the Holmes foundry case study).* According to Nora Maher, an industrial hygienist with the Occupational Health Clinics for Ontario Workers:

> Retrospective assessment of exposures is an inexact science at best, especially where no dependable hygiene reports exist and no material safety data sheets are available…In order to make any statements about past exposure one wants to look at degree and pattern – what the workers were

> doing and what concentrations were present. And that usually means a qualitative assessment. Hazard mapping is an ideal way of conducting such an assessment" (Keith, 2003b, p 16).

Hazard mapping techniques are varied. Data can be gathered from workers via a group questionnaire and then transferred to a map by a worker-researcher (Mujica, 1992; Labor Occupational Safety and Health Program, 1996). Hazard maps can also be created in a focus group setting without the use of a questionnaire.

For example, following a fatality in an electroplating plant in California, the university-based Labor Occupational Health Program (LOHP) (1995) set up a series of risk mapping sessions to raise workers' awareness of hazards in the electroplating industry. LOHP "needed an approach that was bilingual [English and Spanish], that did not depend heavily on reading or writing skills, and that encouraged workers to identify problems and speak out about them" (p 27). Ten sessions were conducted with two hundred and fifty electroplating workers. The risk mapping led to discussion and "people thinking about their workplace in a new way". Workers also learned the importance of presenting their findings and resulting suggestions collectively; because most of the workers were not unionised, this was an important job security strategy. When presented with the findings, most managers were receptive. The sessions also resulted in the agreement by a "group of electroplating employers throughout Northern California to send workers to LOHP's more comprehensive 24-hour hazardous waste training course" (p 28).

As mentioned, hazard mapping can also be used in a group setting to produce retrospective exposure profiles. In the summer of 2000, workers from Prestolite, a

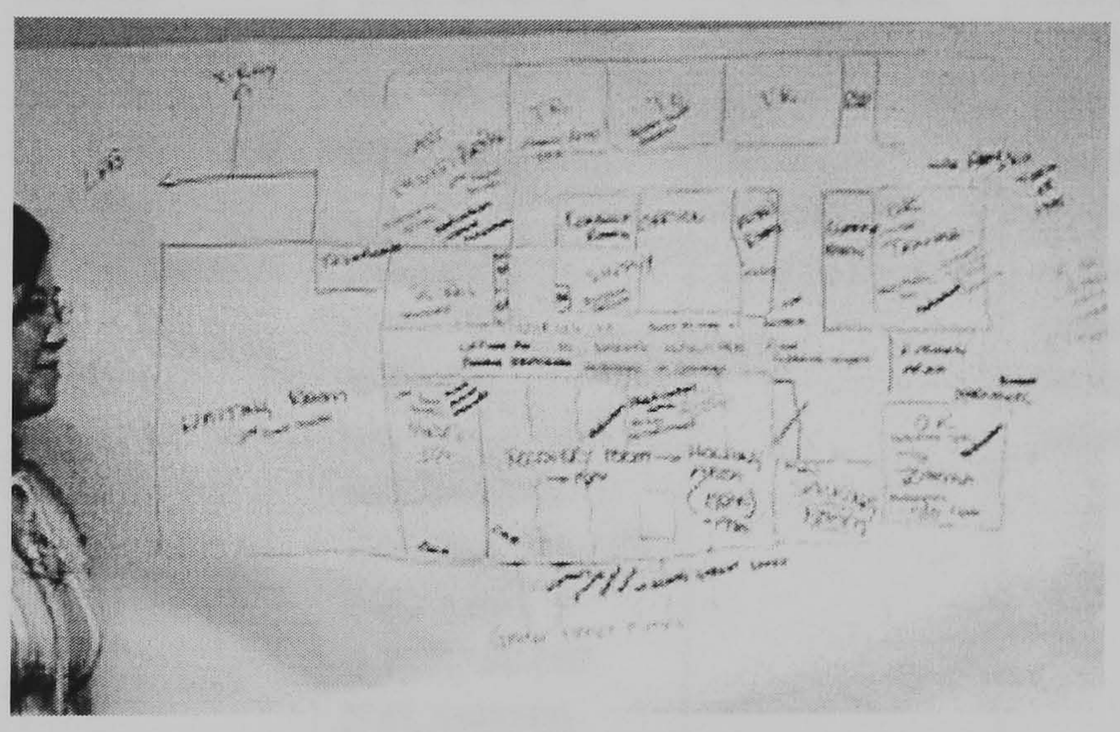
closed industrial facility in Sarnia, Ontario, created a hazard map to depict conditions as they had existed decades before. The project was initiated by a representative of the Canadian Auto Workers union (CAW); its predecessor, the United Auto Workers (UAW) had represented the workers prior to the plant closure. The union representative contacted the staff of the Occupational Health Clinics for Ontario Workers to seek assistance after receiving a letter from a former Prestolite worker with cancer who listed the names of fifty-one former co-workers who had died of cancer. Several former Prestolite employees had also contacted the clinic regarding their own possible work-related health problems. A focus group session was held with the union representative, seven former Prestolite workers and several clinic staff members. During the session, the workers prepared a large "hazard map" of the plant. The map and discussion revealed the following:

> The Prestolite plant opened in 1929 and closed in 1978. It produced a wide array of auto parts, including spark plugs, regulators, electrical motors, alarm clocks and munitions. At its height the plant employed 1,100 people, working shifts, the majority of whom were women. The plant had numerous operations involving forging, machining, electroplating, tool preparation and assembly. Processes included: machining of cast iron, burnishing, polishing, grinding and wet heat treatment. Through drawings and discussion, the workers described exposure to oil mist in the screw machine area, "glaze-on" porcelain in the spark plug area, formaldehyde, nickel, chromium, cadmium in the degreasing and chrome-plating area. The workers did not recall any training. The stamping press area was open to the degreasing, acid dip and a plating section; exposures in that area included acid and solvent/degreaser and possibly methyl ethyl ketone (MEK). Next to it was the Tool Room where lathes, etc. were used. Next was the Electric Motors line, where soldering was done. Parts were dipped into lead pots by hand by approximately 50 workers. The workers believe mica was used and that there may have been asbestos washers in the motors. There was also a small aluminum foundry operation inside the plant. The workers recalled exposures to metalworking fluids, silica, dust, acid mist, electroplating compounds such as nickel, and chromium; lead, and mist arising from the heat-treat operations. They recalled considerable noise. One worker commented, "Back then you went to work and didn't think about the hazards. There was good pay and good benefits."
>
> (Occupational Health Clinics for Ontario Workers, 2000b).

The information derived from the Prestolite hazard mapping session was added to the evidence being collected by the occupational health clinic staff and physicians who were endeavouring to establish exposure profiles for patients' compensation claims *(see also Holmes Foundry case study presented in Chapter 8).*

Another more ambitious project has been initiated by a group of nurses in Sarnia, Ontario, who are concerned about what they perceive to be a very high incidence of breast cancer among emergency room nurses. The creation of a detailed, decade-by-decade exposure profile of the emergency departments in two local hospitals is underway using hazard mapping. Separate maps are planned for each ten to twenty-year period between 1950 and the year 2000. To date, one hazard map has been completed. A two and a half hour focus group-based mapping session was held in June, 2003 at the Occupational Health Clinic for Ontario Workers. The objective was to produce a detailed hazard map of the Sarnia General Hospital emergency and outpatient department as it existed through the 1970s and 1980s *(see Figure 5.7).* Five nurses were in attendance along with a facilitator (the author of this dissertation), a physician and the director of the clinic, and a medical student who agreed to record comments. Participants provided signed informed consent. Each of the nurses present had worked in the emergency department during the designated

Figure 5.7 – Emergency department hazard map



Source: Occupational Health Clinics for Ontario Workers (2003).

time periods. One member of the group drew an outline of the department on a large sheet of craft paper posted on the wall and others contributed details. Together they described their recollections of exposures and other potential hazards. They also indicated differences between the two decades and reported the years when processes, chemicals or pharmaceuticals, physical features of the department, or other characteristics were changed. They categorised the hazards as shown in Table 5.2.

Table 5.2 Sarnia General Hospital Emergency Department Hazards (as per hazard map), 1970s and 1980s

Chemical	Biological	Physical	Work design	Psychosocial
-anaesthesia gases: halothane, nitrous oxide, Trilene -second-hand tobacco smoke -Cidex (cleaning agents for endoscopy. Used respirator protection.) -5 Flurouracil (chemotherapy agent)--no gloving/masking -mercury -formalin in open containers -alcohol for sterilisation -Betadine -"green soap," Hibitane -cleaning agents for floor -patient clothing & body surface contaminants (e.g. patients in Imperial Oil explosion, Holmes foundry, Dow chlorine accidents) -ceiling asbestos, broken tiles -burning mattresses -plaster material -tincture of benzoin -paraldehyde -Mucomyst (acetylcysteine) -Ventolin (salbutemol)	-viruses -bacteria -body fluids. No gloving until mid-1980's -immunizations: DPT (diphtheria, pertussis, tetanus) and BCG (tuberculosis)	-poor building ventilation. Only one row of windows along George St., ventilating to street (car exhaust) -no air conditioning -portable x-ray (at least a few exposures per shift, wearing poor-fitting aprons. No aprons used in 1950's-early 1960's). -annual chest x-rays -steam sterilizer sometimes caused skin burns	-wheelchairs, stretchers poorly functioning -workspace design flaws	-heavy workload -shift work -assault (physical, verbal) -stress with paediatric patients

Source: Occupational Health Clinics for Ontario Workers, 2003a

These examples illustrate the range of potential uses of hazard mapping as a valid occupational health and safety data collection and enlightenment tool. As

discussed, hazard mapping can be an effective means of gathering valid evidence of either current or past workplace hazards.

5.6.1.1 Hazard mapping in the four-step process

The collective hazard mapping technique, as illustrated in the above examples of retrospective exposure profiling, is similar to the method used as part of the four-step workplace mapping research series used to explore current conditions (Keith, 2003b, Keith et al., 2001a, 2002). Hazard maps are created by the focus group participants following the completion of the body mapping exercise.

Ideally, each hazard map is drawn collectively by several workers from a common work area. Separate hazard maps drawn by department or work area can be joined later to create an overall workplace hazard map. Workers, who do not have a clearly defined work area, such as couriers, or those who work in multiple sites, may have to employ some creativity in order to map the hazards that exist within their work environment(s). For example, in a mapping session of public sector workers, a meter reader drew her typical route, complete with vehicle traffic hazards, vicious dogs, asbestos insulation hazards, tripping hazards, and sources of potential violence (Keith, 2003b).

The facilitator encourages participants not to worry about their artistic or architectural drawing abilities. As Aberley, an advocate of community mapping states, "It is important to repeat over and over that there is no 'good' mapping or 'bad' mapping…No map shows reality perfectly. A map is an icon – a potent

representation" (Aberley, 1993, p 5). The drawings can be very rough or even impressionistic. At a minimum, hazard maps should include:

- a sketch of the physical layout of the work area(s) indicating doorways, aisle ways, windows, along with any machinery, equipment, vehicles, conveyors, and other features;
- symbols or stick figures representing the participants and any co-workers;
- symbols or sketches representing hazards and their locations;
- labels or descriptions for each of the hazards, such as "fumes," "mould," "metal dust," "medical waste," and others as applicable;
- any safety features now in place.

Participants then describe their maps, adding more detail as they proceed if they wish. Comments are recorded. The facilitator leads a discussion regarding any observable patterns or the apparent prevalence of a particular type of hazard (Keith, 2003b; Keith et al., 2002).

Completed hazard maps can be subsequently posted in a common area and, as identified areas of concern are addressed, they can be labelled as "corrected" to indicate progress (Keith, 2003b).

Optionally, hazards can be categorised (Mujica, 1992; Labor Occupational Safety and Health Program, 1996; Keith 2001a, 2003b). This technique was employed in the previously described emergency room nurses study *(see Table 5.2)* and in the casino gaming study presented in Chapter 7. The process of grouping and labelling

hazards can help to trigger recall and organise thoughts (Keith 2003b). A colour-coding system such as is shown in Table 5.3 can be used (or adapted):

Table 5.3 Colour-coding

Blue	Biological (e.g. infectious material)
Green	Chemical or Mineral (e.g. asbestos)
Red	Physical (e.g. noise, radiation)
Black	Psychosocial (e.g. bullying, harassment)
Brown	Work Design (e.g. ergonomic)

Source: Keith, 2003b

Symbols can be used instead of words to accommodate a range of literacy levels. Labels with pictures or symbols, such as a flame to indicate a fire hazard, can be created in advance and made available to the participants at the mapping sessions (Keith et al., 2002; Keith, 2003,). The US Oil Chemical and Atomic Workers (OCAW) union recommended the use of a consistent set of symbols for risk mapping that would provide a comprehensible historical record of hazards and facilitate comparisons as new maps are created. The union recommended that workers create "specific hazard maps" for tracking progress, then "area specific hazard maps" to further describe and rate hazards, and then a "facility risk map" for planning and scheduling surveys (Barrett and Foster, 1994, pp 26-27).

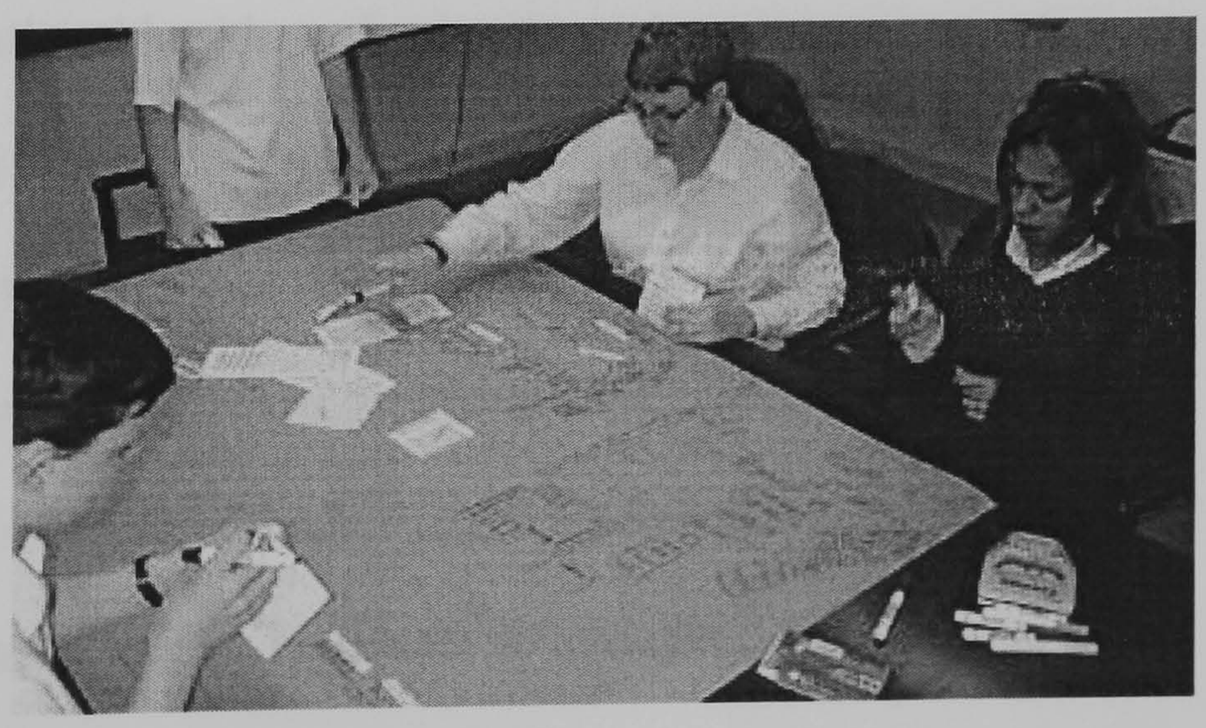
Alternatively, hazard maps can be created using a "process flow map" rather than a "layout map" (Communications, Energy and Paperworkers Union of Canada, c. 1997, p 11). Using this method, hazards are identified in each step of the work process (Oudyk, 1997). Hazards can also be ranked according to their perceived severity, giving each a score using a gradient such as the following: "High Hazard", "Medium Hazard", "Low Hazard", or "Don't Know How to Rate" (Communications, Energy and Paperworkers Union of Canada, c. 1997, p 13). A

combination of both the "layout map" and "process flow map" may be effective (p 11).

Dorothy Wigmore (1996) uses a layered mapping technique to help workers explore social characteristics of their workpace. Layered mapping utilises several sheets of transparent acetate film, each contributing different elements of the overall social environment of the work place. Coloured string is adhered to the layers to show pathways of communications and workplace social interactions. Comfort zones and other psychosocial issues are mapped using colour-coding and stickers. This technique is somewhat complicated and is best conducted with an experienced facilitator.

Hazard mapping can also be used to predict and therefore potentially prevent future work-related injuries and disease. A group of students in their mid to late teen years, who were employed part-time in a variety of industries as part of a cooperative educational programme, completed a collective body map with the help of staff from the Windsor Occupational Health Information Service in Ontario, Canada.

Figure 5.8 – Young workers hazard mapping



Source: Photographed by M Keith, 1998

The map displayed numerous symptoms of musculoskeletal strain in the back, neck, hands, wrists and shoulders, foretelling more serious and perhaps chronic

injuries. Students then completed hazard maps for their particular work placements *(see Figure 5.8)*: a lumberyard, a food service facility, a small manufacturing plant and a large department store. They described improper material handling processes such as heavy lifting, inadequate tools, and burn hazards. The school board official in attendance, who was responsible for the student placements, was disturbed by the revelations and resolved to more thoroughly consider the safety of any jobs to which students were to be referred (Keith 2003b, p 33; Windsor Occupational Health Information Service, 1998).

Like the "collective questionnaire" used in the Italian Workers' Model (Loewenson et al., 1995b), when created collectively in homogeneous groups, hazard mapping has an intrinsic validity check. Collective hazard mapping results in a product that includes not only the input, but also the scrutiny of the co-participants. "Using this collective approach avoids statistical deviations in the results by the possible dominant 'super-healthy' worker or the 'hypochondriac' one" (Mujica, 1992). Workers can also build on each other's knowledge.

The knowledge and experience of workers that emerges through the mapping process can provide occupational health professionals, technicians and scientists with a better understanding of the "day-to-day" reality of the workplace and "allows workers and technicians to mesh science and worker experience" (Mujica, 1992, p 768). Analysts of the Italian worker-based occupational health research model, in exploring its applications for North America, concluded that the use of "risk maps could raise awareness among health professionals about work-related illnesses that go unrecognised and untreated or prevented [and] help physicians and other health

workers learn about potential occupational diseases in their patient populations" (Reich and Goldman, 1984, p 1039). Dr. Michael Lax, medical director of the Central New York Occupational Health Clinical Centre, has incorporated hazard mapping into clinical practice. He claims that the "full picture" created through collective hazard mapping is particularly helpful when "trying to visualise work processes, placement of equipment, and so on, as described by patients (Keith, 2003a, p 16).

5.7 Life mapping

A more in-depth understanding of the impact of work on the health and well-being of workers can be explored using psychosocial mapping techniques (Hazards, 2001b). The aches and pains and stresses of work can carry over into workers' lives outside the workplace affecting overall quality of life. Personal psychosocial effects of working conditions are seldom included in occupational health research. A technique called *life mapping*, or "Your World" mapping, was designed to explore impacts on workers' family lives, relationships, social lives, community and neighbourhood involvement, and on their mental and emotional health (Keith et al., 2001a, 2002; Keith, 1999a, 2003b).

This mapping exercise permits workers to explore their own subjective reality -- how they see themselves in their world. Using a simple psychosocial mapping exercise workers can record -- through images and words -- how conditions at work, such as psychological stresses, and physical demands, can negatively influence their activities, relationships, social interactions, pursuit of personal interests and general emotional wellbeing during non-working hours. Such psychosocial information

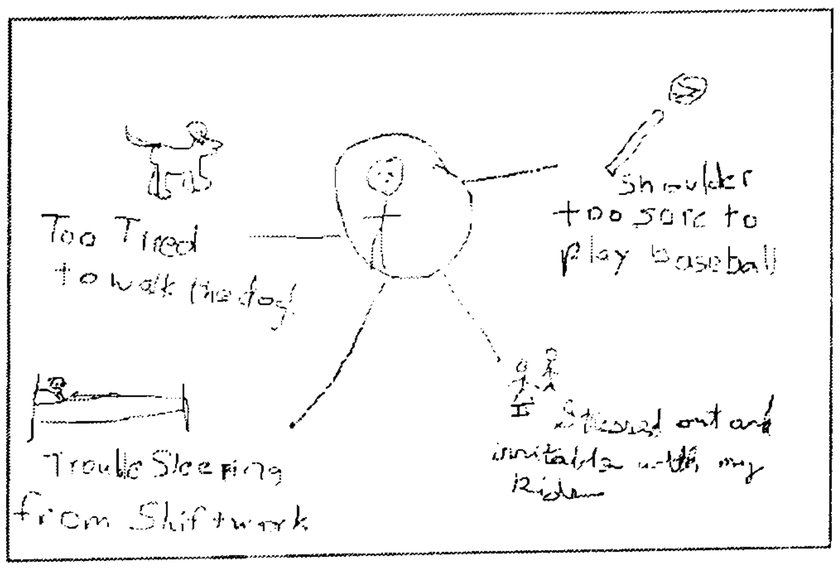
might help to explain such problems as stress-related illnesses, employee turnover, and lack of work satisfaction (Keith, 2003b).

5.7.1 How life mapping is done

Life mapping is done collectively using a large sheet of paper posted on a wall. A single figure of a person is drawn in the centre of the paper to represent each individual worker *(see Figure 5.9)*. In a facilitated workshop or focus group, the facilitator asks participants to map any effects they believe their work is having on their personal lives. They can use either symbols or words, connected by lines radiating from the central image to identify and describe issues. For example, a participant might report that shoulder strain has resulted in the abandonment of a favourite sport or hobby. The participants then describe to the group what they have mapped and discussion ensues.

This technique has been demonstrated to be effective even with participants who may normally be reticent to discuss personal feelings. For example, a small group of male industrial workers in Windsor, Ontario revealed intimate details of their personal lives during a life mapping session. They explained how the stresses of work were carrying over into their marital relationships and interactions with their children. One individual drew figures of a man and woman holding hands and then drew a line through them. He

Figure 5.9 - "Your World" life mapping



Source: Keith (1999a). *A Picture's Worth a Thousand Words.* Windsor, Ontario: WOHIS

then revealed that he had no physical or emotional energy left for his partner after a stressful, demanding day in the automotive plant (Keith, 2003b).

5.7.1.1 Life mapping in the four-step process

Optionally, colour-coding can be used to represent various demographic characteristics such as gender, department, or occupation. If the "Your World" life mapping is being done as part of a four-step mapping process and the participants used colour-coding according to a participant characteristic during body mapping or hazard mapping exercises, the same colour-coding scheme can be used.

While the "Your World" life mapping technique was first developed for the casino gaming research presented in Chapter 7, a similar psychosocial mapping exercise is described as a popular education based research technique for use by community groups by the Canadian Women's Research Centre (Barnsley and Ellis, 1992). Called "Drawing Our Experience", each participant draws herself into the picture and then shows how the issue being explored affects her experience. Lines and arrows are used to "show how things are connected and to show where the barriers are" (p 51). As in "Your World" life mapping, a facilitated group discussion ensues and comments are recorded for qualitative analysis.

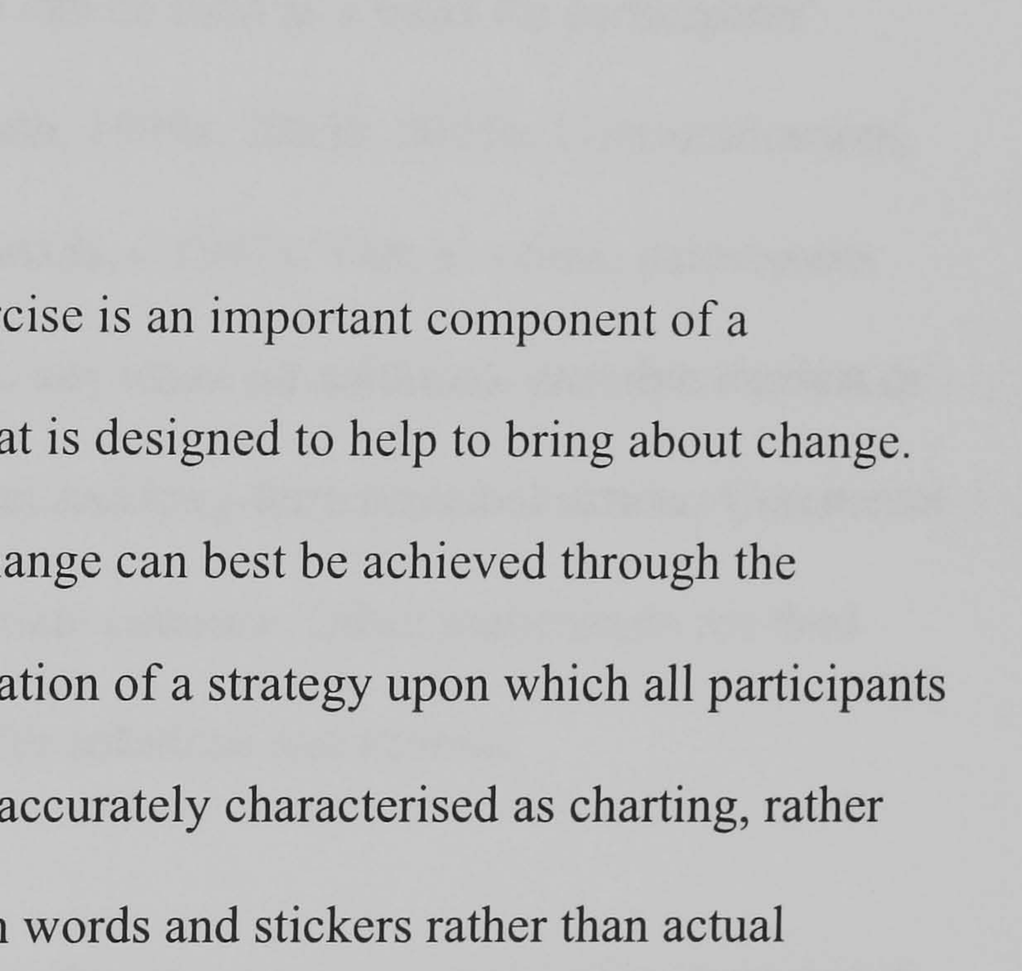
A large-scale worker-based project, using the four-step process that includes "Your World" life mapping, was launched in Brazil in 2003 *(see Figure 5.10)*. A pilot session with rural workers proved to be:

> ...very touching and moving. The workers put so much effort into presenting and were themselves very touched, talking and listening to their own stories. ... It is definitely the right tool for the rural area. So many

things came up, not only about the workplace, but differences between men and women, illiteracy, dignity... (Koehnen, 2003, np).

The capacity to evoke emotion is one of the strengths of "Your World" mapping as it helps workers to see the personal human impact of their work. This can be enlightening, politicising, and motivating.

Figure 5.10 - Brazilian rural workers mapping



Source: Transnationals Information Exchange (TIE), 2003

5.8. Priorities and Action Plan

The priorities and action planning exercise is an important component of a participatory action research project that is designed to help to bring about change. It is based on the understanding that change can best be achieved through the collective development and implementation of a strategy upon which all participants can agree. This exercise may be more accurately characterised as charting, rather than mapping, as it is usually done with words and stickers rather than actual drawings (although pictures and symbols or labels can be used if literacy is an issue).

5.8.1 How the priorities and action planning is done in the four-step process

The four-step mapping process culminates in an exercise designed to set priorities and develop a democratically agreed upon remedial action plan. A large chart labelled, *Priorities and Action Plan* is posted on the wall. It can include columns labelled with such categories as: *Problems, Solutions, Barriers, Short-Term Action,*

Long-Term Action, Votes (again pictures or symbols can replace the words if necessary (Keith et al., 2001, 2002; Keith, 1999a, 2003a, 2003b).

The first step is the creation of a short list of priority problems. If body, hazard or "Your World" mapping preceded this exercise, a variety of problems will likely have been previously identified. However, if this is a stand-alone exercise, more time and discussion will be required to identify priority issues of concern.

Participants are asked by the facilitator to consider the most urgent or serious concerns. A set of agreed upon criteria can be used as a basis for participants' decisions (Keith et al., 2001, 2002; Keith, 1999a, 2003a, 2003b; Communications, Energy and Paperworkers Union of Canada, c.1997). One at a time, participants name their single highest priority issue, any ideas for solutions, possible barriers or limiting factors, and ideas for short-term and long-term remedial action. Comments are recorded on the chart in the appropriate columns. Other participants are then invited to offer additional suggestions for solutions and actions.

Finally, participants can be asked to rank the importance of each of the short-listed problems. This can be done through a simple voting system. For example, each of the participants can be given a predetermined number of "votes." Participants vote using stickers or by marking Xs or checkmarks in the *Votes* column next to problems they deem to be of highest priority. The allotted votes can be used in any combination. For example, all can be applied to one problem or they can be divided up. Once the voting is completed, the score is tallied (Keith et al., 2001, 2002; Keith, 1999a, 2003a, 2003b).

The completed priorities and action plan chart provides a lasting record of high priority issues along with concrete ideas for remediation. The chart can be posted in a common area and positive indicators can be added as remedial actions are carried out.

There are a number of variations to the priorities and action plan exercise. Mujica (1992) also promoted a system of prioritising as part of his model of "risk mapping." Hazards are rated by "intensity," and "frequency," and the number of workers affected; workers decide together how "strenuously" they want to pursue improvements (p 770). Communications, Energy and Paperworkers (CEP) Union of Canada (c.1997) suggests the following headings: *Hazard, Needed Controls, Person Responsible, Target Date.* Rather than using votes to come to a democratic decision, the CEP promotes a consensus-based prioritising process and the delegating of activities and responsibilities to individuals and groups.

Another model of risk charting and action planning is presented as an action research approach to occupational health and safety training (Brown and Nguyen-Scott, 1992; Brown 2003). This model makes use of group process, charting of hazards and protective equipment, colour-coding to indicate whether an area requires improvement, and action planning. An example is given of a group of chemical workers from different workplaces who underwent occupational health and safety training. Priority issues were chosen by consensus in small groups and then individual action plans were developed. Follow-up was done three and twelve months later by the trainers via telephone interview. "Thirty-two percent said their

problems had not been corrected entirely, but that there had been some improvements. Twenty-eight percent reported their problems still had not been corrected" (p746). While the authors cited numerous limitations and modest results, they believed that the method provided a "structured, focused way to review what was learned, identify problem areas, and arrive at strategies for change" (p 746.)

5.9 Limitations and strengths of mapping

The following is a discussion of the strengths and limitations of mapping. Its advantages and disadvantages are particularly examined in relation to the central thesis, which is an analysis of the value of mapping in overcoming barriers to occupational health and safety improvements.

5.9.1 Limitations of mapping

There are some limitations or disadvantages to the use of mapping as an occupational health and safety research and organising tool for workers.

Focus group-based mapping can be time-consuming. It can take a single focus group of approximately eight participants two to three hours to complete a four-step mapping series (Keith et al., 2001). Furthermore, focus group facilitators must be trained to conduct the exercises and discussion effectively and efficiently while avoiding biasing the participants or discouraging open discourse.

Complete and accurate recording of verbal comments made during focus groups is essential and can be challenging if discussion is fast-paced or there are overlapping

conversations. Analysis of the qualitative data may be complicated and time-consuming.

The results of mapping-based research may be challenged because of its inherent subjectivity; data are self-reported and include opinion and conjecture; in other words, there is potential for misinformation. For example, when the Trades Union Congress in the UK announced it was urging its members to conduct mapping, the British Broadcasting Corporation (2000) reported that, "some employers fear that publicity for an ailment prompts people to think they have got it. Some doctors believe that some apparent sufferers of Repetitive Strain Injury, for example, only imagine it" (np). The TUC countered that, "If anything, industrial disease is under-recognised" (np). The mapping process casts a wide net and can gather concerns of minor importance along with major issues (which, in fact, may be a desired goal).

Some of the limitations of participatory action research (PAR) discussed in Chapter 4 are also applicable to mapping. Most of these limitations can be addressed if there is a commitment to making the process work.

5.9.2 Strengths of mapping

There are many arguments for the use of mapping in occupational health and safety research. This is a summary of the strengths of mapping; many have already been outlined in the chapter.

Mapping can be a powerful health and safety investigative and assessment tool (Firth et al., 1997; Hazards, 1997) and can provide evidence to support demands for improvement (Hazards, 1998).

Mapping helps to break from the traditional, technical jargon used by most medical and health and safety professionals which is difficult to understand (Brown, 1995; 2003). It changes the role of workers from passive recipients of technical expertise to active participants in health and safety improvement efforts (Mujica, 1992). Mapping-derived data is more readily and universally comprehended than most quantitative data, such as air sampling results or epidemiological findings (Brown, 1995, 2003). Because of its use of images, colour-coding, stickers and symbols, mapping helps to overcome problems of literacy and language differences (Gonzalez Arroyo et al., 1995; Mascarenhas and Kumar, 1991). This is an important consideration even in Canada where, according to Statistics Canada, more than one-third of the population is only marginally literate (Hardwick, 1996). In fact, "41% to 52% of workers in resource industries, transport, trade and hospitality services" fall within the lower levels of literacy (Hardwick, 1996). When literacy levels present a potential barrier to communication, the adage, *a picture is worth a 1000 words* is particularly apt.

Mapping is participatory; it encourages discussion and analysis. It permits the participation of everyone, including those with less dominant personalities (Mujica, 1992; Keith, 2003a; Mickkelsen, 1995). Mapping allows workers to identify specific problems and more clearly see ways of correcting them (Mujica, 1992). It allows participants to see the inter-connectedness of their health problems,

workplaces and lives (Hazards, 1997, 1998, 2000; Mujica, 1992; Keith et al., 2001a).

Workers participating in workplace mapping exercises create images of work the way they perceive it to be. As author Anais Nin is quoted as saying, "We don't see things as they are, we see them as we are." The process and product reflects workers' own reality. "The way we see things is affected by what we know or what we believe" (Berger, 1972, p 8.). As asserted in the previous chapter, workers are the "experts" regarding their own workplace experience. In keeping with the principles of participatory action research, mapping respects the subjective knowledge, experience and understanding of the participants. "The mapping process produces a wealth of detail as outcome, but also sets in motion a process of affirmation of local people as knowledgeable actors" (Cornwall and Jewkes, 1995, p 1668). It respects and utilises workers' experience and knowledge to paint detailed pictures of their working conditions and interactions (Mujica, 1992). Furthermore, because mapping is based on workers' own personal insights and day-to-day, on-the-job experiences, it can provide a depth of understanding that may be missed by traditional hygiene, ergonomic, technical, or biomedical approaches (Keith, 2003b).

Most often conducted in groups, mapping encourages collective, participative fact-finding and promotes discussion and sharing of information and ideas. During the process of recalling and describing the details of a situation, visualisation can help to jog one's memory or make connections. For example, in a group of workers who are collectively drawing and describing the department in which they work, each will have points to contribute from his or her own experiences and perspectives.

One worker's contribution may provide the foundation for a more elaborate description by the next. Someone might remember a product name; another might be familiar with the design of a piece of equipment. As the picture builds, more details are added and expanded upon.

Similarly, the creation of a collective body map to record health problems or a social map to record psychosocial problems can result in the sharing of information that individuals may otherwise feel reticent to discuss or may not consider relevant. It is less intimidating to be one of a group of people with similar or common problems.

The visual display of data seems to further promote the phenomenon of free-thinking. Pictures open up the mind and free the imagination to develop a creative and comprehensive action plan for analysing and addressing problems. Facilitators have observed the emergence of an enhanced understanding of potential hazards or of causal connections between hazardous conditions and negative health impacts (Keith, 2003b).

Mapping demonstrates an openness to hearing and considering the concerns, problems and opinions of workers (Keith, 2003b).

These numerous strengths are the key to the effectiveness of mapping. Many of the strengths of participatory action research as outlined in Chapter 4 are also applicable to mapping, particularly if it is used in a PAR process.

The strengths and limitations of mapping are further illustrated in the case studies presented in Chapters 7 and 8 and evaluated in Chapter 9.

5.9.3 Worker evaluations of mapping

The merits of mapping are evidenced in the positive evaluations provided by workers who have used mapping (Kirby, 2001; Keith et al., 1998, 2001; Keith, 2003b). Some of the results are included herein to provide an indication of how mapping is perceived by worker participants and worker practitioners.

- Members of the Canadian Union of Public Employees were introduced in 1997 to the concept of mapping during a three-day national conference (using conference materials co-produced by the author of this dissertation) (Keith et al., 1997). Participants were asked to provide written conference evaluations; comments included: "The body mapping technique was the most important aspect to me;" "Learning the body mapping and the risk mapping will help to do problem solving;" "I plan to use the tools to encourage members to become active;" "Body mapping [showed] how common the problems are through the nation;" "Mapping will help to identify concerns;" "Concept of mapping is great. Will use to get profile of workplace hazardous conditions and injuries;" "Mapping is an excellent way to brainstorm" (Canadian Union of Public Employees, 1997).

- Union members, who attended a mapping session in 1999 (led by the author of this dissertation) as part of a Union Counsellors course, made comments such as, "Body mapping created a comfort level;" "Found body mapping very interesting; really showed how most of us have the same kind of work-related

pain but don't expose it like we should;" "Very interesting method of creating discussion;" "An excellent tool; a lot of the same injuries that people have may be related to the type of jobs which they do and if you have a lot of the same types of injuries, can pinpoint the cause easier;" "Body map very informative; eye-opener; lots of awareness;" "I found the body mapping very useful; I would like to use it when we set up our health and safety committee". There were no negative comments regarding the mapping (Windsor Occupational Health Information Service, 1999).

- Evaluations by union representatives and body mapping participants in the Trades Union Congress mapping pilot project included such comments as: "The mapping process, when conducted by the union with its members, shows that the union "…values the membership;" "It is an extremely fruitful way of uncovering health problems;" "The format can be adapted locally to differentiate between the wide range of literacy skills that may be present in the workplace, therefore making the strategy available to all members without fear of intimidation" (Kirby, 2002).

- Casino gaming worker research participants commented that they appreciated the fact that someone was listening to them: "It's nice to know that someone cares" (Keith et al., 1998) *(Additional evaluations by casino gaming worker research participants are included in Chapter 7).*

The participatory nature of mapping is arguably its greatest strength. Mapping involves the direct input of those who are most intimately familiar with their

workplace and its functions. Mapping, particularly the four-step method, can show the interconnectedness of each of the elements. Moreover, the participatory nature of mapping tends to build group cohesiveness. The mapping process itself is affirming for individuals and groups. Because resulting maps represent the concerns of individuals and the workforce or departmental group as a whole, it can foster a broad-based commitment to changing unsafe conditions. The entire mapping process, from conceptualisation to implementation to reporting, encourages interest, involvement, commitment and action.

The sense of ownership that is derived from the participatory process may be at the foundation of its effectiveness as a catalyst for change. The cooperative action-planning process includes a thoughtful evaluation of hazards and collective creation of a realistic plan that incorporates workers' own ideas, knowledge, and action comfort level, such as how far they feel they can safely push the issue. As discussed, the fear of job loss and retaliation from employers and co-workers can limit workers demands for health and safety improvements. Because the action plan is democratically developed and agreed upon, it is less likely to overstep the workers' bounds of comfort and sense of security (Keith, 2003b). The collective process can result in the commitment or *buy in* needed to carry the plan forward.

Workplace mapping has a limited but positive track record. According to the report on the Trades Union Congress pilot body mapping project, "80% of the safety reps in the impact sample had taken action as a result of what they had found out …60% of the managers in the impact sample had taken action as a result of the body mapping representations …" (Kirby, 2001, np).

5.10 Summary

Deceptively simple, mapping can be a powerful tool. Whether employed in worker-based or collaborative health and safety research, the process of mapping and the resulting insights and findings can provide workers and health and safety professionals with a compelling basis for making decisions and recommendations and for influencing regulatory change, policy reform, and shop floor improvements. As Jim Brophy, a mapping proponent and participatory action research practitioner observed, "Time and time again I have seen mapping open eyes and then open doors to improvements. It is simple, enjoyable, accessible, and it works. I believe it is one of the most worthwhile communication and knowledge-generating tools in health and safety today" (Keith, 2003b, p 35).

There is a tendency, not only of employers, but also the labour movement to objectify workers; the union *experts* determine the activities and priorities for the rank and file. "Workers often do not experience, even in the union, empowerment or control of their own lives" (Koehnen, 2002, np). This tendency is one of the primary weaknesses of the labour movement. Mapping provides a means of challenging the labour hierarchy. "I see mapping as a fantastic tool that has a completely different idea of what to do and how to empower workers who define the problem, how the union should move; it is a very basic democratic tool for the rank and file" (np).

The following chapter introduces the two case studies that were conducted to explore the value of mapping as a participatory action research tool for occupational health and safety.