Final report

A literature review of the role of Alcohol and Drugs in contributing to work-related injury.

Undertaken as part of a project for

Alberta Human Resources and Employment

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## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>3</td>
</tr>
<tr>
<td>Methods</td>
<td>5</td>
</tr>
<tr>
<td>Summary of findings</td>
<td>7</td>
</tr>
<tr>
<td>References</td>
<td>23</td>
</tr>
<tr>
<td>Appendix: Individual review of included papers</td>
<td>28</td>
</tr>
</tbody>
</table>
1. Introduction.

Despite increasing awareness of the problem, work related injury remains a significant problem in all parts of the world. The risk factors that contribute to work-related injury also remain poorly understood at present, although it seems plausible that the prior use of drugs and alcohol contributes to this risk. This review considered the published evidence for a causal role of such substances in workplace injury, other than those due to motor vehicles.

The use of drugs and alcohol in society is relatively common. The recent Canadian Addiction Survey estimated that current alcohol use among adults averaged 79.3% of the population, with 20.2% reporting ‘monthly heavy drinking’ and 1.7% reporting a harmful impact on ‘work, studies, or employment opportunities’ in the past 12 months [1]. The same survey estimated the prevalence of illicit drug use in the past year at 14.1% for cannabis, and 1.9% for cocaine/crack. Figures for alcohol and drug use in Alberta were similar to those for Canada, 21.0% reporting monthly heavy drinking, and 15.9% the use of at least one illicit drug in the past year. Further, there is some evidence that while alcohol use may be relatively static, drug use in Canada is increasing. Self reported lifetime cannabis use in Alberta in the 1980’s was approximately 5.9%, whereas by 2003/04 it was 48.7% [1,2]. A survey among Ontario students reported similar findings [3].

Among employers, and other groups, there has been concern that such common use of alcohol and drugs may compromise workplace health and safety [4-6]. This had led to suggestions that testing for the prior use of alcohol and/or drugs may reduce the risk of workplace accidents. However, to date there remains no clear consensus about the role of drugs and alcohol as a risk factor for workplace injury, nor the effectiveness of interventions such as workplace testing programs in preventing such injury. The aim of this review was to identify, extract, and summarise the literature relating to six main questions:

- Is the personal use of alcohol as a social habit a risk factor for work-related injury?
- Is the personal use of alcohol at work, or immediately before work, a risk factor for work-related injury?
- Is the personal use of illicit drugs as a social habit a risk factor for work-related injury?
• Is the personal use of illicit drugs at work, or immediately before work, a risk factor for work-related injury?

• Is the use of prescription or over the counter drugs a risk factor for work-related injury?

• Are interventions aimed at reducing the use of drugs and alcohol among workers, such as putting in place a workplace testing program, effective in reducing the incidence of work-related injury?
2. **Methods**

**Literature Search**

The OVID interface was used to search for articles in both Medline and PsychINFO for the period January 1990-December 2004. All keyword combinations of occupational, work, and industry with injury, injuries, accident and accidents were searched.

In Medline, these terms were combined using the “OR” operator with the MeSH (Medical Subject Heading) term “accidents, occupational” to create an occupational injury literature list. This list was combined using the “AND” operator individually with the subject headings “substance-related disorders”, “alcohol drinking”, “CNS agents”, “pharmaceutical preparations adverse effects”, “therapeutics adverse effects”, “substance abuse detection”, “intervention studies”, and “program evaluation”.

In PsychINFO, the keyword search was combined using the “OR” operator with the subject heading “industrial accidents”, and this was combined using the “AND” operator with the subject heading “drug abuse”.

The titles of all articles were reviewed to try to identify those that were relevant. The abstract was then obtained and reviewed for all those that were thought relevant based on the title. The full article was obtained for all papers considered relevant after this review process. Among those identified only those containing original data were retained, purely review articles being excluded. As articles were retrieved, they were hand searched for additional literature citations, subject headings, and keywords.

All relevant original articles identified in this way and included were subsequently summarized. No articles were excluded on the grounds of the quality of the study. Comments on the quality of the paper are included within each summary, and consideration of the quality of each study was incorporated within the overall review.
Papers were considered within six broad categories related to the questions posed. These comprised:

- Is the personal use of alcohol as a social habit a risk factor for work-related injury?
- Is the personal use of alcohol at work, or immediately before work, a risk factor for work-related injury?
- Is the personal use of illicit drugs as a social habit a risk factor for work-related injury?
- Is the personal use of illicit drugs at work, or immediately before work, a risk factor for work-related injury?
- Is the use of prescription or over the counter drugs a risk factor for work-related injury?
- Are interventions aimed at reducing the use of drugs and alcohol among workers, such as putting in place a workplace testing program, effective in reducing the incidence of work-related injury?
3. Summary of findings of review.

1. Is the personal use of alcohol as a social habit a risk factor for work-related injury?

A total of 31 papers were identified which addressed the issue of a possible association of an individual’s usual or typical use of alcohol over a relatively prolonged period and the likelihood of workplace injury [7-37]. Two of these papers presented information on the likelihood of workplace injury in users of alcohol and non-prescription drugs from which information about the use of alcohol alone could not be separately extracted [27,36]. In one further study alcohol intake was used as a covariate in analyses of the effects of prescription drugs [37].

The majority of studies were either cross sectional surveys of working populations or case control studies of injured workers and a comparison person. Most studies recorded usual alcohol consumption over the 12 months preceding either the injury or the interview, depending on study design, but some used a shorter period such as a month to define typical alcohol consumption. Some quantified alcohol consumption as the presence of alcohol dependence or of ‘problem drinking’, or symptoms of problem drinking or dependence reported in a questionnaire, or the seeking of advice or counselling for problem drinking or dependence. Workplace injury was identified in a variety of different ways including survey questions, examination of sickness absence or workplace accident records, or hospital attendance. Injury was also defined in a number of different ways including ‘any injury’, ‘injury requiring time off work’, ‘injury requiring a minimum time off work (e.g. 5 days)’, or ‘injury requiring medical attention’. Most studies included at least some information on potential confounders such as smoking and age, and the majority, but not all, utilised multi-variate analytical techniques. In addition, there were two papers with the same first author [33,34] which have both been included although they appear to be based on the same subject group, and have apparently conflicting results.

Of the 31 papers reviewed, 19 reported results compatible with an association between alcohol and workplace injury, and for 16 of these the use of alcohol increased the risk of workplace injury. For three of
these the result was not statistically significant, and in some the association was described only for a sub-
group, or only for one of several measures of alcohol use/abuse. For example, two studies reported an
association only in younger workers [24,35], and several reported an association was apparent only with
relatively ‘high’ levels of drinking, or with five drinks or more per day [11,30-32]. These results are
summarised in Table 1.

Three studies reported results suggesting that if anything the use of alcohol might be protective. Beaumont
and Hyman [8] reported fewer days lost due to reportable workplace injury among problem drinkers than
among a control group, while Hertz and Emmet [15] reported an odds ratio of 0.71 (95%CI 0.31-1.38) for
alcohol use in the 3 months prior to the injury among workers with workplace hand injury when compared
with matched controls. Pickett et al [37] in a case control study among farm workers reported a reduced
odds ratio for all frequency of alcohol use compared with abstainers. Interestingly, two additional studies
reported a ‘U’ shaped association between alcohol use and workplace injury, non drinkers and heavy
drinkers both having a higher risk than light drinkers [17,26]. Were these papers correct, this might help to
explain the apparently contradictory results of the other papers.

One further report published by the UK Health and Safety Executive reported a non statistically significant
association between the heavy use of alcohol and an accident at work sufficient to require medical attention
when compared with light or moderate alcohol use (OR 1.19, 95% CI 0.79-1.81) [38].

Only one paper tried to establish whether the individual for whom alcohol use was estimated was
responsible for the events that led to injury. This paper reported a significant association between
behaviour contributing to injury and alcohol use [25].

On balance, the weight of evidence suggests there may be some association between general alcohol use
and the likelihood of workplace injury, but that this association is not particularly strong, and may not be
linear. It is not clear from these studies whether alcohol use and workplace injury are causally related. It
remains entirely possible that alcohol use and likelihood of workplace injury are both determined by some underlying characteristic, such as propensity to engage in risk taking behaviour.

Table 1. Summary of results of papers reviewed in addressing question 1

<table>
<thead>
<tr>
<th>Strength and direction of effect</th>
<th>Number of studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant positive effect overall</td>
<td>8</td>
</tr>
<tr>
<td>Significant positive effect in some subgroups or for some types of injury</td>
<td>5</td>
</tr>
<tr>
<td>Positive effect, not significant</td>
<td>3 (+1 report)</td>
</tr>
<tr>
<td>No effect (e.g. OR approximates 1)</td>
<td>10</td>
</tr>
<tr>
<td>Protective effect, not significant</td>
<td>3</td>
</tr>
<tr>
<td>Significant protective effect</td>
<td>0</td>
</tr>
<tr>
<td>Unable to extract information for alcohol separately</td>
<td>2</td>
</tr>
</tbody>
</table>

References used for Question 1


2. *Is the personal use of alcohol at work, or immediately before work, a risk factor for work-related injury?*

Rather fewer papers have addressed the question of whether alcohol use in the period the time of a workplace injury, or while at work, are a risk factor for the occurrence of an injury. Only six papers were
identified which addressed this question, and data were not presented in sufficient detail in one to allow the relevant results on alcohol use around the time of the injury or while at work to be extracted [17]. Of the remaining five, one asked about alcohol consumption of alcohol immediately prior to going to work or at work during the past year [7], one asked about alcohol consumption in the 24 hours prior to the injury [15], one asked about the use of alcohol (or marijuana) at work [29], one asked about alcohol (or drug) use in the 6 hours prior to the injury and at work [30], and one tested exhaled breath alcohol levels in individuals following an injury event [39].

Of these studies, only one showed a statistically significant association between alcohol (or marijuana) use at work and workplace injury [29]. Unfortunately, the results from this study were not presented for alcohol and marijuana separately. One study showed superficially conflicting results, those who drank on the job being more likely to have an injury in univariate analyses, although no association was demonstrated in multi-variate analyses [30]. One showed no statistically significant association between drinking immediately before work or at work and the likelihood of injury (odds ratios were not given) [7], one showed a possible protective effect of alcohol use in the 24 hours prior to injury (OR 0.50, 95% CI 0.21-1.12) [15], and one showed a lower proportion of workers tested after injury with an alcohol level greater than ‘0’ (70% v 66%), or greater than 17.8 mmol/l (approx 0.080 g/dl) (5.8% v 9.5%), than among controls, again suggesting if anything a protective effect of alcohol use [39]. None of these studies attempted to ascertain whether the person in whom alcohol use was estimated was in some way culpable in the events leading up to their injury.

These studies are more difficult to interpret and less consistent than those identified for general alcohol use, and there is considerably less data. On balance it appears that alcohol use around the time of an injury event, or at work, is at most only weakly related to the likelihood of injury. It may well be that there is no relationship between alcohol use and workplace injury at the levels of alcohol consumption typically associated with attendance at work, perhaps because workers who do drink heavily immediately prior to a period of prospective work simple absent themselves. There is, however, no data to support or refute this suggestion.
3. Is the personal use of illicit drugs as a social habit a risk factor for work-related injury?

A number of studies have tried to address the possibility of an association between the use of illicit drugs and workplace injury, and the majority have also included information on the use of alcohol [27-36]. In addition, one report that had not yet been published in a peer reviewed journal was identified which dealt almost exclusively with the use of drugs by workers [38]. One paper addressed illicit drug use, and included alcohol use in the past month as a covariate, but did not present results for alcohol use and risk of injury and so could not be included in the prior section [40]. Two further papers report results from the same study cohort, the second reporting an extra years follow up [41,42].

Of these, nine studies (ten papers) were identified in which results were presented relating to illicit drug use and the risk of work-related injury. Five of these nine studies suggested an association of some sort [31,34,38, 40-42]. Smith et al [38] reported an association only for work-related road traffic accidents (adjusted OR for drug use in past year = 1.71, 95% CI 0.53-5.58) but not for work accidents (adjusted OR for drug use in past year = 0.87, 95% CI 0.48-1.58). Kaestner and Grossman [40] reported an association between the use of cocaine or marijuana in the past year and an increased risk of work-related injury for males only. Hoffmann et al [31] reported an increased relative likelihood for work-related accident in the past year for those who had used marijuana for 1-2 days in the past year (1.51), but not those who had used marijuana for 3-51 days (0.98), or weekly for the past year (1.01). They similarly showed an increased relative likelihood for those who had used cocaine for 1-2 days (1.75), and also for 3-51 days (1.35), but...
not those who had used weekly for past year (0.78). None of these associations were statistically significant. Macdonald et al [34] appeared to show an association only for cocaine/crack, and not for other illicit drugs, although full results were not given. The study cohort of US postal workers established by Zwerling et al [41], that was also reported by Ryan et al [42] after a further years follow up, showed an association between a positive pre-employment drug test for marijuana or cocaine and time to first ‘work-related accident’ as well as an association between marijuana or cocaine use and time to first work-related injury. Results were similar in the two papers, although the association between testing positive for cocaine and time to first injury was significant at the first analysis, but not at the second, whereas the converse was true for the association of cocaine with time to first accident.

Two further studies showed an association in univariate analyses but not in multivariate analyses [32,33]. Further, for one of these studies, the association was seen only for ‘high risk’ jobs, such as driving, working with heavy equipment and machinery, or working with toxic chemicals [32].

For the two remaining studies, one reported an association for accidents generally but not specifically workplace accidents, and only for drug use in the workplace [30], and one recorded no injuries attributable to ‘intoxication’ [28].

Further, for four studies it was not possible to separate any reported effect of alcohol and drugs, as they reported outcomes for variables related to substance (ab)use [27,29,35,36]. Among these four studies, three showed an association between the use of substances generally and the risk of workplace injury [27,35,36], and for one this association was significant [27]. The last of these studies showed an association for substance use on the job but not substance use generally. Whether this effect was due to alcohol or drug use cannot be determined.

Overall this literature is difficult to evaluate, and probably inadequate to reach a definitive conclusion. If drug use is associated with work-related injury it appears to be more apparent among males, possibly more likely to occur with cocaine use, and possibly only occurs in certain situations such as when driving or in
other ‘high risk’ work. Further, while a slim majority of studies appear to show an association of some sort, even within these studies this does not necessarily constitute causation.

Table 2  Summary of results of papers reviewed in addressing question 3

<table>
<thead>
<tr>
<th>Strength and direction of effect</th>
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</thead>
<tbody>
<tr>
<td>Significant positive effect overall</td>
<td>0</td>
</tr>
<tr>
<td>Significant positive effect in some subgroups or for some types of injury</td>
<td>4</td>
</tr>
<tr>
<td>Positive effect, not significant</td>
<td>1</td>
</tr>
<tr>
<td>No effect (e.g. OR approximates 1)</td>
<td>4</td>
</tr>
<tr>
<td>Protective effect, not significant</td>
<td>0</td>
</tr>
<tr>
<td>Significant protective effect.</td>
<td>0</td>
</tr>
<tr>
<td>Unable to extract information for illicit drugs separately</td>
<td>4</td>
</tr>
</tbody>
</table>

References used for Question 3

4. **Is the personal use of illicit drugs at work, or immediately before work, a risk factor for work-related injury?**

Fewer studies again have studied a possible association between the use of illicit drugs immediately prior to a workplace injury, or the use of drugs at work and the risk of work-related injury. Frone et al [29] reported that on the job substance abuse, which included both alcohol and marijuana, was associated with the frequency of work related injury. Hingson et al [30] reported an association between drug use in the workplace and the risk of any ‘accident requiring medical attention’, but it appears this association was not significant for workplace accidents (result not given). Holcom et al [32] found a significant association between drug use at work, but not recent drug use, and work-related injury for workers in ‘high risk’ jobs, but not those in low risk jobs. Further, the drug use variables were all omitted from multi-variate models as they did not improve the models.

These data are insufficient to reach any firm conclusion about the role of illicit drug use at work, or immediately before a work-related injury, in increasing the risk of injury.

References used for Question 4.

5. *Is the use of prescription or over the counter drugs a risk factor for work-related injury?*

A total seven papers were identified which reported studies of the use of therapeutic medications, usually including both prescription drugs and over the counter drugs, and the risk of work-related injury. Five of these were case control studies and two cross sectional studies. Of the two cross sectional studies, one reported a tendency for those taking psychoactive drugs to have more injuries, although results were not statistically significant, and no association was described for other categories of drugs [43], while the other reported work injury in the past 12 months to be associated with therapeutic drug use in the past 12 months but gave little other detail about which particular categories of drugs might be involved. [33].

Of the remaining five case control studies [37,44-47], four of the five showed some association between the use of medications and the risk of work-related injury. Dunn [44] reported an increased use of medication in the 24 hours prior to an injury among workers with work-related injuries (44%) compared with non injured colleagues (35%), although in this study cases and controls were matched only on gender, and the reported differences were not statistically significant. The association between risk of injury for different classes of medications was not described, although the most frequently used were aspirin, or vitamin and/or iron. Antihistamine use was more common among controls. Gilmore et al [45] reported a statistically significant association between the occurrence of work-related injury and the use of some medications in the prior 90 days, specifically antibiotics (OR 1.2, 95%CI 1.0-1.5) and antihistamines (OR 1.5, 95%CI 1.1-1.9). The odds ratios for antidepressant use (OR 1.2, 95%CI 0.9-1.6), sedative hypnotic use (OR 1.2, 95%CI 0.8-1.7), and hypoglycaemics (OR 1.3, 95%CI 0.9-1.9) were elevated but not significantly, while those for the use of narcotics (OR 0.9, 95%CI 0.7-1.1) and antipsychotics (OR 0.5, 95%CI 0.3-1.1) were both lower than one. Hanrahan and Paramore [46] reported an association between the use of sedating antihistamines in the two weeks prior to injury and the risk of injury for younger individuals only. Odds ratios for the use of sedating antihistamines were increased for age groups up to the age group 40-49, but then were decreased for age groups greater than this suggesting if anything a protective effect among older individuals on their risk of injury. The use of non-sedating antihistamines did not show a significant relationship with the risk of accidents. Pickett et al [37] collected information on farm workers with injury
during the past year and compared this with use of medication in the month prior to injury for both cases and controls. Two classes of medications were significantly associated with the risk of injury among men, ‘heart and circulatory medications’, and ‘stomach remedies and laxatives’. No association was found for the use of ‘narcotic analgesics’, ‘tranquilizers or sleeping pills’, or ‘antidepressants’, and very few cases or controls were taking these, suggesting the study may have lacked power for these classes of medications.

Hegmann et al [47], in contrast to the above studies, reported no association between the use of medications and ‘workplace incidents’, a category of event that included faulty product, damage to product, and injury.

Overall it appears that there may be some relationship between the use of medication and the risk of injury, but this relationship is not simple to understand. It does not appear related specifically to psycho-active drugs such as antidepressants, tranquilizers, or sleeping pills, rather being reported in association with drugs that might be unexpected to affect cognitive function. The exception to this may be the use of antihistamines. Several of the studies report that this specific category of medication is associated with an increased risk of injury.

References used for Question 5.

6. *Are interventions aimed at reducing the use of drugs and alcohol among workers, such as putting in place a workplace testing program, effective in reducing the incidence of work-related injury?*

A total of 11 papers were identified which reported the effects of introducing a workplace intervention related to drugs or alcohol on work-related injury [48-58]. The majority of these reported the effect of introducing, or changing in some way, a drug or alcohol testing program. A minority did this as part of an overall program including other interventions such as the provision of counselling or other treatment and support for individuals with substance (ab)use [54,56,58]. Most employed a pre-post intervention design, comparing injury or accident rates before an intervention with rates after an intervention, and did not have a comparison group in which the intervention was not implemented.

Seven of these eleven studies reported some effect from the introduction of an intervention. However, in many of these the results are difficult to interpret. Several reported results which showed a trend towards a reduction in work-related injury with intervention but the results were either not statistically significant [48], of borderline significance [56], analysed in a way does not appear to have made full use of the data [51,53], or did not include any test of statistical significance [57]. One further study reported results that showed no association between work-related injury rates and the introduction of a drug testing program overall, but did show an association between a lower work-related injury rate and the use of post-accident testing [52]. The final study among these seven, and perhaps the most rigorous, reported an association between a workplace drug testing program and injury rates only for some industry sectors comprising ‘construction’, ‘manufacturing’ and ‘services’ [58]. No association was reported for ‘agriculture forestry and fishing’, ‘mining’, ‘transportation and public utilities’, ‘wholesale and retail trade’, or ‘finance, insurance and real estate’. Interestingly, one of the above studies, which did report an association between drug testing and injury rates, was carried out exclusively in the construction industry [53].

The other four studies identified in this category did not report an association between drug testing programs and work-related injury, two if anything reporting the opposite [49,54].
The majority of these studies reported results for the introduction of a drug testing program at a pre-employment stage, or at least included this as a considerable component of the testing. The result of Feinauer et al [52] that reported an association for post accident testing, but not pre-employment testing is therefore of considerable interest. Unfortunately, it is not possible to tease out results for just post-accident testing in the other studies, and so it is impossible to clarify this issue further.

Of the three studies that looked at interventions which included elements of education, awareness, and or counselling as part of a support program, two reported an association between the introduction of the program and a reduction in work-related injury [54,56,58]. However, for one of these the change was of borderline statistical significance [56], and for one the reduction was restricted to only some industry sectors, as reported above [58].

Overall the evidence that the introduction of a drug testing program has an effect on work-related injury remains weak. Many of the studies are of relatively poor design, and there is often little consideration of the potential effects of confounding or bias in the papers. The majority consider all types of drug testing, and any additional support introduced such as training and awareness or counselling, together, although there may be differences in the effects of these different elements. In addition, most use a simple pre-post type design in which the effect of the described intervention may be contaminated by other changes including an increased general awareness of the workforce about work-related injury. Consequently it is difficult to infer any cause-effect relationship between workplace interventions, including drug testing programs, and work-related injury rates, from these studies.

References used for Question 6.

4. Discussion

Although the issue of the use of alcohol and drugs and work-related injury has attracted, and continues to attract, considerable attention, it remains difficult to distil a clear message about almost all the issues related to this topic, on the information currently available. The balance of evidence suggests there probably is an association between the use of alcohol and the risk of work-related injury, but this association does not seem strong, it may not be linear, and if it exists it may not be causal. Any association may be because some types of alcohol use are associated with risk taking behaviour. The evidence relating to alcohol use at work, or immediately preceding a work related injury, which would presumably point to a higher risk of intoxication at the time of injury for the worker involved, is, if anything, less convincing. This is a difficult area to research, and there are relatively few high quality studies that have attempted to explore the use of alcohol and the incidence of injury. Further, few of the studies of the use of alcohol and work-related injury have tried to gauge whether the use of alcohol actually contributed to the injury occurring in some way. By not identifying culpability for the injury, and testing the person culpable, rather than the person injured, there is a possibility that the wrong person has been tested and a real association missed.

Many of the above comments are also applicable to the use of illicit drugs and the risk of work-related injury. Although drug use causes considerable concern, and may be increasing within society, there remains little high quality data on which to base an assessment of whether drug use contributes to the risk of work-related injury or not. It is likely that much illicit drug use remains poorly recognised, and the effects of different drugs may not be similar, with consequent difficulties in classification of exposure.

The use of some classes of prescription and over the counter medications may be associated with an increased risk of work-related injury. Overall the evidence is relatively sparse, but the group of drugs for which this seems most likely are the sedating anti-histamines. The evidence for other types of psycho-active drugs, which might be anticipated to impair cognitive function, remains considerably weaker. Unfortunately, It is not possible to disentangle the effects of these medications, and the effect of the illness which they are being used to treat, and so
it may simply be that the literature suggests that some types of illness pre-dispose to work-related injury, perhaps because workers are distracted by their symptoms.

Given that the evidence that drug and alcohol use contributes to the risk of work-related injury in weak, it is not surprising that studies of interventions aimed at reducing the use of alcohol and drugs as a way to reduce the risk of injury do not show a clear and consistent effect. Many of the studies reported are difficult to interpret due to problems with design or analysis, and there are marked differences between studies in the types of intervention used. Consequently it is difficult to be confident that there is, or is not, a benefit in reducing the risk of work-related injury in introducing an alcohol and drug program into a workplace.

Perhaps what comes out of this review most clearly is the need for further, high quality research in the area of risk factors for work-related injury. Considerable care needs to be taken with the way in which the use of alcohol and drugs is estimated. Questionnaire methods are prone to errors and bias in recall, while testing of biological samples may confirm exposure but may not accurately predict the effect of the drug on cognitive function, which is their likely mechanism of action. In order to identify a cause and effect relationship it would also be helpful to more clearly identify relevant outcomes. Perhaps the most relevant outcome may be an injury which arose in circumstances in which some responsibility could be attributed to the actions of a specific person. In those circumstances the issue of cognitive impairment of that individual becomes very relevant. On the issue of workplace interventions, again, further research is needed before a definite answer can be given about any potential benefit from introducing these. Greater standardization and better classification of interventions would be helpful in trying to assess their impact. At present, there remain considerable gaps in our knowledge both about the impact of the use of alcohol or drugs on work-related injury, and the best way in which this effect, if present, might be minimised.
5. References


Appendix.

Individual review of included papers.
I ALCOHOL

The relationship of drinking and hangovers to workplace problems: an empirical study


Summary

Aim

The study directly examined the relationship between employee’s drinking patterns (including drinking before and during work), their hangovers, and the problems those same workers experience on the job.

Design

cross-section

Population

The study site was a unionized heavy machinery manufacturing plant in the US Midwest with 4,800 hourly workers. A random sample stratified by shift and team of 1,120 of these workers was done. The response rate was 74%.

Measurements

The data were obtained through confidential structured interviews done in the respondents’ homes.

Outcomes: Workers were asked how many times in the past year they had:

- had an accident at work;
- visited the medical department at work;
- or become sick at work; filed a grievance; been criticized by a supervisor; had an argument with a supervisor; had a serious argument or fight with a co-worker; had trouble getting the job done;
- been on disciplinary lay-off; fell asleep on the job; lost benefits because of absences; and how many days work lost.

Exposures: Respondents were asked:

- how often during the past year they had at least one drink just before or during working hours;
- the usual number of drinks they had when they did;
- how often they had four or more drinks within an hour of going to work during the previous year;
- how often they drank during the past year;
- how many drinks they had when they did;
- how often they consumed 10 or more drinks on a single occasion during the previous year (heavy drinking)

Potential Confounders: Work shift, department, family income, education, marital status, ethnicity, gender, and age.

Results

The percentage of subjects reporting an outcome (accidents) was compared to an exposure in a series of bivariate analyses. Variables were dichotomized. There were no significant differences in percent reporting an accident for current drinkers, heavy drinkers, drinking just before or at work, or coming to work with a hangover. A similar pattern was seen for the frequency of visits to the medical department, some of which would be due to injuries.
Accidents were not included in the final multivariate model. Frequency of visits to the medical department was included in the final model, however none of the alcohol exposure regression coefficients were significantly different from zero (Table 4).

**Authors Conclusions**

It appears that that overall drinking and heavy drinking are related to workplace problems only because they are correlated with drinking at work, with being hungover at work, or with other background characteristics.

**Critique**

**Measurement**

Measurements were self-reported. Accidents and the term “hangover” were not defined.

*Exposures:* One comparison was based on current drinkers vs current non-drinkers. The latter category would include abstainers and former abusers. This may have reduced the power of that analysis.

**Analysis**

It was implied in the Results section that $\chi^2$ analyses were done using percentages, rather than numbers, which if done was incorrect.

**Information Adequacy**

The derivation of dichotomous variables from items with response scales was not described. That the unstandardized regression coefficients were used to compute the $t$ values was not clear from the presentation of the regression analysis (Table 4).

**Reviewers Conclusions**

The study was not consistent with an association between the alcohol exposure measurements and accidents for this sample of hourly workers.

**Implications**

The generalizability may be limited as unionized hourly shift workers from one worksite of one company from one country were sampled.

The use of illicit and therapeutic drugs was not considered.
The work performance indicators of problem drinking: some British evidence

Summary

Aim

The industrial accident and absence record of a sample of problem drinkers was compared to that of a control group.

Design

case control study

Population

All subjects were employed in three departments by a large British local authority from 1978 to 1983. Cases consisted of 100 problem drinkers. These were identified and referred for treatment through a workplace alcohol policy implemented in 1978. A control group of 60 was randomly selected from the same three departments.

Measurements

Data was obtained from organizational records.

Outcomes: The number of accidents, resulting lost time, number of absences and number of absence days. Reportable accidents involved three or more lost time days or a fatality. Authorized absence was categorized as certificated (doctors statements) or non-certificated.

Exposures: Problem drinker identification.

Potential Confounders: Skill or occupation level, service length, and age.

Results

A comparison suggested that problem drinkers had fewer reportable accidents and resulting number of lost time days (Table 1). Negative correlations were found between problem drinking and the number of reportable accidents ($r=-0.111 \ P>0.10$) and the number of lost time days ($r=-0.139 \ P<0.10$) (Table 2).

The analysis was repeated on non-reportable accidents from one department (N=57). Problem drinkers had fewer non-reportable accidents ($r=-0.173 \ P>0.05$) and more lost time days ($r=0.259 \ P<0.05$) (Tables 3 and 4).

Authors Conclusions

It appeared that problem drinkers did not have above average industrial accident rates. It also appeared important to distinguish between the number of occurrences and the resulting time loss.

Critique

Bias

Measurement

The use of organization records likely underestimated the prevalence of problem drinkers and accidents.
Outcomes: Non-reportable accident was undefined. Accidents were not broken down by circumstance or type.

Exposure: The problem drinker classification was not described, let alone validated.

Confounding

Information Adequacy

The workplace alcohol policy was not described. There was no description of the breakdown of cases and controls by department. The title did not reflect the all male study group.

Reviewers Conclusions

The evidence in general was not consistent with an association between problem drinking as identified here and accidents.

Implications

Potential confounding due to specific occupation, illicit and therapeutic drugs, and the work environment not addressed.

Generalizability was limited as a single organization was studied.
Relationships of job and some individual characteristics to occupational injuries in employed people: a community-based study


Summary

Aim

This study assessed the associations of job and some individual factors with occupational injuries among employed people from a general population in northeastern France.

Design

The association of occupational injury to excess alcohol, psychotropic drug use, and other factors was examined in a cross sectional study.

Population

A random sample of 8,000 phonebook households from the Lorraine region of NE France was taken, and all household members aged 15 or more were mailed a questionnaire. Responses from at least one subject were received from 3,460 households (44%). The response rate of eligible household members was 86%. Altogether, 6,214 subjects filled in a questionnaire. This study was concerned only with the 2,833 employed subjects. Questionnaires were completed between May and July of 1996.

Measurements

Outcome: A history of at least one occupational injury in the preceding 2 years was used. This was defined as damage to the body, whatever may be its severity, which resulted from an accident at work with sick leave of at least one day in addition to the day when the accident occurred and for which the subject got compensation.

Exposure: Excessive alcoholic drink consumption was determined by DETA questionnaire with a score of two or more, and regular psychotropic drug use (for headache, tiredness, anguish, and sleeping pills) was noted.

Potential Confounders: Gender, age, job category, BMI, smoking habit, presence of a disease were scored.

All variables except age, jobs, and BMI were dichotomized.

Results

Excess alcohol consumption was not significantly related to injury and was not included in the final unsaturated loglinear model. The final model retained injury and gender, job category, age, drug use, and disease. Adjusted injury ORs were significant for five occupational categories compared to a professional category (2.94-6.40), males (1.99), 29 years of age or less (1.70), psychotropic drug use (1.54, 95% CI 1.16-2.05, P<0.01), and disease (1.50) (Table 5).

Authors Conclusions

Valuable results were obtained with loglinear models. Job category, sex, young age, regular psychotropic drug use, and disease presence influence occupational injuries in the overall active population.

Critique

Bias
Population

Measurement

Post-injury subjects may have been more likely to underreport drinking exposure.

Measurement

Underreporting from self-reports may have led to misclassification and reduced the power of the analysis. The two-year recall period may have decreased the accuracy of all measurements.

Exposure: Alcohol and specific psychotropic medication dose was unmeasured and this may have reduced the power of the analysis.

Confounding

Confounding by disease diagnosis could not be assessed as disease presence was analyzed as a dichotomous variable.

Information Adequacy

The exposure variable regular psychotropic drug use was not well described. There was no data presented to support the statement that excess alcohol use and psychotropic drug use (and disease and smoking habit) were related to each other.

Reviewers Conclusions

Risk factors for occupational injury in the study group were job category, gender, age, psychotropic drug use, and the presence of disease.

Implications

Direct comparison of injury rate with other studies was limited by the two-year recall period, other studies have used one year.

The generalizability beyond the study group was less than the authors indicated. This was a result of the proportion of homes without telephones, the proportion of phone listings without addresses, the loss rate, the household response rate, the employment rate, the response rate within households, and the rate of incomplete data sets.
Studies on blood alcohol in the workers of a Zambian copper mine
Buchanan DJ 1988 Alcohol and Alcoholism23(3): 239-242

Summary

Aim
The study was initiated because of concern expressed at meetings at the Accident Prevention Committee of the Chambishi Mine about alcohol being involved in the causation of accidents.

Design
case control study

Population
Accident cases: All occupational injury cases referred to the Kalulushi Mine Hospital between December 1980 and May 1985.

“Random” breath tests: Selected groups of employees responsible for the safety of other workers (supervisors, bus and hoist drivers) were selected at the discretion of their line managers. Tests were done on nine occasions between October 1983 and July 1984.

Disciplinary cases: Workers suspected of being under the influence on duty between December 1981 and April 1983.

Measurements

Outcomes: Blood alcohol level (BAL).

Exposures: Group membership.

Potential Confounders: None.

Results
Proportions of BAL exceeding 17.6 mmol/l were: accident cases 18/309 (5.8%), “random” tests 9/95 (9.5%), and disciplinary cases 80/87 (92%).

Authors Conclusions
Firmer conclusions could have been reached had it been possible to study alcohol levels in a comparable group of uninjured workers at the same point in time.

Critique
Bias
Measurement

Accidents were not broken down by circumstance or type. Alcohol levels may have been underestimated, particularly in accident cases.

Confounding

Information Adequacy

There was no indication of the interval between the testing indication and drawing a sample for each group.

Reviewers Conclusions

The study was inconclusive, for the reasons outlined above.

Implications

Potential confounding was not addressed.

Generalizability was limited by the use of a single worksite of one African company.
Relationship between certain individual characteristics and occupational injuries for various jobs in the construction industry: a case control study


Summary

Aim

The present study aimed at assessing the relationships between certain individual characteristics and occupational injuries and their severity in construction workers with various jobs.

Design

case control study

Population

Occupational health physicians recruited construction workers in 1995 and 1996 from the Meurthe-et-Moselle region of NE France. Men with five years of experience were eligible. Cases had at least one occupational injury with sick leave. One control having the same job was paired to each case; he was the first eligible subject uninjured in the past five years examined by the same physician during yearly medical examinations. Altogether 880 case-control pairs were recruited. All the subjects contacted agreed to participate.

Measures

Outcome: At least one occupational injury with sick leave.

Exposures: Alcoholic drink consumption (never/sometimes/every day or almost) and sleep disorders (a composite of sleep duration, “sleeping not well”, and regular consumption of sleeping pills).

Potential Confounders: Educational and training background, occupation, seniority, BMI, disabilities, smoker, and socio-demographic factors.

The occupational physician completed a standardized questionnaire. Physical disabilities, hearing and vision disorders were assessed at examination.

Results

Alcoholic drink consumption was not significantly different in univariate analysis. Sleep disorders (OR 1.97), along with age <30 years and current smoker, was significant in stepwise forward multivariate analysis of all jobs combined (Table II). Sleep disorders were also retained in subsequent multivariate analyses where results were broken down by occupational group (Table III), duration of sick leave and hospitalization (Table IV), and in combinations (Tables V and VI). Regular sleeping pill consumption was not analyzed separately and so these results were not further discussed here.

Authors Conclusions

Revealed risk factors were: young age, sleep disorders, smoking, disability, sporting activity and job experience.

Critique

Bias

Population
Measures

Exposures: Type and quantity of drinks and sleeping pills were not measured.

Confounding

Potential confounding due to illicit drug use was not considered.

Information Adequacy

Interrater reliability was not discussed. The article’s title does not indicate that only men were studied.

Reviewers Conclusions

Injury risk factors for all jobs combined were young age, sleep disorders, and smoking.

Disabilities, sporting activity and job experience were risk factors for some occupations and injury severities.

Implications

The broad injury definition used may have obscured associations with specific injury types etiologically related to substance impairment.

Women, temporary workers, and fatalities were excluded. The generalizability beyond the study group was unclear.
Heavy drinking and the risk of occupational injury

Dawson DA 1994 Accident Analysis and Prevention 26(5): 655-665

Summary

Aim

This study evaluated the association between the frequency of heavy drinking and the risk of occupational injury, using nationally representative data.

Design

retrospective cross section

Population

Two additional surveys concerning alcohol consumption and work injuries were administered with the 1988 annual National Health Interview Survey (NHIS). Randomly chosen household adults (18 years or older) who had worked at some time during the previous year were eligible (N=29,192). This person may or may not have been the designated household respondent for the NHIS.

Measurements

Data was collected by personal interview.

Outcomes: Occupational injury in the past year. Injuries required medical treatment other than first aid, loss of consciousness, inability to do a work-related activity, or transfer to another job.

Exposures: Frequency of heavy drinking was defined as the number of days that five or more drinks were consumed in the 12 months preceding the most recent drink.

Potential Confounders: Occupation, job requirement for strenuous physical activity, smoking status, and drinking context. Education, marital status, age, gender were based on data provided by the NHIS household respondent, who may or may not have been the same person from whom the drinking and occupational data were collected.

Results

Occupation, strenuous job activity, education (college graduate), age, gender and smoking were retained in multivariate models. The reference group for injury ORs was persons never drinking five or more drinks. The ORs showed dose response, ranging from 1.05 to 1.08 for those who drank excessively once a year, to the range of 1.39 to 1.74 in the daily consumption group. The current drinkers sub group had slightly smaller ORs than the total sample, and inclusion of the smoking variable reduced the strength of the association in both the total sample and current drinkers. Only one of the associated 95% CIs contained 1.00 (Table 4).

Authors Conclusions

Episodes of heavy drinking were associated with a slight increase in the risk of occupational injury. This may pose a particular hazard where workers were subjected to higher risks.

Critique

Bias

Measurement
Self reporting may have reduced accuracy.

**Outcome:** Injuries were not separated by their circumstances, nature, number, or severity. There was no measure of time worked, and so injury rates could not be determined.

**Exposure:** Total quantity of alcohol consumed was not measured.

**Confounding**

It may not have been valid to use demographic data from a potentially different subject from the same household.

**Information Adequacy**

The only response rate provided was of those eligible to complete the alcohol consumption and work injury survey. There was no study group description.

**Reviewers Conclusions**

Evidence was presented that was consistent with an association between frequency of heavy drinking and occupational injury. This finding was subject some reservation due to the blending of demographic data from different sources.

**Implications**

Potential confounding due illicit and therapeutic drugs were not addressed.

This study would generalize to employed adults in a fashion similar to the NHIS, which was intended to be nationally representative of US households.
The relationship between heavy alcohol use and work productivity loss in active duty military personnel: A secondary analysis of the 1995 Department of Defense Worldwide Survey


Summary

Aim

The study examined the association between heavy alcohol use among active duty military personnel and five work productivity events that may have an adverse effect on military performance and readiness.

Design

A cross sectional study compared heavy drinkers to light drinkers on five productivity outcomes, including occupational injury.

Population

Data for this survey were obtained from the 1995 Department of Defense Survey of Health-Related Behaviors among Military Personnel. Exclusions were based on a lack of military service (basic trainees, service academy cadets) or inability to contact the individuals during the data collection period (permanent change of station, AWOL). The response rate was approximately 70% among those sampled. Respondents classified as infrequent/light drinkers (N = 3,147) and heavy drinkers (N = 2,242) were used in this study.

Measurements

Self-report questionnaires were filled out in groups.

Outcome: Subjects were asked how many work days in the past 12 months they were hurt in an on the job accident (nine categories). RRs for occupational injury were reported for “any” or “2 or more days” in which this event occurred.

Other outcomes studied were frequency of lateness, leaving early, working below normal level, and absenteeism.

Exposures: Subjects classified as infrequent/light drinkers consumed 1 to 4 drinks per occasion 1 to 3 times a month (1-12 drinks a month), and heavy drinkers consumed 5 or more drinks per occasion at least once per week (21+ drinks a month).

Potential Confounders: The sampling strategy dictated that results were stratified by gender and enlisted personnel / officers. Age was controlled as a dichotomous variable.

Results

Weighted relative risks and 95% CIs were determined by the Mantel-Haenszel method after adjusting for two age groups (25 years or less and over 25 years).

There were no significant differences observed in either RR for enlisted ranks of both genders, or for male officers in the “any” days category. There was insufficient data to calculate the male officers RR in the “two days or more” category or for either RR for female officers.

Authors Conclusions

In that time’s downsizing military environment there would have been less tolerance for individuals who exhibited behaviors that might have interfered with military readiness and that may have contributed to underestimating associations.
Critique

Bias

Population

Measurement

Outcome: What being “hurt” meant was not defined. Injury severity was not measured which would have reduced the power of the analysis.

Confounding

The potentially confounding influences of il / licit drugs, smoking, education, and race/ethnicity were not controlled for.

Information Adequacy

Data on the effect of illegal drug use and smoking was presented but not analyzed. The recall period for alcohol consumption was not stated. Non-responders were described as socio-demographically similar; no data was presented or explicitly referred to.

Reviewers Conclusions

The study was not consistent with an association of the risk occupational injury and alcohol intake between heavy and infrequent / light drinkers among active duty military personnel.

Implications

A multivariate analysis would have been more appropriate.

The injury definition used was broader than most studies.
**Individual characteristics in occupational accidents due to imbalance: a case control study of the employees of a railway company**

Gauchard GC et al 2003 Occupational and Environmental Medicine 60:330-335

**Summary**

**Aim**

To assess the relations between certain individual characteristics and occupational accidents due to imbalance.

**Design**

case control study

**Population**

Occupational health physicians recruited from twenty-three French National Society of Railway (SNCF) sites. Men with three years of experience were eligible, and recruitment occurred in the year ending February 2000. Cases had at least one occupational injury with sick leave due to imbalance. One control having the same job was paired to each case; he was the first eligible subject uninjured in the past three years examined by the same physician during yearly medical examinations. Altogether 427 case-control pairs were recruited. All but one of the subjects contacted agreed to participate.

**Measures**

The occupational physician completed a standardized questionnaire in the presence of the subject. The time period considered was the time of the accident for cases, and the time of the interview for controls.

**Outcome:** At least one occupational injury with sick leave due to imbalance.

**Exposure:** Alcoholic drink consumption (nearly every day )

**Potential Confounders:** Sleep disorders (a composite of sleep duration, “sleeping not well”, and regular consumption of sleeping pills), smoking habit, BMI, job type, duration in present job, work environment changes (physical environment and/or activities), job satisfaction (request for a job change) and age.

**Results**

Alcoholic drink consumption was not significant and was not retained in the final model for all accidents combined. When all accidents combined was subdivided, the adjusted OR for alcoholic drink consumption was 6.17 (1.36-28.0 P<0.05) in the “bad landing on the floor (when getting out of a vehicle)” category. Interpretation of this needed to be cautious due to the small number of subjects (N=70). Alcoholic drink consumption was not retained in the final model of sick leave of eight days or more.

**Authors Conclusions**

Some factors related to living conditions and lifestyle such as …consumption of alcohol…were correlated with occurrence of occupational accidents…. Some (accidents) were more affected by the specific release mechanism of work related falls. Mechanisms of postural control and movement impairment were discussed.

**Critique**

43 of 136
Bias

Measurement

The recall period for exposure and potentially confounding variables was not explicitly stated. Bad landing on the floor (when getting out of a vehicle), alcoholic drink consumption and sleep disorders were not well defined. Quantity of alcohol was unmeasured.

Confounding

Other drugs in addition to alcohol and “sleeping pills” were not considered.

Information Adequacy

The article’s title does not indicate that only men were studied. Interrater reliability was not discussed. Cases but not control attributes were described at the beginning of the results.

Reviewers Conclusions

Some evidence for a significant association between the exposure as stated (alcoholic drink consumption (nearly every day)) and the injury subgroup “bad landing on the floor” was found.

Implications

There was limited generalizability of the beyond the study group (one company, sector and country).

It may be possible to demonstrate associations between substance usage patterns and injuries by focusing on specific substance-related effects and specific injury sensitive occupational activities.
Occupational accidents and alcohol consumption in Spain


Summary

Aim

To estimate the proportion of occupational accidents related to the regular consumption of alcohol in the population, based on the Spanish National Health Survey (ENSE).

Design

Retrospective cross section

Population

The survey was representative of the non-institutionalized Spanish population and was carried out in July 1987. Subjects 16 years old or more were asked about alcohol consumption. All women and men 65 years and older were excluded. Accordingly, the study group consisted of men 16 to 64 years old (N=11,016). Women were excluded because most said they were housewives. Men 65 years or more were excluded because most said they were retired.

Measurements

Data was collected in interviews.

Outcomes: Any type of accident where the subject carried out his work activity.

Exposures: The usual consumption frequency and quantity for each beverage type was used to calculate the absolute quantity of alcohol consumed daily during the year prior to the interview.

Potential Confounders: Community size, tobacco consumption, education, and age.

Results

Community size, smoking, and age were retained in the final model. There were clear dose response trends in all age groups between accident ORs and mean daily alcohol consumption (Table 3). Alcohol consumption of 170 ml/day or more had associated ORs of 2.82 for the 16-24 age group, 2.42 for the 25-44 group, and 1.48 for the 45-64 group. The 95% CIs in the oldest group all included 1.00.

Population attributable proportions (PAP) were calculated (Table 4). The largest proportion of accidents occurs at lower levels of consumption (30-69 ml/day).

Authors Conclusions

Approximately 17% of all occupational accidents were estimated to be attributable to the regular consumption of alcohol in the population. The most important problem occurred in individuals aged 25-44. Interventions that focused on moderate consumption would have had the greatest impact in reducing occupational accidents.

Critique
Bias

Measurement

Self-reports may have reduced accuracy. Accident and not injury was the outcome. Accident was undefined, and was not broken down by circumstance, type, severity, or number.

Confounding

Information Adequacy

Reviewers Conclusions

Evidence was presented that was consistent with an association between frequency-quantity measurement of alcohol consumption and occupational accidents.

Implications

Potential confounding due to occupation, illicit and therapeutic drugs, and the work environment were not addressed.

The parent survey was intended to generalize to the non-institutionalized Spanish population, constrained to men 16 years or older. Cultural factors may limit generalizability, for example the Spanish habit of consuming wine with the midday meal.
Risk factors for occupational hand injury


Summary

Aim

A case control study of occupational hand injury was conducted in an effort to identify risk factors for disabling injury.

Design

matched-pair case control

Population

The study group was obtained from municipal workers from an American city between March and July 1983. Fire and police personnel were excluded. Cases consisted of acute traumatic occupational injuries to the fingers, hand, or wrist that resulted in restricted activity or loss of work time beyond the day of injury. Injuries due to human or animal assault were excluded. Controls were matched by job, date and shift of the injury, and gender. A total of 124 out of a possible 141 cases were matched (88%). A total of 99 cases were men (80%).

Measurements

Telephone interviews and occupational clinic records were data sources.

Outcomes: Acute traumatic occupational injuries to the fingers, hand, or wrist that resulted in restricted activity or loss of work time beyond the day of injury. Injuries due to human or animal assault were excluded.

Exposures: Alcohol use 24 hours and three months prior to the injury date, and medication use within 24 hours.

Potential Confounders: job experience, acute illness, sleeping habits, vision, hearing, previous injury, chronic illness, sports participation, smoking, education, marital status, age

Results

The alcohol and medication consumption variables were not retained in the final multivariate model. Univariate analysis gave ORs that ranged from 0.50 to 0.71 for these. A significant association with sleeping nine or more hours was found (OR 4.5).

Authors Conclusions

Some of the excess risk found for hypersomnia was suggested to be due to alcohol or medication consumption, or underlying illness.

Critique

Bias

Measurements

Recall bias was a possible explanation for alcohol consumption ORs less than 1.00.
Measurement

Self-reports may have reduced accuracy. By definition, only more severe injuries of the hand were studied. Exposure dose was unmeasured. Medication was not broken down by type.

Confounding

Confounding was a possible explanation for alcohol consumption ORs less than 1.00.

Information Adequacy

Reviewers Conclusions

The study was not consistent with an association between alcohol or medication use and occupational hand injury.

Implications

Potential confounding due to illicit drugs was not addressed.

As the study group originated from only one city there may be limited generalizability.
Alcohol abuse and job hazards

Summary

Aim

Do hazardous working conditions encourage heavy drinking and/or does heavy drinking contribute to job-related injuries and deaths? Simultaneous equations, probit and least squares models, were constructed to answer these questions.

Design

retrospective cross section

Populations

Two populations were separately analyzed.

The US national Quality of Employment Survey (1972-1973) subjects were at least 16 years old and worked 20 or more hours per week. A requirement for no missing key data resulted in a sub sample of 1,393 subjects.

The National Health and Nutrition Examination Survey II (1976-1980) sampled the US civilian, noninstitutionalized population with some oversampling of low income persons and the elderly. Data on alcohol use was collected on persons aged 12-74. One example sample size was 8,477.

Measurements

QES

Outcomes: Drinks once or more every day, three or more drinks at a time, drinks on the job.

Exposures: Job caused or exacerbated injury or illness in the past year; job-related injury or illness during the past three years; job exposure to danger. Two objective measures of occupational and industry mortality risk were also used: one used data from 1976-1980; the other used 1979 data.

Potential Confounders: Age, gender, race, education, earnings, marital status, region and state of residence, smoking status, industry, occupation, and union membership.

NHANES II

Outcomes: Drinks one or more times per day (Heavy Total Alcohol), separate variables for beer, wine, and liquor consumption of four or more times per week


Potential Confounders: Age, race, gender, marital status, education, family income, occupation, industry, rural residence, residence in Southern state, and smoking status.

Results

Measures of total alcohol abuse and measures of job hazards in the QES did not appear to support the hypothesis that alcohol abuse was associated job related accidents or injuries, or vice versa. Total alcohol abuse may not have been the appropriate measure for investigating correlations between alcohol and job hazards.
The NHANES II data suggested that heavy beer use and the occupational mortality rate were strongly associated and significant, in both models. Similar results were obtained with industry mortality rate, but with smaller \( t \)-statistics. Statistically insignificant and negative coefficients were obtained in estimating associations between either wine or liquor abuse on the one hand and either the occupation or industry mortality rate on the other. Statistically insignificant results were also obtained in investigating heavy total alcohol and the two measures of job hazards.

**Authors Conclusions**

That beer and hazards associations were significant in both structural equations suggested that mutual causality was present. The reduction in job related deaths that would result from the elimination of employee alcohol use would likely be overestimated by counting the number of fatalities with alcohol in their blood.

**Critique**

**Bias**

**Measurement**

Survey data were self-reported, which may have reduced accuracy. A number of recall periods were not specified.

**QES**

*Exposures:* The injury definition included illnesses. Injuries were not separated by cause, type, or severity. The occupational and industry mortality rate data were taken from later years than the survey data.

**NHANES II**

*Outcomes:* Amount of alcohol consumed was not measured.

*Exposures:* Fatalities were not separated by cause or type. The occupational and industry mortality rate data were taken from 1979, while the survey data was collected from 1976 to 1980.

**Confounding**

**Information Adequacy**

The study groups used were not described.

**Reviewers Conclusions**

Evidence was found that was consistent with an association with beer use and mortality rates.

**Implications**

Potential confounding due to illicit and therapeutic drugs was not addressed.

The study groups were subsets US national samples done in the 1970’s. Generalizability was likely limited to that time period.
Employee Drinking Practices and Work Performance

Mangione TW et al 1999 Journal of studies on Alcohol 60(2): 261-270

Summary

Aim

The purpose of this study was to examine the independent effects of a variety of drinking indicators on self-reported work performance, including occupational injury.

Design

cross-sectional survey

Population

Data was collected in 1994 from 16 worksites that were randomly selected from a stratified list of 114 worksites from seven corporations. These sixteen worksites were stratified by the type of workforce, industrial setting, and managerial tolerance toward drinking. A sample of 9,163 was selected. Individual site response rates varied from 59% to 91% with an overall response rate of 71%.

Questionnaires were mailed to employees’ home addresses in all but two sites.

Measurements

Outcome: How many times in the previous 12 months respondents had been: hurt on the job; missed work; done poor quality work; arrived late or left early; done less amount of work; or had an argument with a coworker. A composite work performance measure used was the sum of all these events.

Exposures: Frequencies of drinking to get high/drunk and drinking on the job were determined and average daily drinking volume calculated. The recall period was 30 days. The CAGE questionnaire was administered. Frequency of prescription medication use for anxiety and depression and marijuana use in the past year were measured.

Potential Confounders: health status, hierarchy level, weekly work hours, work shift, current experience, job satisfaction, education, children at home, age and gender

Results

The mean number of injuries for six drinking categories were compared by ANOVA in a descriptive analysis. The relationship between drinking and on the job injury was U-shaped, with the highest rates of reported injuries occurring among abstainers and heavy drinkers, and lower rates for the intermediate drinking level categories. Abstainers were significantly different from each level except heavy drinkers by t-tests.

Regression analysis was run on each outcome (eg injury) separately, but those results were not presented. The general pattern of results of the drinking indicators with the composite dependent variable was replicated in analysis of each separate dependent indicator. Three drinking indicators were significantly associated with the composite dependent variable (drinking at work (P=0.001), CAGE (P=0.001), and impairment frequency (P=0.05)). The use of marijuana was a significant correlate of alcohol use (not presented).

Authors Conclusions

Conclusions discussed related to work performance as a whole, and not occupational injury.
Critique

Bias

Population

Measurement

Measurements

All measures were self-reported.

Outcome: “Hurt on the job” was not explicitly defined.

Exposures: Thirty day recall periods were used on three of four alcohol exposure measures while a one-year recall period was used for outcomes.

Confounding

The “never” category of the drinking to get high/drunken frequency measure combined those who had not consumed alcohol in the last 30 days with abstainers, which may have led to confounding. Occupation and the use of illicit drugs other than marijuana were not considered in the analysis.

Analysis

The use of a multiple range testing procedure would have been more appropriate than repeated t-tests between drinking categories (Table 1).

Information Adequacy

The ANOVA analysis (Table 1) does not control for confounding, yet there was no mention of this or of the combination of abstainers with non-current drinkers in discussions of the U-shaped relationship found between drinking and injury.

Reviewers Conclusions

The most relevant data on occupational injury alone was not presented.

Implications

There was limited generalization beyond the study group. Although effort was made to include diverse workforces, the study population was essentially unique.
Perceptual acuity and the risk of industrial accidents


Summary

Aim

The main focus of interest was factors that can interfere with faculties needed for recognizing warning signals of imminent danger.

Design

cohort nested matched case control

Population

The study group was obtained from the male manual workers of a Dutch shipyard. The first 300 injured workers listed in a first aid register from April 1984 to March 1986 were taken as cases. Twenty three percent had more than one injury during this period. A single randomly selected control was matched in August 1986 by year of birth. Usable responses were obtained from 250 (83%) cases and 262 (87%) controls.

Measurements

Questionnaires were handed out at work in December 1986.

Outcome: Risk of injury.

Exposures: Number of daily drinks and tranquilizers.

Potential Confounders: Number of daily cigarettes, wearing of spectacles or earplugs, noon hour nap, sports during leisure hours, past year traffic accident, and job title. Hearing loss >20 dB at 4 kHz and weighted noise exposure by job title were obtained from records dated 1983. The percent of working time spent at the docks varied by job title, and was included as alcohol was freely available there.

Results

A history of alcohol consumption was retained in a multivariate model of injury risk (OR 1.65 1.05-2.60). Noise and hearing loss were also retained. The proportion of injuries attributable to alcohol consumption was calculated to be 37%.

Authors Conclusions

Alcohol consumption at work should be eliminated.

Critique

Bias
Measurement

Controls were selected after and not concurrently with cases. Self-reports may have reduced accuracy. Injury was not broken down by circumstance, type, or severity in the analysis. Alcohol consumption was analyzed as a dichotomous variable.

Confounding

Information Adequacy

The title did not reflect the all male study group.

Reviewers Conclusions

The study was consistent with an association between alcohol consumption and injury risk.

Implications

Potential confounding due to illicit drugs or the work environment (other than noise) was not addressed.

Generalizability was limited by the use of a single organization.
A study of absenteeism, accidents, and sickness payments in problem drinkers in one industry


Summary

Aim

To examine accidents, absences, and sickness leave costs in problem drinkers compared to matched controls.

Design

matched case control

Population

Subjects were drawn from a single US company with over 10,000 employees.

Fifty cases were initially selected from the first-hand knowledge of personnel staff. Two cases were excluded as not meeting criteria beyond all doubt. Criteria were one of: a doctor’s written diagnosis as an “alcoholic”; voluntary treatment request; or determination by knowledgeable nurses and supervisors of “problem drinking” by repeated evidence of intoxication, alcohol related absences or arrests, financial and domestic troubles, and personality changes. Cases consisted of 32 men and 16 women.

Controls were matched by job type, service duration within a year, age, ethnic background, and gender. The first randomly drawn match was placed in the control group, with no attempt at determination of problem drinking. A second matched control group was drawn in the same manner and was combined for analysis.

Measurements

Data was obtained through organizational records.

Outcomes: Occupational accidents with no lost time, occupational accidents with eight or more lost time days, and off the job accidents with eight or more lost time days. Accident meant any traumatic injury suffered by a worker and considered serious enough by its victim to be reported to supervision, or any accident or its results observed and reported by supervision. Other outcomes were the number of absence episodes, total absent days, and total of the resulting sickness payments. Absences were eight days or more, and included those due to on or off the job injury, and illness.

Exposure: Problem drinking as per case definition.

Potential Confounders: Controls were matched by job type, service duration within a year, age, ethnic background, and gender. Analyses were stratified by gender (Table 1 and 2) and age (Table 2).

Results

The ratio of total non-time lost accidents between cases and controls was 29/16, or 1.81. The ratio of total time lost accidents was 26/11.5, or 2.26. There were only 2 occupational accidents in women; both were non-time lost accidents in cases 40 or more years of age. Among men less than 40 years results were similar. The ratio of non-time lost accidents was 27/14.5, or 1.86, and the ratio of time lost accidents was 21/8, or 2.63. Smaller cell sizes for women, or men 40 years or more limit additional description.

The ratios for the total number of absence episodes, total days absent, and total sickness payments between cases and controls were 2.44, 2.51, and 2.94, respectively. There were no clear gender differences.
Authors Conclusions

Problem drinkers in this study had more accidents, absences, and cost more in sickness payments.

Critique

Bias

Measurement

The number of non-time lost accidents was likely underestimated. Accidents were not broken down by circumstance. Absences included illness and lost time from off the job injury. The exposure classification was not validated. There was no estimate of alcohol exposure dose.

Confounding

Information Adequacy

When records were extracted was not stated. There was no study group description, or statistical analysis.

Reviewers Conclusions

This descriptive study was consistent with an association between problem drinking, as described, and occupational accidents.

Implications

Potential confounding due to illicit or therapeutic drugs and the work environment was not addressed.

Generalizability was limited due to the selection of the cases, the use of a single company, and the time period concerned.
Estimating the prevalence of alcohol and other drug related problems in industry

Schlosser D and McBride JW 1984 New South Wales Drug and Alcohol Authority Research Grant Report Series B 84/3

Summary

Aim

To obtain reliable data on the prevalence of alcohol and other drug problems among employees in an Australian company, and to develop measurement methodology.

Design

retrospective cross section

Population

All employees of a Sydney, Australia chemical plant were surveyed in June 1983. A total of 456 usable responses were received, for a response rate of 93%. Men comprised 89% of the study group.

Measurements

Most data was collected from an on site questionnaire that was administered in groups.

Outcomes: Number of accidents in the past year. Also examined as a function of problem drinking: amount and pattern of use of cannabis, sleeping pills, tranquilizers, and tobacco; sick leave days; occupation; shift work; tenure; number of previous employments in the past three and a half years; marital and home status; age; and gender.

Exposures: The revised Mortimer-Filkins questionnaire was used to classify subjects as non-problem drinkers, presumptive problem drinkers, and problem drinkers.

Potential Confounders: None as such.

Results

The Mortimer-Filkins category prevalences were: non-problem drinkers 80%, presumptive problem drinkers 14%, and problem drinkers 6%. The number of self-reported accidents was 174, while company records noted 246 (71%).

The number of self-reported accidents in the past year was significantly related to the Mortimer-Filkins categories (P=0.01 $\chi^2$). Subjects reporting two or more accidents were in the lowest proportion group in the non-problem drinker category, and were the highest proportion among the problem drinkers. The reverse was true for those reporting no accidents. The relationship was described as not being particularly strong as a result of a correlation coefficient of 0.20.

Authors Conclusions

The relationship between alcohol use and accidents was suggested to be complex. Some problem drinkers may have high accident rates. Others may be involved in relatively fewer accidents by absenting themselves when impaired.

An unusually high number of accidents may serve as an indicator that might result in an intervention.
Critique

Bias

Measurement

Self-reports may have reduced accuracy. Accident was undefined, and was not analyzed by circumstance, type, or severity. Alcohol dose was not related to the accident outcome.

Confounding

Information Adequacy

There was no overall study group description.

Reviewers Conclusions

The study was inconclusive.

Implications

Interpretation was difficult, as potential confounding was not addressed.

Generalizability was limited by studying one worksite for one time.
Alcohol consumption patterns and work-related injuries among Colorado farm residents


Summary

Aim

To assess the role of alcohol consumption patterns on farmwork-related injuries.

Design

Three consecutive cross-sections were combined and injury rates examined as a function of alcohol consumption.

Population

Colorado farm residents were identified from a DMV farm truck list. A stratified probability sample randomly selected approximately 2.6% rural farms with an operator living on the premises. The farm was excluded if it did not earn a minimum $1000 income in a normal year from sales of agricultural products. Both the primary operator and spouse were separately interviewed.

Measurements

Information was collected by telephone survey.

Outcome: History of farmwork-related injuries during the previous 12 months.

Exposures: Alcohol consumption (frequency and quantity) in the previous month.

Potential Confounders: Occupation, previous 12 months employment and demographics were noted.

Results

Final enrollment was 872 individuals. The response rate in 1993 was 62%, 1994 86%, and 75% in 1995. The most common injury category was sprains and strains.

Injury RRs were adjusted for the influence of gender, age, primary occupation, off-farm paid employment, history of work on someone else’s farm (Table 5) in multivariate analyses.

Alcohol consumption frequency was highly predictive of injury among farm residents, however there was little difference in RR for those who drank 1-2 days per week compared to those who drank 3 or more days per week (Model 1). Quantity of alcohol consumed was also highly predictive of experiencing an injury, although moderate consumption yielded a higher RR compared to the highest consumption category (Model 2). When alcohol consumption frequency and quantity were combined, the relationship between consumption and injury risk was only significantly elevated (RR 1.45 (1.06-2.00)) among the modest drinkers (fewest days and fewest drinks) (Model 3).

Authors Conclusions

This study does provide support for the need to evaluate alcohol use in relation to farmwork-related injury risk. The reduction of alcohol use would not be a strong candidate likely to contribute to a significant reduction in farm injuries, with the possible exception of moderate drinkers, from the perspective of prevention program design.

Critique

Bias
Population Measurements

Those injured may have been more likely to underreport alcohol consumption.

Measurements

Self-reports were used. There were different time frames for alcohol exposure (a month) and injury outcome (a year). The PWP model used allowed for repeated injuries.

Outcome: Other studies have excluded sprain and strain injuries. Fatalities were not included, although this was likely a small percentage.

Exposures: Problem drinkers were not identified with the categories used.

Confounding

Potential confounding due to illicit drug use was not considered.

Information Adequacy

A comparison of non-responders to responders was not presented. There was no mention made of overlapping CIs while corresponding injury rates were described as higher in comparisons (Tables 3 and 4). Non-significant RRrs were implied to be highly predictive (Models 1 and 2). There was no mention made of the potential role of underreporting in the lack of dose response observed at higher alcohol consumption levels. There were minor discrepancies between descriptions of the leading cause of injury and nature of injury and the data in Tables 1 and 2.

Reviewer's Conclusions

This study was basically inconclusive.

Implications

Farm workers or farm operators not on the farm truck list were not included in this study. There was a low response rate in the first year of the study. The study would have had limited generalisability outside a farming environment.
Heavy drinking, alcohol dependence, and injuries at work among young workers in the United States labor force


Summary

Aim

To determine whether heavily drinking and alcohol dependent workers are at higher risk of occupational injury.

Design

The use of alcohol in injured and uninjured workers was evaluated by cross-sectional survey and both retrospective and prospective analysis in order to determine the association with the risk of occupational injury.

Population

The National Longitudinal Youth Survey generalizes to all US residents born between 1957 and 1964, when properly weighted. The cross-sectional study was restricted to the 8,569 respondents who worked for any length of time in the six months before the 1989 annual interview (age 24-32), excluding a small military sub sample. Of these respondents, 7,925 were interviewed in the 1990 annual survey and were included in the prospective analysis.

Measurements

Where possible personal interviews were done in respondent’s homes.

Outcome: Occupational injury recalled within 6 months of interview excluding early complications, late effects, and sprains and strains (ICD-9). This was measured in both cross sectional (1989) and prospective analysis (1990).

Exposures: Current drinker (30 days prior to interview), abuse / dependence (DSM-III-R), heavy drinker (6 or more drinks at a time in prior 30 days), and frequency of heavy drinking. These were measured in 1989.

Potential Confounders:

Cocaine and marijuana use in the month before the 1988 annual interview (an indicator of intrinsically higher risk taking behavior), the number of supervised employees, presence of salary control over supervised employees, the number of employees at work location, education, demographic factors, and whether any else was present during an interview, industry, and occupation. Separate industry and occupation risks were based on calculated average sex-specific injury rates for standard groups, multiplied by the time subjects spent working in these groups over the recall period.

Results

Multivariate analysis controlled for potential confounding from education, occupational and industry risk, whether anyone else was present during the interview, and gender, where appropriate. There was no association between alcohol dependence and injury in either cross-sectional or prospective analysis. The ORs for heavy drinkers were reduced to 1.2 (0.7-2.1) in the cross-sectional analysis and 1.6 (1.0-2.8) in the prospective analysis. There was no dose response in injury ORs as the frequency of heavy drinking increased.

Authors Conclusions

The findings did not provide consistent evidence that alcohol use, heavy drinking, or alcohol dependence strongly increased the risk of injury at work among young workers in the US labor force.
Critique

Bias

Measurement

All measures were self-reported. A month recall period was used to classify a six-month injury risk period. The DSM-III-R definition of alcohol dependence may have been modified and hence of questionable validity. The validity of using drug use history from 1988 as an indicator of intrinsically higher injury risk was not established.

Confounding

Information Adequacy

The NLYS response rate was provided for 1988, but not 1989 or 1990. A demographic description of the study group was not provided. What was meant by “residual category of alcohol abusers” was unclear, and as a result of this, whether or not the DSM-III-R meaning of dependence had been modified was ambiguous. The sizes of the “small military sub sample” or “very small residual category of alcohol abusers” were not indicated.

Reviewers Conclusions

There wasn’t consistent evidence that alcohol use, heavy drinking, or alcohol dependence strongly increased the risk of injury at work among the study group.

Implications

The study was generalizable to US workers in the chosen age range.

Some evidence of reporting changes was found. The injury OR increased when another person was present during the interview, and this variable was retained in the final multivariate model.

Had significant associations had been found, the lack of control for the potentially confounding influences of illicit drug use would have complicated their interpretation.
The relationship between high-risk and problem drinking and the occurrence of work injuries and related absences


Summary

Aim

To determine whether there are relationships between problem drinking and high alcohol consumption, and outcomes such as accidental work injuries and related absences.

Design

prospective cross section

Population

An Australian metal products plant was the sole worksite studied. Of the 1,206 employees between May 1985 and July 1986, 247 were classified as ineligible, 100 didn’t consent, and 353 were excluded, leaving a study group of 506. White-collar workers (251) were excluded because injury rates were low. Women (46) were also excluded.

Measurements

Outcomes: Number of injuries and lost time days in the twelve-month period following questionnaire administration was determined from company records.

Exposures: Questionnaires were administered in groups during work hours. Alcohol consumption was measured by recording how many standard drinks had been consumed on each day in the previous week. Heavy drinking was defined for men as 42 or more standard drinks per week. Modified Mortimer-Filkins test scores classified subjects into three groups: abstainers and non-problem drinkers (<15); presumptive problem drinkers (16-23); and problem drinkers (24 or more). The frequency of having eight or more drinks on one occasion was used as a binge-drinking indicator.

Potential Confounders: Job classification (from personnel records), shift type, experience, job satisfaction, recent stressful life events, education, with whom the subject lived, marital status, age, country of birth, and gender.

Results

Stepwise logistic regression predicting two or more injuries was done, with retained job satisfaction, recent stressful life events, and age as confounders. When the Mortimer-Filkins test score was entered as a continuum, the OR for an increase in test score of 10 was 1.6 (1.1-2.3). The presumptive and problem drinkers category ORs were 1.7 and 2.2, respectively, although they were not significant. A logistic regression done on the whole sample to predict the absence of injuries found no significantly predictive alcohol variables.

The model for injury-related absences retained job satisfaction and age as confounders. While the problem drinker category OR was 2.7 (1.2-6.4), the presumptive problem drinker category OR was 0.5 (0.2-1.3).

The relationship between injury-related absences and high alcohol consumption was not significant ($\chi^2$). The relationship between binge drinking and occupational injury also was not significant.

Authors Conclusions
Problem drinking, as measured by the Mortimer-Filkins test, but not high levels of alcohol consumption, was significantly related to occupational injuries. It appeared that workers with two or more injuries differed in some respects from those who had one or no injury.

**Critique**

**Bias**

**Measurement**

*Outcome:* Injury was not defined, and not broken down by circumstance or type.

*Exposure:* Self-reports may have reduced accuracy. Alcohol consumption was determined over a one-week period, while outcomes were counted for a one-year period.

**Confounding**

**Information Adequacy**

The men only study group was not reflected in the title. Non-responders weren’t described.

**Reviewers Conclusions**

Evidence was presented that was consistent with an association between problem drinking, as described here, and two or more occupational injuries.

**Implications**

Potential confounding due to illicit and therapeutic drugs, and the work environment was not addressed.

Generalizability was limited due to the circumscribed study group from one worksite of one company.
The relationship between alcohol consumption patterns and car, work, sports and home accidents for different age groups

Wells S and Macdonald 1999 Accident Analysis and Prevention 31: 663-665

Summary

Aim

The purpose of this study was to examine the relationship between alcohol consumption patterns and car, work, sports and home accidents for different age groups.

Design

A secondary analysis of cross-sectional survey data was done.

Population

A 1994 stratified sample of the Canadian population aged 15 and older was done by Statistics Canada during the eighth cycle of the General Social Survey. Random digit dialing was used to obtain households and one person was then randomly selected. Residents of the Yukon, North West Territories, and institutions were excluded. The overall response rate was 82% resulting in 10,385 usable interviews.

Measurements

Outcomes: At least one accident at work in the previous 12 months that either disrupted their normal activities for at least half a day or resulted in out of pocket expenses of $200 or more. Secondary outcomes were categorized as occurring while playing sports, driving, or occurring at home.

Exposure: Categorized indicators of alcohol consumption included average number of drinks consumed in a week (non-drinkers, up to 13 drinks, 14 or more drinks), average number of drinks consumed, highest number of drinks consumed on one occasion in the previous year, and frequency of drinking in the previous year.

Potential Confounders: The analysis was stratified by age.

Results

Results were presented as graphs of percentage with accidents versus weekly drinking volume. Data analysis was by Chi-square tests. The two youngest age groups (15-24, 25-34) were significantly more likely to have accidents at work with increased weekly drinking volume (p<0.01), but the relationship was not significant for the older age groups. Similar results were obtained with the youngest age group for auto and sports accidents, but not for home accidents. Findings for the three other alcohol exposure indicators were described as being similar overall.

Authors Conclusions

A significant relationship was found between alcohol consumption and the likelihood of car, work and sports accidents for the youngest age groups but not for the oldest age groups.

Critique

Bias

Population

Measurement
**Measurement**

The definition used for accidents included property damage with injury. There was no estimate of injury severity. All measurements were self-reports.

**Confounding**

The analysis was stratified by age alone. There was no controlling for the effect of gender, occupation, or any of a number of potential confounders.

**Information Adequacy**

The recall period for the first two alcohol exposure variables was unclear. A demographic description of the study group was not presented. Calculation of injury rates and RRs would have better illuminated the relationships seen. The use of bar charts would have been more appropriate than graphs for the categorical variable weekly drinking volume.

**Reviewers Conclusions**

It was not possible to draw meaningful conclusions from this analysis.

**Implications**

A multivariate analysis would have been more appropriate.

There is no appropriately controlled, nationally representative study in this area.
The relationship between alcohol and industrial accidents
White AC 1977 British Journal on Alcohol and Alcoholism 12(4): 165-166

Summary

Aim
To assess the financial cost, and loss in production and earnings due to accidents requiring hospitalization as a result of alcohol impairment.

Design
cohort nested case control study

Population
Industrial accident patients aged 16 years or more admitted to the burn unit of Birmingham Accident Hospital (UK) for seven or more days from May 1975 to May 1976. The study group comprised 56 men.

Measurements

Outcomes: Weekly total alcohol consumption and number of heavy drinkers (more than 28 standard drinks weekly) was determined. Weekly consumption referred to the seven days prior to admission, or the ‘usual’ consumption, whichever was greater. Consumption was ascertained in measures, or standard drinks. This was 20 oz of beer, 6 oz of wine, 3 oz of sherry, or 1 ⅔ oz of spirits. Data was collected by personal interview.

Exposures: The sample was divided evenly into two groups, those who might have made some contribution towards their accidents (contributory), and patients who were unlikely to have contributed to their accidents (non-contributory). The author made this distinction after considering the available clinical information.

Potential Confounders: None.

Results
The weekly alcohol consumption for the contributory group was 1.84 times that of the non-contributory group. There were 8 heavy drinkers in the contributory group, compared to 1 in the non-contributory group, which was significantly different (P<0.05, $\chi^2$). No subjects were considered to be alcoholic. One subject in each group had consumed a pint of beer within four hours prior to the accident.

Authors Conclusions
The greater alcohol consumption was accounted for entirely by the significantly higher number of heavy drinkers in the contributory versus the non-contributory group. The costs of alcohol related accidents requiring hospitalization would have been considerable had the findings occurred nationally.

Critique

Bias
Measurement
Self-reports may have reduced accuracy.

Outcome: The validity of substituting ‘usual’ consumption when this was greater than consumption seven days prior to admission was questionable.
Exposure: The criteria for contributory group assignment were not described. The assignment to exposure group was made with an awareness of alcohol consumption.

Confounding

Information Adequacy

There was no description of the study groups.

Reviewers Conclusions

The study was inconclusive.

Implications

Potential confounding was not addressed. This and other methodological flaws make interpretation difficult.

The relatively unique study group would limit generalizability.
Alcohol and occupational injuries among older workers


Summary

Aim

To assess the association between responses to the CAGE questionnaire and the occurrence of an occupational injury within the last year in a nationally representative sample of older workers.

Design

retrospective cross section

Population

The Health and Retirement Study was a nationally representative sample of the continental US done primarily in 1992. A household was considered eligible if it contained a person 51-61 years old. The HRS response rate was 82%. Farmers were excluded leaving 6,857 non-farmers who worked in the preceding year. Spouses were included irrespective of age.

Measurements

Data was self reported.

Outcomes: Work injuries that required special medical attention or treatment or interfered with work activities in the preceding year.

Exposures: Number of positive responses to one of the four CAGE questions (ever felt should cut down drinking, ever annoyed by drinking criticism, ever feel guilty over drinking, ever have an eye opener), number of drinks per day.

Potential Confounders: Occupation, occupational physical demands, smoking, education, marital status, age, gender

Results

Smoking was not retained in the final multivariate model. Those who drank 1-2 drinks a day had the lowest injury risk. The injury risk was highest for those who drank five or more drinks a day (OR 4.45 1.77-11.16). However, injury ORs were increased for those who drank less than one (1.81) or no (1.64) drinks a day. The injury risk increased as the number of positive CAGE questions increased, to an OR of 1.68 (1.04—2.69) with three or four positive responses.

Authors Conclusions

The association between injuries and five or more drinks per day may be stronger than three or more positive CAGE responses because the former reflects current drinking habits while the later reflects lifetime problem drinking.

Critique
Bias

Measurement

Self-reporting likely reduced accuracy.

Outcome: Injuries were not separated by their nature, severity or circumstances. There was no measure of work hours, and so injury rates could not be determined.

Exposure: The recall period for the number of daily drinks was not given. Drinking frequency was not measured.

Confounding

Information Adequacy

Reviewers Conclusions

Evidence was presented that was consistent with the association of alcohol consumption and occupational injury.

Implications

Potential confounding due to illicit and therapeutic drugs and was not addressed.

The study generalized to US non-farm workers aged 51-61 in 1992. It was unclear to what extent findings generalized to the same cohort in subsequent years, or to the same age range in different time periods.

II ALCOHOL AND ILLICIT DRUGS

Chemical dependence: Analysis of work absenteeism and associated medical illnesses


Summary
Aim
To design a screening program that would facilitate identification of chemically dependent workers.

Design
cohort nested matched case control

Population
The cohort consisted active status hourly employees of a US manufacturing plant between 1985 and 1989. Cases were defined as employees with a medical diagnosis of drug and/or alcohol dependence (N=34). The control group was a stratified random sample based on age, race and sex (N=104). Three controls were matched for each case.

Measurements
Data was obtained from medical insurance reports.

Outcomes: Injury diagnostic cluster: Strains and sprains; fractures and dislocations; and lacerations, contusions, abrasions. Number of absences of five or more days, work absence from the disability starting date until the return to work date.

Exposures: A diagnosis of drug and/or alcohol dependence.

Potential Confounders: Controls were matched by age, race, and sex.

Results
The unadjusted ORs for strains and sprains (6.49 2.27-18.57), fractures and dislocations (6.35 1.73-23.31), and lacerations, contusions, abrasions (4.31 1.57-11.78) were all significant (P<0.05). The mean number of absences and their total duration were greater for cases than controls, and the differences were significant.

Authors Conclusions
Injuries…occurred in significantly greater frequencies among chemically dependent workers.

Critique
Bias
Measurement
Diagnostic reliability between clinicians was not addressed. The use of medical insurance reports likely resulted in underreporting of dependence and injury diagnoses, particularly less serious examples. Injuries were not broken down by circumstance or severity. The relationship of injury to the onset, diagnosis, course or treatment of dependence was not considered. Absences unrelated to injury were included in the analysis. Specific substances and usage patterns were not considered.
Confounding

Information Adequacy

Reviewers Conclusions

The study was consistent with an association between a substance dependent diagnosis and occupational injury.

Implications

Potential confounding due to task-related risk was not addressed.

Generalizability was limited by use of one worksite of one company.
Prevalence and consequences of smoking, alcohol use, and illicit drug use at five worksites

French MT et al 1995 Public Health Reports 110: 593-599

Summary

Aim

To examine the prevalence of smoking, alcohol use, illicit drug use, and prescription drug misuse and describe the corresponding labour market conditions at five worksites.

Design

retrospective cross section

Population

Employees of five anonymous US worksites were sampled between late 1991 and early 1993. At each worksite, total employees ranged from 250 to 6,000, sample sizes ranged from 220 to 444, and response rates ranged from 65 to 92 %.

Measurements

Questionnaires were administered in groups.

Outcomes: Being hurt in a substance-caused on the job accident. Other outcomes were: on the job intoxication; substance related tardiness or early leaving, absences, performance reduction; and help needed for substance problem.

Exposures: Alcohol: Past year abstainer, daily drinker, heavy drinker (five or more drinks per occasion five or more days per month), and total number of drinks.

Illicit drugs: Any use and use six or more times, past year and during lifetime.

Prescription drugs: Past year misuse.

Potential Confounders: Days absent past year, annual salary, tenure, full-time, job dissatisfaction, education, marital status, race, age, and gender.

Results

Among those who reported using alcohol (N=1,004) or illicit drugs (N=86) in the past year, no subject reported that they were hurt in an on the job accident because of substance use. Accordingly, no multivariate analysis of injury outcome was done.

Authors Conclusions

Not applicable.

Critique

Bias
Measurement

Self-reports may have reduced accuracy.

Outcomes: Injury was undefined, and not broken down by circumstance, type, severity, or number. Specifying that injuries resulted from accidents “caused” by substance use may have led to underreporting. The injury recall period was unclear.

Exposure: Illicit and prescription drug dose was unmeasured.

Confounding

Information Adequacy

Reviewers Conclusions

The study was inconclusive. Low prevalence, small sample size, and underreporting may have contributed to the absence of reported of injuries caused by substance use.

Implications

Generalizability was would have been limited by the small number of companies comprising the study group.
Predictors of work injuries among employed adolescents


Summary

Aim

Predictors of work injuries were studied in a sample of employed adolescents.

Design

retrospective cross section

Population

Subjects responded to ads at three colleges and thirty-seven high schools in Erie County, New York. A total of 319 full-time students, 16 to 19 years old in the spring of 1996, and employed at least 5 hours a week, were eligible.

Measurements

Questionnaires were completed in group sessions. Subjects were told they could skip any questions that they felt uncomfortable answering.

Outcome: Respondents were asked to report the frequency of experiencing seven types of work injuries during the preceding 9 months.

Exposures: On-the-job use for each of alcohol or marijuana was measured by the frequency of use just before starting a work shift, during lunch breaks, during work hours, and being under the influence at work. The general use pattern for each of alcohol and marijuana was measured by the daily quantity consumed, the overall frequency, frequency of heavy use, and frequency of getting very high.

Potential Confounders: Job tenure, work hours, physical hazards, supervisor monitoring, workload, job boredom, role ambiguity, supervisor conflict, coworker conflict, work-school conflict, job dissatisfaction, depression, and somatic symptoms.

Results

Standardized regression coefficients were reported. On-the-job substance use was found to be significant in the final model (r=0.20 P<0.001 Model 5). General substance use was not significant (r=-0.02).

Authors Conclusions

The results showed that after controlling for a number of demographic, personality, employment, and health characteristics, on-the-job substance use was positively related to work injuries. Future survey research on work injuries should devote more attention to the direct measurement of on-the-job substance use and impairment.

Critique

Bias

Measurement

Self-reports were used for all measurements. On-the-job substance use did not have a quantity measure. ‘‘Getting very high’’ was not well defined.
Confounding

Information Adequacy

Multiple items each with response scales measured outcome, exposures and confounders. This data was combined prior to estimating regression coefficients. The calculation of these composite variables was not described. There was no study group description provided.

Reviewers Conclusions

Evidence consistent with a positive association between on-the-job substance use and occupational injury was presented.

Implications

There was limited generalizability beyond the study group as it was self-selected.

The interpretation of the study was complicated by the potentially confounding influences of smoking, medication use and other illicit drugs.
Employee drinking patterns and accidental injury: a study of four New England states


Summary

Aim

To assess whether workers who drink or take drugs at work or drink heavily outside the workplace are more likely to be injured in workplace accidents than those who do not.

Design

retrospective cross section

Population

Residents of Connecticut, Rhode Island, Vermont, and New Hampshire were telephone surveyed in 1982 and 1983. Response rates were 75 and 78 %, respectively. The study group consisted of employed subjects 18 years or more (N=1740).

Measurements

Data was taken from telephone interviews.

Outcomes: Number of injuries that required medical attention, number of injuries that required overnight hospitalization, and whether an occupational injury. The recall period was one year.

Exposures: Alcohol or drug use six hours prior to injury; frequency and quantity of drinking on the job, during lunch, or during the hour before reporting for work; number of days reported for work intoxicated or hung over; usual frequency and quantity of drinking; and number of impaired work days resulting from use of marijuana or other illicit or therapeutic drugs. The recall period was one month.

Potential Confounders: Occupation, education, marital status, age, gender.

Results

Sprains, strains and wounds comprised almost three quarters of reported injuries. Occupational injuries were found to be 41% of the total. No significant associations were found between job-related substance misuse and occupational injuries. Occupational injuries were significantly related to subjects who averaged five or more drinks a day outside the work environment (RR 2.0 1.0-4.1 P<0.05). Increased injury risks in this group were also found for total accidents requiring medical attention or hospitalization.

Drug use at work increased risks for total accidents requiring medical attention or hospitalization.

Authors Conclusions

Heavy drinkers were significantly more likely to experience occupational accidents.

Critique
Bias

Measurement

Self-reports may have reduced accuracy. A one-month exposure recall period was used to classify injuries received in the preceding year. Substance use patterns may have changed, resulting in misclassification. Injury appeared to be synonymous with accident. Injury causation, type, or number was not considered in the analysis. The dichotomous drugs at work variable may have obscured relationships between specific drugs, their frequency of use, and injuries.

Confounding

Information Adequacy

Not all exposure-outcome combinations were discussed, and the RRs were not shown for a number of those found to be NS. A table with all exposure-outcome combinations that included RRs (ORs), 95% CIs, and P values would have allowed the reader draw their own conclusions.

Reviewers Conclusions

Evidence was presented that was consistent with an association between heavy daily drinking, as measured, and occupational injury.

Implications

Potential confounding due to specific occupation, risk taking behaviors, and the work environment were not addressed.

The study generalized to the working adult population of the four states surveyed. Generalization at this point would likely be limited by the elapsed time involved, and to a lesser extent by regional factors.
Drug use, workplace accidents, and employee turnover


Summary

Aim

The purpose of this paper was to examine the relationship between drug use and the risk of three work-related outcomes – past-year accidents, being fired, or resigning from a job - using data from a nationally representative US survey.

Design

A secondary analysis of US national cross-sectional survey data was done.

Population

The annual National Household Survey on Drug Abuse (NHSDA) was designed to represent the non-institutional US population aged 12 or older, based on multistage area probability samples. In the 1994 survey, 9,097 respondents age 18 or more reported working full- or part-time (51.1%).

Measures

Hour-long interviews with self-administered answer sheets for all alcohol and illicit drug use questions were used.

Outcomes: Work-related accidents that resulted in any injury to self, another person, or property damage. Other outcomes were: being fired; or voluntarily resigning from the job. All outcome variables were dichotomous. The recall period was the past year.

Exposures: Historic pattern and current use of marijuana and cocaine (six categories); days drunk in the past year (ten categories); dependence symptoms to alcohol or illicit drugs in the past year (dichotomous).

Potential Confounders: The use of drugs in a physically unsafe situation in the past year was used to control for risk taking (dichotomous), and socio-demographic indicators.

Results

There were no significant increases in the accident risk with past or current use of marijuana or cocaine, more frequent episodes of drunkenness, or symptoms of dependence. The accident OR for dependence symptoms was 2.18, P=0.062. The accident risk was most elevated by occupational group.

Some significant differences were seen with the other outcome variables, notably an OR of 7.24 (P<0.01) for getting fired with dependence symptoms.

Authors Conclusions

The frequency and history measures of marijuana and cocaine use, frequency of drunkenness, and symptoms of drug dependence do not affect the likelihood of a work related accident. This research serves a vital function of examining whether broad patterns of drug use have an impact on work related behaviors, utilizing nationally representative data.

Critique

Bias
Population

Measures

Downward trends in accident ORs as cocaine use becomes more recent and frequent may have reflected a recall bias (Table 3).

Measures

All measures were self-reports.

Outcomes: Property damage was included in the occupational accident outcome used.

Exposures: There was no measure of alcohol dose.

Potential Confounders: Drug use in physically unsafe conditions was not established as a valid measure of risk-taking.

Confounding

Medication use was not considered.

Information Adequacy

“Drunk” was not defined. The 95% CIs for the analyses were not reported. The 1994 NHSDA initial response rate was not provided in this study.

Reviewers Conclusions

The evidence was not consistent with an association between alcohol or drug use pattern and occupational injury.

Implications

The study group generalized to the non-institutional US working population aged 18 or older.
Employee accidents: Influences of personal characteristics, job characteristics, and substance use in jobs differing in accident potential

Holcom ML et al 1993 Journal of Safety Research 24: 205-221

Summary

Aim

To use discriminant function analysis to investigate the influence of various personal and job-related factors on employee accidents.

Design

retrospective cross section

Population

Intact work groups of municipal workers from a large southwestern US city were randomly selected. Uniformed fireman and police officers were excluded. A total of 1,054 responses with complete data were used (69%).

Measurements

Questionnaires were completed during work hours.

Outcomes: The past year’s sum of: accidents that a respondent experienced in which someone suffered an injury without time loss, accidents that a respondent had where either the respondent or a coworker was injured resulting in two or more time loss days, and noninjury accidents in which the respondent damaged property or disrupted work. Results were categorized as no accidents or some accidents for analysis.

Exposures: Past year substance use at work, past year drug use, lifetime drug use, light or heavy alcohol use.

Potential Confounders: Demographics: number of children, married, age, and gender.

General Deviance and Social Maladjustment: Religious attendance, parent’s substance use, self esteem (4 items), depression (2 items), family discord (2 items), family substance use (2 items), problematic peers (4 items), and peer substance use (2 items).

Job Structure: Number of coworkers, paid by salary, pay level, stay in same work location, work alone, physical work environment (4 items), and power (6 items).

Job Attitudes: Tension (9 items), satisfaction (20 items), faith in management (3 items), and organizational commitment (9 items).

Results

Results were stratified into low risk (essentially office work) and high risk jobs. Substance use variables had very little influence in the low risk job sample, based on discriminant loadings (correlations) of ±0.30 or more. The block of four substance use variables and Demographics did not contribute significantly to the separation of accident and non-accident groups in the hierarchical analysis. The General Deviance and Job Structure blocks did significantly contribute.
Substance use at work and during the last year were the most important individual predictors in the high risk sample. Despite this, the block of four substance variables was not able to add to the prediction of accidents beyond that allowed for by the other blocks of variables (General Deviance, Job Structure, and Job Attitude).

Authors Conclusions

Measures of drug use contributed little to the prediction of accidents after controlling for work environments and deviance factors. Drug use was strongly related to psychosocial measures.

Critique

Bias

Measurement

Self-reports may have reduced accuracy. Accidents were not broken down by circumstance, type, or severity for the presented analysis. Substance doses were not considered. The validity of many of the psychosocial measures was not established.

Confounding

Information Adequacy

The time period the survey was completed was not provided. There was no demographic description of eligible persons who weren’t included in the study (N=369).

Reviewers Conclusions

The study was not consistent with a strong association between substance use, as described, and occupational accidents.

Implications

Generalizability was limited by the use of municipal government employees from a single, large city.
The effect of drug use on workplace accidents


Summary

Aim

The relationship between illicit drug use and workplace accidents among young adults in the US was examined in two complementary ways. The first examined whether individuals who use drugs are more likely than their non-using counterparts to experience an accident on the job. The second examined whether wages and workers’ compensation benefits have an effect on drug use, and was not considered here.

Design

retrospective cross section

Population

The US National Longitudinal Survey of Youth was used as the study group source. Data from the 1988 and 1992 interviews were used, with the corresponding study group ages being 23-30 and 27-34, respectively. To be included, subjects had to be employed at some time during the year prior to the interview and have no missing data. Blacks were excluded in response to concerns over differences in the accuracy of self-reports of drug use.

Measurements

Data was self-reported.

Outcomes: Involvement in a workplace incident that resulted in an injury or illness, or a lost time accident, in the past year

Exposures: Marijuana and cocaine use in the past year.

Potential Confounders: Three variables were added to the reported model: person specific characteristics (age, education, Armed Forces Qualifications Test score, past month alcohol use, and past years labour market experience), job attributes (tenure, union status, usual hours worked per week, hourly wage, and level of workers’ compensation benefits), and industry and occupation

Results

A total of 64 logit models were estimated (Table 2). Cocaine and marijuana were significantly and positively associated with injury in males in 1988. These results were not sensitive to the inclusion of a large set of control variables. The estimates implied that drug use did not have a significant effect on the lost time risk. The estimates for the 1992 male sample though positive, were not significant. The lost time risk was significantly and positively associated with drug use.

The estimates of the effect of drug use among the female samples were usually not significant. Only in 1988 cocaine use, for both accident and time loss outcomes, were the parameter estimates significant.

Authors Conclusions

The evidence supported the lack of an association between drug use and injury incidence for the female sample. The less hazardous occupations women work in and relatively lower levels of drug abuse were suggested as explanations for this. Drug use in the male sample increased the injury probability by 25%, which was a large and significant effect. If drug use was reduced to zero in the 1992 male group, estimates indicated that the injury
incidence would decline from 10 to 9%, or a 10% change. This appeared to be a modest effect given that a program that reduced drug use to zero would presumably be quite costly.

**Critique**

**Bias**

**Measurement**

Measurements were self-reported, which may have decreased reporting accuracy. Injuries were not broken down by cause or type. Exposure pattern was unmeasured.

**Confounding**

An alcohol consumption recall period of a month was used in conjunction with an injury recall period of a year.

**Information Adequacy**

**Reviewers Conclusions**

The study was consistent with an association of marijuana, and to a lesser extent cocaine, and occupational injury.

**Implications**

Therapeutic drug use was not considered.

The study generalized directly to the US non-Black workers of the stated ages and years. Generalizability beyond these and ages time periods may be limited.
The role of drugs in workplace injuries: Is drug testing appropriate?


Summary

Aim

To empirically assess the role of drugs and alcohol in causing workplace injuries.

Design

retrospective cross section

Population

All Ontarian telephone directories were systematically sampled, and questionnaires mailed out. A total of 882 responses were received from employed adults, for an overall response rate of 31%. Comparisons of each demographic variable to the adult working population of Ontario were significant.

Measurements

Data was taken from written questionnaires.

Outcome: Presence of a work injury requiring medical attention in the previous year.

Exposures: Illicit or therapeutic drug use in the past year, number of standard alcoholic drinks consumed in the previous week, Shortened Michigan Alcohol Screening Test (SMAST), Drug Abuse Screening Test (DAST), history of stopping alcohol or drug use.

Potential Confounders: Workplace factors, lifestyle problems, and demographics (major occupational categories, marital status, age, and gender).

Results

Of thirteen variables felt to be important, eight were retained in the final multivariate model. Among these were alcohol problems as defined by the SMAST (P=0.0006) and therapeutic drug use in the past year (P=0.0255). Illicit drug use in the past year was not retained.

Authors Conclusions

Evidence exists for a causal role of alcohol problems and therapeutic drug use in job injuries. Accident prevention programs might be more effective by focusing efforts on reducing the influence of these factors rather than illicit drug use.

Critique

Bias
Measurement

Self-reports may have reduced accuracy. Injury was not broken down by circumstance, type, severity, or number. Doses of illicit and therapeutic drugs were not considered.

Confounding

Information Adequacy

Age eligibility criteria were not specified. There was no study group description. Odds ratios were not provided for the regression variables.

Reviewers Conclusions

Evidence was presented that was consistent with an association between alcohol problems, as defined by the SMAST, and use in the past year of therapeutic medication with occupational injury.

Implications

Potential confounding due to risk taking behavior, job experience, and management and worker attitude toward safety were not addressed.

Generalizability was limited by the low response rate and small sample size.
Comparison of lifestyle and substance use factors related to accidental injuries at work, home, and recreational events.


Summary

Aim

The purpose of this study was to examine whether risk factors vary for people with no injuries, work injuries, home injuries, recreational injuries, and with multiple injury episodes.

Design

cross-section

Population

Addresses were obtained from a random sample of all Ontarian telephone directories. Questionnaires were mailed in June and July of 1992 to 3300 households and 825 eligible responses were received (25%).

Measurements

All variables were dichotomized.

Outcomes: The number of injuries requiring professional medical attention in the prior year at work, at home, and during recreational activities outside the home.

Exposures: Licit and illicit drug use in the previous year; number of standard drinks consumed in the previous week; Shortened Michigan Alcoholism Screening Test (SMAST); Drug Abuse Screening Test (DAST); quit drinking or using drugs; quantity smoked.

Confounders: lifestyle problems, occupation, marital status, age, and gender

Results

Cocaine use, smoking on average at least one cigarette a day, sometimes or often have trouble getting to sleep or staying awake, and usually have no money in the bank before payday had significantly higher percentages of people in the work injury than the no injury category by $\chi^2$ analysis.

Authors Conclusions

These largely concerned comparison of findings between injury locations.

Critique

Bias

Measurement

Measurements were self-reported. Dichotomous variables were used throughout.

Outcomes: A broad definition of was injury used.
Exposures: Quantity was unmeasured with the exception of alcohol and cigarette consumption. The recall period for alcohol consumption was a week.

Confounding

The analysis used did not adjust for confounding, the significance of any differences observed were questionable. Respondent household clustering was not taken into account in the analysis.

Information Adequacy

Age cutoff criteria were not specified. A table of study group characteristics was not presented.

Reviewers Conclusions

The study was inconclusive as a multivariate analysis was not done.

Implications

Generalizability was limited to the study group. Comparisons to the Ontario employed adult population were significantly different for each demographic variable. There was also a low response rate.
Risk of job-related injury among construction workers with a diagnosis of substance abuse


Summary

Aim

To determine whether a medical diagnosis of substance abuse was associated with an increased risk of injury on the job.

Design

retrospective cross-section

Population

Unionized Washington state construction labourers 1990-1991 who worked union hours and were eligible for the union health insurance for at least one month.

Measurements

Individualized data was obtained from workers’ compensation claim files, health insurance claims, and union records.

Outcome: Union hour specific total and time loss (four or more days) injury rates were calculated.

Exposures: ICD-9 diagnoses of alcoholic or drug psychosis, alcohol or drug dependence, or non-dependent abuse of drugs.

Potential Confounders: Results were stratified by age.

Results

Of 7,895 workers in the cohort 422 were defined as being substance abusers (5.3%). Most of these were alcohol dependent (84%). When a diagnosis was prerequisite to counting injuries as substance-related a significant difference was found for time loss injuries only in the 25-34 years age group (RR 1.93 (1.27-2.59)). When timing was ignored the RR for time loss injuries was 1.49 (p<0.05) in the same age group. The time loss injury RR was 1.79 in this age group using only alcohol psychosis and dependence as the exposure. There were no significant differences between the total injury rates.

Authors Conclusions

The findings were suggestive of an increased risk of work-related injury among labourers who had a diagnosis of substance abuse, although the numbers were small. This relationship appeared to be confined to those in the 25-34 year age group.

Critique

Bias

Measurement

Outcome: A broad injury definition was used. Injury was underreported, in part because some injuries occurred on non-union worksites.
**Exposures:** The exposure variable was dichotomous. Exposures were underreported, in part due to payment limitations.

**Confounding**

Stratification by gender was not presented.

**Information Adequacy**

Demographic characteristics of the study group were not described. Confidence intervals were not presented in Table 3.

**Reviewers Conclusions**

The task-specific injury risk was unlikely to have been equal. The interpretation of this study is difficult as a result of this potential confounding.

**Implications**

The study group comprised nearly 8,000 workers in one union working for numerous companies at numerous job sites in one state in one country. There may be some limited generalizability to other jurisdictions.
The effectiveness of preemployment drug screening in the prediction of employment outcome


Summary

Aim

The issue of increased misclassification over time was addressed by reevaluating a previously studied cohort after an additional year of follow-up.

Design

cohort study

Population

The cohort from Zwerling C et al 1990 was followed up for an average of 729 days.

Measurements

Were unchanged from Zwerling C et al 1990 except as noted.


Potential Confounders: Exercise was dropped after the previous analysis revealed no indication that it was a confounder.

Exposure: as Zwerling et al 1990

Results

An examination of hiring status compared to drug test results showed that applicants in the other drugs category were significantly less likely to be hired than nonusers (OR 0.64 0.45-0.92 P=0.015).

The Cox proportional hazards and time-dependent co-variate regressions used the five potential confounders simultaneously. At the end point, workers in the marijuana positive group had significantly elevated risks for injuries and accidents. The cocaine positive group was not quite significant for injuries but was for accidents. The RR magnitudes ranged from 1.46 to 1.62. There were no increased risks for injury or accidents in the other drugs group, as in the previous analysis (Table 4).

When broken down by time period (first 90 days, 91-365 days, and over 365 days) there were no significant injury or accident risk differences when compared to the baseline period of 91-365 days (Table 5).

Risks were then compared at mean follow-ups of 13 and 24 months (Table 6, * denotes P<0.05 for individual RRs). Injury risk went from 1.85* to 1.51* and accidents risk 1.55* to 1.46* in the marijuana positive group. The risks associated with marijuana use, based on 198 employees, decreased, but all remained significantly elevated. In the cocaine positive group, injury risk went from 1.85* to 1.62 and accidents risk 1.59 to 1.54*. The cocaine analysis was based on a much smaller group of 55 employees. Risk estimates were not significant at either 13 or 24 months. Both risks decreased, although the change in accident risk was quite small.

Authors Conclusions
There appeared to be a trend toward decreased risks after the first year for marijuana users, which may reflect the effects of misclassification due to changes in employee drug use after hire. The differences in the smaller subgroup of cocaine users were not subject to meaningful interpretation.

**Critique**

As Zwerling C et al 1990 except as noted.

**Bias**

**Measurement**

**Confounding**

**Information Adequacy**

The overlapping ranges of the injury and accident risk estimates CIs in Table 6 was not discussed.

**Reviewers Conclusions**

Injury and accident risks in the marijuana group possibly declined in the second year of the study. The risk differences in the cocaine positive group were not interpretable.

**Implications**

The substantial overlap of the risk CIs between 13 and 24 months of follow up inhibits drawing more definitive conclusions.
The scale and impact of illegal drug use by workers


Summary

Aim

To describe drug use in the working population, to investigate the effects of drug use on work performance, and to determine whether there is an association between illegal drug use and workplace accident or workplace injury.

Design

Cross sectional survey conducted by postal questionnaire.

The authors also included a subgroup (referred to by the authors as a cohort) who had pre and post shift measures at the beginning and end of the working week of computer based tasks to estimate cognitive performance

Population

Three populations were utilised for the study of illegal drug use and workplace accidents or workplace injury:

- a random sample of 30,000 individuals from the electoral registers of two south Wales towns;
- a sample of 20,000 individuals aged 18-40 who had attended 1 of 8 Emergency Departments (2,500 per department) with either work injury; vehicle, sports or home injury; or non trauma reason;
- a sample of 2758 students attending two colleges in south Wales who were also in employment.

Measurements

Information was collected by postal questionnaire.

Outcome:

Injuries at work in the previous 12 months were recorded on the questionnaire as either ‘minor accidents’ (not requiring medical attention form someone else) or accidents (requiring medical attention from someone else). Information on work–related road traffic accidents was also obtained.

Exposures:

Questions about recreational drug use in the previous 12 months were developed for this survey based on a previously used survey tool (British Crime Survey).

Potential Confounders:

Information on demographics, physical health, mental health, lifestyle (including alcohol and smoking) and work was also collected using the same postal questionnaire.

Results

Workplace accidents were associated with more frequent risk taking at work, being male, higher levels of job characteristics, depression, poorer health, lower income, and reporting other workplace accidents. The adjusted odds ratio for illicit drug use in the past year when comparing those reporting workplace accidents with those that did not was 0.87 (95%CI 0.48-1.58).

For work–related road traffic accidents the adjusted odds ratio for illicit drug use in the past year was 1.71 (95%CI 0.53-5.58). when analyses we re-run for groups using ‘cannabis only’ or ‘cannabis and at least one other illicit...
drug”, an association between cannabis only use and work-related road traffic accidents was of borderline significance (OR 2.97, 95%CI 0.91-9.67).

**Authors Conclusions**

There was no association between illicit drug use and workplace accidents although there was an association between cannabis only use and work–related road traffic accidents, and between drug use and non-work accidents. The lack of an association may be because: no association exists; the study lacked power to detect a real but small effect; or, accidents were not restricted to those arising from the individuals own error.

**Critique**

**Bias**

**Population**

No identifiers were included on the mail out questionnaires and so no follow up of non-responders was possible. Of 30,000 who were sent the community based postal questionnaire only 7979 responded and of these 4620 were in employment. Of the 20,000 sent questionnaires for the emergency department study, of which 8,000 were identified as attending because of a workplace injury, only 1994 employed workers responded. Among the college students only 666 of 2758 responded. These low response rates raise the possibility of response bias. The Emergency Department population and student population were also selected to be relatively young which may affect the generalisability of the results.

**Measurements**

The same measurement instruments and techniques were used for all groups minimising the risk of measurement bias between groups. There may, nonetheless, have been some underreporting of drug use, workplace injury, or relevant potential confounders by individuals. In particular, individuals with heavy use of drugs or frequent accidents may be prone to underestimate their use or occurrence.

**Measurements**

**Outcome:**

Self-reporting of workplace injury may underestimate the true incidence. This may be especially likely as time since the injury increases. A twelve month recall period would likely be reasonable for fairly major injuries but some more minor injuries may have been forgotten. No determination of whether the individual had in some way contributed to events leading to the accident was made (i.e. was it an error of judgment by the injured person that led to the injury). This may have led to accidents and injuries being included that were unlikely to be contributed to by the use of illicit drugs.

**Exposures:**

Drug use within past 12 months may not be the relevant measure of use likely to contribute to an accident or injury. Self reporting of illicit drug use may be prone to error as individuals may underestimate or not disclose their drug use.

**Confounding**

Measurement of confounders was based on self reported questionnaire data and so was liable to the same errors as listed above.

**Reviewers Conclusions**
A large study, but with a disappointingly low participation rate. Self reporting of exposure and outcome of interest liable to error and potentially bias. Given the numbers recruited would nonetheless be expected to have reasonable power to detect relevant associations.

**Implications**

Suggests that there is no association, or at most a relatively weak association between general use of illicit drugs and workplace accidents or workplace injury.
Worker substance use, workplace problems and the risk of occupational injury: A matched case control study

Spicer RS et al 2003 Journal of Studies on Alcohol 64(4): 570-578

Summary

Aim

This study examined the relationship between occupational injury and problem substance use among transportation workers, controlling for two categories of problem behaviors.

Design

A matched case-control study utilizing incident density sampling nested in a cohort of transportation workers

Population

The study cohort was defined as all hourly workers an American national transportation company between 1993 and 1998. All workers suffering an acute occupational injury were counted as cases. Five uninjured controls matched by job type were randomly selected from the active workforce on the injury date.

Measurements

Data was compiled using anonymous links from injury records, human resource records, disciplinary charges, EAP files, and workplace substance abuse prevention program records.

Outcome: Occupational injury, excluding repetitive stress injuries and back strains and sprains.

Exposure: A worker was labeled as having a substance use problem if there was a history of:
- substance use-related disciplinary action;
- an alcohol/drug-related visit to the company’s EAP;
- or an excused, unpaid, confidential absence from work due to drug or alcohol impairment in the year prior to the injury.

Potential Confounders: Problem behavior (absenteeism or dishonesty/unprofessionalism), seniority, regional differences, race/ethnicity, age, and gender.

Results

Of 26,413 workers, there were 3,994 cases. The injured were more likely to be young, minority ethnic group, women, and employed less than 5 years. There were also significant regional differences. After controlling for worker demographics and problem behaviors, the injury OR for problem substance use was 1.21 (0.94-1.54) in the final multivariate model (p=0.138). Only the injury ORs for absenteeism (1.73 (1.33-2.23)) and dishonesty / unprofessional behavior (2.19 (1.60-2.98)) were significant (both p < 0.01), after controlling for problem substance use. There were no significant interactions between the problem substance use indicator and other independent variables.

Authors Conclusions

When problem behaviors were controlled for the relationship between substance use problems and occupational injuries was weak. Workers who use substances are not necessarily working in an impaired state, but have a propensity for other behaviors that put them at risk for occupational injury. Workplace injury prevention programs should address the expression of problem behaviors as a complement to drug and alcohol deterrent programs.
Critique

Bias

Measurement

A substance problem may have been more likely to come to attention post-injury, as would be the case with post-accident drug testing.

Measurement

The validity of using corporate records to measure deviant behavior was not known. The use of organizational records likely underestimated the prevalence of substance abuse and problem behavior.

Confounding

The potentially confounding effect of therapeutic medication was not considered. The cause and effect relationship between substance abuse and workplace problem behaviors has not been well described, these variables may not be independent.

Reviewers Conclusions

There was little evidence for substance use indicators being risk factors for occupational injury. There was some evidence that more serious problem behaviors were a risk factor for occupational injury. The relationship between problem behavior, substance use, and occupational injury risk needs further clarification.

Implications

The case definition did not distinguish workers injured as a result of someone else’s actions from those who injured themselves. A preferable case definition might have been all workers who caused an injury, irrespective of who was injured.

The power of the analysis may have been limited by the low exposure prevalence. Established substance abuse prevention and early intervention programs were in effect over the course of the study. The use of a dichotomous exposure variable may have obscured associations with specific substances and their dose response. The study design precluded establishing the temporal relationship of exposure to injury.

There was limited generalizability of the results beyond the unique population studied. This consisted of heavily unionized hourly workers from one national transportation company, with one quarter of these in safety-sensitive positions.
The efficacy of pre-employment drug screening for marijuana and cocaine in predicting employment outcome

Zwerling C et al 1990 JAMA 264(20): 2639-43

See also: Editorial 1990 JAMA 264(20): 2676-7
1992 JAMA 267(1): 52

Summary

Aim

The study was designed to detect and measure any association between the presence of marijuana and/or cocaine on a pre-employment drug screen and employment outcomes.

Design

cohort study

Population

All applicants for career positions with the US Postal Service in Boston between September 24 1986 and January 6 1989 were drug tested. Of 4,964 applicants, 164 were excluded because of rare minority group membership, data entry errors, a clinical history of non-alcohol substance abuse, or an opiate positive drug screen. The study cohort consisted of the 2,537 applicants who accepted positions before January 28, 1989. Mean follow up was 406 days.

Measurements

Outcomes: Time to first work related injury and time to first work related accident. Other outcomes were absence rate; time to first report of disciplinary action; and time to termination. Data was obtained from organizational records.

Exposure: The results of drug screening were categorized as negative, cannabinoid positive, cocaine positive, and multiple or other non-therapeutic drugs. All relevant parties were blind to exposure status. Positive initial immunoassay urine screens were confirmed by gas chromatography / mass spectroscopy. Cannabinoids were detected up to four weeks after the last use, and a cocaine metabolite was detectable up to 72 hours after the last use.

Potential Confounders: smoking status, job classification, exercise habits, race, age at hire, and gender.

Results

There did not appear to be any major differences in drug test results that were related to hiring status. The marijuana positive group comprised 198 workers (7.8%) and the cocaine positive group 55 (2.2%). A total of 312 injuries and 503 accidents were recorded.

The Cox proportional hazards multivariate analysis used included all six potential confounders simultaneously. The marijuana positive group had significantly increased risks for injuries (RR 1.85 1.03-2.64 P=0.001) and accidents (RR 1.55 1.16-2.08 P=0.003). The cocaine positive group had a significantly increased risk of injuries (RR 1.85 1.01-3.39 P=0.048), but not accidents (RR 1.59 0.95-2.67 P=0.078). The other drugs group did not show an increased risk for injuries or accidents.
Authors Conclusions

The findings of this study suggested that many of the claims cited to justify pre-employment drug screening had been exaggerated.

Critique

Bias

Clinical exclusion of non-alcohol substance abusers (N=46) and an opiate positive group (N=7) were potential sources of selection bias.

Measurement

Outcomes: Injuries and accidents were not defined, and so were broad categories. The higher number of accidents suggested that it was less specific. The use of organizational records likely underestimated injury and accident occurrence, particularly of minor ones.

Exposure: Exposure classification occurred after a single test, and this occurred in a different time period than outcome classification. Both these factors may have resulted in misclassification. There was no measurement of dose or usage pattern. This meant that the negative group consisted of abstainers, casual users, and currently abstinent abusers. The positive groups consisted of casual users and abusers.

Confounding

The non-current smoker group would have included former smokers with abstainers.

Information Adequacy

The rationale and implications of excluding non-alcohol substance abusers and the opiate positive group was not well described. The magnitude of increased risks was not presented.

Reviewers Conclusions

Some evidence consistent with an association between marijuana and cocaine exposure and injury risk was found.

Implications

Potential confounding due to consumption of alcohol and therapeutic drugs and potential selection bias complicated the interpretation of the observed associations.

The study may have generalized to similar worksites, subject to regional differences.
III THERAPEUTIC DRUGS

Industrial accidents and medication


Summary

Aim

To determine whether or not medication is a significant causal factor in industrial accidents.

Design

case control study

Population

A Toronto packaging manufacturing plant served as the study group source.

For several months employees reporting to the company health centre for treatment of a work–related injury were interviewed regarding medication use.

Gender-matched controls were obtained from the next alphabetically listed employee in health centre records, and were similarly interviewed. There was no attempt to match by age or work type.

A total of 115 pairs were obtained. There were no significant differences in the mean ages between cases and controls.

Measurements

Data was obtained by interview.

Outcomes: Medication type(s) used in the previous 24 hours.

Exposures: Injury or control group membership.

Potential Confounders: None.

Results

There were no significant differences between the number of cases (27) and the number of controls (31) who took medications. There were also no significant differences in the total different medications taken between cases (35) and controls (44).

Authors Conclusions

From these data it appears that in most cases there is no relationship between medication ingestion and industrial accidents and thus industrial health services do not need to be overly concerned about the general problem of employee medication.

Critique
Bias

The selection of controls was dependent on a case attribute (surname), and may not have been a random, unrelated association.

Interviewers were not blinded to the injury (exposure) status of subjects when ascertaining outcome.

Measurement

The use of self-reports may have reduced the accuracy of medication use data (outcome). The amount and timing of medication ingestion was not considered.

The injuries treated at the company health centre likely were a subset of the total number of occupational injuries occurring, particularly of minor ones. Cases were not distinguished by the degree to which the individual’s action contributed to injury.

Confounding

Information Adequacy

Demographic descriptions of the cases and control groups were not provided.

Reviewers Conclusions

The study was inconclusive.

Implications

The small numbers involved precluded meaningful breakdown of exposure by circumstances, type, or severity, or of outcome by specific medication.

Potential confounding due to age, experience, injury risk associated with job type, was not addressed.

Generalizability was limited by the use of a single worksite of one company in one industry.
Occupational injuries and medication use


Summary

Aim

To investigate the association between prior usage of medication and traumatic occupational injuries.

Design

cohort nested matched case control

Population

Subjects were employed adult (18 years or older) members of a Puget Sound area HMO for 90 days or more. Cases were restricted to injuries most reliably classified as occupational acute trauma in 1992 or 1993. Two randomly selected eligible controls were matched on gender, decade of birth, and Standard Industrial Classification code for their employer. To reduce the possibility of prevalent injury cases to be classified as incident cases, both cases and controls could not have been seen for an occupational injury within 90 days of the reference date.

Measurements

Data was collected from computerized patient and pharmacy records.

Outcomes: Acute occupational injury. Injuries likely to be chronic, including sprains and strains, were excluded.

Exposures: Medication, grouped by class and function, dispensed within 30 days of the injury date.

Potential Confounders: A Chronic Disease Score based on the previous year’s pharmacy records and the numbers of visits recorded in the 90 days prior to the index visit were included in models, where appropriate.

Results

The risk of total injuries was increased following antihistamine (OR 1.5 1.1-1.9), and to a lesser extent, antibiotic (OR 1.2 1.0-1.5) use within 30 days of the reference date, in both genders. When stratified by injury type, antihistamine use was associated with an increased risk of burns, fractures and dislocations, and open wounds and contusions. The increased risk due to antibiotic use was most notable for burns.

Authors Conclusions

We have demonstrated a modest association between the use of some medications and occupational injuries.

Critique

Bias

Measurement

The specific nature of the injury definition likely resulted in some injury case exclusions. Injury circumstance was not considered, ie the degree to which the individual’s action contributed to the injury was unknown. Medication purchase rather than consumption was measured. Dose was not analyzed.

Confounding
Information Adequacy

Reviewers Conclusions

Evidence consistent with an association between the purchase of some medication types and subsequent occupational injury was found.

Implications

Potential confounding due to alcohol or illicit drugs, occupation, experience, and the work environment were not addressed.

Generalizability was limited by the study group originating from a single HMO, where workers employed in the highest injury risk industries were underrepresented.
Aeroallergens, allergic rhinitis, and sedating antihistamines: risk factors for traumatic occupational injury and economic impact


Summary

Aim

1 To assess the impact of allergic rhinitis, antihistamine, and aeroallergen exposures on the risk of traumatic work-related injuries.
2 To estimate the economic impact in the US of an increased risk of traumatic work-related injuries, including both direct medical costs and indirect costs (ie, lost work productivity). This was not examined here.

Design

retrospective case control study

Population

US upper Midwest Workers’ Compensation (WC) claimants during peak outdoor seasonal allergen exposures between March and October 1997.

Cases: acute traumatic injury cases were selected from the claim categories “falls or slip injury”, “struck or struck by objects”, or “caught in or between objects or machines”.

Controls: Control cases were selected from “materials handling strain – chronic back injury” claims from a state WC database.

Records were excluded if they were not work-related, still in litigation, minors at time of interview, or if workers were deceased. Unequally sized pools for cases and controls were differentially sampled to obtain similarly sized samples for analysis.

Measurements

A 30 min telephone interview survey was conducted May 1998 to March 1999.

Outcome: acute traumatic injury cases were defined from the claim categories “falls or slip injury”, “struck or struck by objects”, or “caught in or between objects or machines”.

Exposures: Medication use 2 weeks prior to injury;
allergic rhinitis diagnostic status (none, self-diagnosed, or physician diagnosed) for a 1-year period prior to injury;
and allergen intensity (low, medium and high) and predominant type were obtained for 2 weeks prior to the injury at the injured worker’s zip code location from a private database linked in a blind fashion to the WC claims data.

Potential Confounders: number of alcoholic drinks within 30 days prior to injury
occupation, education, marital status, race, age, gender

Results

The final sample consisted of 1,223 cases and 1,202 controls. The overall response rate was 72.6%, with no significant difference in response rate between cases and controls. There were some statistical differences in age, nature of injury, length of service, and industry group between non-respondents and respondents.
Univariate analysis

Cases and controls had similar distributions for gender, education, marital status, race, and occupational groups. Cases were older than controls (P< 0.05). Mean alcohol consumption was not significantly higher for controls than for cases. Cases and controls had similar prevalence for AR, exposures to pollen levels and types, and antihistamine use.

Multivariate analyses

No parameters attained significance for non-sedating antihistamines.

The final model selected was significant for sedating antihistamine exposure (OR 2.93), age, and for the interaction. Traumatic injury risk increased with increasing age in non-users of sedating antihistamines (from OR 0.78 for workers in their 20’s to OR 1.34 for workers in their 60’s). Sedating antihistamine exposure reversed this relationship (OR 0.76 for workers in their 60’s to OR 1.33 for workers in their 20’s), an example of exposure effect modification. This was taken as evidence that sedating antihistamines were associated with increased injury risk among young workers (Table VII).

Injury – sedating antihistamine ORs increased as pollen levels increased in both physician-diagnosed and self-diagnosed AR, however none were significant (Table VIII).

At high pollen levels, injury cases of physician and self diagnosed AR were over twice as likely to have used sedating antihistamines than their controls (Table IX).

Authors Conclusions

Sedating antihistamine exposures elevated acute injury risk in young workers.

There was compelling suggestive evidence of a combined AR - pollen intensity – sedating antihistamine exposure risk for injury.

The use sedating antihistamines may be associated with an acute, traumatic injury risk in the work force.

Sedating antihistamines should be avoided in the management of AR, and non-sedating treatments were advocated.

Critique

Bias

Population

Some statistically significant differences were observed between non-responders and responders.

Measurements

Measurements

Self-reports were used to establish medication and alcohol usage. Interviews occurred an average of 1.3 years after injury. Different time periods were used for different measures: medication use 2 weeks prior to the injury, alcohol 30 days prior, and AR diagnosis for a 1 year period.

Confounding

Outcomes were not adjusted for the potentially confounding effects of other CNS depressants or illicit drugs.
Information Adequacy

The relationships (eg geographic) between source databases for cases and controls were not well described. There were no CIs provided for the final multivariate model selected (Table VI), or with age-exposure injury ORs (Table VII). There was no indication why 80% CIs were used only in Table VIII.

Reviewers Opinions

Conclusions

There was statistically significant evidence that sedating antihistamines increased the risk for injury in the study group.

There was non-significant suggestive evidence that this risk was increased in AR sufferers during exposures to high pollen levels.

This study may generalize to workers where there is a risk for workplace traumatic injury, first in the Midwest, then possibly to other US states or other industrialized countries.

Implications

Use of sedating antihistamines should be avoided where there is a risk of workplace traumatic injury.
Medication reporting in the workplace


Summary

Aim

Incident events in an explosives manufacturing facility were analyzed to determine whether medication use was related to safety incidents.

Design

retrospective case control study

Population

The plant studied produced rocket motors, including solid rocket fuel.

Cases consisted of 86 workers involved in 92 reportable incidents randomly selected from a total of 229 workers employed doing a number of jobs in hazardous work areas who had been involved in 287 reportable incidents occurring between November 1989 and October 1990.

Controls consisted of 89 workers involving 92 episodes of random substance testing randomly selected from 376 workers employed in hazardous or high security areas, who had been selected for 378 episodes of random substance testing during the same time period.

Measurements

Data was obtained from worker’s medical records.

Outcomes: Medication use, which was categorized as 1) non-restricted or none, or 2) restricted. Restricted medications had possible adverse side effects that may have resulted in impairment. Results of substance testing, which was categorized as negative or positive.

Exposures: Involvement in a reportable incident. Workers were solely involved, an involved group member, or were supervising. Reportable incidents resulted in injury or faulty or damaged product, and postincident substance testing.

Potential Confounders: Bivariate analyses were done.

Results

There were no significant differences between the percent cases and controls that took restricted medications and the percent that had a positive drug test result. Gender, age, and experience less than a year were significantly different.

Workers directly responsible for incidents comprised about 70% of cases. About a third of these involved injury to self or another person. About forty percent of cases declared restricted medication at the time of post incident substance testing. Only about a fifth of these workers had declared use of a restricted medication before incident occurrence.

Authors Conclusions

No relationship was found between constrained medication use and measurements of workplace safety.
Critique

Bias

Measurement

There was evidence of underreporting in medical records of restricted medication use in cases. It may be inferred that this also occurred in controls. Property damage incidents were not separated from injury incidents in the main comparison between case and control groups (Table 4). Injury type and severity were not considered. Medication dose was not considered. Post incident urine substance testing did not measure intoxication.

Confounding

Bivariate analyses were done.

Information Adequacy

Reviewers Conclusions

The study was not consistent with a relationship between reportable incidents and medication use, as described.

Implications

Controls were selected from a different, though overlapping, worker population.

Potential confounding due to job type was not addressed. The relationship of gender, age, and job tenure particularly to medication use was not described which made potential confounding difficult to assess.

Generalizability was limited by the use of one worksite in a uncommon, specialized industry.
Medications as risk factors for farm injury


Summary

Aim

To examine associations between the use of medications by farm people, characteristics of themselves and their farms, and their involvement in injury-producing accidents.

Design

retrospective case control study

Population

An initial mail based population survey, from the fall of 1990 to the fall of 1991, identified farm persons 16 years or more who lived and/or worked on an Ontario farm on a full time basis.

Cases were defined as farm persons for whom at least one farm injury was reported for the year prior to the initial survey. Proxy responses for cases were accepted. Four uninjured controls from unrelated farms were matched by their relationship to a farm owner. Response rates to a case-control survey questionnaire were: cases 136/176 (77%) and controls 581/704 (83%).

Measurements

Data was taken from a case-control survey questionnaire.

Outcomes: Farming-related unintentional injuries, including those that happened on public roadways, serious enough to limit normal activities for at least four hours in the year prior to the initial survey.

Exposures: Regular use of specified classes of medications at least once a week over a thirty-day recall period. Responses were categorized as not taken regularly, taken alone, and taken in combination. For cases, the recall period preceded the injury, and for controls the case-control survey. Frequency of alcohol use was also measured.

Potential Confounders: Weekly farm work exposure in hours, gross farm income, and tillable acreage (operational characteristics), tobacco use and number of co-morbid conditions (behavioral/health characteristics), education, age, and gender (demographic characteristics).

Results

In final multivariate models heart or circulatory medications taken alone in men over 45 years had elevated injury risk (OR 4.2 1.2-14.7), as did stomach remedies or laxatives taken alone in men (OR 3.1 1.2-8.2). Frequency of alcohol use was not included in these models.

Authors Conclusions

Our results do suggest that strong and statistically significant increases in risk for injury were observed in association with the regular use of stomach remedies or laxatives by men, and regular use of heart and circulatory medications by men over the age of 45.

Critique
Bias

Measurement

Self-reporting and the use of proxy respondents when necessary for cases may have reduced data accuracy. A one-month exposure recall period was used to classify the preceding year’s injury. Recall periods were at different times for cases and controls. The degree to which a case’s actions contributed to the injury was unknown. Injury severity was not considered. Doses of specific medications, particularly when the injury occurred, were not considered.

Confounding

Information Adequacy

Reviewers Conclusions

Evidence was found that was consistent with an association between two classes of medication and injury risk.

Implications

Potential confounding due to illicit drugs was not addressed. Underlying medical conditions, and any resulting limitations, were not completely controlled for.

The results of the study were more generalizable to farm owner-operators, as they reported the majority of injuries in the initial study.
Prescription medication in the workplace

Proctor, RC 1981 North Carolina Medical Journal 42(8): 545-547

Summary

Aim

A survey investigated the effect of prescription medication on occupational safety, absenteeism, and job performance.

Design

retrospective cross section

Population

The 2,200 employees of three wood furniture companies were surveyed. A total of 762 responses were received, for a response rate of 35%.

Measurements

Outcomes: Number of accidents, number of days absent, and work performance, on a five-point scale. Data was obtained from linked employee records.

Exposures: Presence of medication consumption, categorized hierarchically as: none or any, non-psychoactive or psychoactive, diazepam or other. Data was obtained from a self-report questionnaire.

Potential Confounders: None.

Results

There was no apparent difference in the mean number of accidents between those taking medication (N=181) and those not (N=581). The number of accidents was reported higher for those taking psychoactive medication (0.16 ± 0.41 SD N=67) than for those not (0.10 ± 0.30 N=114). The number of accidents was also reported higher for those taking all other psychoactives (0.21 ± 0.41 N=28) versus diazepam (0.12 ± 0.40 N=39).

Number of absent days were higher for medicated (8.96 ± 9.99) than non-medicated (5.60 ± 6.09) subjects. There were no other apparent differences in absences in the other category comparisons.

Authors Conclusions

Although the limitations of these preliminary data are recognized, the available figures clearly suggested that use of diazepam was not associated with any major difference … in accident or absentee rate above that observed in patients taking any other type of medication.

Critique

Bias

Measurement

The recall period for outcomes was not reported. Accident was not defined, and so it was unclear if property damage was included. Employee records likely underestimated the number of accidents, particularly the less serious ones. Accident circumstances, type, or severity were not considered.
The time period that “the two medications used most recently” were used in would have varied between subjects. Self-reports may have resulted in less accuracy.

**Confounding**

**Information Adequacy**

When the survey was done was not stated. There were no demographic descriptions of the study group or non-responders provided.

**Reviewers Conclusions**

The study was not consistent with an association between self-reported medication use and number of accidents and absences.

**Implications**

Potential confounding was not addressed.

Generalizability was limited by the study group comprising three manufacturers from the same industry and a low response rate.
IV INTERVENTION STUDIES

Efficacy of drug testing programs implemented by contractors


Summary

Aim

The primary objective was to measure statistically the effect of drug testing on incident rates for a sample of construction companies.

Design

single group pre-post

Population

A total of 1,144 companies were surveyed from industry listings in May-June of 1989. There was deliberate bias towards larger firms as they were more likely to have implemented drug testing. Responses were received from 203 companies. Of these, 61 had a form of drug testing but only 31 responses were usable due to missing data. Testing was implemented between 1985-1988.

Measurements

Data was collected by questionnaire.

Outcome: The change (difference) in the OHSA incident rate from the year before to the year after the implementation of drug testing. The incident rate for the year of implementation itself was not used.

Exposure: Any form of drug testing.

Potential Confounders: Results were stratified by company size, unionization, and pre-period incident rate.

Results

A t-test done on the hypothesis that the mean rate difference between all pre-post periods was different from zero was not significantly different. When companies were subdivided according to their pre-period incident rate, the pre-post change was significantly different for companies in the highest initial rate group.

Authors Conclusions

Drug testing can work for companies with high or low incident rates, although those with high incident rates are more likely to get higher reduction in their rates.

Critique

Bias

The intervention group was self-selected, and most had relatively higher incident rates. Within-group exposure to the intervention or to injury risk was unlikely to have been homogenous.
Measurement

Company self-reports, group exposures and group rate outcomes were used.

Outcomes: Illnesses were included with injuries. Injuries were not subdivided by cause, type or severity.

Exposure: A variety of testing programs were equated. These likely varied by substance tested, testing basis, and testing frequency.

Confounding

Factors other than the intervention (workforce changes, changes to intervention protocols, other safety measures, reporting procedures, etc) could have influenced the outcome over the three years of the total pre-post period.

Information Adequacy

There was no study group description. There was a contradiction in the results regarding the significance testing of the whole sample.

Reviewers Conclusions

The pre-post rate change in the subgroup with initial incident rates above the national average likely represents regression towards the mean. Hence, the study was inconclusive.

Implications

National industry incident rates were declining during the study period. There was no comparison group for this secular trend, and the analysis did not adjust for this. Without a comparison group, baseline comparisons of incident rates and the prevalence of illicit drug use or other injury risk factors could not be done. There was no comparison done of the prevalence of illicit drug use or other injury risk factors between pre and post periods.

Generalizability was limited as the sampling was deliberately biased towards larger companies.
A critical evaluation of the Utah Power and Light Company’s substance abuse management program: absenteeism, accidents, and costs.

Crouch DJ et al 1989 NIDA Research Monograph 91: 169-93

**Summary**

**Aim**

The purpose of this study was to evaluate organizational costs associated with drug-involved employees (not considered here) and to examine safety records for trends indicative of the deterrent effect of the program.

**Design**

descriptive pre post

**Population**

Employees of UP&L Co 1983-1987. At writing, there were “currently” 5,424 employees.

**Measurements**

*Outcomes:* Reportable medical and first aid injuries, and lost time days. Other outcomes were vehicle accidents, medical expenditures, and absenteeism. Data was obtained from organizational records.

*Exposure:* Preemployment testing began in November of 1985. For cause testing began July 1986. Testing did not begin in earnest in the Mining Division until October 1986. Urine samples were drug tested.

*Potential Confounders:* none

**Results**

In 1986, 13 of 250 (5.2%) and in 1987 15 of 758 (2.0%) tests were positive (Table 4). Most of these were preemployment tests, followed by post accident testing (Table 3). The total number of reportable medical and first aid injuries increased from 1983 to a peak in 1985 and then decreased for two years (Figure 2). The number of time lost days increased dramatically in 1985 over 1983 and 1984, and remained elevated in 1986 and 1987 (Figure 3).

**Authors Conclusions**

It was felt that the lost time data did not truly reflect causative effects from the drug testing. Post accident suspension periods, while workers were awaiting test results, were counted as lost time. A record keeping mechanism change began in 1986. Two major accidents occurred in 1987 with inordinately high time loss. Medical and first aid reported injuries demonstrated a dramatic decrease from the 1985 peak through the last two years. These data should be interpreted cautiously when drawing a causal relationship between drug testing and the decreasing injury frequency because numerous external factors were not controlled for.

**Critique**

**Bias**

Within-group exposure to the intervention or to injury risk was unlikely to have been homogenous. For example, accident uninvolved incumbent employees would not have been subject to pre employment or post accident testing.
Measurement

Outcomes: Injuries and accidents were not defined, and so were broad categories. The use of organizational records likely underestimated injury occurrence, particularly for less severe injuries.

Confounding

Information Adequacy

There was no description of the study group as a whole. A bar chart would have been more appropriate for Figure 2. Rates for injuries and time lost data were not presented. Statistical testing was not done.

Reviewers Conclusions

The study was inconclusive.

Implications

Random fluctuation cannot be excluded as the source of the wide swings in injury counts. There was no comparison group. The use of alcohol, therapeutic drugs, and other injury risk factors were not considered.

Generalizability was limited as two worksites from one company were studied.
Injuries at a metal foundry as a function of job classification, length of employment, and drug screening


Summary

Aim

The hypothesis of interest here was that implementation of drug screening as part of the hiring process reduced the frequency of accidents overall, and particularly the number of accidents involving alcohol and drugs.

Design

single-group time-series

Population

The study group consisted of all 599 men and 11 women employed between 1980 and 1995 at a foundry. It was noted that most jobs and workstations were unchanged over the study period.

Measurements

Outcome: Total accidents per month. Data was obtained from company records.

Exposure: Pre-employment and post-accident drug testing.

Potential Confounders: none

Results

The most common injuries were eye injuries followed by strains, pulls, and tears. Of the 846 accidents, 211 were OSHA recordable and 635 were not. Of the former, 200 were reported as lost time injuries, and 11 as restricted duty.

The intervention was introduced at month 169 of the 192 studied. Multiple regression and auto regressive integrated moving average (ARIMA) models tested for a significant intervention effect but none was found.

Authors Conclusions

Three possibilities were suggested to account for the results: the foundry may not have had a drug related problem; the prevalence of drug or alcohol use may have decreased as a consequence of other safety-related interventions; or the intervention was ineffective.

Critique

Bias

Within group exposure to the intervention or to injury risks was unlikely to be homogenous.

Measurement

Outcome: Organizational records likely underreported injuries, particularly if minor, despite assertions to the contrary.

Confounding
The instability or variability in injuries may have reduced the power of the analysis. Individual-level confounders are not a problem in a time-series analysis.

**Information Adequacy**

The foundry location was not provided. There was no indication of what substances were tested. There were no numeric details provided of the statistical analyses.

**Reviewers Conclusions**

The study was inconsistent with a significant intervention effect.

**Implications**

Generalizability was limited as one worksite was studied.
Effects of drug-testing programme on employee attitudes, productivity, and attendance behaviors


Summary

Aim

This study discussed a longitudinal and experimental field study that examined the effects of drug testing programmes on employee attitudes, productivity and attendance behaviors.

Design

single-group pre-post design with a time series

Population

The study group comprised all 958 workers from a unionized assembly plant in the rural mid-western US.

Measurements

Data was obtained from organizational records. The survey data was not considered.

Outcome: Number (not rate) of drug-related injury cases in a specified time. Other outcomes were not considered.

Exposure: The drug-testing program included both current employees and job applicants. Immunoassay urine screening was followed by a confirmatory test.

Potential Confounders: none

Results

Data was initially presented as a time series of number of injuries per six month period: -18 months 24 cases; -12 months 22 cases; -6 months 17 cases, 6 months 14 cases; 12 months 13 cases; 18 months 12 cases; 24 months 13 cases. This presentation of the data was not statistically analyzed.

A t-test was done on the mean of 12 months pre- and 24 months post-intervention, and a significant difference was found (P<0.01).

Authors Conclusions

The results presented here provide at best, circumspect support for the claims of drug-testing proponents that the programmes can reduce … accidents, (and) drug-related injury… .

Critique

Bias

Within-group exposure to the intervention or to injury risk was unlikely to have been homogenous.

Measurement

Group exposures and group rate outcomes were used.

Outcome: Drug-related injury was not defined, and was likely underestimated. Injury rates were not calculated.
Exposure: The basis (pre employment, scheduled, random, for cause, post accident) of employee testing was not described. What was tested for was unspecified.

Confounding

Information Adequacy

There was no indication of workforce size changes. There was no study group description. The intervention was less than fully described.

Reviewers Conclusions

Evidence was presented that was consistent with a significant difference in numbers of injuries between the pre and post periods.

Implications

The observed difference was viewed with skepticism as numbers, not rates, were compared.

Without a comparison group, baseline comparisons of injury cases and the prevalence of illicit drug use or other injury risk factors could not be done. There was no comparison done of the prevalence of illicit drug use or other injury risk factors between pre and post periods. Testing was introduced as part of an overall effort to improve a number of problems. It was difficult to conclude that the observed change, if real, was due the intervention and not to other factors.

The generalizability of this study was limited as one company was studied.
Drug testing as a strategy to reduce occupational accidents: a longitudinal analysis


Summary

Aim

The relationship between drug testing and OSHA recordable accident and illness rates was examined.

Design

time series

Population

Wisconsin businesses enrolled in Workers’ Compensation with 100 or more workers were surveyed. A total of 48 responses were received. Twelve of these companies used pre-employment drug testing. Of these, in addition, three used post-accident testing, three used reasonable cause, and one used both. A subset of the initial population, the twelve companies that used drug testing, was used for the second analysis. Drug testing was implemented between 1985-1987.

Measurements

Companies reported measurements in response to a survey. Company (group) rates were used.

Outcome: Annual change in the facility Occupational Safety and Health Administration (OSHA) recordable accident and illness rates.

Exposures Analysis 1: Pre-employment with or without post-accident and/or reasonable cause drug testing.

Exposures Analysis 2: Post-accident and/or reasonable cause drug testing.

Confounders Analysis 1: Were non-manufacturing facility, large company size (500 or more employees) and presence of unionization. An included endogenous variable was the change in the OSHA rate between 1984-1988.

Confounders Analysis 2: Large company size, unionization, and the annual change in the Industry OSHA rate.

Results

The first analysis compared annual OSHA rate changes between companies that do and do not use a form of drug testing. Drug testing was not correlated with changes in OSHA rates by ordinary least squares.

The second analysis examined annual facility OSHA rate changes over a four-year period as a function of post-accident and reasonable cause testing. A generalized least squares model indicated that post-accident testing had a significant negative impact on the change in the facility OSHA rate (P<0.01). Reasonable cause drug testing did not achieve significance.

Authors Conclusions

The efficacy of pre-employment testing as a strategy for reducing occupational injuries was called into serious question. Evidence was presented that supports implementing post-accident drug testing as a strategy to reduce occupational injuries. The subjective nature of reasonable cause testing may be the reason that it did not reduce facility OSHA rates.
Critique

Bias

The intervention group was self-selected. Within-group exposure to the intervention or to injury risk was unlikely to have been homogenous.

Measurement

Companies reported measurements. Company (group) rates were used.

Outcome: Illnesses were included with injuries. Injuries were not subdivided by cause or type. These factors would tend to reduce the strength of any association.

Exposures: There was no indication of what substances were tested. The first analysis equated different forms of drugs testing.

Confounding

Information Adequacy

The number of companies surveyed and when they were surveyed was not provided. There was some ambiguity in the time frames, particularly for the second analysis. Actual rates or changes in rates were not provided.

Reviewers Conclusions

Some evidence was presented consistent with an association between a decrease in the annual facility OHSA rate and post accident drug testing.

Implications

What was found was an association between those companies that self-selected to use post accident drug testing and a decrease in the OHSA rate. There was no adjustment for confounding due to the prevalence of il/licit drug or alcohol use or other injury risk factors making interpretation of the association difficult.

Generalizability was limited due to the relatively small, unique group of companies studied.
Evaluation of drug testing in the workplace: Study of the construction industry


Summary

Aim

The study investigated the efficacy of workplace drug-testing programs in reducing injury incident rates and workers’ compensation experience–rating modification factors within the construction industry.

Design

single-group pre-post design

Population

A random sample of 405 companies was taken from the Associated General Contractors US national membership directory. A total of 69 eligible responses were received, for a response rate of 17%. Of these 69, 49 (71%) had a drug-testing program. Drug-testing implementation occurred between 1985 and 1999. Larger companies and companies that drug-tested were likely overrepresented compared to the total construction firm population.

Measurements

Companies responded to a faxed a four page questionnaire.

Outcomes: OHSA incident rates were the total recordable occupational injuries and illnesses per 100 full-time workers (or 200,000 work-hours). Experience ratings and perception-based outcomes were not evaluated.

Exposure: The presence of company drug testing.

Potential Confounders: Union status, company size, and recent significant company growth.

Results

Injury incidence rates were: 8.79 per 100 work-years two years prior to testing implementation; 8.66 one year prior; 4.61 one year after; and 5.06 injury incidents two years after drug testing. This presentation of the data was not statistically analyzed.

Instead, overall means for the pre and post intervention periods were calculated. The incidence rate went from 8.92 to 4.36 injuries per 200,000 work-hours within two years of implementation of drug testing. The duration of the pre-post periods was not described. A paired t-test was done to see if company injury incident rates decreased significantly following the introduction of a drug-testing program, and P was found to be < 0.0001.

Authors Conclusions

Policy implications were discussed.

Critique

Bias

The intervention group was self selected. Within-group exposure to the intervention(s) or to injury risk was unlikely to have been homogenous.
**Measurement**

A company representative reported measurements. Group exposures and group rate outcomes were used.

*Outcomes:* The incident definition included illnesses with injuries, and so was broad.

*Exposure:* The many variations of testing programs were treated equally.

**Confounding**

A description of stratification by union status, company size and recent significant growth was given in the Results, but no data was presented.

**Analysis**

There was no adjustment for the downward industry secular trend in incident rates over the study period. As stated, the null hypothesis of the single group pre-post comparison required a one-tailed paired $t$-test.

**Information Adequacy**

What percent of AGC listed companies were sampled was not provided. When the questionnaires were completed was not reported. Reporting of confidence intervals was assiduously avoided.

**Reviewers Conclusions**

A significant difference between injury incident rates was found in a single group pre-post comparison.

Without a comparison group, baseline comparisons of injury rates and the prevalence of illicit drug use or other injury risk factors could not be done. There was no comparison done of the prevalence of illicit drug use or other injury risk factors between pre and post periods. It was difficult to conclude that the change was due the intervention and not to other factors.

Generalizability beyond the study group was limited. The generalizability to AGC directory-listed firms could not be assessed. The study group was unlikely to represent the total construction firm population.
Impact of an alcohol misuse intervention for health care workers – 2: employee assistance programme utilization, on the job injuries, job loss, and health services utilization

Lapham S et al 2003 Alcohol and Alcoholism 38(2): 183-8

Summary

Aim

The effects of an enhanced substance misuse prevention / early intervention programme among health care professionals employed in a managed care organization were evaluated.

Design

A non-random pre-post design with a non-equivalent comparison group was used.

Population

The study group consisted of employees of a managed care organization (MCO) in the southwestern US from July 1996 to June 2000. The intervention group included workers at an acute care hospital with specialty clinics, a primary care clinic, and administrative offices. A total of 3,442 persons were employed from January 1997 to June 2000. The comparison group consisted of 2,032 employees who worked at satellite primary care, specialty care clinics, and administrative offices in the metropolitan and outlying regions during the study.

Measurements

Information was obtained from anonymously linked HR, Employee Health, Patient, and EAP provider databases.

Outcome: Injuries were limited to accidental injuries. Other outcomes were occupational injuries, EAP referrals, health care utilization, and job termination. The mean number of events per person month was calculated separately before and after programme implementation in September 1998.

Exposure: The Workplace Initiative in Substance Education (Project WISE) complemented existing substance misuse prevention and intervention services. New added elements included substance misuse awareness training for management staff, mailed substance misuse prevention information to those completing a HRA, brief motivational counseling for employees and family members, and a campaign to designed to increase employee awareness of substance misuse as a health problem.

Potential Confounders: Job class, gender and age.

Results

After controlling for potential confounding by gender, age classification, and job classification in multivariate analysis by GEE, there were no significant differences in occupational injury rates independent of time between the intervention and comparison groups (OR 1.05).

Employees working in the post-intervention period had a significantly increased risk of occupational injury than those employed in the pre-intervention time period, independent of work site (OR 1.73, P < 0.01). No significant site by time period interaction was noted.

Authors Conclusions

The implementation of Project Wise was not associated with changes to injury rates.

Critique
Bias

Population

Pre-intervention outcomes were unequal. Within-group intervention exposure may not have been homogenous.

Measurement

Outcomes: Data from two of the databases were not available throughout the study period. The validity of some of the outcome measures was not established.

Confounding

An upward injury rate secular trend was noted.

Information Adequacy

There was no explanation for the use of a non-parametric method to do univariate comparisons, and a parametric procedure for multivariate comparisons. There were numerous discrepancies between gender and age OR data presented in Tables 3 and 4 and its description in the Results section. Confidence intervals were not presented in Tables 3 and 4.

Reviewers Conclusions

The study was not consistent with an intervention effect.

Implications

The power of the analysis may have been limited by the preexisting prevention and intervention services. Baseline comparisons of the prevalence of illicit drug use or other injury risk factors between the intervention and comparison group were not done. There was no comparison done of the prevalence of illicit drug use or other injury risk factors between pre and post periods. It would have been difficult to conclude that any observed change was due the intervention and not to other factors.

The use of a study population from one organization limited generalization.

Less problematic research designs need to be considered for intervention studies in this area.
An evaluation of preemployment drug testing


Summary

Aim

To estimate the relationship between preemployment drug test results and injury, accidents, absenteeism, and turnover. A utility analysis was done to evaluate the practical significance of preemployment drug testing but was not considered here.

Design

cohort study

Population

All applicants for permanent US Postal Service positions from 21 selected sites between September 14, 1987 to May 27, 1988 were drug tested. Of 5,465 applicants, 4,396 were eventually hired and made up the study group. The average job tenure was 1.3 years.

Measurements

Outcomes: Injuries and accidents. These were categorized as single or multiple. Other outcomes were absenteeism and turnover. Data was obtained from organizational records.

Exposure: The results of drug screening were categorized as negative, overall test positive (any drug), marijuana positive, cocaine positive (± marijuana metabolites), and other or multiple drug positive. Legitimate use of therapeutic drugs did not contribute to a positive result. Some study sites informed job applicants two to five days in advance of drug testing. All relevant parties were blind to exposure status. Positive initial immunoassay urine screens were confirmed by gas chromatography / mass spectroscopy.

Potential Confounders: Occupational group, race, gender and age.

Results

Of qualified applicants, 19% who were drug negative were disqualified compared to 27% of those drug positive. Men, Blacks, and 25-35 year-olds were more likely to test positive. No significant relationships were found between drug test results and injuries or accidents. When job category was adjusted for in logistic regression analyses similar results were obtained. This remained the case when accidents were broken down by type, cause, or severity.

Authors Conclusions

Applicants who tested positive for illicit drugs exhibited, through their criminal, medical or work histories, certain deviant lifestyle characteristics that quite likely served to disqualify them at a higher rate than those testing negative. It was suggested that the low injury and accident rates and the relatively short duration of follow up contributed to the lack of statistical power to detect any true differences.

Critique

Bias

The foreknowledge of testing at some sites likely resulted in some misclassification.
Measurement

Outcomes: The use of organizational records likely underestimated injury and accident occurrence. Injuries and accidents were apparently not defined.

Exposure: Exposure classification occurred after a single test, and this occurred in a different time period than outcome classification. Both these factors may have resulted in misclassification. There was no measurement of dose or usage pattern. This meant that the negative group consisted of abstainers, casual users, and currently abstinent abusers. The positive groups consisted casual users and abusers.

Confounding

Information Adequacy

The disposition of applicants with clinical histories of substance use, abuse or dependence was not provided. Numeric data for the association between testing and injuries and accidents was not presented.

Reviewers Conclusions

The findings were not consistent with an association between preemployment drug testing and injuries or accidents.

Implications

Potential confounding due to consumption of alcohol and therapeutic drugs and potential selection bias complicated the interpretation of the results. Separate analyses of injuries by type, cause or severity were not done, as was the case for accidents.

Direct generalizability beyond the selected US Postal Service sites may be limited by differing organizational processes / requirements and regional differences.
Relationships between urinalysis testing for substance use, medical expenditures, and the occurrence of injuries at a large manufacturing firm


Summary

Aim

The focus of this article was the effect of drug testing frequency on accident rates and health care costs in a manufacturing company.

Design

The impact of testing frequency on injury was fitted to a multiple linear regression model.

Population

The study group comprised all 1,791 employees at 15 sites of a US based manufacturing company during the period 1996-1999. Employees at three smaller sites were excluded because they were not subject to drug testing, and at one site the covering HMO could not produce person-level data.

Measurements

Data was obtained from medical claim and personnel files. All employees were enrolled in company sponsored health plans.

Outcome: Monthly injury rates. Other outcomes were total and substance related medical expenditures.

Exposure: Quarterly random drug testing rates. Urine specimens were tested for marijuana, amphetamines, cocaine, phencyclidine, and opiates. These were done in the context of an established drug-free workplace program that was in effect throughout the study period. Positive tests without legal explanation resulted in discharge.

Potential Confounders: Job type (machine operators or labourers/handlers vs all others), health status (number of unique major diagnostic categories), age, and gender.

Results

The monthly injury rate per employee was about 0.6% during the study period. The P value for the association between drug testing and injury rates was found to be 0.0532. This was described as marginally significant. If drug testing rate was doubled the probability of injury would decrease by about 0.01% per month.

Authors Conclusions

The results above were reiterated.

Critique

Bias

Measurement

Outcome: Injury was not defined, and hence was broad. The use of medical claims records likely underestimated injury rates, particularly of less serious injuries.
Potential Confounders: The validity of the severity of illness indicator was not established.

Confounding Analysis

The writer was unable to assess whether a different model would have been more appropriate.

Information Adequacy

The rationale for assuming a linear relationship between drug testing and injury rates was not well described.

Reviewers Conclusions

Random testing frequency was not quite significantly related to injury rate in this study group.

Implications

A larger study population may have provided enough power to achieve significance.

There was limited generalization beyond the study group due to its relative uniqueness.
Results of the drug testing program at Southern Pacific Railroad

Taggart HW 1989 NIDA Research Monograph 91: 97-108

Summary

Aim

To describe the company’s implementation of a drug testing program.

Design

descriptive pre post

Population


Measurements

Outcomes: Injury counts and rates per 200,000 work-hours were obtained from company records.

Exposure: Testing began August 1984 in one of three departments and was implemented in the remaining two departments by the end of 1985. Preemployment, post accident and for cause testing was done. Alcohol was among the substances tested for. Urine samples were screened by immunoassay, and positive tests were confirmed by gas chromatography / mass spectroscopy, and in later cases also by high performance liquid chromatography.

Potential Confounders: none

Results

From implementation in 1984 to 1987, the annual number of tests increased. A decline in the annual percentage of positive tests was seen overall and for each department (Figure 1). In 1984, 85 of 370 (22.9%) of drug tests were positive and in 1987, 129 of 2,372 (5.4%).

A gradual decline in the company’s injury rate occurred over this period (Figure 5). In 1983, the injury rate was 15.5 per 200,000 work hours and for the first half of 1988 was 5.8.

Authors Conclusions

We now have sufficient statistical data from which we can convincingly show in a court room that: Drug testing does make the workplace safer…by substantially reducing…injuries.

Critique

Bias

Within-group exposure to the intervention or to injury risk was unlikely to have been homogenous. For example, accident uninvolved incumbent employees would not have been subject to pre employment or post accident testing.

Measurement

Outcomes: Injury was not defined, and so was a broad category. The use of organizational records likely underestimated injury occurrence, particularly for less severe injuries.
Confounding

Information Adequacy

A study group description was not provided. A table of testing results broken down by year, department and type of test would have improved clarity. A bar chart would have been more appropriate for Figure 5. Injury rates for 1984-1987 were not presented. Statistical testing was not done.

Reviewers Conclusions

The study was inconclusive.

Implications

An independent secular trend or chance cannot be excluded as the source of the injury rate trend. There was no group that did not receive the intervention to compare to. The use of therapeutic drugs and other injury risk factors were not considered.

Generalizability was limited as one company was studied.
Do drug-free workplace programs prevent occupational injuries? Evidence from Washington State

Wickizer TM et al 2004 Health Services Research 39(1): 91-110

Summary

Aim

To evaluate the effect of a publicly sponsored drug-free workplace program on reducing risk of occupational injuries.

Design

A non-random pre-post design with a non-equivalent comparison group was used.

Population

Companies that remained insured with the state workers’ compensation plan from January 1994 through December 1999 were selected. The intervention cohort consisted of 261 companies that enrolled in the Washington Drug-Free Workplace Program (WDFWP) between July and December 1996. The comparison cohort consisted of all (20,215) non-WDFWP companies. One-third Of Washington State’s non-federal workforce was not insured by workers’ compensation.

Measurements

Injury data was taken from all workers’ compensation injury claims submitted from January 1994 through October 2000. This was linked to data on hours worked per quarter for each company from the same period. Companies were arranged into nine sector categories and overall injury incidence rates and rates of time loss injuries involving four or more days were calculated. The intervention period began October 1996 and extended for 36 months. The pre-intervention period preceded this by 33 months, beginning January 1994.

Outcome: The primary measure of program effect was the change in the rate difference (intervention cohort injury rate minus comparison cohort injury rate) between the pre-intervention and intervention periods. The authors felt that by examining injury rate differences over time the general downward trend of occupational injuries that occurred in the US during the time period in question was taken into account.

Exposures: In order to participate in the WDFWP, employers had to develop a written substance abuse policy outlining prohibitions and sanctions, and require pre-employment, post-accident, and post-treatment drug testing (random drug testing was optional). Employees who violated policy could not be terminated if they agreed to confidential treatment through approved EAPs, were compliant with follow-up care, and had no subsequent violations. All employees had to receive annual education on substance abuse. Participating companies received a 5% discount from their workers’ compensation premiums for three years.

Potential Confounders: Were considered only in the ARIMA models, which adjusted for a secular trend, seasonal effects, random effects, and an autoregressive component.

Results

The reported injury rates of three intervention sector categories were not meaningful because of the limited number of person-years used to calculate them. These three industry groups (finance, mining, and agriculture, forestry, and fishing) were included in the analysis for the sake of completeness. Intervention companies were larger than comparison companies (57 vs 33 FTE workers, P< 0.01).

The overall injury rate difference indicated that the construction, manufacturing, and services industry groups showed statistically significant (p<0.05) decreases between pre-intervention and intervention time periods (Table
The overall injury rate difference across all industry groups declined from 12.13 to 8.80 injuries per 100 person-years (p<0.05). As intervention construction and service companies were larger than comparison companies, the analysis was repeated with companies stratified by size. There were no meaningful changes in parameter estimates or statistical tests.

Time loss injury rate differences were significant (p<0.05) in the construction and services industries (Table 3). Across all industry groups, the time loss rate change declined from 2.63 to 1.71 injuries per 100 person-years (p<0.05).

Autoregressive, integrated moving average (ARIMA) models were tested for the industry groups that had statistically significant changes in injury rate differences by confidence interval analysis. Models for construction, manufacturing, and services industries indicated that the intervention was associated with a significant change (p<0.05) in the quarterly injury rate difference after adjusting for an autoregressive component, random effects, seasonal effects, and a secular trend.

Authors Conclusions

The authors felt that the study indicated that the intervention was associated with a selective, industry-specific preventive effect.

For construction, manufacturing, and services industries, the net reduction in (all) injury rates was both meaningful and statistically significant.

The strongest evidence of an intervention effect may come from the construction industry (Figure 1).

A significant preventive effect for lost work time injuries was documented for construction and services.

That an intervention effect was found in some industries but not in others suggested that a general self-selection bias was unlikely.

Critique

Bias

The intervention group was self-selected, with 1.3% of eligible companies taking up the program. Five of the six sector categories had higher pre-intervention injury rates for intervention companies than comparison firms (construction was the exception). The comparison group differed in size and in distribution of companies across industry groups. Within-group exposure to the intervention or to injury risk was unlikely to have been homogenous.

Measurement

Group exposures and group rate outcomes were used. Counting all workers’ compensation injury claims as injuries may have obscured an intervention effect (or lack thereof) for particular injury types.

Confounding

Factors other than the intervention (workforce changes, changes to intervention protocols, other safety measures, reporting procedures, etc) could have influenced the outcome over the duration of the study.

Information Adequacy

The State’s self-insured non-federal workforce was not described. Numeric data on the ARIMA analysis was not presented.
**Reviewers Conclusions**

Evidence was presented of industry-specific significant differences in workers’ compensation injury claim rates between the pre and post time periods. This was most apparent in the construction industry.

**Implications**

Baseline comparisons of the prevalence of illicit drug use or other injury risk factors between the intervention and comparison group were not done. There was no comparison done of the prevalence of illicit drug use or other injury risk factors between pre and post periods. It was difficult to conclude that the observed change was due the intervention and not to other factors.

Less problematic research designs that establish individual protection need to be considered for intervention studies in this area.

Other jurisdictions in industrialized countries may want to consider this issue.
### Consistent with an intervention effect:

<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention Components</th>
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<tbody>
<tr>
<td>Wickizer et al 2004</td>
<td>(PE, PA, ±R, PT) E T</td>
</tr>
<tr>
<td>Ozminkowski et al 2003</td>
<td>PE, PA, FC, (R) incentive, T</td>
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<td>Feinhauer and Havlovic 1993 subgroup analysis</td>
<td>PE, (PA, FC)</td>
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<tr>
<td>Gerber and Yacoubian 2001</td>
<td>(Mixed)</td>
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<tr>
<td>Ryan et al 1992</td>
<td>(PE)</td>
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<tr>
<td>Zwerling et al 1990</td>
<td>(PE)</td>
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<tr>
<td>Elmuti 1993</td>
<td>(PE and ?)</td>
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### Not consistent with an intervention effect:

<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention Components</th>
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<tbody>
<tr>
<td>Lapham et al 2003</td>
<td>(E), T</td>
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</table>

### Inconclusive:


**Intervention component abbreviations:**

- **FC** for cause drug testing
- **PE** pre-employment testing
- **R** random testing
- **E** Education
- **PA** post accident testing
- **PT** post treatment testing
- **S** scheduled testing
- **T** treatment

- Though preponderance of studies were consistent with an intervention effect, appears to be a scatter, good and bad studies on both sides.
- Prevalence of substance use usually not evaluated with intervention.
- Use of group-level (ecologic), pre-test post-test designs complicated interpretation.
- Comparison of Wickizer et al 2004 and Lapham et al 2003 suggested the question is drug testing alone the efficacious component.
- Ozminkowski et al 2003 doubling of testing rate decrease injury odds by 57%, probability decreases by 0.01% per month, from 0.60 to 0.59% per month.
- US Postal Service cohort studies

**Zwerling et al 1990 and Ryan et al 1992**
- Single large city (Boston)
- 2 year follow up, Cox proportional hazards

**Normand et al 1990**
- 21 sites, larger cohort (1.7x)
- 1.3 years follow up, logistic regression

- Potential confounders (though usually not considered): Industry, company size, recent growth, and unionization.