



The effect of alcohol and drug testing at the workplace on individual's occupational accident risk



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ABSTRACT

Programmes for testing Alcohol and Drugs (A&D) at the workplace, at random and by surprise, are believed to have a positive impact on safety and to reduce individual's accident risk. Despite this perception, there is limited scientific evidence and poor statistical support of this assumption. This study aims at testing whether there is such a cause-effect relationship between A&D testing and post-accident reduction, and how to quantify it. The methodology applied data-mining techniques together with classical statistics hypothesis testing. It covers a wide range of data concerning accidents, alcohol and drug tests, biographical and occupational records of a large railway transportation company in Portugal, for a period of 5½ years. Results give sound statistical evidence of individual's accident risk decrease after being tested, by quantifying the relations between A&D testing and post-testing accidents. Results also estimate the optimal testing frequency that balances testing costs and accident reduction. Optimum rates of tests per year per worker are in the ranges]0.5–1.0] in white-collars and professions at large, and]0.0–0.5] in operations/technical personnel. The fraction of accident victims that are prevented by the application of optimal frequencies are around 59% for workers onboard trains, 72% for those working near trains, and 85% for white-collars. Testing at the optimal frequency generates net savings of at least 15:1, in onboard personnel. In conclusion, testing for alcohol and drugs at workplace, at random and by surprise, has a statistically significant preventive effect in overall professions, but is stronger within white-collars.

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1. Introduction and scope

The abuse of alcohol and illicit drugs can affect performance of workers (Lancet editorial, 2009) and thus constitute an additional hazard, which increases health and safety risks in the workplace. The application of A&D testing practices, especially at random, might constitute a promising strategy to identify and discourage such unwanted behaviours. The compulsory testing of these so-called psychoactive substances is expected to play a deterrent role on the abuse behaviour – which is beneficial in many ways to the individual, the employer and the society at large. This

perception becomes even stronger in some specific activities, such as the transportation sector, including for instance, aviation (Li et al., 2005), maritime (O'Connor and O'Connor, 2006), or railways (UIC, 2008), in which the erroneous action of one worker can endanger the safety of thousands of persons.

The reason to embrace this study on the possible relationships between A&D testing programmes and the level of safety – measured through accident rates – is twofold: (1) it covers the workforce of a transportation company where the concern with occupational health and public safety is understandably very high and is a strategic goal and (2) the unique opportunity of having access to a comprehensive database that includes detailed information on A&D testing for all employees. This is a rare opportunity, since in various countries and many companies, A&D testing faces restrictions regarding data protection law and individual rights. However, in this particular case, the testing programme implemented has legal support, based on the recognition that the collective safety and health outweighs the individual rights to privacy

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(PCC, 1995; PP, 2009; PSCJ, 1998). Moreover, the company uses the programme not only to discourage abuses and unsafe behaviours, but also offers rehabilitation programmes to its employees, free of charge.

Improving health and safety in the workplace depends on many variables and circumstances (Lund and Aarø, 2004), thus it is difficult to demonstrate that A&D testing has indeed a preventive impact and that it may actually contribute to reduce accident rates. Even more difficult is to give statistical evidence capable of quantifying such association.

The main goal of this study is to provide sound evidence of the referred association and measure the differences in accident rates between tested and untested employees. Furthermore, the authors intend to establish the optimal frequency of testing, *i.e.*, the annual frequency of testing that is more effective in preventing accidents, as well as to provide a rough, but measurable, estimate on the return on investment.

The remaining sections of the paper provide a literature review on the subject and derived research hypotheses, followed by a summary of the methodology used and statistical approach applied. The final sections discuss the most relevant results and conclusions.

2. Literature review and derived research hypotheses

All psychoactive substances have, to a higher or lesser extent, a dysfunctional effect on work capability (Kauert, 2008; Schuckjt, 2009). A worker under the effect of a psychoactive substance becomes a hazard to him/herself and to others around. Even if the deviant behaviour is not readily visible or detectable, this person has a reduced ability to identify and control hazards – this incapacity suggests the need to address A&D abuse in the workplace (Baer and Hess, 2008).

The abuse of psychoactive substances is associated with many adverse consequences to health (Chipman et al., 2009; Degenhardt and Hall, 2012; Schuckjt, 2009) and consequently to safety at work, such as violence, accidents (Li and Bai, 2008), injuries (Trent, 1991) and absenteeism. An increasing number of countries and companies are coping with this risk (Strang et al., 2012) by the application of means of control, also in the scope of Occupational Safety and Health (OSH), such as screening for psychoactive substances in employees.

On the turn of the millennium, Kraus (2001) had carried out a systematic review of 740 publications dealing with the topics of testing for A&D in the workplace, of which only 6 presented some kind of quantification of the effect on accident rates, and all others were devoted to rather qualitative aspects, such as, philosophical, social, moral or legal arguments. Management issues and test protocols were also among the findings of these publications. After a deeper scrutiny of the 6 relevant studies, Kraus was unable to either accept or refute the hypothesis that A&D testing would lead to a reduction of accidents, because the studies reviewed suffered from several methodological shortfalls (*e.g.*: lack of a control group, or insufficient sample-size, or absence of inferential statistics). For the same reason, Kraus concluded that there was limited and biased evidence that random tests by surprise would have a stronger preventive affect, when compared with scheduled and announced tests.

To balance the lack of international standards concerning policy and practice of workplace A&D testing, the International Labour Organisation (ILO, 2003) made recommendations towards new research work aimed at evaluating «*the relationship between the consumption of alcohol and drugs and both the safety and productivity at work*» and it also suggested estimating the «*costs and benefits of screening for A&D*».

A few economic studies on the prevention of A&D abuse at work were conducted in US, with abundance of studied cases and advanced statistics (Livingston, 1975; Ozminkowski et al., 2003; Rummel et al., 2004; Wickizer et al., 2004; Miller et al., 2007; Mehay and Webb, 2007). These revealed the relevance of balancing the costs of preventing A&D abuse and the correspondent financial return on investment.

The research by Ozminkowski et al. (2003), concerning 1791 manufacturing workers, concluded that the relation between frequency of drug testing and injuries' medical expenses was statistically significant, and had a U-shape. These findings led the authors to conclude that medical expenses resulting from accidents can be minimised if workers are subjected to drug testing at an average annual frequency of 1.68 times per worker.

In the study by Wickizer et al. (2004), 14,500 employees of 261 companies with programs for drug prevention were compared to 650,000 employees in 20,000 companies with no such programs. A statistically significant association has been demonstrated, between drug prevention programs and lower rates of occupational accidents, on services, construction and manufacturing sectors. There were small unspecified net savings associated with these programs, more so in the construction industry.

The research performed by Miller et al. (2007), covering employees of a large USA carrier, showed a statistically significant association between the A&D abuse prevention program and lower rates of occupational accidents. It was also found a benefit-cost ratio of 26 \$US saved in accident reduction for each 1 \$US spent in the preventive program.

On the other hand, the study by Mehay and Webb (2007), about a zero tolerance policy applied on drug prevention programs of US Navy, concluded that net benefits were negative for most plausible values of the key parameters – the deterrence effect, replacement cost, and productivity losses due to drug use.

The literature tends to agree that the number of A&D abusers detected over time decreases with continued application of tests (Taggart, 1989; French et al., 2004; Miller et al., 2007; Wenzek and Ricordel, 2008). The deterrent effect of workplace testing is usually attributed to the inhibition resulting from individual's perception of being held liable in case their state of abuse is analytically confirmed by the tests.

However, the question of the deterrent effect being or not sustainable over time, has been subjected to controversy. A review made by Cashman et al. (2009) looked for relationships between A&D testing and the supposedly reduction of accident injuries, on professional drivers of motorised vehicles. The search produced some 6000 hits, but only 19 publications received further attention. Among these, only 2 complied with the criteria established for the study, in terms of data and quality. Both covered time series of test trials in the US. The conclusions highlighted some evidence of short-time effect, but were unable to demonstrate sustainability of prevention on the long-term and the respective authors argued for the need of more research.

Within the transportation sector, in particular, there is a large international agreement for the need to control and manage the risks of working under the effect of alcohol and/or drugs. Consequently, the OECD International Transport Forum (OECD, 2010) is considering a number of legal measures to this purpose. Likewise, the Health and Safety Group of the International Union of Railways (IUC, 2008) has deemed important to implement A&D testing programmes for railway transportation workers in all activities that interact with traffic safety. Such strategy had previously been recommended by the US National Institute of Drug Abuse (Gust and Walsh, 1989; Hanson, 1993; Zwerling, 1993).

In the USA, drug screening programmes are mandatory by Presidential order (The President, 1986) for all federal workplaces. According to Miller et al. (2007, p. 565), «*the program was*

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