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WORKPLACE DRUG TESTING: A CASE STUDY IN THE MISAPPLICATION OF TECHNOLOGY

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INTRODUCTION

In less than a decade drug testing has become a way of life in public and private employment. There is also widespread drug testing in the military and efforts are under way to require drug testing in schools, hospitals, prisons, and other settings. Public opinion polls indicate strong support for drug testing. Why? Is it necessary? Is it effective? Is it consistent with societal values? Does it promote important societal interests? Other countries also have substance abuse problems. Why is the United States alone in fighting substance abuse with millions of drug tests each year?

Social scientists from many disciplines could, no doubt, use the drug testing phenomenon as a window into American culture. The dissertations practically write themselves. Among other things, scholars could choose to focus on a society infatuated with technology, fearful of and frustrated by crime, enticed by profit, dominated by politics, or tempted by facile solutions to complex problems. Drug testing, especially drug testing of workers, also provides an excellent case study in technology assessment. By analyzing the headlong rush into drug testing, it is possible to identify the elements of a flawed technology policy, thereby helping to identify the elements of a more carefully considered use of technology.

Much scholarly research examines drug testing in the workplace.[1]

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1. *See generally* Michael S. Cecere & Philip B. Rosen, *Legal Implications of Substance Abuse Testing in the Workplace*, 62 NOTRE DAME L. REV. 859 (1987) (suggesting criteria for an effective testing program that would survive judicial scrutiny); Thomas L. McGovern, *Employee Drug-Testing Legislation: Redrawing the Battlelines in the War on Drugs*, 39 STAN. L. REV. 1453 (1987) (discussing drug testing legislation on the state and federal level and constructing model legislation for the state of California balancing employees' rights and employers' needs); Mark A. Rothstein, *Drug Testing in the Workplace: The Challenge to Employment Relations and Employment Law*, 63 CHI.-KENT L. REV. 683 (1987) (concluding that much drug testing is unwarranted considering technology, accuracy, and legal issues).

Authors have focused on the accuracy of the tests,[2] the constitutionality of government mandated testing,[3] the legality of testing by private sector employers,[4] and labor law and arbitration issues raised by testing at unionized workplaces.[5] This Article, however, views drug testing from a

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2. *See, e.g.*, Kurt M. Dubowski, *Drug-Use Testing: Scientific Perspectives*, 11 NOVA L. REV. 415 (1987) (discussing the benefits and limitations of various technologies and biospecimens used for drug testing); David T. Lykken, *The Validity of Tests: Caveat Emptor*, 27 JURIMETRICS J. 263 (1987) (applying probability theory to an analysis of hypothetical drug testing programs); Lawrence Miike & Maria Hewitt, *Accuracy and Reliability of Urine Drug Tests*, 36 KAN. L. REV. 641 (1988) (discussing the reliability and accuracy of screening and confirmatory testing in a variety of workplace settings).

3. *See, e.g.*, Edward S. Adams, *Random Drug Testing of Government Employees: A Constitutional Procedure*, 54 U. CHI. L. REV. 1335 (1987) (proposing a random drug testing procedure for government employees that passes fourth and fourteenth amendment scrutiny); Allan Adler, *Probative Value and the Unreasonable Search: Constitutional Perspective on Workplace Drug Testing*, 1988 U. CHI. LEGAL F. 113 (discussing the evidentiary value of urine drug testing and concluding that urinalysis does not provide sufficient probative evidence of workplace drug use to pass fourth amendment scrutiny); Daniel J. Fritze, *Drug Testing of Government Employees and Government-Regulated Industries: Expounding the Fourth Amendment*, 25 WAKE FOREST L. REV. 831 (1990) (concluding that Supreme Court decisions upholding the drug testing of government employees are logical extensions of pre-existing law, not radical departures from the fourth amendment); Elaine Kaplan & Lois G. Williams, *Will Employees' Rights Be the First Casualty of the War on Drugs?*, 36 KAN. L. REV. 755 (1988) (arguing that the drug testing of federal employees violates the fourth amendment); Daniel P. Mazo, *Yellow Rows of Test Tubes: Due Process Constraints on Discharges of Public Employees Based on Drug Urinalysis Testing*, 135 U. PA. L. REV. 1623 (1987) (discussing procedural safeguards available to employees with respect to employer terminations based on positive drug test results); David A. Miller, *Mandatory Urinalysis Testing and the Privacy Rights of Subject Employees: Toward A General Rule of Legality Under the Fourth Amendment*, 48 U. PITT. L. REV. 201 (1986) (critiquing the developing constitutional standard for drug testing and suggesting the enhancement of this standard through judicial and legislative means); Michael R. O'Donnell, *Employment Drug Testing—Balancing the Interests in the Workplace*, 74 VA. L. REV. 969 (1988) (discussing the reasonable suspicion standard and its incorporation into a model drug testing statute); Lois Yurow, *Alternative Challenges to Drug Testing of Government Employees: Options After* Von Raab *and* Skinner, 58 GEO. WASH. L. REV. 148 (1989) (analyzing strategies available to employees given recent Supreme Court interpretations of the fourth amendment).

4. *See, e.g.*, Edward M. Chen et al., *Common Law Privacy: A Limit on an Employer's Power to Test for Drugs?*, 12 GEO. MASON U. L. REV. 651 (1990) (discussing litigation possibilities for private sector employees based on the common law right to privacy); Charles J. Dangelo, *The Individual Worker and Drug Testing: Tort Actions for Defamation, Emotional Distress, and Invasion of Privacy*, 28 DUQ. L. REV. 545 (1990) (discussing state actions available to private sector employees in litigating against workplace drug testing); L. Camille Hébert, *Private Sector Drug Testing: Employer Rights, Risks, and Responsibilities*, 36 KAN. L. REV. 823 (1988) (analyzing drug testing litigation strategies available to private sector employees on a state by state basis).

5. *See, e.g.*, Marion Crain, *Expanded Employee Drug-Detection Programs and the Public Good: Big Brother at the Bargaining Table*, 64 N.Y.U. L. REV. 1286 (1989) (arguing that judicial intervention is unnecessary and that drug testing, like other working conditions, should be addressed through collective bargaining); Tina Schneider Denenberg & Richard V. Denenberg, *Drug Testing from the Arbitrator's Perspective*, 11 NOVA L. REV.

different perspective. In considering the broad technical, legal, and policy implications of workplace drug testing, it discusses why workplace testing represents a misapplication of technology.

Section I provides a summary of drug testing technology and drug testing programs. The first part of the Section discusses the technologies, processes, and costs associated with present day drug testing. The second half then traces the adoption of workplace testing in both the public and private sectors.[6] Section II then discusses six problems in relying on drug testing to eliminate workplace substance abuse: the failure to understand the drug abuse problem, the failure to consider the technology's limitations, the failure to coordinate the technology with other methods of dealing with the problem, the adoption of workplace testing for reasons unrelated to the efficacy or appropriateness of the technology, and the failure to assess the effectiveness of workplace drug testing. The Article concludes that drug testing has been an ineffective and harmful misapplication of technology.

I. A REVIEW OF THE STATE OF WORKPLACE DRUG TESTING

A. Drug Testing Technology

Drug testing analyzes a body sample, usually urine,[7] for the presence of drugs or drug metabolites. Current drug testing techniques were developed in the late 1960s and early 1970s as a way of monitoring heroin use among people at drug treatment centers.[8] Since 1972, when the Syva Corporation first marketed its Enzyme Multiplied Immunoassay Technique ("EMIT"), drug testing has become increasingly sophisticated, automated, and competitive.

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371 (1987) (discussing the channels available for recourse in a unionized workplace); Geoffrey T. Kirk, Comment, *Employee Drug Testing: Federal Courts Are Redefining Individual Rights of Privacy, Will Labor Arbitrators Follow Suit?*, 44 U. MIAMI L. REV. 489 (1989) (analyzing arbitration results in private sector workplace testing and concluding that there is a general trend to allow substantial employer freedom to test).

6. Much of the background material in this first Section has been adapted from my previous Article, Rothstein, *supra* note 1, at 691–703.

7. Blood, breath, saliva, hair, and other specimens have been used occasionally. ROBERT P. DECRESCE ET AL., DRUG TESTING IN THE WORKPLACE 61 (1989).

8. *See* Eliot Marshall, *Testing Urine for Drugs*, 241 SCIENCE 150, 150 (1988). *See generally* MARK A. ROTHSTEIN, MEDICAL SCREENING AND THE EMPLOYEE HEALTH COST CRISIS 101–09 (1989).

Scientifically valid testing involves two steps.[9] First, a "screening" test eliminates from further testing those samples where the presence of the target substance is below a designated threshold level. Next, samples containing substance levels at or above the threshold level are subjected to "confirmatory" testing using a different procedure.[10] Confirmatory testing is essential to establish both the identity and quantity of the substance in the sample.[11] The costs and the capabilities of the various screening and confirmatory tests vary.

Immunoassays, the most widely used screening tests,[12] are of three kinds: enzyme, radio, and fluorescence. All of these tests are based on sophisticated immunological processes.[13] The most commonly used enzyme immunoassay test, EMIT, tests for a broad spectrum of drugs.[14] Although a single EMIT test can be performed both quickly and inexpensively,[15] the EMIT test equipment is costly, starting at a base price of 3,500 dollars.[16] Radioimmunoassay testing ("RIA") measures only a single drug per test, yet offers broad detection capabilities similar to EMIT. In contrast to EMIT, RIA is more costly, requires a more highly trained technician, and produces radioactive waste.[17] Fluorescence polarization immunoassay testing ("FPIA") also detects a broad range of

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9. *See* Dubowski, *supra* note 2, at 437.

10. According to the Toxicology Section of the American Academy of Forensic Sciences, the confirmatory test must be "'based upon different chemical or physical principles than the initial analysis method(s).'" DECRESCE ET AL., *supra* note 7, at 84–85; Dubowski, *supra* note 2, at 437.

11. *See* DECRESCE ET AL., *supra* note 7, at 84, 95.

12. Color or spot tests, *see* Dubowski, *supra* note 2, at 446–47, and thin-layer chromatography, *see id.* at 447–52, also are used.

13. All three of these tests require three solutions: a urine sample, an antibody solution, and a "labeled" drug solution. While the first two solutions are similar in all three tests, the preparation of the labeled drug solution varies. Depending on the test, a known quantity of the target drug or its metabolite is bound to an enzyme, radioactive iodine, or fluorescein, respectively. The urine, antibody, and labeled solutions are then combined. If the urine sample contains metabolites of the target drug, the labeled drug and the drug contained in the urine sample compete to bind to antibodies. The drug in the urine sample will bind with the labeled antibodies, leaving the labeled drug unbound. As a result, either the enzyme, radioactive iodine, or fluorescein remains active. By measuring the cloudiness of the solution resulting from this reaction, the presence or absence of the target drug in the urine sample is determined. *See* Miike & Hewitt, *supra* note 2, at 645.

14. In particular, the EMIT test is used for opiates, barbiturates, amphetamines, cocaine, benzodiazepines, methaqualone, methadone, phencyclidine, proxyphene, and cannabinoids. *See* KEVIN B. ZEESE, DRUG TESTING LEGAL MANUAL 2–9 (1991).

15. A single test costs approximately five dollars. *See* DECRESCE ET AL., *supra* note 7, at 83.

16. *See* ZEESE, *supra* note 14.

17. *See* Council on Scientific Affairs, American Medical Association, *Scientific Issues in Drug Testing*, 257 JAMA 3110, 3112–13 (1987). RIA is used mostly by the military. *See id.* at 3112.

drugs. It is a relatively new technique, however, and reports of its accuracy are sparse in the professional literature.[18]

The most widely used confirmatory test is gas chromatography/mass spectrometry ("GC/MS").[19] Although highly accurate, GC/MS confirmation entails three significant drawbacks: it requires expensive testing equipment, costing from 50,000 to 200,000 dollars; it requires highly trained technicians to prepare samples and interpret test results; and it is a time-consuming process.[20]

Laboratories vary widely in their pricing structures for drug testing. Some laboratories charge customers a flat fee per sample tested, while others divide the fee so that only those samples requiring confirmatory testing incur an additional charge.[21] Other factors affecting price are the type of analysis used, the number of specimens tested, and the types of drugs tested for. In general, screening charges range from five to twenty dollars per test, and GC/MS confirmation charges range from thirty to one hundred dollars per test.[22]

In addition to tests performed by professional laboratories, less expensive, "on-site" tests have become an increasingly popular alternative.[23] In contrast to laboratory testing, on-site testing involves a relatively simple process.[24] Additionally, on-site tests are fast, inex-

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18. *See* ZEESE, *supra* note 14, at 2–14.

19. In GC, pretreatment extracts the drug from a given sample. The extracted sample is then converted to a gaseous form and pushed through a long glass column by helium gas. By comparing the time required for the sample to pass through the column with the known and unique time required for the target drug, one determines the identity of the drug in the sample. *See* Miike & Hewitt, *supra* note 2, at 646. Although GC can be used alone, the addition of MS improves the accuracy of the results. As the sample exits the column, it is bombarded by electrons that break down the compound's molecules into electrically charged ion fragments. By comparing this ion fragment pattern with the known and unique fragment pattern for the target drug, the identity of the drug in the sample can be confirmed with the results obtained in the GC process. *See id. See also* ZEESE, *supra* note 14, at 2–25 to 2–26.

20. *See* Dubowski, *supra* note 2, at 474.

21. *See* David W. Hoyt et al., *Drug Testing in the Workplace—Are Methods Legally Defensible?*, 258 JAMA 504, 508 (1987).

22. *See id.*

23. *See On-Site Drug Testing Kits Start Moving into Corporate Market*, 1 Drug Detection Rep. (Pace Publications) No. 5, at 1–2 (June 5, 1991) [hereinafter *On-Site Drug Testing*].

24. In these tests, a few drops of urine are placed on the surface of chemically treated paper or cards, and within three to five minutes, a change in color will indicate a positive result. *See* DECRESCE ET AL., *supra* note 7, at 83–84 (describing KDI Quik Test); ZEESE, *supra* note 14, at 2–16 to 2–17 (describing E-Z Screen).

pensive,[25] and do not require highly trained personnel.[26] Nevertheless, the tests may not detect all commonly abused drugs, they may not be able to distinguish among drugs, and they may produce high numbers of false negative and false positive results.[27] Despite these limitations, and manufacturers' recommendations to use confirmatory testing, many users rely on the results of a single on-site test.[28]

B. Drug Testing in the Workplace

1. The Public Sector

Workplace drug testing in the public sector developed during the 1980s. In 1981, widespread testing began in the military.[29] In 1982, President Reagan established the President's Commission on Organized Crime ("Commission").[30] In its 1986 report on drug abuse, the Commission recommended drug testing for public and private sector employees.[31] That same year, President Reagan issued Executive Order 12,564 ("Order"),[32] which required the head of each federal executive agency to establish a program to test for illegal drug use by employees in "sensitive positions."[33] This broad mandate authorized the testing of 1.1 million of

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25. *See* DECRESCE ET AL., *supra* note 7, at 83–84; ZEESE, *supra* note 14, at 2–16 to 2–17.

26. *See* DECRESCE ET AL., *supra* note 7, at 83–84.

27. *See id.*

28. *See On-Site Drug Testing*, *supra* note 23, at 6.

29. From 1983 to 1985, the military performed drug tests costing over one-half billion dollars. *See* Arthur J. McBay, *Efficient Drug Testing: Addressing the Basic Issues*, 11 NOVA L. REV. 647, 648 (1987). Drug testing is now estimated to be a one billion dollar a year industry. *See* Katie Hatner & Susan Garland, *Testing for Drug Use: Handle with Care*, BUS. WK., Mar. 28, 1988, at 65.

30. *See* Exec. Order No. 12,435, 3 C.F.R. 202 (1983), *reprinted in* 18 U.S.C. § 1961 (1988), *amended* Exec. Order No. 12,507, 50 Fed. Reg. 11,835 (Mar. 22, 1985), *revoked* Exec. Order No. 12,610, 52 Fed. Reg. 36,901 (Sept. 30, 1987).

31. *See* PRESIDENT'S COMMISSION ON ORGANIZED CRIME, AMERICA'S HABIT: DRUG ABUSE, DRUG TRAFFICKING, AND ORGANIZED CRIME 452 (1986).

32. Exec. Order No. 12,564, 3 C.F.R. 224 (1985), *reprinted in* 5 U.S.C. § 7301 (1988).

33. The Order defines an "employee in a sensitive position" as including those who have been granted access to classified information, individuals serving under Presidential appointments, law enforcement officers, and others in positions that involve "national security, the protection of life" and property, public health or safety, or other functions requiring a high degree of trust and "confidence." *Id.*

the nation's 2.1 million civilian federal employees, excluding postal workers.[34]

The Order specifically authorizes testing of individuals under four circumstances: (1) in instances where there is a reasonable suspicion of illegal drug use, (2) in post-accident examinations, (3) in conjunction with counseling or rehabilitation for illegal drug use, and (4) in preemployment applicant testing.[35] The Order mandates confirmatory testing and allows the employee to provide a urine specimen in private unless there is reason to believe that adulteration will occur.

Guidelines promulgated by the Department of Health and Human Services establish scientific and technical requirements concerning specimen collection, laboratory analysis, and transmittal and interpretation of test results for the federal drug testing program.[36] The guidelines require testing for marijuana and cocaine and permit testing for any drug listed in Schedule I or II of the Controlled Substances Act.[37] Significantly, the guidelines contain no specific mention of testing for alcohol or other legal drugs of abuse.

2. *The Private Sector*

After public employers began testing and public officials exhorted private employers to join the "war on drugs," private sector drug testing became widespread. Within the private sector, large companies have primarily embraced drug testing. Among major corporations, only ten percent used drug testing in 1982. By 1985 this figure reached twenty-five percent,[38] and by 1988 it nearly doubled to forty-eight percent.[39] In 1990, eighty-one percent of companies with over 25,000 employees per-

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34. *See* Bernard Weinraub, *Administration Aides Back Tests of Federal Employees for Drugs*, N.Y. TIMES, Sept. 11, 1986, at A1.

35. *See* Exec. Order No. 12,564, §§ 3(c)-(d), 3 C.F.R. 226 (1986), *reprinted in* 5 U.S.C. § 7301 (1988).

36. *See* 52 Fed. Reg. 30,638 (1987).

37. *See id.* at 30,639; The Anti-Drug Abuse Act, Pub. L. No. 99–570, 100 Stat. 3207 (1986) (codified in scattered sections of 18 and 21 U.S.C.).

38. *See* Fern Schumer Chapman, *The Ruckus Over Medical Testing*, FORTUNE, Aug. 19, 1985, at 58; *but see* BUREAU OF NATIONAL AFFAIRS, EMPLOYEE ASSISTANCE PROGRAMS: BENEFITS, PROBLEMS, AND PROSPECTS 73 (1987) (offering evidence that the percentage of *Fortune* 500 companies using workplace drug testing grew from three to thirty percent during the 1982 to 1985 period).

39. *See* Elizabeth M. Fowler, *Drug Testing Common for Job Seekers*, N.Y. TIMES, Jan. 19, 1988, at D21.

formed drug testing.[40] According to one study, most drug testing is preemployment, although some companies also use for-cause, post-rehabilitation, periodic, and random testing.[41] Some companies test all applicants and employees; others limit testing to employees in hazardous or safety-sensitive positions.

Despite the trend toward more widespread drug testing, there is evidence that some employers are rethinking the issue. For example, in one study of employers that had drug testing programs in 1988, nine percent of large employers and forty-six percent of small employers had discontinued drug testing by 1990.[42] Moreover, of those employers discontinuing drug testing, only one in six indicated they were reconsidering their decisions.[43]

II. THE MISAPPLICATION OF DRUG TESTING TECHNOLOGY

The proliferation of drug testing in the workplace epitomizes the failure of technology assessment. Although some workplace drug testing programs have been thoughtfully conceived, many, if not most, employer programs have been adopted without careful consideration of the need for or consequences of testing. In general, the ill-conceived programs illustrate the following six errors of technology assessment.

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40. *See* Data Watch, *Employer Drug Testing Programs*, BUS. & HEALTH, July 1990, at 8 (citing the 1990 Conference Board Study, *infra* note 41). Note that consistent survey data are not available for all four testing years. *Fortune* 500 companies are used for the surveys in 1982, 1985, and 1988, but the 1990 Conference Board survey used companies with over 25,000 employees.

41. The following table summarizes the percentage breakdown.

REASONS FOR WORKPLACE DRUG TESTING, 1990

Method	*Frequency (%)*
Preemployment	92
For-cause	74
Post-rehabilitation	42
Periodic	28
Random	9
Other	9

See HELEN AXEL, CONFERENCE BOARD, CORPORATE EXPERIENCES WITH DRUG TESTING PROGRAMS, RESEARCH REPORT NO. 941 (1990).

42. *See* Howard V. Hayge, *Anti-Drug Programs in the Workplace: Are They Here to Stay?*, MONTHLY LAB. REV., Apr. 1991, at 27. In this study, a large employer was one that had 250 or more employees, while a small employer was one that had fewer than 50 employees.

43. *See id.*

A. The Failure to Understand the Drug Abuse Problem

Between 1985 and 1990 the percentage of large companies performing drug testing more than tripled.[44] Based on this statistic as well as the escalating political significance of the "war on drugs," one would be tempted to conclude that this period was one of growing substance abuse. To the contrary, drug abuse rates declined sharply.[45] Notwithstanding the decline in overall rates of drug use, the profile of the illicit drug user has also changed since the mid-1980s. Today, the illicit drug user is statistically more likely to be younger, poorer, unemployed, minority, inner-city, and more addicted.[46] While overall drug use declined in the late 1980's,[47] hard-core drug use increased.[48]

The changing nature of drug abuse has important implications for law enforcement, education, health care, rehabilitation programs, and other areas. For employers, it suggests that if there were ever a need to conduct drug tests, by 1985 the need was beginning to lessen. Arguably,

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44. *See supra* notes 38–40 and accompanying text.

45. The statistics for cocaine use are particularly telling. The number of adults (defined as those over twelve years old) who used cocaine on a monthly basis declined from 5.8 million in 1985, *see* NATIONAL INSTITUTE ON DRUG ABUSE, NATIONAL HOUSEHOLD SURVEY ON DRUG ABUSE 1985 POPULATION ESTIMATES 14 (1985) [hereinafter POPULATION ESTIMATES 1985], to 1.6 million in 1990, *see* NATIONAL INSTITUTE ON DRUG ABUSE, NATIONAL HOUSEHOLD SURVEY ON DRUG ABUSE 1990 POPULATION ESTIMATES 29 (1990) [hereinafter POPULATION ESTIMATES 1990]. In general, the number of adults who used any illicit drug on a monthly basis declined from 23.0 million in 1985, *see* POPULATION ESTIMATES 1985 at 54, to 12.9 million in 1990, *see* POPULATION ESTIMATES 1990 at 17. Note that the National Institute on Drug Abuse's National Household Survey uses a national, randomly-drawn sampling of approximately 10,000 households. The Drug Abuse Warning Network's report of estimated cocaine medical emergencies declined from 109,672 in 1989 to 79,398 in 1990, a decrease of 27.6 percent in one year. *HHS Reports Sharp Decline in Emergency Room Visits*, 5 Nat'l Rep. on Substance Abuse (Buraff Publications) No. 16, at 6 (July 17, 1991).

46. In 1990 the overall illicit drug abuse rate for adults was 6.4%. *See* NATIONAL INSTITUTE ON DRUG ABUSE, SUMMARY OF FINDINGS FROM THE 1990 NATIONAL HOUSEHOLD SURVEY ON DRUG ABUSE 1–2 (1990). This rate, however, was 14.9% for 18–25 year olds, 14.0% for the unemployed, 8.6% for blacks, 7.9% for males, and 7.3% for people living in large cities. *Id. See also* Peter Kerr, *The American Drug Problem Takes on 2 Faces*, N.Y. TIMES, July 10, 1988, at E5.

47. *See supra* note 45 and accompanying text.

48. In 1988, the ratio of daily cocaine users to monthly cocaine users was 292,000/2,900,000, or 10.0%. By 1990, the fraction was 336,000/1,600,000, or 21.0%. NATIONAL INSTITUTE ON DRUG ABUSE, PRESS RELEASE NO. RP0729, at 1–3 (Dec. 19, 1990). Note that because the survey measures *household* drug use, it is thought to be more accurate in reporting casual users (who have households) than hard-core users (who may be institutionalized or homeless). Accordingly, the National Institute on Drug Abuse ("NIDA") amended its latest estimate of people who use cocaine at least once a week from 662,000 to 1.7 million. *Estimate by the U.S. of Cocaine Addicts Rises to 1.7 Million*, N.Y. TIMES, Feb. 7, 1991, at D24.

casual drug users pose a greater threat to employers than do hard-core drug users. Hard-core addicts are less likely to seek and maintain traditional employment and are much more easily detected, without drug testing, at preemployment medical examinations. Even if hired, hard-core drug users are likely to be detected by supervisory personnel. On the other hand, a casual drug user in a safety-sensitive job who comes to work under the influence of drugs or who uses drugs while on the job could more easily escape detection and cause potentially tragic consequences.

Fortunately, the number of casual drug users is declining as illegal drug use increasingly becomes socially unacceptable. In many instances, however, employers have based drug testing programs on erroneous assumptions that all drug users are alike and that their numbers are growing. These employers simply fail to understand the problem.

B. The Failure to Consider the Technology's Limitations

In addition to harboring misconceived notions about the present drug problem, many employers have erroneously placed unbridled faith in the efficacy of drug testing technology. Drug testing technology is plagued by a number of problems and limitations, including cross-reactivity, the inability of the technology to detect impairment or determine the time of ingestion, and the passive inhalation problem.

First, there is the problem of "cross-reactivity." Because drug tests detect metabolites of drugs rather than the drugs themselves, screening tests sometimes incorrectly identify as metabolites of illicit drugs the metabolites of other substances or normal human enzymes. For example, eating poppy seeds may result in a positive test for opiates[49] and drinking certain herbal teas may result in a positive test for cocaine.[50] To avoid this problem, experts recommend using pretest questionnaires inquiring about medications and other cross-reactants,[51] and post-test review by trained "Medical Review Officer[s]."[52] The effectiveness of such steps, though, is questionable. Knowledgable users can fabricate appropriate answers to questions in order to hide their drug use.

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49. *See* Carl M. Selvaka, *Poppy Seed Ingestion as a Contributing Factor to Opiate-Positive Urinalysis Results: The Pacific Perspective*, 36 J. FORENSIC SCI. 685, 685 (1991).

50. *See* Dubowski, *supra* note 2, at 515–16.

51. *See* DECRESCE ET AL., *supra* note 7, at 97–100, 150.

52. Robert B. Swotinsky & Kenneth H. Chase, *The Medical Review Officer*, 32 J. OCCUP. MED. 1003, 1006–07 (1990). *See infra* note 79.

A second and related issue stemming from metabolite detection concerns "impairment detectability." As the inert, inactive by-products of drugs, drug metabolites detected in urine do not indicate impairment. Although a blood test can reveal the presence of drugs in the blood in their active state, there is no known correlation, with the exception of ethanol, between "blood drug levels and degree of impairment."[53] Moreover, there is no agreement among experts on what concentration of drug in urine indicates impairment.[54]

A third significant factor that prevents any conclusion about impairment based on a positive drug test is the considerable duration of detectability of drug metabolites in urine. Depending on the drug, metabolites can be detected in urine from one day to several weeks following exposure.[55] The effects of most drugs, however, persist for only a few hours after use. Because drugs are detectable long after their effects have subsided, any correlation between a positive test and workplace impairment is tenuous.[56]

A fourth concern is that a drug test will be positive because of "passive inhalation." Evidence suggests that marijuana tests using a threshold level of twenty nanograms (billionths of a gram) per milliliter of urine may result in positive test results for subjects exposed to only second-hand smoke.[57] Although using a higher cutoff, such as one hundred nanograms per milliliter of urine, will eliminate this problem,[58] there is currently discussion about actually lowering cutoffs to prevent false negative test results.[59]

The accuracy of drug testing also may be affected by several other factors. Alteration of the specimen, by substitution, dilution, or adultera-

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53. Miike & Hewitt, *supra* note 2, at 641.

54. *See* DECRESCE ET AL., *supra* note 7, at 99. In general, it is very difficult to correlate drug test results with specific impairment levels. Many variables influence how a drug will affect an individual user, including the type and dose of drug, the time lapse from its administration, the duration of its effect and use, and its interaction with other drugs. *See generally* Dubowski, *supra* note 2, at 523–26 (explaining the relationship between the drug dose, time, concentration, and interaction with other drugs that arises after absorption and before excretion). Individual characteristics, such as age, weight, sex, and drug tolerance also are contributing factors. Consequently, generalizing is extremely difficult.

55. *See* Council on Scientific Affairs, American Medical Association, *supra* note 17, at 3112.

56. *See* Dubowski, *supra* note 2, at 521.

57. *See id.* at 510–12.

58. *See* DECRESCE ET AL., *supra* note 7, at 120.

59. *See Drug Screens Miss Twenty Percent of Positive Samples, Study Finds*, 5 Nat'l Rep. on Substance Abuse (Buraff Publications) No. 22, at 2 (Oct. 23, 1991) (reporting on study by the National Institute of Justice of the U.S. Department of Justice).

tion;[60] improper calibration or cleaning of equipment;[61] and technician error[62] all may undermine test accuracy. Indeed, even the best testing methods yield valid results only to the extent that the laboratory adheres to rigid standards of quality control. Laboratory proficiency criteria, however, have been inadequate.[63] Even where a laboratory adheres to the most rigid quality control standards, indeterminancy extends to the statistical predictive value of the tests. Even comparatively accurate testing methods generate large numbers of false positive results when the population tested has a low prevalence of the target trait.[64] That is why both manufacturers of screening tests and forensic toxicologists caution that screening tests must be confirmed by using another analytical method.[65]

Nevertheless, concerns about cost and expediency have led some employers to take ill-advised shortcuts, ignoring the need for confirmatory testing and rigid quality control standards. For example, in a 1988 study of small businesses near Boston, Massachusetts, over half of the employers using preemployment drug testing refused to hire applicants on the basis of a single, unconfirmed, positive screening test.[66] Other employers discharge employees on the basis of unconfirmed positive results,[67] and an increasing amount of drug testing is being performed on-site by individuals with little or no training.[68]

Despite these limitations of drug testing, one may infer that people who test positive are more likely than those who test negative to come to work under the influence of drugs or to take drugs during the work day. This inference, however, does not provide a blanket justification for drug testing. The best way to ensure high productivity is through supervision and quality control, which will detect employee shortcomings regardless

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60. *See* DECRESCE ET AL., *supra* note 7, at 97–99.

61. *See* ZEESE, *supra* note 14, at 3–10.2 to 3–10.3.

62. *See id.*

63. *See* Miike & Hewitt, *supra* note 2, at 652. *See also* Dubowski, *supra* note 2, at 532–33 ("[T]here is no nationwide licensure system in place at the federal level to control and regulate drug-use testing establishments.").

64. For example, the EMIT test has a sensitivity of 99% and a specificity of 90%. If the prevalence of the target substance is five percent among the tested population pool, the positive predictive value of the test is 34.3%. That means that approximately two of three positive test results will be false positives. *See* Rothstein, *supra* note 1, at 695–97; Miike & Hewitt, *supra* note 2, at 649–51, 657–62.

65. *See* DECRESCE ET AL., *supra* note 7, at 84; Council on Scientific Affairs, American Medical Association, *supra* note 17, at 3113.

66. *See* Robert Godefroi & Robert A. McCunney, *Letter to the Editor*, 30 J. OCCUP. MED. 300, 302 (1988).

67. *See, e.g.*, Satterfield v. Lockheed Missiles & Space Co., 617 F. Supp. 1359, 1360 (D.S.C. 1985).

68. *See On-Site Drug Testing*, *supra* note 23, at 1–2.

of the cause. Drug testing should be reserved for those limited circumstances when it is essential to protect against an immediate threat to the public health and safety[69] and there are no alternatives to detect actual impairment, such as close supervision or performance testing.[70]

C. The Failure to Consider the Social Consequences of Workplace Testing

1. Invading Individual Privacy and Breaching Confidentiality

The collection of a body sample for drug testing is both simple and cheap, yet sample collection implicates important privacy concerns. In particular, urine drug testing raises three privacy issues: the invasion of privacy inherent in the collection procedure itself, the invasion of privacy based on the substantive test results, and the breach of confidentiality associated with the potential disclosure of the test results.

The act of urination is regarded by American culture as one of the most private of bodily functions. As the Supreme Court has observed:

> There are few activities in our society more personal or private than the passing of urine. Most people describe it by euphemisms if they talk about it at all. It is a function traditionally performed without public observation; indeed, its performance in public is generally prohibited by law as well as social custom.[71]

Notwithstanding its adverse effect on individual privacy, urine collection plays a pivotal role in workplace drug testing. For example, the federal government drug testing regulation requires direct observation of urination by a monitor if there is suspicion that the specimen will be adulterated.[72] Other testing programs routinely require indirect observation,[73]

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69. For a discussion of the factors to be considered in deciding whether to implement drug testing and the specifics of implementing a program see ROTHSTEIN, *supra* note 8, at 117–24; Rothstein, *supra* note 1, at 731–43.

70. *See* ZEESE, *supra* note 14, at 2–50 to 2–52.

71. Skinner v. Railway Labor Executives Ass'n, 489 U.S. 602, 617 (1989) (quoting National Treasury Employees Union v. Von Raab, 816 F.2d 170, 175 (5th Cir. 1987), *aff'd*, 489 U.S. 656 (1989)).

72. *See* 49 C.F.R. § 40.25 (1990).

73. Indirect observation usually entails the stationing of a monitor behind a partition to listen for the normal sounds of urination. Other methods of indirect observation besides listening include timing the subject and measuring the temperature, color, and pH of the specimen.

and some even require direct observation.[74]

This first privacy aspect of drug testing has led to a number of successful legal challenges. In one such case an employer was found to have committed unlawful retaliation under the Mine Safety and Health Act after discharging two employees who were unable to urinate in the presence of others.[75] In another case, an employee was awarded 125,000 dollars in damages for invasion of privacy and negligent infliction of emotional distress after he was forced to submit a urine sample under direct observation.[76] Finally, a railroad's random testing program was tem[illegible]arily enjoined pursuant to a consent order when it was learned that television cameras had been installed in toilet cubicles to monitor employee urination.[77]

A second privacy issue is raised by the substantive information revealed through urine testing. Because the tests measure inert metabolites of substances ingested days or weeks earlier, some commentators suggest that drug testing is irrelevant to work performance and that drug testing invades the off-work privacy of employees.[78] Furthermore, the capacity of drug testing to identify prescription medications may reveal an individual's underlying and private medical condition. For example, an employee testing positive for barbiturates may be taking phenobarbital pursuant to a physician's prescription to help control epilepsy. The compelled disclosure of this medical condition may violate the Americans With Disabilities Act.[79]

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74. Direct observation of the subject is done to ensure that there is no substitution or adulteration of the specimen. False negative results on drug tests may be obtained by dilution with water or adding table salt (for amphetamines, barbiturates, cocaine, opiates), liquid plumbing agent (for amphetamines, marijuana, other drugs), bleach or vinegar (for marijuana), or eye cleanser (for benzodiazepines, marijuana). *See* John Bitter, *More Employers Are Utilizing Drug-Screening Programs*, OCCUP. HEALTH & SAFETY, Apr. 1990, at 27, 30–31.

75. *See* Jim Walter Resources, Inc. v. Mine Safety & Health Review Comm'n, 920 F.2d 738, 742 (11th Cir. 1990).

76. *See* Kelly v. Schlumberger Technology Corp., 849 F.2d 41 (1st Cir. 1988).

77. *See* Abate v. Southern Pac. Transp. Co., No. 90–1955 (E.D. La. June 7, 1990), *reported in* 4 Nat'l Rep. on Substance Abuse (Buraff Publications), No. 14, at 6 (June 20, 1990). While the plaintiffs successfully obtained an initial restraining order, they were eventually denied injunctive relief because of their lack of standing. *See* Abate v. Southern Pac. Transp. Co., 928 F.2d 167, 168 (5th Cir. 1991).

78. *See, e.g.*, George D. Lundberg, *Mandatory Unindicated Urine Drug Screening: Still Chemical McCarthyism*, 256 JAMA 3003 (1986); Kevin B. Zeese, *Drug Hysteria Causing Use of Useless Urine Tests*, 11 NOVA L. REV. 815, 820 (1987).

79. Pursuant to federal regulations, when drug testing is governmentally mandated, disclosure of prescription drug usage is made only to a physician, a "medical review officer." 49 C.F.R. § 40.33 (1990). *See* Swotinsky & Chase, *supra* note 52. Under § 104(d) of the Americans with Disabilities Act of 1990 ("ADA"), Pub. L. No. 101–336, 104 Stat. 327 (codified in scattered sections of 29, 42, and 47 U.S.C.), however, even physicians are precluded from inquiring into medications taken or illnesses, before a conditional offer of employment. *See* 42 U.S.C. § 12,112(c) (West. Supp. 1991). Although a drug test is not

Finally, drug test results are often not kept confidential, despite the possibly devastating long-term consequences of a positive result. Because drug test results are not usually considered to be confidential medical records, they are often stored in personnel files, where access may not be controlled. The results are sometimes shared with co-workers, supervisors, managers, prospective employers, health insurers, or government benefits agencies. While excessive or improper disclosures may lead to liability,[80] employers often have a common law privilege to make certain disclosures.[81] In an unsuccessful challenge to this privilege, a police cadet in Boston brought an action for invasion of privacy after a superior officer told other cadets about the cadet's dismissal from the academy for a positive drug test. The Massachusetts Supreme Judicial Court held that the police commissioner had a privilege to disclose the test result to the other cadets.[82]

2. *Undermining the Employer-Employee Relationship*

In addition to invading individual privacy, mandatory drug testing harms the employer-employee relationship. Where employees must submit to testing (or face dismissal) without any suspicion of drug use, the

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considered a "medical examination" under the ADA, *see id.* § 12.112(d), preemployment drug testing may not require disclosure of prescription medications. *See* H.R. REP. NO. 485, 101st Cong., 2d Sess., pt. 2, at 79–80 (1990).

80. *See, e.g.*, Houston Belt & Terminal Ry. v. Wherry, 548 S.W.2d 743 (Tex. Ct. App. 1977), *appeal dismissed*, 434 U.S. 962 (1978). Joe Wherry, a railroad switchman, fainted after sustaining a knee injury on the job. In an attempt to establish the cause of the fainting, the company physician ordered a diabetes test and a drug test. The initial drug test result showed traces of methadone, but a second test showed the presence of a normal urinary compound whose chemical characteristics are similar to methadone. Wherry was later discharged for failure to report his accident in a timely manner. During the course of a Department of Labor investigation of the dismissal, the railroad wrote a letter to the Department of Labor stating that Wherry "passed out and fell" and that "traces of methadone" were present in his system. *Id.* at 747. Wherry sued for libel. The Texas Court of Civil Appeals affirmed an award of 150,000 dollars in compensatory damages and 50,000 dollars in punitive damages based on this and other statements. The court stated that "the jury was entitled to conclude from the evidence that [the employer] made false statements in writing that [Wherry] was a narcotics user when they knew better." *Id.* at 752.

81. *See* Charles D. Tiefer, Comment, *Qualified Privilege to Defame Employees and Credit Applicants*, 12 HARV. C.R.-C.L. L. REV. 143, 144 (1977).

82. Gauthier v. Police Comm'r, 557 N.E.2d 1374, 1376 (Mass. 1990) ("[T]he public, and therefore the defendants, have a legitimate interest in deterring drug use by police cadets. Furthermore, deterrence is clearly served by prompt disclosure to those who passed the drug test that those who did not had been dismissed. In view of the public interest served by such limited publication, together with the diminution of the cadets' reasonable expectation of privacy due to the obvious physical and ethical demands of their employment, the balance of interests as a matter of law weighs in favor of the defendants.") (citations omitted).

employer sends a message of distrust to employees. Irreparable harm may result to the employer-employee relationship.[83] Because the overwhelming majority of employees do not use drugs and consequently test negative, one questions whether the benefits of detecting the relatively few drug users who may be identifiable by other means is sufficient to outweigh the morale problems implicit in testing.[84]

3. Ignoring other drug problems

Alcohol is the number one substance of use in the United States.[85] Not surprisingly, alcohol abuse more often causes problems at the workplace than does the abuse of other substances. In one study investigating workplace fatalities, drug and alcohol testing at 173 autopsies revealed that twenty-three workers had detectable blood alcohol contents, eleven workers had detectable traces of prescription drugs with the potential to

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83. *See, e.g., Eight Workers Quit in Protest Over 7-Eleven's Drug-Testing Policy*, 5 Nat'l Rep. on Substance Abuse (Buraff Publications) No. 5, at 6 (Feb. 13, 1991).

84. Although trust in an employer-employee relationship is different in nature and degree from the trust in a parent-child relationship, the recent marketing of a drug testing product for the home is an even more extreme example of drug testing's indifference to social relations. An enterprising new company now sells a set of three spray cans, for $49.95, which allegedly detect the presence in the environment (e.g., clothing, furniture) of cocaine and marijuana. The sprays turn reddish-brown or turquoise in the presence of drugs. The manufacturer markets the product to parents as a way of monitoring their children. *See Just Spray No*, TIME, Sept. 10, 1990, at 46.

85. The following table indicates the domination of alcohol use.

POPULATION ESTIMATES OF MONTHLY ADULT DRUG USE, 1990

Drug	*Millions*
Alcohol	102.9
Marijuana	10.2
Cocaine (excluding crack)	1.6
Analgesics	1.5
Inhalants	1.2
Stimulants	1.0
Tranquilizers	.6
Sedatives	.6
Hallucinogens	.6
Crack	.5
Heroin	.05

See NATIONAL INSTITUTE OF DRUG ABUSE, NIDA CAPSULES, POPULATION ESTIMATES OF LIFETIME AND CURRENT DRUG ABUSE, 1990 (Dec. 1990). An "adult" is defined as a person of 12 or more years. *See supra* note 45 for a discussion of the NIDA survey.

alter physical functions, but only one worker had a detectable trace of marijuana.[86]

If public safety is indeed the primary reason for workplace drug testing, there is little justification for limiting drug testing to illicit drugs. Alcohol is, by far, the primary substance of abuse, and prescription drugs are second. Abuse of legal, prescription drugs accounts for the majority of drug-related emergency room visits, seventy percent of all drug-related deaths, and more injuries and deaths than all illegal drugs combined.[87] Even ignoring the abuse of nonprescription drugs, illicit drugs rank a very distant third in terms of the quantifiable hazards seen in the workplace. Nevertheless, the federal drug testing program, as well as the policies of many employers, limits testing to illicit drugs.

4. The Economic Costs of Drug Testing

In the public debate over drug testing, the high costs of testing programs are rarely mentioned. In 1990, commercial laboratories had drug testing revenues of over a third of a billion dollars.[88] According to one estimate, testing every federal government employee once a year could cost 300 million dollars annually and testing all employees in both the public and private sectors could cost eight to ten billion dollars annually.[89] This latter figure approximates the entire amount spent by the federal government on all aspects of the war on drugs, including interdiction, law enforcement, criminal justice, education, treatment, and research.[90]

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86. *See* Robert J. Lewis & Sharon P. Cooper. *Alcohol, Other Drugs, and Fatal Work-Related Injuries*, 31 J. OCCUP. MED. 23, 24–25 (1989). The Lewis and Cooper study was based upon autopsies performed in conjunction with 196 workplace fatalities in the Houston, Texas area in 1984 and 1985. Alcohol testing was performed at 173 of the autopsies, while drug testing was performed at 172. A similar finding was reached in a study published in 1991, where drug and alcohol testing based on portions of 459 workplace fatalities revealed the following positive test results: Alcohol—40; Prescription Drugs—28; Nonprescription Drugs—22; Marijuana—10; Other Illicit Drugs—0. *See* Brian C. Alleyne et al., *Alcohol and Other Drug Use in Occupational Fatalities*, 33 J. OCCUP. MED. 496, 497 (1991).

87. *See* NATIONAL INSTITUTE ON DRUG ABUSE, DATA FROM THE DRUG ABUSE WARNING NETWORK ANNUAL DATA 1983 (1983).

88. *See* Milt Freudenheim, *Booming Business: Drug Use Tests*, N.Y. TIMES, Jan. 3, 1990, at D1 (indicating that 1990 drug testing revenues were 340 million dollars, up 48% from the 230 million dollars in revenues for 1989).

89. *See* DECRESCE ET AL., *supra* note 7, at 8.

90. *See* Philip Shenon, *The Score on Drugs: It Depends on How You See the Figures*, N.Y. TIMES, Apr. 22, 1990, at 6E. The proposed budget for fiscal year 1992 is 11.7 billion dollars. *See Feds Increase Estimate of Addicts; Third Strategy Calls for More Treatment*, 5 Nat'l Rep. on Substance Abuse (Buraff Publications) No. 5, at 1 (Feb. 13, 1991).

In addition to the high aggregate costs of drug testing, the cost of individual positive results rival, if not exceed, employee annual salaries. For example, the federal government's drug testing program costs 77,000 dollars for each federal employee testing positive.[91] As evidenced by Texas Instruments' drug testing program initiated in 1990, similar expenditures exist within the private sector. Including start-up costs, Texas Instruments spent one million dollars to test more than ten thousand employees. Yet only forty-nine workers tested positive, most of them for marijuana.[92] Even though it cost the company over 20,000 dollars for each positive result, the random testing program was still viewed as successful.[93]

At the same time that vast resources are spent on workplace testing, treatment is available for only 12.83 percent of serious drug abusers in the United States,[94] and at least 66,700 people are on drug treatment waiting lists.[95] These statistics suggest that the national drug strategy is misdirected. Similarly, at the company level, many employers' concerns are one-sided; they only look to weed out substance abusers, rather than providing assistance.[96]

D. The Failure to Coordinate the Technology with Other Methods of Dealing with the Problem

Although there is dispute among experts about the relative importance of drug testing in a comprehensive workplace substance abuse program,

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91. *See Federal Drug Testing Said to Produce Little Benefit Despite Its High Costs*, 5 Nat'l Rep. on Substance Abuse (Buraff Publications) No. 8, at 1 (Mar. 27, 1991) (based on a report by Rep. Gerry Sikorski, released Mar. 2, 1991).

92. *See Texas Instruments: Employee Input Led to Drug Tests for Every Worker*, 5 Nat'l Rep. on Substance Abuse (Buraff Publications) No. 11, at 4 (May 8, 1991).

93. *See id.* The testing program, while not as expensive as that of the federal government, incurred significant costs. Including start-up costs, the company spent approximately 20,400 dollars for each positive result. Even excluding start-up costs and using only the marginal cost of $20.62 per employee tested, the company spent over 4,200 dollars for each positive result.

94. HOUSE COMM. ON GOV'T OPERATIONS, THE ROLE OF DEMAND REDUCTION IN THE NATIONAL DRUG CONTROL STRATEGY, H.R. REP. NO. 992, 101st Cong., 2d Sess. 49 (1990) (citing NATIONAL ASSOCIATION OF STATE ALCOHOL AND DRUG ABUSE DIRECTORS, TREATMENT WORKS: THE TRAGIC COST OF UNDERVALUING TREATMENT IN THE "DRUG WAR" (1990)).

95. *Id.* at 78. The 66,700 figure probably understates the problem because programs may be so full that they do not add people to their waiting lists, and other people needing treatment do not even bother trying.

96. *See* BUREAU OF NATIONAL AFFAIRS, *supra* note 38, at 77 (arguing that some employee assistance programs express fear that employers will altogether replace employee assistance programs with drug testing programs "as a cheaper substitute that will do the job [of eradicating workplace impairment] just as well").

there is general agreement that drug testing should be but one element of an overall program.[97] Two essential, but often overlooked, elements of a comprehensive program include education and rehabilitation.[98] Education involves informing employees about the dangers of substance abuse, instructing them on how to detect substance abuse problems in themselves and fellow workers, and advising them about company and community assistance programs. Education also includes training supervisory personnel to recognize the signs and symptoms of drug abuse as well as impairment on the job. Rehabilitation includes both on-site and off-site treatment, often as part of a broader employee assistance program.[99] If drug testing is to have value as the detection component of a comprehensive substance abuse program, it must be coordinated with education and rehabilitation elements, and the nontechnological components must be given funding and primacy proportionate to that of the technological components.

In their haste to adopt drug testing, some employers neglect to answer a number of basic questions regarding its adoption as well as questions concerning other aspects of a comprehensive workplace substance abuse program.[100] Indeed, knowing that these issues must be addressed may affect whether drug testing is adopted and, if so, what type of program is selected. It is a fundamental mistake to focus solely on the drug testing technology itself, without considering the broader context in which it is to be used.[101]

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97. *See* BUREAU OF NATIONAL AFFAIRS, ALCOHOL & DRUGS IN THE WORKPLACE: COSTS, CONTROLS AND CONTROVERSIES 75–124 (1986) (discussing case studies of various drug abuse programs).

98. *See* ZEESE, *supra* note [illegible] at 9–1 to 9–23.

99. *See* William J. Sonnenstuhl et al., *Employee Assistance and Drug Testing: Fairness and Injustice in the Workplace*, 11 NOVA L. REV. 709, 711–13 (1987); *Companies Do More Than Test for Drugs*, WALL ST. J., June 1, 1990, at B1.

100. These questions include the following: What are the goals of drug testing? What will be done with the test results? Will those testing positive be fired? Will they be offered rehabilitation? With or without pay? Who pays for the rehabilitation? Does it depend on whether the individual is the company president or custodian? Does it depend on the substance? What happens after rehabilitation? Is there retesting? What happens after a second positive result? If the individual is terminated, will the company oppose unemployment compensation on the ground that the employee was fired for misconduct? What will prospective employers be told when they ask for a reference?

101. For an example of the hasty decisions often made by employers, consider a recent incident in Boston, Massachusetts. Shortly after six o'clock in the morning on December 28, 1990, a passenger on a Boston trolley called the transit headquarters to report that a trolley driver was acting abnormally and was abusive to passengers. Two dispatchers ignored the call. Twenty-five minutes later the trolley slammed into a parked trolley at the station, injuring 33 passengers. The operator, a 64-year-old man with 20 years of experience, tested positive for alcohol. The Massachusetts Bay Transportation Authority, which runs Boston's transit system, immediately announced that it was instituting random drug and alcohol testing. There was no announcement about what steps, if any, were being taken to

Every employer should undertake an individual needs assessment before implementing drug testing. This assessment should be repeated at regular intervals to determine whether the original need to test still exists, to review quality assurance measures, and to evaluate whether drug testing has effectively achieved its desired goals. Similar assessments should be conducted on a societal basis to review whether the substantial social and economic investment in workplace drug testing is justified.

E. The Adoption of Workplace Testing for Reasons Unrelated to the Efficacy or Appropriateness of the Technology

1. Politics

There is an unmistakable political component to drug testing in both the public and private sectors. With a media-conscious war on drugs, much drug testing was initiated by government entities and private companies because the failure to do so might be perceived as condoning drug use. This sentiment was aptly expressed by former-President Reagan who stated: "I have heard critics say employers have no business looking for drug abuse in the workplace, but when you pin the critics down, too often they seem to be among the handful who still believe that drug abuse is a victimless crime."[102] The statement miscast the issue as simply that an individual or a company supported either drug testing or drug taking. With the issue thus framed, many companies felt compelled to adopt drug testing programs. They thought that the failure to do so could be viewed as condoning drug use.[103] The need to test was not

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change the response of dispatchers. *See Random Drug Tests Ordered After Boston Trolley Crash*, N.Y. Times, Jan. 1, 1991, at A9.

102. *Workplace Next Battleground in Drug Crusade, Reagan Tells Meeting*, 6 Empl. Rels. Wkly. (BNA) No. 7, at 205 (Feb. 15, 1988).

103. Some employers have adopted drug testing programs because they were required to do so by federal law. For example, Department of Transportation regulations promulgated in 1989, 54 Fed. Reg. 49,854 (1989), required drug testing of four million employees working for employers in the aviation, mass transportation, pipeline, maritime, railroad, and interstate bus and trucking industries. *See DOT Issues Final Test Rules for 4 Million; Additional Drugs May Be Added to List*, 4 Nat'l Rep. on Substance Abuse (Buraff Publications) No. 1, at 1–2 (Dec. 6, 1989). In addition, the Drug-Free Workplace Act of 1988, Pub. L. No. 100–690, 102 Stat. 4304 (codified in 41 U.S.C. §§ 701–07), applicable to employers with federal contracts in excess of 25,000 dollars, requires each covered employer to publish and distribute a statement prohibiting the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance in the workplace; provide for penalties for employees convicted of drug related violations on the job; and establishing an employee awareness program on the dangers and penalties of workplace drug abuse, and the availability of resources for drug rehabilitation and counseling. 41 U.S.C. § 701(a)(1) (1988). Employers failing to meet these requirements may have their federal contracts terminated

established. The goal of testing was not clear. The effectiveness of testing was unproven. Nevertheless, drug testing became almost a patriotic duty.

State and local politicians also recognize the political significance of drug testing. For example, during the 1986 gubernatorial campaign in Kansas, then-Governor Mike Hayden campaigned for a drug-free state government from the top down.[104] In 1988 he signed legislation authorizing the drug testing of all state employees in safety-sensitive positions, as well as the governor, lieutenant governor, appointed heads of state agencies, and the governor's staff.[105] The cost to the taxpayers of Kansas for this gesture was 221,000 dollars.[106]

In numerous other state and local elections the drug testing of candidates is a major campaign issue. A candidate's willingness to take a drug test and to publicize the results has become, ostensibly, a tangible illustration of the candidate's commitment to fighting drug abuse. Moreover, the laboratory's certification that the candidate is "clean" seems to take on greater symbolic value, as if the laboratory also certifies that the candidate possesses honesty, integrity, good judgment, intelligence, courage, and rectitude, along with the resolve to do "whatever it takes" to rid the voting district of drugs.

The symbolic value of drug testing occurs in areas other than elections. The most significant example involves the United States Customs Service, the federal agency charged with preventing illegal drugs from entering the country. Without any evidence of a drug problem, the federal government mandated the drug testing of all Customs Service employees before promotion. Of the first 3,600 people tested, only five tested positive.[107] The National Treasury Employees Union, represent-

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and may be barred from future contracts for up to five years. 41 U.S.C. § 701(b) (1988). Although drug testing is not required, many employers use drug testing as a part of their compliance strategy.

104. *See Governor, Staff Covered by Drug Testing Measure*, 2 Nat'l Rep. on Substance Abuse (Buraff Publications) No. 12, at 7 (May 11, 1988) (Commenting on the bill after his approval, Hayden said that "[l]eading by example is an effective style of leadership. That's why we asked the Legislature to include myself and others in the drug screening. I believe the example of a drug-free workforce should be set at the highest level.") (internal quotation omitted).

105. KAN. STAT. ANN. § 75-4362 (1988).

106. *See Governor, Staff Covered by Drug Testing Measure, supra* note 104.

107. *See* National Treasury Employees Union v. Von Raab, 489 U.S. 656, 673 (1989). The 0.14% (five positive out of 3,600 tested) was lower than other federal agencies have reported, but not significantly lower. For example, the Drug Enforcement Administration's positive rate from July, 1988 to September, 1989 was 0.41% (five positive of 1,222 tested), *see* UNITED STATES GENERAL ACCOUNTING OFFICE, ACTION BY CERTAIN AGENCIES WHEN EMPLOYEES TEST POSITIVE FOR ILLEGAL DRUGS 10 (1990), and the Department of Transportation's random testing during the same time period resulted in a 0.56% (115 positive of 20,414 tested) positive rate, *see id.* at 9.

ing the Customs Service agents, challenged the drug testing program, arguing that it was an unreasonable search and seizure in violation of the Fourth Amendment. The Supreme Court upheld, by five-to-four, the validity of the program.[108] Justice Scalia's dissent addressed the issue of symbolism:

> What better way to show that the Government is serious about its "war on drugs" than to subject its employees on the front line of that war to this invasion of their privacy and affront to their dignity? To be sure, there is only a slight chance that it will prevent some serious public harm resulting from Service employee drug use, but it will show to the world that the Service is "clean," and—most important of all—will demonstrate the determination of the government to eliminate this scourge of our society! I think it obvious that this justification is unacceptable; that the impairment of individual liberties cannot be the means of making a point; that symbolism, even symbolism for so worthy a cause as the abolition of

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Drug testing by the military during a similar time period provides an interesting comparison. Induction physical examinations of 322,256 applicants between June and December, 1988, revealed the following positive test rates: 7,616 (2.4%) marijuana; 2,853 (0.9%) cocaine; 955 (0.3%) marijuana and cocaine. In this study, though, testing was announced, possibly leading to a lower incidence of positive results because drug users may have withdrawn their applications. *See Prevalence of Drug Use Among Applicants for Military Service—United States, June-December 1988*, 38 MORBIDITY & MORTALITY WKLY. REP. 580, 581–82 (1989).

108. *See* Von Raab, 489 U.S. 656. According to the majority opinion of Justice Kennedy, "the Government has a compelling interest in ensuring that front-line interdiction personnel are physically fit, and have unimpeachable integrity and judgment." *Id.* at 670. Although the Court recognized the interference with individual privacy in urine testing, *see id.* at 671, it concluded that Customs employees have a diminished expectation of privacy. *See id.* at 672. "[W]e believe the Government has demonstrated that its compelling interests in safeguarding our borders and the public safety outweigh the privacy expectations of employees . . . ." *Id.* at 677.

A companion case, Skinner v. Railway Labor Executives Ass'n, 489 U.S. 602 (1989), involved a union challenge to a Federal Railroad Administration regulation requiring post-accident blood and urine tests of employees for drug and alcohol use. Again, the Court upheld the regulation mandating testing:

> Because the record indicates that blood and urine tests, taken together, are highly effective means of ascertaining on-the-job impairment and of deterring the use of drugs by railroad employees, we believe the Court of Appeals erred in concluding that the postaccident testing regulations are not reasonably related to the Government objectives that support them.

Id. at 632 (footnote omitted).

unlawful drugs, cannot validate an otherwise unreasonable search.[109]

2. Profits

Some advocates of drug testing see it as a means of assuring safe, productive, and drug-free workplaces. A number of these advocates, however, also have a financial stake in the proliferation of drug testing. Drug testing is a multi-million dollar growth industry for test equipment manufacturers, laboratories, consultants, and even private physicians.[110] In extolling the virtues of drug testing and describing the alleged catastrophes in failing to test, some advocates' misstatements about drug abuse rates, potential legal liability for failing to test, and the effectiveness of testing border on the deceptive or even fraudulent.[111]

An investigation of the growing drug treatment industry[112] suggests that some treatment centers may be more interested in profitability than in treating employees with drug problems.[113] Thus, even if an employer is genuinely interested in assisting its employees, it is questionable whether sending them to residential treatment facilities costing up to one thousand dollars per day[114] is efficacious.

First, after treatment for a few weeks the patient is often pronounced cured just as the company-paid benefits run out. Second, as many as ninety-eight percent of all positive workplace tests may arise from casual

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109. Von Raab, 489 U.S. at 686–87 (Scalia, J., dissenting).

110. Physicians, for example, now offer drug testing services as a "profitable sideline." Dennis Murray, *How to Make Drug Testing a Profitable Practice Sideline*, MED. ECON., Aug. 5, 1991, at 66.

111. *See, e.g.*, John P. Morgan, *The "Scientific" Justification for Urine Drug Testing*, 36 KAN. L. REV. 683, 697 (1988) (accusing testing proponents of "zealotry and improper use of statistics to support a moral stance").

112. In 1982 the private, for-profit drug treatment industry consisted of 159 programs with a total of 9,800 clients in treatment; by 1987 it had grown to 735 programs with a total of 30,000 clients in treatment. *See* INSTITUTE OF MEDICINE, 1 TREATING DRUG PROBLEMS: A STUDY OF THE EVOLUTION, EFFECTIVENESS, AND FINANCING OF PUBLIC AND PRIVATE DRUG TREATMENT SYSTEMS 277 (Dean R. Gerstein & Henrich J. Harwood eds., 1990). Private insurance reimbursements for drug treatment increased from 43.5 million dollars in 1982 to 348 million dollars in 1987. *See id.*; *see generally* James B. Jacobs & Lynn Zimmer, *Drug Treatment and Workplace Drug Testing: Politics, Symbolism and Organizational Dilemmas*, 9 BEHAV. SCI. & L. 345 (1991).

113. *See Texas Scrutinizes Treatment Program Operations*, ALCOHOLISM & DRUG ABUSE WK., Aug. 7, 1991, at 4 (discussing the investigation of corrupt treatment referral processes involving the payment of "headhunters" and others who assist in securing patients at residential treatment facilities).

114. *See* Richard Phalon, *Sobering Facts on Rehab.*, FORBES, Mar. 9, 1987, at 140–42.

marijuana use[115] for which residential treatment is not medically necessary.[116] Third, for those who really need drug treatment, success rates vary widely, sometimes falling below ten percent.[117] Finally, increasing expenditures by employers for drug treatment programs may be causing some companies to cut back on other employee benefits.[118] In a 1989 study of 167 companies, more companies had drug testing than common first aid.[119]

When many of the strongest proponents of using drug testing technology and follow-up treatment are those who stand to gain politically or financially, decision makers should be wary of the technology. Intelligent health policy is not legitimated through campaign gestures, trade exhibits, or slick advertising.

F. The Failure to Assess the Effectiveness of Workplace Drug Testing

Large-scale workplace drug testing developed from the anti-drug policies of the President's Commission on Organized Crime.[120] As such, it is primarily a law enforcement strategy. Unable to cut the supply of

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115. *See* E. C. Curtis, *Drug Abuse: A Westinghouse Corporation Perspective*, in NIDA, WORKPLACE DRUG ABUSE POLICY 84 (1989).

116. According to the Institute of Medicine:

> Treatment is not an appropriate or efficient response to the most common patterns of drug consumption, namely, experimental and occasional use, and may not be needed in cases of abuse in which impairment is slight or the pattern of abuse is new. Other interventions, such as brief preventative counseling, educational services, and disciplinary sanctions, may be legitimate, useful, or effective in promoting cessation and abstinence in these instances.

INSTITUTE OF MEDICINE, *supra* note 112, at 7.

117. *See* Robert L. Hubbard et al., DRUG ABUSE TREATMENT: A NATIONAL STUDY OF EFFECTIVENESS 117 (1989) (finding in a study of marijuana treatment programs that "only . . . 1 of 10 outpatient drug-free clients were abstinent from marijuana in the year after treatment. . . . [and] that many clients continue[d] to engage in regular marijuana use during and after treatment . . . ."). One of the main problems in drug rehabilitation is that it attempts to use the alcoholism treatment model without convincing evidence that this approach works with drugs such as cocaine. *See* GABRIEL G. NAHAS, COCAINE: THE GREAT WHITE PLAGUE 240 (1989).

118. *See Mandated Drug-Free Workplace Campaigns Said to Be Hurting Company Benefit Plans*, Nat'l. Rep. on Substance Abuse (Buraff Publications) No. 18, at 1 (Aug. 14, 1991).

119. *See* RYAN Associates and Occupational Health Research, *Most Common Program Services*, 1 VISIONS: PERIODICAL NAT'L ASS'N OCCUPATIONAL HEALTH PROFS. 6 (1990).

120. *See supra* notes 30–34 and accompanying text.

illegal drugs, the Commission apparently believed that if drug users became unemployable, then demand would be cut.[121] The specimen jar was added to the arsenal of the anti-drug army.

It was unrealistic, however, to expect that workplace drug testing would cause a significant reduction in illicit drug use. Substance abuse has long been prevalent in the United States.[122] The rate of abuse fluctuates and the substance of abuse varies, but the fact of abuse persists. From our morning dose of caffeine to our evening sedative, our society is substance-dependent and over-medicated. The current epidemic of substance abuse is rooted in unemployment, poverty, despair, alienation, and numerous other social factors,[123] and a technological solution is not necessarily appropriate. Workplace drug testing was, for the most part, a doomed attempt to impose a technological solution on a non-technological problem. In many instances, it was adopted without an understanding of the effectiveness and nature of the technology, and without attempting to make it part of a coordinated effort to attack the problem of drug use in the workplace. Rather than recognizing the social limitations of drug testing, though, advocates often point to "new and improved" technology as the solution.[124]

Before subjecting millions of people to and spending millions of dollars on drug testing in the workplace, one would assume that the

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121. *See* DAVID F. MUSTO, THE AMERICAN DISEASE: ORIGINS OF NARCOTIC CONTROL 273 (1987).

122. *See* David F. Musto, *Opium, Cocaine and Marijuana in American History*, SCI. AM., July 1991, at 40 (arguing that American society has oscillated between acceptance and outright rejection of drug use).

123. *See* Peter Kerr, *Rich vs. Poor: Drug Patterns Are Diverging*, N.Y. TIMES, Aug. 30, 1987, at A1 (finding that cocaine use among the rich has decreased while cocaine use among the poor has increased); David N. Nurco et al., *Recent Research on the Relationship Between Illicit Drug Use and Crime*, 9 BEHAV. SCI. & L. 221 (1991) (showing that a correlation exists between illicit drug use and criminal behavior).

124. For example, one problem with urine drug testing is the intrusiveness of using a urine test. Rather than questioning the value of drug testing at all, RIA hair screening, which requires only a one and one-half inch clump of hair, is being advocated as a neat and "proper" alternative. *See* Ted Gest, *Does He or Doesn't He? New Drug Tests Target Hair*, U.S. NEWS & WORLD REP., May 28, 1990, at 58. Despite a scientific consensus that the technique is unproven, it is already being used. *See* FOOD AND DRUG ADMINISTRATION, COMPLIANCE POLICY GUIDE FOR RADIOIMMUNOASSAY (RIA) ANALYSIS OF HAIR TO DETECT THE PRESENCE OF DRUG ABUSE, *construed in* 55 Fed. Reg. 23,985 (1990) (noting that the process is "unreliable and not generally recognized by qualified experts as effective" and is "an unproven procedure unsupported by the scientific literature on well-controlled studies"). But in a recent case, the RIA hair screening of Lake Tahoe casino employees was upheld. *See* Koch v. Harrah's Club, 5 Individual Employment Rts. Cases (BNA) 1295 (D. Nev. Sept. 12, 1990). The court relied on the fact that employees who tested positive and refused to admit to drug use were required to submit to unannounced urine testing in which urine samples were collected at least twice per week and in which positive test results were checked using GC/MS confirmation. *See id.* at 1296.

effectiveness of workplace drug testing had been well established. Rather, there is a dearth of evidence on the effectiveness of drug testing as a deterrent to drug use.[125] Few, if any, scientific, peer-reviewed studies demonstrate the effectiveness of workplace drug testing in reducing employee drug abuse and improving safety and productivity. No study compares the effectiveness of drug testing with other methods of dealing with workplace drug abuse, and few scientific studies even exist that document the unsurprising conclusion that individuals testing positive for marijuana or cocaine at a preemployment drug test are more likely to be fired, injured, or disciplined.

Many employers *believe* that drug testing is responsible for, among other things, improved quality of job applicants, workplace safety, community image, employee morale, and job performance.[126] Nevertheless, a 1990 study of postal workers published in the *Journal of the American Medical Association*[127] found a much lower correlation between a positive drug test and reduced productivity than those previously claimed by drug testing advocates. The approximately fifty-percent risk of firing, injury, discipline, or absence was much less than the 200–1500% risk described in the only prior study—written in 1983 by now-Vice President Dan Quayle.[128] According to the authors of the recent study, "the findings suggest that many of the claims cited to justify preemployment drug screening have been exaggerated."[129] Notwithstanding this conclusion, a headline published the same day in *The Wall Street Journal* read: *Study May Spur Job-Applicant Drug Screening.*[130]

Drug testing advocates often cite to three sets of data to support their claim that drug testing works.[131] First, they point to declining numbers of applicants and employees with positive drug tests. A decline in

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125. *See* David Wessel, *Evidence Is Skimpy that Drug Testing Works, but Employers Embrace Practice*, WALL ST. J., Sept. 7, 1989, at B1.

126. *See* HELEN AXEL, CONFERENCE BOARD, *supra* note 41; *see also Employers Embrace Drug Testing as Means to Cut Insurance Costs*, 20 O.S.H. Rep. (BNA) No. 34, at 1300 (Jan. 30, 1991); *Workplace Savings Are Noted in Reports at NIDA Conference*, 3 Nat'l Rep. on Substance Abuse (Buraff Publications) No. 21, at 2–3 (Oct. 11, 1989) (comparing the costs and benefits of the drug testing program used by the Georgia Power Company and concluding that the program was economically cost effective).

127. *See* Craig Zwerling et al., *The Efficacy of Preemployment Drug Screening for Marijuana and Cocaine in Predicting Employment Outcome*, 264 JAMA 2639, 2639 (1990).

128. *See* Dan Quayle, *American Productivity: The Devastating Effect of Alcoholism and Drug Abuse*, 38 AM. PSYCHOL. 454 (1983).

129. Zwerling et al., *supra* note 127, at 2643.

130. Ron Winslow, *Study May Spur Job-Applicant Drug Screening*, WALL ST. J., Nov. 28, 1990, at B1.

131. *See* Edward Kaim, *Does Drug Testing Work? A Review of the Scientific Literature*, 4 EMPLOYMENT TESTING 713, 713 (1991).

positive results for applicants and employees would be expected, however, because after 1985 drug use rates declined sharply.[132] The correlation demonstrates a complex network of social pressures combining to decrease casual drug use in society at large, not just the workplace.

Some advocates of testing have asserted that workplace drug testing *caused* the drop in overall use rates. But this argument is refuted by the fact that a virtually identical decline was measured in a group not subject to drug testing, high school students.[133] In particular, the decreases in cocaine use among high school seniors and adults are nearly identical for the 1985 to 1990 period.[134] Moreover, drug use rates among high school seniors began declining well before drug testing was widely performed in the workplace.[135] These trends collectively suggest that societal influences completely apart from drug testing influenced the recent declines in drug use rates.

Second, proponents of workplace drug testing often point to anecdotal reports of improved productivity and safety, for example, fewer drug-related absences and accidents, as being directly attributable to drug testing.[136] Because of reduced drug usage, though, some improvement would occur in any event. Even assuming that improvements in safety have resulted from employer action related to drugs, it is not clear that the improvements would not have taken place without drug *testing*. For some employers, workplace drug testing was the first and only effort to do something about substance abuse. For these companies, drug testing is being compared with doing nothing. Employers that institute drug education programs, supervisory training programs, and employee assistance programs may well achieve the same safety and productivity improvements without resorting to drug testing. Indeed, better supervision and performance review in general may be more effective than drug

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132. *See supra* note 45 and accompanying text.

133. *See* University of Michigan Institute for Social Research, Press Release No. 18 (Jan. 23, 1991). *See also* Denise B. Kandel & Mark Davies, *Decline in the Use of Illicit Drugs by High School Students in New York State: A Comparison with National Data*, 81 AM. J. PUB. HEALTH 1064, 1064 (1991) (at least 50% decline in use of almost all illicit drugs by high school students in New York State from 1983 to 1988).

134. *Compare* University of Michigan Institute for Social Research, *supra* note 133, at 8 (Table 3) (indicating that monthly cocaine use among high school seniors nationwide fell from 6.7% in 1985 to 1.9% in 1990) *with* POPULATION ESTIMATES 1985, *supra* note 45, at 14 *and* POPULATION ESTIMATES 1990, *supra* note 45, at 29 (indicating that adult cocaine use fell from 5.8 million monthly users in 1985 to 1.6 million monthly users in 1990).

135. From a peak of 37.1% in 1978, marijuana use declined to 25.7% in 1985 (before the advent of widespread workplace testing), and continued declining to 14.0% in 1990. *See* University of Michigan Institute for Social Research, *supra* note 133, at 8 (Table 3).

136. *See supra* note 126 and accompanying text.

testing in improving productivity, and it may cost less.[137] Most significantly, these other methods of dealing with workplace drug use also avoid damaging workplace relationships and reaching the ethical and legal issues raised by drug testing.

Third, drug testing supporters point to the fairly widespread endorsement of drug testing in public and employee surveys.[138] One possible explanation is that the surveys are flawed, such as by priming respondents through prior questioning and not giving respondents a choice between drug testing and other alternatives. Another explanation is that the respondents misunderstand the need to test, what drug tests measure, or the effectiveness of testing. Many of the same public opinion polls indicate a widespread, mistaken view that drug abuse rates are increasing.

It is irresponsible to promote the indiscriminate use of an intrusive, expensive, stigmatizing, and controversial technology in the absence of compelling evidence of its effectiveness. It is reckless to continue using the technology without even attempting to determine whether it is needed or whether it is efficacious.

CONCLUSION

In the face of a desperate and seemingly intractable social problem, decision makers in the public and private sectors have been tempted to utilize one of the few available weapons. Drug-testing offers a seductive, simple solution to a complex and seemingly unmanageable problem. Drug testing is quick and easy, and one immediately senses success by discovering the users of illicit substances. It is tempting to believe that simply excluding individuals with a positive drug test will eliminate the problem of substance abuse in the workplace.

Unfortunately, the problem is much more complicated. Too often employers have embraced workplace drug testing without considering its individual, societal, political, and economic implications, and without considering its actual effectiveness. Limited legal recourse and regulation, after the adoption of workplace testing, has proven a poor substitute for an initial objective assessment of the technology.

Workplace drug testing teaches many important lessons in technology assessment. It points out the critical need to understand the underlying problem, know the limits of the technology, and assess the effectiveness

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137. *See generally* ZEESE, *supra* note 14, at 9–1 to 9–10.

138. *See, e.g.*, Rosemary Orthmann, *Polls Show Most Employees Favor Drug Testing*, 4 EMPLOYMENT TESTING 652, 652 (1990).

of the technology before its implementation. The adoption of a technological solution to a difficult problem may completely eliminate the problem. It may also prove harmful, ineffective, and hard to displace after its adoption. Unfortunately, workplace drug testing has followed this latter course.