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OCCUPATIONAL INJURY RISK IN SWEDEN

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1 BACKGROUND

Sweden is a small, industrially well advanced, export-dependent social democratic experiment in the far north of Europe. The early pre-industrial development in the resource-based sectors of forestry, mining and steel was boosted during the country's period as a great political power during the 1600s, when the manufacturing and export of arms became important drivers of development.

In the 1880s, 70% of the Swedish population of 4.5m was sustained by agriculture and only 11% by manufacturing and mining. During this decade 10% of the population emigrated, mainly to the USA. The agricultural crises of the 1860s and 70s forced large proportions of the rural population to leave the countryside and an urban proletariat developed. Rapid industrialization was underpinned by legislated freedom of trade (1846 and 1864), which saw the end of the traditional guilds.

The average life span for men was 45 and for women 48. The normal working day was 12-14 hours. Twelve of every 100 newborn boys died in their first year of life, one in five never saw their 20th birthday. Twenty percent of all children never saw any form of schooling at all, and religion/Lutheranism made up 90% of basic education. The right to vote was dependent on annual income and private wealth; only six in every 100 citizens could vote (Beckholmen, 1984).

Early workers unions were dominated by issues of education, religion and sobriety, but from 1881 the social democratic movement reached Sweden via Germany and Denmark.

Rapid industrialization, massive investment in the building of railways and ports, and the growth and economic success of the exporting manufacturers Bofors, Atlas Capco, Alfa Laval-Separator, Primus-Bahco, LM Ericsson, AGA, SKF, Asea, Bolinder-Munktell - took Sweden into the 20th century.

The strong union movement, supported by communist and social democratic parties in the parliament from 1917, had its counterpart in a strong and unified employers' confederation based on a limited circle of manufacturing capitalists. Up until the 1970s, ownership of the Swedish export industry was limited to less than 20 owner groups & banks, many of whom were single extended families.

The depression 1930-34 hit the export dependent Swedish economy very hard, and a very strong social democratic government was formed in 1932. A historic first central agreement between Unions and Employers was struck in Saltsjöbaden in 1938. This can be seen as the birth year of the modern Swedish welfare state.




Four Swedish Prime Ministers:
Hjalmar Branting 1920-25; Per Albin Hansson 1932-46; Tage Erlander 1946-69; Olof Palme 1969-76, 1982-86

1.1 The 1938 Compromise; Ideology & Economy

The 1938 award represented a historic compromise between labor and capital and it had a decisive influence on the political and economic development of the country. The social democrat government ruled uninterrupted for 44 years, until 1976, and regained power between 1982 – 1991 and 1994 – 2006. Together with a strong, centralized union movement with an average union membership of over 80% and unions strongly committed to productivity improvement and international competitiveness, the Swedish social democrats has engineered the welfare state and sought to foster the social contract, which was its necessary foundation.

Strong union and government support for the successful and growing export industry was paralleled by a strong development of the large revenue funded public (state and local council) service sector and the development of a strong and comprehensive web of social security benefits.

High participation rates, especially for women (in comparison to most other countries), low unemployment through active labor market interventionist policies, an increasingly rationalized and efficient export industry employing decreasing numbers of workers, and a steadily growing public service sector has characterized the country from the 1960s until the early 1990s, the period often referred to as the Record Years.

A high rate of direct taxes, paid by two breadwinners in most families, together with high levies on remuneration paid by employers has resulted in a system where more than 52% of GDP is handled in the revenue and transfer systems.

The high quality of public service delivery and social benefits next to virtually no other country during the 70s and 80s has been scaled back since the mid 1990s, when the country also has seen the effects of financial deregulation, European integration and globalization. In terms of employment, there has been an exodus of large proportions of the successful manufacturing export industry, which have found labor cheaper and labor costs lower elsewhere and have decided to expand outside Sweden.

1.2 Demographics and labor market

The population of Sweden in 2012 is 9.5m an increase by 6.7% over the last 12 years (8.9m in 2000). The labor force in 1990 was 4.5m, contracted to 4.15m in the year 2000, and is back at 4.6m in 2012 (SCB, 2012).

Participation rates (2007) in the Swedish labor market are 88% for men and 83% for women - but 81% for men born abroad and 69% for women born abroad.

There was a big contraction in the Swedish labor market during the financial crisis 1992-94. The public sector employment (state and local council) shrunk by 20% between 1990 and 2000, from 1.65m to 1.32m

employees. The loss of 330,000 jobs in the public sector represents 100% of the contraction of the labor market between 1990 and 2000.

Unemployment was at the old standard Swedish low 1.7% in 1990, but as the recession fuelled by lower demand among large trading partners (ie. Germany) hit in 92-93 employment fell sharply. The present (2012) unemployment figures are 7,5%, much higher than it ever was in the period 1960-90 and thus representing a permanent shift in Swedish labor market policy (SCB, 2001).

The major traits in the changes to labor market during the period 1990 - 2010 have been

- a reduction in public sector employment as services have been cut back,
- a continuing receding labor force in the manufacturing export industry,
- a steady growth of small business employment,
- high participation rates among the domestically born
- high unemployment rates after the shutting down of active labor market programs
- high unemployment among the young and the immigrants

1.3 Negotiated occupational health and safety

Workers' protection and safety training became part of the industrial consensus and the Joint Industrial Safety Council was formed in 1942. This represented a forum for negotiations around health and safety issues and aspects of work environment and has often been used to help settle disputes over quantitative terms and award conditions through improvements of OH&S information and training.

After two major strikes in the northern iron ore mines (1968-69) and among the forestry workers (1970-71), which both had work environment improvements as the core issues, new legislation created the Work Environment Fund (1972) based on an employer premium on remuneration of 0.9% (later 0.35%), a central Work Environment framework agreement was struck between unions and employers, and a new Work Environment Act was extended and improved (1973, 1976). Workers' participation in OH&S was formalized through the safety representative system.

The 70s and 80s saw a massive educational drive in Swedish workplaces; some 700,000 safety representatives and line supervisors underwent basic work environment training on the job. The National Board of Occupational Safety & Health was given the necessary resources to develop crucial research into occupational hygiene, work related cancer and physical hazards at work.

With the financial support of the Work Environment Fund, which in the mid80s had an annual budget of SEK 560m, research, information and education in OH&S developed in academic institutions, in union and employer organizations, in the technical and medical Company Health Care system (built with state subsidies) and in industry (ASF, 1983).

In 1974 the Negotiated Occupational No-Fault Liability Insurance was launched and a union/employer consortium started to settle constructive damages in impairment cases according to strict no-fault principles. The negotiated insurance package has grown to include death benefits, unemployment benefits (top-up), general sickness benefits (top-up), and a number of other employment related social benefits, and the insurance vehicle is often used to facilitate the centrally negotiated agreements. The flat-rate premium for the No-Fault Liability Insurance is a symbolic 0.02% of remuneration for blue-collar workers and 0.01% for white-collar employees; the minimum premium is set at SEK 250.-/per annum, typically paid by a single self-employed operator (FORA, 2001).

On average, the risk of sustaining a work related injury resulting in at least 30 days of sick leave and/or permanent impairment in Sweden dropped from 2.73 per 1,000 employed in 1994-95 to 2.10 per 1,000 employed in 2010, a reduction of 23% (AFA Insurance, 2012). The trend follows the restructuring of the labor market, where the proportion of high-risk occupations in relation to low-risk occupations is changing over time.

1.4 The closing down of the Swedish work environment research

A thorough parliamentary investigation in 1989-90 by the Swedish Commission on Working Conditions was conducted to identify and investigate the risk of injury and disease in the Swedish labor market. The investigation (Ministry of Labor, 1989) produced risk profiles on all occupations based on figures of

- early retirement,
- mortality,
- severe traumatic injury,
- hearing loss,
- musculo-skeletal disease,
- strain/sprain and over-exertion injury,
- lung disease,
- skin disease,
- potential effects on foetus,
- cancer,
- myocardial infarction,
- stress,
- suicide.

In the period 1989 to 1996, a “working life fund”, which was established with a temporary employers' tax in the mid 80s in a deal between the social democrats and the farmers party in parliament to reduce overheating in the economy, redistributed some SEK 11,000 Million to the labor market through "work environment" projects. Industrial companies, unions, hospitals, councils, schools, in fact, most organizations which could formulate a need for broadly defined work environment improvement were funded.

During the same period, there was a tacit political agreement in the social democrat government to dismantle the state funded National Institute for Working Life (NIWL), to do away with the rule setting aside a certain percentage of employer’s tax for the Work Environment Fund and to abolish the said Fund. The changing of the law took only one parliamentary season to accomplish, the Fund took six years to kill off but the NIWL was handed over to the Alliance government and was not closed down until 2007.

After the closing down of the Work Environment Fund, the remaining work environment research funding in Sweden is provided by the Swedish Council for Working Life and Social Research, FAS, (60 MSEK/annum) and AFA Insurance (150 MSEK/annum). There is some other (sector) funding from councils and counties, which could be seen as work environment related, but this is marginal.

2 EXAMPLES OF RESEARCH AND DEVELOPMENT PROJECTS 2002-2012

All the projects funded by the largest work environment research funder (AFA Insurance) in the period 2002 through 2012 under the headings of “Ergonomics and workload”, “Physical work environment”, “Accidental injury” and “Musculoskeletal diseases” were collated. The sample covered 47 projects over 10 years with a funding of SEK 114m. This represents a small fraction (8%) of the total AFA Insurance annual funding of SEK 150m, most of which is allocated to general health and medical research.

Topic	**Funds**	**Proportion of SEK 114m**
Medical research	35m	31 %
Noise	25m	22 %
Allergy	10,4m	9 %
Psycho-social problems	7m	6 %
Vibration	6,8m	6 %
Branch of industry/general studies	6,5m	6 %
Accidental injury	6,2m	5 %
Ergonomics	4,9m	4 %
Electromagnetic issues	4,5m	4 %
Eye injuries	4,3m	4 %
Fumes in restaurant kitchens	3,5m	3 %
	114m	**100%**

Table 1 47 projects under the headings of “Ergonomics and workload”, “Physical work environment”, “Accidental injury” and “Musculoskeletal diseases” funded by AFA Insurance 2002-2012.

The distribution among projects within these categories, described in the research catalogue as related to occupational accident and injury, shows a predominance of studies of medical diagnoses related to work and noise induced hearing loss. Scientific studies of occupational accidents/prevention of traumatic injury represent 0,5 % of the total AFA Insurance work environment funding over 10 years.

Since the closing of the National Institute for Work Life in 2007, there is no strong institution for work environment and occupational injury prevention research in Sweden. Groups active in the area are at the School of Technology and Health, KTH (ergonomics, safety), Chalmers (production management), Gävle University College (occupational overexertion), Luleå Technical University (ergonomics, noise, vibration), Lunds Technical University (ergonomics), Stockholm University (chemical exposures).

3 SAFETY MANAGEMENT – THE OHS INFORMATION SYSTEMS.

An estimated 96% of the Swedish labor market is covered by AFA Insurance, which would imply a near total coverage of the whole (official) domain of paid labor in the country. The claims settling and injury reporting system of the No-fault Liability Insurance can be seen to give a representative picture of the occupational injury problem in Sweden. However, work performed outside the formal structure, in the growing informal, untaxed market, exists in unknown proportions and is not covered.

Initiatives from the industrial partners have seen the reporting and claims handling system of the National workers' compensation transformed into branch of industry OHS information systems (Informationssystem om Arbetsmiljö, IA). This has merged the reporting, investigation and analysis of injury, disease, incidents and near-misses into the local safety management structure of the company. The system handles all sorts of deviations; it operates as the general tool for safety and risk (line-) management and is used for communication between company, insurance and compliance control authority.

The OHS information systems, with training and software support, are provided free of charge to the company and the participating companies in the industry branch share the risk information between each other. The industry branch information system is governed by the respective representatives of unions and employers. Adopting the systems is voluntary and based on the agreement between the local labor market parties and companies to participate. The Mining and Pulp & Paper industries have been using the systems the longest.

INDUSTRY	Total number of employed	Covered by IA safety management systems	% covered of total number
Pulp & Paper	23 000	16 000	70
Steel & Metal	40 000	27 000	68
Mining	7 500	7 100	95
Sawmills	14 000	4 200	30
Forestry	5 000	2 300	50
Energy	35 000	17 500	50
Food	55 000	10 000	18
Manufacturing	345 000	15 000	4
Wood & Furniture	30 000	8 000	27
Transport	127 000	6 000	5
Construction	220 000	9 000	4
Summa	**901 500**	**122 100**	**14**

Table 2 The first 10 branch of industry safety management systems (IA System), the total number of employed and the branch of industry coverage (July 2012).

4 SEVERE OCCUPATIONAL INJURIES AMONG SWEDISH METAL WORKERS (2012)

272 000 Swedes work within the award of the Swedish Metalworkers Union, IF Metall. 23% of metalworkers are female and 16% under the age of 30. The IF Metall award covers large parts of Swedish industry – plastics, pharmaceuticals, construction material, steel, chemistry, glassworks, car repair and metal manufacturing.

The Swedish work environment is better organized and safer than in most other industrial countries. In spite of this, annually around 5 000 workers in Swedish workplaces are severely injured (>30 days absence from work and/or some degree of permanent impairment) with different degrees of permanent impairment.

The occupational groups in the metal trades are exposed to higher than average risks of sustaining a severe injury at work (AFA Insurance 2012). The risk of occupational injury among metalworkers is relatively stable over time and seems settled at a level 3-4 times higher than the average occupational injury risk in the Swedish labor market.

Occupations	2004	2005	2006	2007	2008	2009	2010
Metalworkers	6,5	6,8	7,9	8,1	6,9	5,3	7,3
Average, all other occupations	2,3	2,2	2,1	2,1	2,0	1,8	2,1

(AFA Insurance 2012)

Table 3 Annual risk (number of cases per 1000 employed) of severe occupational injury among metalworkers and the like compared to the average risk in the rest of the labor market, 2004-2010, men and women.

To describe the most common injury scenarios among metalworkers you could combine

- the most common preceding events, with
- the largest occupational groups, and
- the most common severe diagnoses

and examine how injuries are distributed on typical scenarios, age and gender. This could point to priorities for prevention activities.

The largest occupational groups *mechanics, machine builders and repair workers* (Swedish Standardized Occupational Classification, SSYK 7233), *tool machine operators* (SSYK 8211), *technicians, metal-, rubber- and plastics products* (SSYK 8283) and other machine operators (SSYK 8290) have been merged into one group of "metalworkers" in the analysis. These occupations represent 45% of injuries 2009, 2010 and 2011 among employees covered by the IF Metall award according to the claims register at Nov 2012.

The three most common preceding events – *using machine or tool, falls, manual handling* (54% of the injuries) – and leading to some form of *fracture* (40% of injuries) among metalworkers 2009, 2010 or 2011 have been sorted according to *gender* and *age*.

The age dependent over-risk, i.e. the risk of sustaining a certain event/injury in the age group within the occupations analysed compared to the risk of injury among all of the same gender in the occupation, is shown in Table 4. It appears that younger and older female metalworkers run increased risks of injury in *manual handling*, and that older female metalworkers run increased risks of *falls* at work.

Older male metalworkers run slightly increased risks in relation to the three most common occupational injuries compared to their younger workmates.

	Load, shift carry or move (manual handling)	Operate machine or tool	Fall			Load, shift carry or move (manual handling)	Operate machine or tool	Fall
Women					Men			
< 25	2,5	0,7	0,0		< 25	1,3	1,2	0,7
26-35	0,0	1,4	0,0		26-35	0,7	1,2	0,9
36-45	0,3	0,9	0,2		36-45	0,9	0,7	0,7
46-55	1,2	1,1	1,7		46-55	1,1	0,8	1,2
56-64	2,0	0,8	3,5		56-64	1,2	1,4	1,6

Table 4 Increased risks for injury events leading to fracture. Average risk/gender/occupation = 1. IF Metall award, occupations SSYK 7233, 8211, 8283, 8290, women and men, age groups. (AFA register 2012-11).

4.1 Operating machine or tool

The main activity preceding severe injury when operating a machine or tool is to *clean out, remove, adjust or change* something – 38% of women's and 32% of men's injuries happen in this way. 18% of women's and 8% of men's injuries are preceded by *work glove getting caught*. 10% of men's injuries are related to *drilling machines*, 8% to *polishing machines* or *lathes* and 7% to *scissors* or *cutting machines*.

Adjusting and correcting tasks, cleaning around or inside machine during operation, adjusting work piece during operation are activities which substantially increase the risk of injury. This type of, often informal work operations need to be carefully analyzed for different types of machines in order to improve the man-machine interface.

The *drilling machine* is the single most common machine involved in injury. Decisions on which type of drill is suited to the different job tasks are important for the control of injury risk.

Compared to male metalworkers, female metalworkers are twice as likely to severely injure themselves due to *work glove getting caught*. Is it still a problem to supply women in the manufacturing industries with suitable work gloves in appropriate sizes?

4.2 Load, shift, carry or move (manual handling)

The major part of women's injuries – 70% - is sustained when handling a load *without a lifting device* – only 28% of men's injuries. 50% of men's injuries are sustained when handling a load *with a lifting device*.

The *handling of lifting and transport devices* among male metalworkers represent an area demanding special safety training similar to forklift truck driving. To underestimate the risks in these operations might be more frequent among young males.

Manual handling – without mechanical aides – among young female metalworkers seems to be a priority area for injury prevention measures. Maybe young female workers must consciously abstain from trying to be stronger, or as strong as, their male workmates and use lifting devices in heavy manual handling tasks.

4.3 Fall

42% of the women and 33% of the men *slip or trip when moving*. 18% of the men and 25% of the women fall due to *ice and snow outdoors*. 21% of the men and 22% of the women *fall when operating a machine or tool*. 6% of women and 3% of men injure themselves during *cleaning* operations. In 25% of the injuries among male metalworkers, a *ladder* is involved.

Female metalworkers over the age of 55 run drastically increased risks of severe injury when they have a *fall* at work. Twice the proportion of fractures to the lower arm compared to the men (Table 4) identifies the elderly, female metalworker. The risk of falling is an epidemiological trait in women of this age group and it would seem that prevention is more straightforward in the work place than during leisure time.

The free use of simple, practical and easily movable *ladders* for unstructured work tasks increases the risk of trivial fall incidents and severe injuries. You often tend to underestimate the potential consequence of a quick corrective intervention, where the ladder constitutes the weak part of the operation.

5 THREAT & VIOLENCE AT WORK

The information about causes of injuries, risk exposures and accident processes at work, collected as part of the claims management of AFA Insurance since 1988, is based on the answers to three questions on the claims form related to "activity prior to accident", "accident mechanism" and "contact event". Initially, this text information was coded in an alliterative, telegrammatic form (Heidenstrom 1985). Since 2004, the full free text of the accident process is saved and available for analysis, and from 2007 with the help of text mining software (Brooks 2007; 2008).

Free-text descriptions are by far superior to aggregated coded information (e.g."nailed gum boot to knee with nail gun"). This often represents informal knowledge which might be well-known at the coal face but not known to those removed from the hazardous exposure.

Annually, around 3000 claims for occupational injury due to exposure to threats or violence are reported (AFA Insurance 2009).

5.1 Police Officers

All claims associated with threat or violence in the period 2004 through 2007 (48 months) from Police Officers (n=777) were treated to a text mining analysis in order to establish the exposure patterns associated with occupational injury due to threat or violence.

Cluster	Descriptive Terms	N ♂	N ♀	Severe* ♂ (%)	Severe ♀ (%)
1 Taking into custody, transporting to police station, handcuff, resisting person	Put, cell, resist, handcuffs, hold, stand, run, pull, take into custody, struggle, floor, squeeze, backseat, police car, transport, rowdy	53	33	15.1	18.2
2 Spit, saliva; face, mouth, eyes	Saliva, infection, spit, hepatatis, face, mouth, eye, transport, question, patient, police station	30	18	23.3	5.6
3 Car chase, car theft, patrol car	Steal, car, driver, drive, reverse, stab, knife, throat, control, stop, talk, patrol car, jump	21	9	38.1	22.2
4 Police raid, house search, gun, knife, pepper spray	Unit, police raid shoot, house, shot, search, fire weapon, life, pull, service weapon, die, danger, situation	37	8	70.3	62.5
5 Mentally deranged female, clawing, biting, kicking, pulling, hitting (psych. causes)	Female, psychiatric illness, assistance, bite, claw, nail, spit, hepatitis, attack, backseat, take into care, refuse arrest, pull	20	25	10.0	24.0
6 Verbal threat	Threat, earpiece, phone call, note, letterbox, serious, death threat, call, family, worry, kill, experience, menacing, show gun, fear	16	11	81.3	72.7
7 Intervene, stop fight, attacked by violent person	Street patrol, fight, gang, attack, fist, lie, head, neck, back	50	17	22.0	29.4
8 Hit/kicked by fist, knee, foot	Rowdy person, hit, fist, kick, intervention, stop, stand, queueing, arrest, beating	38	10	21.1	20.0
9 Stones/objects thrown (sports/ demonstration)	Supporter, throw bottle, stone, ice hockey, hooligan, bruise, iron bar, shinguards	22	7	9.1	57.1
10 Violent drunk person	Drunk, drunk driver, take into custody, arrest, kick, transport, resistance, knee, cell, elbow, face	69	42	13.0	16.7
11 Violent drug addict	Drug addict, violent resistance, needle, fight, push, tear, wriggle, escape, fall	61	15	22.9	6.7
12 Violent suspect with knife	Violent suspect, knife, punch, unknown perpetrator, resistance, violence, bleed	100	29	22.9	20.6
Clear	Total 741 (95.4%)	517	224		
Unclear	n=36 (4.6%)				
* Severe means >30 days disability or medical impairment					

Table 5 Clusters of reported occupational injuries due to threat or violence among male (♂) and female (♀) police officers, proportions of severe injuries (>30 days and/or permanent impairment). AFA Insurance, accepted claims 2004-2007 (Larsson, Oldertz, Tezic 2010)

Tables 5 and 6 show the twelve text mining "clusters", which identify 95% of the exposure scenarios related to threat and violence injuries among Police Officers. The level of information in the clusters describing the different scenarios is such that measures of risk management and control could be developed through training, operational routines, or technical resources, i.e.:

- further differentiate operational procedures/techniques among police officers between arrests of violent suspects, mentally deranged suspects, drunk suspects, addicted suspects;
- develop further the operations of police officers manually taking suspects into custody according to the different environments – suspect's car, backseat of patrol car, cell;
- carefully analyse the operational procedures in terms of using female officers for certain types of interventions.

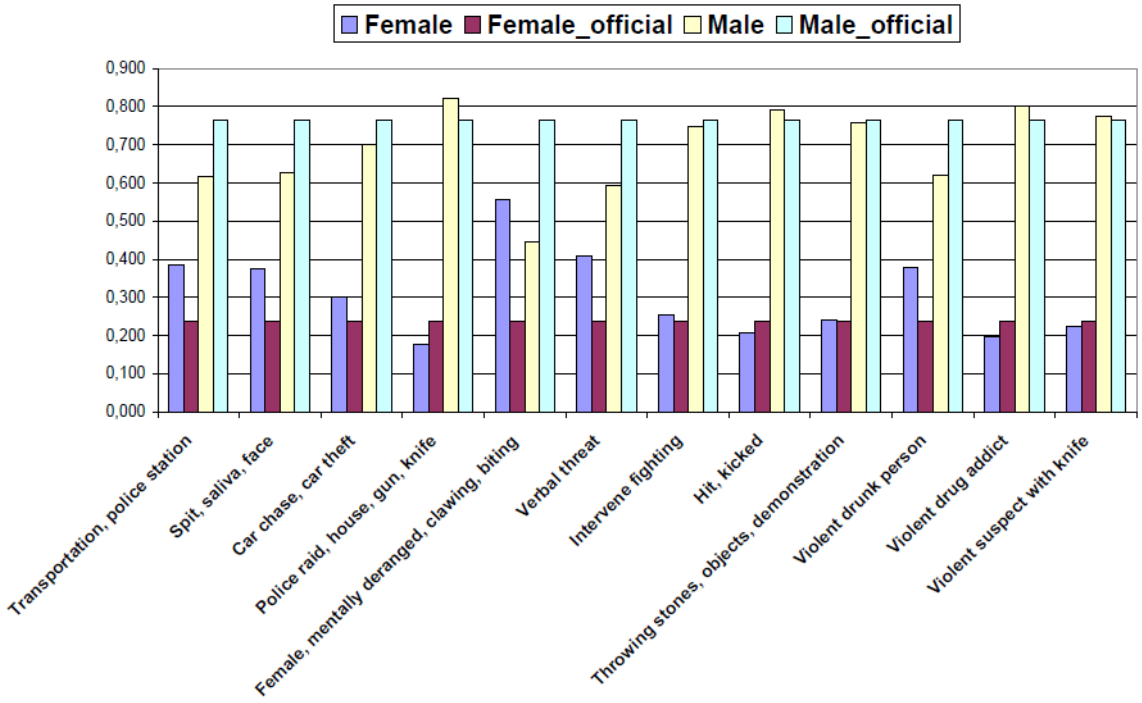

Table 6	Gender representation in exposure scenarios related to injury compared to gender distribution in the occupation (official) (n=741)

6 THE SWEDISH WAY

Work environment problems have been given considerable resources and generated much political interest in Sweden, particularly during the last 40 years.

If the Swedes indeed have developed a good work environment, with rational, clean and safe workplaces, well educated employees and competent and egalitarian managers this has to be understood against the historical background of a strong, well developed and extremely successful manufacturing export industry, a united and well organized employer, and a powerful labor movement organizing in excess of 90% of industrial workers, together with social democratic governments building a large social welfare system and consolidating the role of representative democracy and negotiated problem solving outside the parliament.

Both the public and the negotiated insurances in relation to work related injury and disease are built to guarantee economic welfare and equality; the systems are comprehensive, gives everyone equal access to benefits; exhibits few moral hazard problems and delivers fair no-fault compensation without unnecessary legal transfer costs.

The present challenges to safety and health in the Swedish work environment are

- the reduction in the export manufacturing labor force when skills and competence move abroad,
- the high endemic unemployment which pushes down wages, terms and working conditions,
- the growing informal and untaxed labor market – in construction, in personal services, in health care.

Like in other countries with high quality and expensive social welfare, the balance between different sectors in the economy and between private and public spending is presently being adjusted.

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