EFFICACY OF DRUG TESTING PROGRAMS IMPLEMENTED BY CONTRACTORS

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ABSTRACT: The construction industry, like any other, suffers great losses from substance abuse by employees. These losses include increased accidents, reduced physical and mental productivity, and increased medical expenses. These expenses are a burden on everyone's shoulders, the guilty as well as the innocent. Drug testing, which includes job-applicant screening and testing of current employees, has generated much controversy, both technical and legal. The present study investigates the technical aspect of drug testing in the construction industry: Is it effective in reducing injury incident rates? Although incident rates for the whole sample dropped from 11.21 incidents per 200,000 man-hours to 9.07 after drug testing, a 19% reduction, the difference was not proven statistically significant. The sample was broken down by company size, type (union, nonunion, or both), incident rate before testing, and other criteria. Two groups showed significant decreases in incident rates after testing: Companies that did not have a recent significant size increase, and companies with an incident rate above the national average that started a testing policy. Size, type, and number of drug testing types were not proven as factors influencing the change in incident rate.

INTRODUCTION

Substance abuse in the workplace is a major problem in society, as well as industry, causing the loss of many lives and tens of billions of dollars every year. Construction is a high-risk industry, with an incident rate almost double the national average for all industries ("Accident" 1988). A recent study (Altayeb 1990) estimated that substance abuse cost American society more than $260 billion in 1990. Nearly 60% of the cost of substance abuse is attributed to lost employment and reduced productivity and 13% to health care costs and treatment ("Seventh" 1990). In the construction industry, a study by the University of Michigan (Maloney 1987) estimates that substance abuse is a problem for 10–15% of the nation's construction workers, costing that industry more than $10 billion. Losses in the employer as a result of substance abuse are not only those visible in the form of accidents, but also include lost productivity (both physical and mental), poor decision making, turnover, increased medical claims, absenteeism, actions creating criminal liability for the company, theft of company property, and others. Earlier studies, such as Hoffer (1986), found that the characteristics of a typical drug user

- Is late three times as often as other employees
- Requests early dismissal or times off 2.2 times more often
- Has 2.5 times as many absences of eight days or more
- Uses three times the normal level of sick benefits
- Is five times more likely to file a worker's compensation claim
- Is involved in accidents 3.6 times more often

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- Performs at 67% of his/her normal level of ability
- Is more likely to be involved in theft of company property

As substance abuse continues, the search for solutions widens. The use of drug testing in the workplace, as well as the technical and legal controversy on the subject, has been increasing over the past decade. The judiciary system in the United States is still trying to define the limits of an employer's right to test its employees or applicants versus the individual's right for privacy and protection against unreasonable searches. On the other hand, drug testing has neither been proven nor disproven to tangibly reduce accidents and costs after implementation.

Types of Drug Testing

Drug testing basically includes testing prospective and/or current employees. The first type is usually referred to as "preemployment testing" or "job-applicant screening," and is one of the most popular types of drug testing. Employers have more freedom dealing with people who are not yet their employees. Current-employee testing has many types, the most popular of which are testing for probable cause (or reasonable suspicion) and postaccident (investigation) testing. Other types are random testing, periodic testing (generally as part of an annual or semiannual checkup), testing for promotion or changing jobs, and testing after completion of a rehabilitation or probation period. The types of drug testing covered by this study are: (1) Preemployment testing; (2) random testing; (3) periodic testing; (4) testing for probable cause; and (5) postaccident testing.

Definitions

Incident rate—as defined by the Occupational Safety and Health Administration (OSHA)—is the total recordable occupational injuries and illnesses per 100 full-time workers (or 200,000 man-hours) per year. It generally reflects the safety record of an organization, but does not indicate the severity of the incidents. The national incident average for the construction industry was 15.2, 15.1, 14.7, and 14.6 incidents per year, for the years 1985 through 1988, respectively. (In this paper, for the sake of comparison, the national average was considered 15.0.)

Two new terms are used in this study: Change and relative change (RChange). Both measure the impact of drug testing on the incident rate over a period of two years. However, Change measures the effectiveness in absolute terms, while RChange measures it in relative terms. Both are measured over a period of two years, the year before and the year after the testing. For example, if the year of drug testing implementation for a firm was 1986, then incident rates were taken for 1985 and 1987. Incident rate for the year of implementation itself (e.g. 1986) was neglected. The two new variables are defined as

$$\text{Change} = \text{INRTB} - \text{INRTA} \quad \ldots\ldots (1)$$

$$\text{RChange} = \frac{\text{INRTB} - \text{INRTA}}{\text{INRTB}} \cdot 100\% \quad \ldots\ldots (2)$$

where INRTA = incident rate in the year after the implementation of drug testing; and INRTB = incident rate in the year before the implementation of drug testing.

Change was adopted as the main criterion in rejecting, or failing to reject, any hypothesis in this study. Change is positive if the incident rate drops after drug testing; and is negative, otherwise. It is measured using the same unit used for the incident rate. RChange was used as a secondary criterion for measuring the effect of drug testing on the incident rate of the studied sample, and is a dimensionless term.

Research Objectives

The primary objective of the research was to measure statistically the effect of drug testing on incident rates for a sample of construction companies. This was accomplished by evaluating the average Change after the implementation of drug testing in the sample.

The fundamental hypothesis was that incident rates decrease significantly in the year following the implementation of a drug testing policy. The null hypothesis was that the two variables INRTB and INRTA are equal (not significantly different), versus the alternative hypothesis that the two variables are not equal (significantly different). Mathematically speaking

$$H0: \mu = 0 \ (\mu = \text{Change} = \text{INRTB} - \text{INRTA}) \quad \ldots\ldots\ldots\ldots\ldots (3a)$$

against alternative

$$H1: \mu \neq 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3b)$$

The secondary objectives of the study were to study the correlations between Change and RChange, on the one hand, and the following factors on the other hand: (1) Size of the organization; (2) type (labor status) of the company, e.g. union, nonunion, or both (double-breasted); (3) incident rate before the implementation of the drug testing policy (INRTB); (4) total number of drug testing types implemented by each responding company; and (5) recent, significant size increase in responding companies.

Limitations and Assumptions

The term substance in this research included alcohol, illicit drugs, and unauthorized prescription drugs. Tobacco was not included. The research was conducted within the construction industry only and included a variety of company sizes, specialties, and organizational types, from a variety of geographic locations. A confidence level of 95% (5% significance level) was adopted as a criterion for acceptance or rejection of any hypothesis. Because the sample was not large enough to break down by category, all drug testing policies were treated equally, disregarding how many and which types of testing were implemented. In cases of a company implementing different drug testing types in different years, the first type implemented was considered the beginning of the policy implementation.

Sample

The data needed for the study were obtained through responses to survey questions. Because large companies are more likely to have drug-testing policies, the sample was biased deliberately toward large companies. However, it also included companies from all sizes, types, specialties, and geographic locations. The mailing list included all of *ENR* magazine's top 400 contractors, 384 companies from the Associated General Contractors (AGC)

directory, and 360 companies from the Associated Builders and Contractors (ABC) directory, totaling 1,144 companies. The names from the AGC and ABC directories were chosen systematically (i.e. every nth name), with any repetition omitted. A total of 203 companies responded, of which 61 had a type of drug testing policy at the time of the survey (May–June 1989). However, only 31 of the 61 responding companies had sufficient data, i.e. the incident rates for the years before and after the implementation of testing. These companies initiated drug testing between 1985 and 1988.

Caution must be exercised when estimating the percentage of construction companies that had drug testing policies. The percentage in the sample (61 out of 203, or 30%) is not representative, because the sample was biased towards large companies. The percentage was believed to have been lower than 30% at the time of the survey (summer 1989). One study, published by the US Department of Health and Human Services in 1988, stated that 15.3% of construction companies use drug testing ("Employee" 1988).

Effectiveness of Drug Testing

Overall Effectiveness

The incident rates were averaged for the 31 companies in the testing group (companies that tested that had sufficient data) for the year before implementing the policy (INRTB), the year of implementation, INRTD, and the year after the implementation (INRTA). All incident rates were calculated per 100 full-time employees, or 200,000 man-hours with the following results:

- Average incident rate, year before implementation (INRTB) = 11.2145
- Average incident rate, year of implementation (INRTD) = 10.5834
- Average incident rate, year after implementation (INRTA) = 9.0711

The average change in incident rate, between the year before and the year after (i.e. in a period of two years) was 2.1434, or 19.11%. For the fundamental hypothesis that the two variables INRTB and INRTA are equal, a t-test was conducted. It was found that $t = 1.66$ with probability $> |t| = 0.1075$, which meant that there was a probability $p = 10.75\%$ that the null hypothesis was true, i.e. the means were equal (not significantly different). At the 5% significance level, the null hypothesis was not rejected. Thus, it can be concluded that the incident rates before and after testing were not significantly different.

The incident rates averages did not represent a certain year, because companies in the sample started testing between 1985 and 1988. However, for the sake of comparison, the incident rates for the group of responding companies that did not use drug testing averaged 9.54 in 1985, 10.82 in 1986, 10.65 in 1987, and 9.63 in 1988. The testing group averaged 8.11 in 1986, 10.00 in 1987, and 11.69 in 1988. There were no sufficient data for 1985. These numbers may be misleading. This group (i.e. the testing group) was not the same group every year. Every year there were newcomers to the group. Most of those newcomers had relatively high incident rates, probably why they started testing.

According to the US Department of Labor, Bureau of Labor Statistics in Washington, D.C., the national average for incident rates in the construction industry dropped from 15.20 in 1985 to 14.60 in 1988, an average

annual decrease of 0.20. For two years, therefore, the average decrease would be 0.4, or 2.6%. On the other hand, the incident rate for the no-testing group in the sample had increased over the same period of time (1985–88) by an annual average of 0.32, an average of 0.64, or 7.3% for two years.

Effectiveness by Group

As believed by the writer, the effect of drug testing on an individual company is generally influenced, positively or negatively, by the company's own characteristics and conditions such as size, type, and other factors. By sorting the sample several times according to each factor, more accurate observations were reached in regard to the correlation between the factor considered and the variable Change. Five of these factors were covered in this study: Company size; company type; incident rate; drug testing type; and company growth.

For simplicity of responding as well as computations, six size groups were given—up to 99; 100–249; 250–499; 500–999; 1,000–2,500; and over 2,500 employees, for size groups 1–6, respectively. Although the questionnaire did not differentiate between hourly and salary or field and office employees, many companies stated that they tested hourly field workers. Because of the relatively small number in each group, companies were regrouped into three new groups: 1&2, 3&4, and 5&6.

Type of the company was considered, i.e. union, nonunion, or both (U, N, or B in Table 1). Companies were also divided into four groups according to their incident rates for the year before drug testing implementation. Groups 1–4 included companies with up to 5; 5–10; 10–15; and over 15 incidents per 100 full-time workers per year, respectively.

As well, the number of drug testing types in the company's policy was examined. The number of testing situations ranged from 1 to 5. Finally, recent significant size increase in the company, whether through a merger with another company or growth, was studied.

Two procedures were used, a t-test and the analysis of the variance (ANOVA). The t-test was used to reject or accept the equality of Change within the groups (size group, type group, etc.). The ANOVA procedure was used to find the F-value between the dependent variable (size, type, etc.) and the independent variable, Change, and then to determine the P-value (the probability of independence between the two variables). Results were summarized for the 31 respondents with complete data, and arranged in a descending order with respect to Change. Table 1 displays this summary.

When the correlation between size and Change was studied, it was found that even though small companies (groups 1 and 2) had smaller Change than larger companies (groups 3 and 4, or groups 5 and 6), INRTB and INRTA were not proven significantly different for any size group. In an ANOVA procedure, it was found that the F-value = 0.56, with a probability of independence P = 73%. That does not indicate any correlation between size and Change. When doing the t-test and the ANOVA, the size groups remained as the six groups defined earlier. When labor type of the company was considered, it was found that nonunion companies achieved that biggest Change, but again, INRTB and INRTA were not proven significantly different for any type group. In an ANOVA, the F- and P-values were 0.43 and 66%, respectively. This again does not indicate any correlation between type and Change. Tables 2 and 3 show the results summary.

Incident rate before testing (INRTB) was then studied for its correlation

TABLE 1. Companies Rates by Change with Their Other Criteria

Rank (1)	INRTB (2)	INRTA (3)	Change (%) (4)	RChange (%) (5)	Size (6)	Type[a] (7)	Test Types 1[b] (8)	2[c] (9)	3[d] (10)	4[e] (11)	5[f] (12)	Size increase (13)
1	35.27	13.78	21.49	60.93	5	N	x	—	—	x	x	No
2	18.86	0.57	18.29	96.97	2	B	x	x	—	x	x	No
3	43.38	25.80	17.58	40.53	3	N	—	—	—	x	x	No
4	22.2	13.00	9.20	41.44	5	U	—	—	—	x	x	No
5	14.00	7.60	6.40	45.71	4	N	x	x	—	x	x	No
6	23.98	18.13	5.85	24.40	4	B	—	—	—	—	x	No
7	10.39	6.13	4.26	41.00	3	N	x	—	—	x	x	No
8	11.00	6.80	4.20	38.13	6	U	—	—	—	x	x	No
9	10.85	7.23	3.62	33.36	6	N	x	x	—	—	x	No
10	7.50	4.25	3.25	43.33	4	U	x	—	—	x	x	Yes
11	16.40	13.40	3.00	18.29	2	B	x	—	—	x	x	No
12	9.80	7.20	2.60	26.53	6	B	x	—	—	x	x	No
13	3.38	1.04	2.34	69.23	2	B	x	—	—	—	—	No
14	7.46	6.02	1.44	19.30	2	N	x	x	x	x	x	No
15	10.90	9.94	0.96	8.81	6	N	—	—	x	x	—	No
16	2.50	1.60	0.90	36.00	4	N	—	—	—	x	—	No
17	3.23	2.42	0.81	25.08	6	N	x	—	—	x	x	No
18	5.60	4.80	0.80	14.29	6	N	x	x	—	x	x	Yes
19	15.40	14.60	0.80	5.19	5	U	—	—	—	x	x	No
20	8.08	7.87	0.21	2.60	2	U	x	—	—	—	—	No
21	0.71	0.63	0.08	11.27	3	N	x	—	—	—	—	No
22	0.00	0.00	0.00	—	1	not given	x	—	—	—	—	No
23	10.47	11.10	−0.63	−6.02	4	B	x	—	x	—	—	No

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24	2.00	2.70	−0.70	−35.00	6	B	x	x	—	x	—	No
25	4.70	5.50	−0.80	−17.02	6	N	—	—	—	x	x	Yes
26	3.50	5.00	−1.50	−42.86	6	B	x	—	—	x	—	Yes
27	0.00	3.33	−3.33	—	2	N	x	—	—	—	—	Yes
28	12.31	16.66	−4.35	−35.34	2	N	—	x	—	x	x	Yes
29	7.91	16.93	−9.02	−114.03	2	B	—	x	—	x	x	No
30	13.00	23.10	−10.10	−77.69	5	B	x	—	—	x	x	Yes
31	12.87	24.07	−11.20	−87.02	4	U	—	—	—	x	x	No

[a]N = nonunion; U = union; B = both.
[b]Preemployment testing.
[c]Random testing.
[d]Periodic testing.
[e]Testing for probable cause.
[f]Postaccident testing.

TABLE 2. Summary Results by Group Size

Variable (1)	Group Size 1 & 2 (2)	3 & 4 (3)	5 & 6 (4)
Number of companies	9	9	13
INRTB	8.267	13.978	11.342
INRTA	7.314	11.034	8.928
Change	0.953	2.943	2.414
RChange	11.5%	21.1%	21.3%
t (H0: Change = 0)	0.38	1.16	1.21
Probability > $\|t\|$	0.71	0.28	0.25

TABLE 3. Summary Results by Type Group

Variable (1)	Type of Group Union (2)	Nonunion (3)	Both (4)
Number of companies	6	14	10
INRTB	12.842	11.521	10.930
INRTA	11.765	7.960	9.917
Change	1.077	3.561	1.013
RChange	8.4%	30.9%	9.3%
t (H0: Change = 0)	0.39	1.81	0.40
Probability > $\|t\|$	0.71	0.09	0.70

TABLE 4. Change in Incident Rates by Incident Rate Group

Variable (1)	Incident Rate Group Group 1 (2)	Group 2 (3)	Group 3 (4)	Group 4 (5)
INRTB	<5	5–10	10–15	>15
Number of companies	9	6	10	7
INRTB	2.224	7.725	11.754	25.070
INRTA	2.469	7.845	12.514	14.183
Change	−0.245	−0.120	−0.760	10.887
RChange	−11.0%	−1.6%	−6.5%	43.4%
t (H0: Change = 0)	−0.45	−0.07	−0.35	3.51
Probability > $\|t\|$	0.66	0.95	0.73	0.01

with Change (Table 4). As mentioned earlier, respondents were divided into four incident rate groups. A t-test was done on each group yielding the results shown in Table 4. Groups 1, 2, and 3 with incident rates below the national average, showed a negative yet small Change, i.e. incident rates increased. On the other hand, the fourth group, with an incident rate greater than national average, had a 10.89, or 43.4%, decrease. This decrease was statistically significant. In an ANOVA procedure, the F-value between INRTB and Change was found to be 24.23 with a probability of independence between the two variables (P-value) equal to 0.0001. The two tests combined shows a strong correlation between INRTB and Change, i.e. the higher the

incident rate before testing, the higher the likelihood for a reduction in the incident rate. The results seen in Table 4 support the thought that companies with higher incident rates are more likely to have greater problems with substance abuse, and thus, a drug testing program would have a stronger influence in such an environment.

The number of testing situations in the company's policy was then studied. The number of tests was the considered factor, ignoring the types of these tests. For example, a company with preemployment and probable-cause testing types was treated the same as another company with probable-cause- and post-accident-testing types. Responding companies were divided into three groups according to the number of tests implemented in their policies: 1–2, 3, and 4–5 types of tests. Although the third group showed a greater Change, it was not statistically possible to prove that INRTB and INRTA were significantly different for any of the three groups. In an ANOVA procedure, the F-value between number of tests and Change was found to be 0.64, with a probability of independence between the two variables (P-value) equal to 0.64. This finding supports the finding of the t-test, i.e. there is no significant correlation between the number of drug testing types a company has, and the reduction in incident rate it will observe as a result of that drug testing policy. The results are displayed in Table 5.

The last factor studied for its influence on Change was whether or not the responding company had reported a recent significant size increase. This was believed by the writer to be an important factor, because of the disorder and disarray in the company's organization that usually follow such a significant size increase. The sample was divided into two groups, those who reported and those who did not report such an increase. When comparing

TABLE 5. Change in Incident Rate by Test Group

Variable (1)	Number of Tests in the Company Policy		
	1–2 (2)	3 (3)	4–5 (4)
Number of companies	16	11	4
INRTB	10.817	11.696	11.480
INRTA	9.276	10.345	4.748
Change	1.541	1.351	6.732
RChange	14.25%	11.55%	58.64%
t (H0: Change = 0)	1.01	0.53	1.66
Probability > $\|t\|$	0.33	0.60	0.20

TABLE 6. Change in Incident Rate With and Without Significant Size Increase

Variable (1)	Companies reported size increase (2)	Companies with no size increase (3)
Number of companies	7	24
INRTB	6.659	12.543
INRTA	8.949	9.107
Change	−2.290	3.437
RChange	−34.4%	27.4%
t (H0: Change = 0)	−1.42	2.27
Probability > $\|t\|$	0.21	0.03

the two groups, the reader can observe the difference. The first group had about 34% increase in its incident rates, while the second group had about 27% decrease. In a t-test, it was possible to prove that INRTB and INRTA were significantly different in the second group. This means that firms with no recent appreciable change in size in the period preceding the drug testing implementation, showed significant reduction in incident rates. The results are shown in Table 6.

Results

Drug testing helped the overall sample (31 companies) reduce the incident rate from an annual average of 11.2145 to an annual average of 9.0711 incidents per 200,000 man-hours, a Change equal to 2.1434 incidents/200,000 man-hours, or a relative change (RChange) equal to 19.1%. Statistically, the null hypothesis that incident rates before and after the implementation of drug testing policies (INRTB and INRTA) are equal was rejected for the whole sample. That rejection was under 5% significance level. With a closer look at the results in Table 1–7, several observations can be made.

First, the size of the company did not seem to have a significant difference on the magnitude of Change. Second, the type of company (union, nonunion, or both) was not proven a factor in affecting Change, despite the finding that nonunion companies had the biggest decrease in incident rates among other type groups. Union restrictions might have affected the results of drug testing policies of union and double-breasted (both union and open-shop) companies. Third, the higher the incident rate before implementing the policy (INRTB), the better the likelihood for incident rate reduction. Companies with incident rates above the national average (15 incidents/200,000 man-hours/year) are very likely to reduce their incident rate substantially by implementing a drug testing policy. Fourth, the number of drug-test types in the company's policy was not proven a factor affecting the change in incident rates, although companies that had four or five types of tests got larger Change value than companies with three or fewer types. And finally, significant size increase tends to adversely affect the incident rates for some time after it occurs. Unlike companies that had such an increase, companies that did not have such an increase recently reduced their incident rates significantly after implementing a drug testing policy.

Conclusion

Drug testing can work for a company of any size, although it might be needed more in larger companies. However, the safety program, including the drug testing policy, may vary significantly according to the size of the company. Small companies may not be able to afford a comprehensive safety program with an employee assistance program (EAP). 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. In addition to reducing incident rates, drug testing may prevent the rates from having a potential increase, or may at least minimize this increase.

When a company experiences a major organizational change, such as significant size increase, incident rates are likely to go up, even with the presence of drug testing. This does not mean that drug testing does not do any good. All factors have to be taken into consideration when looking for the reason of incident rate increase.

Drug testing is not always the solution for the substance-abuse problem.

Drug testing is a tool in the fight against the problem. Management is the party that knows best about the situation, so it should make the decision on whether or not a drug testing policy is necessary, and if needed, what kind of testing is suitable for the company's circumstances or any specific project being built. Management has to evaluate the company's own situation in order to know what it needs. Learning about drug testing through the experience of other companies in the industry is useful as are consulting experts in drug testing.

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