Pacific Northwest
NATIONAL LABORATORY

902 Battelle Boulevard
P.O. Box 999, MSIN K7-68
Richland, WA 99352
(509) 371-6350
caitlin.condon@pnnl.gov
www.pnnl.gov

March 8, 2023

Mr. John Grasso
Contracting Officer's Representative
Office of Nuclear Regulatory Research (RES)
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Grasso:

SUBJECT: FINAL TASK A DELIVERABLE FOR TASK ORDER 31310020F0059, "NRC FITNESS FOR DUTY ACTIVITIES SUPPORT," CAC KF0067 – PNNL PROJECT 77120

Pacific Northwest National Laboratory (PNNL) has completed the Task A Final Technical Letter Report for the benchmarking of international drug and alcohol testing programs for Task Order 31310020F0059, "NRC Fitness for Duty Activities Support". The report focuses on a policy analysis and benchmarking metrics comparison among different countries and regions. This report incorporates NRC's comments and has been approved by PNNL for public release. The report can be found in OSTI.gov here.

If you have any questions, please contact Caitlin Condon at 509-371-6350 or caitlin.condon@pnnl.gov.

Sincerely,

Caitlin Condon

Caitlin A. Condon
Task Order Manager
Energy & Environmental Directorate
Pacific Northwest National Laboratory

cc: Kelly Dickerson, NRC
Paul Harris, NRC
Luba Hamilton, PNNL
Rajiv Prasad, PNNL
Katie Wagner, PNNL

Pacific Northwest
NATIONAL LABORATORY

PNNL-31409, Rev. 2

International Benchmarking

A Global Perspective of Workplace Drug and Alcohol Testing

January 2023

Caitlin Condon
Ellen Kennedy
Patrick Mirick
Dave Goodman
Amoret Bunn
Angela Dalton

Prepared for the U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Under Contract DE-AC05-76RL01830
Interagency Agreement: 31310019N0001
Task Order Number: 31310020F0059

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, makes **any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights**. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC05-76RL01830

Printed in the United States of America

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information,
P.O. Box 62, Oak Ridge, TN 37831-0062;
ph: (865) 576-8401
fax: (865) 576-5728
email: reports@adonis.osti.gov

Available to the public from the National Technical Information Service
5301 Shawnee Rd., Alexandria, VA 22312
ph: (800) 553-NTIS (6847)
email: orders@ntis.gov <https://www.ntis.gov/about>
Online ordering: http://www.ntis.gov

PNNL-31409, Rev. 2

International Benchmarking

A Global Perspective of Workplace Drug and Alcohol Testing

January 2023

Caitlin Condon
Ellen Kennedy
Patrick Mirick
Dave Goodman
Amoret Bunn
Angela Dalton

Prepared for the U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Under Contract DE-AC05-76RL01830
Interagency Agreement: 31310019N0001

Pacific Northwest National Laboratory
Richland, Washington 99354

Abstract

Workplace drug and alcohol testing has been widely implemented in diverse industries and is designed to detect the use of and deter the influence of legal and illegal substances that would impair the ability to perform work that has significant security and safety implications. Across the globe, patterns of drug and alcohol use and abuse and the regulations controlling drug and alcohol use vary by location (e.g., regions, countries, etc.). The prevalence of workplace drug and alcohol testing and protection of individuals' rights in the workplace similarly tend to exhibit contextual differences. With the advancements in drug-testing technologies and the recent issuance of guidance for additional testing matrices (e.g., oral fluid, hair, etc.) by the U.S. Department of Health and Human Services, gaining a global perspective on the current state of drug and alcohol testing practices and regulations is important for leveraging such advancements to improve the effectiveness of drug and alcohol testing.

The U.S. Nuclear Regulatory Commission (NRC) tasked the Pacific Northwest National Laboratory (PNNL) fitness for duty (FFD) team to conduct a benchmarking analysis of international drug and alcohol testing regulations and programs to identify similarities and differences in workplace testing programs and the basis for any differences. The benchmarking study focuses on a policy analysis and benchmarking metrics comparison among different countries and regions. The policy analysis includes the following three types of relevant international and national policies relevant to drug and alcohol testing in the nuclear industry:

1. National drug and alcohol policy
2. Workplace drug and alcohol testing
3. FFD regulations for Nuclear Power Plants

The international drug and alcohol benchmarking metrics focusses on the use of blood, breath, urine, hair, and oral fluid in testing; drug and drug metabolite cutoff values; point-of-collection testing devices; roadside testing methodologies; innovations in drug testing; and the extent of availability of such data. Gaining an understanding of workplace drug and alcohol testing in other countries as well as information about new testing methods, matrices, tools, and technologies that other countries have adopted provides NRC with international comparative information regarding the technical basis for such programs and methods as it relates to the protection of worker and public health and safety.

Acronyms and Abbreviations

ARIDE	Advanced Roadside Impaired Driving Enforcement
CDSA	Canadian Controlled Drugs and Substances Act
CFR	Code of Federal Regulations
CSA	Controlled Substance Act
DEA	U.S. Drug Enforcement Agency
DEC	drug evaluation and classification
DOT	U.S. Department of Transportation
DRE	drug recognition expert
DUI	driving under the influence
DWI	driving while intoxicated
EMCDDA	European Monitoring Centre for Drugs and Drug Addiction
EU	European Union
EWDTS	European Workplace Drug Testing Society
FFD	fitness for duty
FR	*Federal Register*
GCDP	Global Commission on Drug Policy
HHS	U.S. Department of Health and Human Services
HIPAA	Health Insurance Portability and Accountability Act
IAEA	International Atomic Energy Agency
LSD	lysergic acid diethylamide
MDMA	3,4-methylenedioxy-methamphetamine
NDEWS	National Drug Early Warning System
NDPS	Narcotic Drugs and Psychotropic Substances Act
NHTSA	National Highway Traffic Safety Administration
NIDA	National Institute on Drug Abuse
NPP	nuclear power plant
NRC	U.S. Nuclear Regulatory Commission
PCP	phencyclidine
PNNL	Pacific Northwest National Laboratory
SFST	Standardized Field Sobriety Testing
THC	tetrahydrocannabinol
UN	United Nations
UK	United Kingdom
UNODC	United Nations Office on Drugs and Crime
WHO	World Health Organization

Contents

Figures

Tables

1.0 Introduction

Workplace drug and alcohol testing has been widely implemented in diverse industries and is designed to detect the use of and deter the influence of legal and illegal substances that would impair the ability to perform work that has significant security and safety implications. In 1986, the United States addressed drug use in the workplace by establishing the Drug-Free Workplace Program (Executive Order 12564, 1986), which requires Federal agencies to establish guidelines for a drug-free workplace and drug and alcohol testing to deter drug use for the Federal workforce. In 1988, the U.S. Department of Health and Human Services (HHS) issued its *Mandatory Guidelines for Federal Workplace Drug Testing Program* (53 *Federal Register* [FR] 11979, 1988); hereafter referred to as the "Mandatory Guidelines." These drug testing Mandatory Guidelines have been established and continuously updated by HHS with operational experience learned from its National Laboratory Certification Program and inputs from the public and Federal agencies. These Mandatory Guidelines have been used by Federal agencies such as the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of the Transportation (DOT) to inform their regulations that require affected entities to drug test individuals performing duties and responsibilities in safety- and security-sensitive industries to protect the public and environment.

The NRC regulates the use of drugs and alcohol under the fitness for duty (FFD) program. The program requires, in part, that individuals performing work that potentially affects public health and safety are not under the influence of any substance, legal or illegal, that may impair their ability to perform their duties. The initial NRC FFD program was established on June 7, 1989, (54 FR 24468, 1989) and codified in Title 10 of the *Code of Federal Regulations* (CFR) Part 26 (10 CFR 26) with a subsequent major update issued in a 2008 Final Rule (73 FR 16966, 2008). The drug- and alcohol-related performance objectives for FFD programs as provided in 10 CFR 26.23 states that described licensees and other entities must:

> (a) provide reasonable assurance that individuals are trustworthy and reliable as demonstrated by the avoidance of substance abuse;
>
> (b) provide reasonable assurance that individuals are not under the influence of any substance, legal or illegal, or mentally or physically impaired from any cause, which in any way adversely affects their ability to safely and competently perform their duties;
>
> (c) provide reasonable measures for the early detection of individuals who are not fit to perform the duties that require them to be subject to the FFD program; and
>
> (d) provide reasonable assurance that the workplaces subject to this part are free from the presence and effects of illegal drugs and alcohol.

The FFD program has used the Mandatory Guidelines to establish the technical requirements for drug testing in the commercial reactor industry subject to Part 26. HHS periodically updates its guidelines based on the most current scientific evidence and lessons learned from the Federal drug-testing programs. Beginning in 2017, HHS updated its Mandatory Guidelines in the *Federal Register* (82 FR 7920-7970), published its Oral Fluid Mandatory Guidelines (84 FR 57554-57600), and the proposed guidelines for using hair specimens for drug testing (85 FR 56108-56151). Consequently, HHS has issued guidance to incorporate recent advances in drug testing methods and has updated its panel of drugs and drug metabolites (and their associated cutoffs) to be tested. Federal agencies, such as NRC and DOT, are evaluating these changes to, in part, improve the effectiveness and efficiency of their drug testing programs and reduce regulatory burden.

NRC requested that Pacific Northwest National Laboratory (PNNL) collect information about and evaluate how other countries, especially those with nuclear power generation capabilities, regulate the use of drugs and alcohol. Gaining an understanding of workplace drug and alcohol testing practices of other countries as well as information about new testing methods, matrices, tools, and technologies that other countries have adopted can provide the NRC with comparative international data regarding the technical basis for such programs and methods related to the protection of worker and public health and safety.

1.1 Study Objective

This study's objective is to benchmark international drug and alcohol testing regulations and programs to provide the NRC with comparative information regarding workplace drug and alcohol testing programs, testing methods, and workplace FFD programs. The primary focus areas for this study includes collecting data on current international drug and alcohol testing regulations and programs, gaining insight of the prevailing international standards for testing matrices including the use of oral fluids and hair samples, and frequency of random tests being conducted. The study also focuses on the international FFD programs and policies for safety- and security-sensitive positions within the international nuclear workforce. Where information about the nuclear workforce is not available, the team examined other safety- and security-sensitive industries that might have similar drug and alcohol testing regulations and workforce requirements. In addition, national drug and alcohol use regulations in other countries have been reviewed and analyzed to provide the context in which the industry-specific testing requirements have been discussed.

For each country, the PNNL project team collected information ranging from general to specific with the intent to answer the following questions:

- What policies and regulatory controls are in place for drug and alcohol use across the country's populace? (Section 4.1)
- What drug and alcohol restrictions and testing practices apply to workplace testing? (Section 4.2)
- What regulatory controls and testing are used for the nuclear workforce? (Section 4.3)

Although there are some 30 countries that have operating nuclear power reactors, the availability of relevant information on drug and alcohol testing varies substantially from country to country. To the extent that such information is available, the project team has focused the efforts primarily on Canada, France, the United Kingdom (UK), and other members of the European Union (EU). Relevant information from additional countries (e.g., India, Japan, and Mexico) also was included as appropriate to enrich the analysis and discussion. See Appendix A for a list of countries with operating nuclear power reactors.

1.2 Study Scope

This international benchmarking study focuses on international information and analysis of drugs of concern, drug and alcohol use, and drug and alcohol testing from a policy and a technical perspective.

1.2.1 Drugs of Concern

Drugs of concern include a broad range of substances that have varying levels of potential for misuse and abuse. The classification of drugs may differ by location and circumstance of use. Across the globe, drugs typically are used for therapeutic purposes; however, social/recreational use was observed in many locales, regions, and countries (e.g., legal recreational use of cannabis in the Netherlands and in some States in the United States). All drugs, whether used therapeutically or recreationally, could be abused and may cause impairment; in this study, we focus on several of these types of drugs. Sections 3.0 and 4.1 provide a more detailed discussion of these drugs, their use, legal status, and potential cultural or societal significance associated with drug use. These drugs include substances subject to the NRC drug and alcohol testing requirements as well as other drugs that were identified through research.

1.2.2 Drug Use

When benchmarking international drug and alcohol testing regulations and programs, the nature of the drug and the context and location of its use (e.g., in the workplace) are important considerations. Drug legality and drug use restrictions also are important factors. Certain drugs may be uncontrolled and widely available, while other drugs may be allowable only under certain circumstances (e.g., properly prescribed and used as directed) but might be unallowable or illegal under other circumstances (e.g., use of medication prescribed for others). Yet some drugs may not have any acceptable medical use and are illegal in all circumstances. Furthermore, while a drug (either legal or illegal) may be socially acceptable in one country, it may not be in another country. For example, alcohol, while regulated, is widely seen as socially acceptable in the United States, while it is frowned upon, either for religious or other reasons, in other countries. It may be that a drug is acceptable for one type of use in one country while it is not in another. For example, heroin is a Schedule 1 controlled substance in the United States with no currently acceptable medical use and a high addiction potential, while supervised injectable heroin treatment has been used in some European countries (e.g., Germany, Switzerland, the Netherlands) to treat heroin addiction cases where prevailing treatment methods have failed repeatedly (Strang et al. 2012). This may be important in testing programs because they will likely only cover drugs of concern for the country being studied. Similarly, the legal implications of drug and alcohol use also differ based on the country and the schedule[1] of the drug. Hence, the schedule, legality, acceptability, and applicability of drug regulations to the benchmarking of a testing program is influenced by the country and/or locality.

1.2.3 Drug and Alcohol Testing

Drug and alcohol testing has been conducted in a variety of settings to serve varied purposes. It commonly is used in pre-employment screening and ongoing workplace monitoring to make sure workers are free from the influence of drugs and alcohol while on the job. Roadside testing is conducted by law enforcement personnel to interdict individuals driving under the influence (DUI) or driving while intoxicated (DWI) to protect the drivers, passengers, and the public. Community-based drug and alcohol testing helps criminal justice systems enforce drug- and alcohol-related legal requirements such as probation, custody, and DUI/DWI programs. In addition, drug testing has long been a pivotal part of anti-doping programs to help uphold fairness and integrity in sportsmanship. Although the focus of this study is workplace drug and

[1] The term “class” is used synonymously with schedule in some non-U.S. contexts. For example, the Misuse of Drugs Act of the United Kingdom identifies three classes of controlled drugs based on the potential danger they have to users and society.

alcohol testing, wherever useful information, such as innovation in testing tools, methods, and standards, was gleaned from other types of testing, it was incorporated into the discussion. In Sections 4.2 and 4.3, we discuss workplace drug and alcohol testing policies and drug and alcohol testing programs at nuclear power plants (NPPs) in different countries; key organizations and stakeholders involved in regulating, requiring, and conducting such testing; and key considerations regarding workers' rights and protections.

1.3 Structure of Report

This report is organized as follows:

- Section 2.0 describes the study methodology including terminology, data collection approach and criteria used for selecting the countries for analysis.
- Section 3.0 provides an overview of drugs of concern and the types of drug and alcohol testing of interest described in this report.
- Section 4.0 discusses the findings on international drug and alcohol use and regulation, including the use of impairing drugs and substances, applicable policies and regulations, worker privacy, and other protections that impact how drug and alcohol use may be regulated and enforced.
- Section 5.0 discusses relevant benchmark metrics and considerations for drug and alcohol testing.
- Section 6.0 presents conclusions on drug and alcohol testing for safety- and security-sensitive positions within the international nuclear workforce.
- Section 7.0 provides a list of references used in this report.
- Appendices A, B, and C provide detailed information about the countries with nuclear power reactors, U.S. regional drug use trends, and a summary of workplace drug and alcohol testing laws by country and region, respectively.

2.0 Methodology

To inform the development of an international benchmark for drug and alcohol testing, the PNNL project team developed a conceptual approach to data collection and established criteria to be used for identifying specific countries to be included in this benchmarking analysis. In this section, the methodology used to identify and collect data sources, search criteria, and the types of data available are described. The approach used to analyze, compare, integrate, and synthesize data also are described and any methodological limitations have been noted.

Of note, the terminology associated with "drug testing" can be confusing. This report used the following definitions:

- *Matrix* – The biological material collected from an individual. These materials include blood, breath, urine, hair, and oral fluids (85 FR 56108-56151, 2020)
- *Drug screening* – Analyses that distinguish negative or positive presence of a drug or metabolite. An example would be the immunoassay screening that is used for the initial detection of drugs in a urine specimen. A positive drug screen or positive initial test would be followed by a confirmatory test for the specific drug or metabolite in the specimen.
- *Drug testing* – Analysis of specific drugs or drug classes. Results are of a consequence equal to or greater than a predetermined threshold, or cutoff level. Examples of a drug test would be for the level of ethyl alcohol in the breath or blood specimen, or for phencyclidine (PCP) in urine. Such results include confirmatory analyses. Further discussion of the drug analytes has been provided in Section 5.0.
- *Conditions for testing* – The types of drug and alcohol testing in the NRC's FFD program are described in 10 CFR 26.31(c) as:

  > Licensees and other entities shall administer drug and alcohol tests to the individuals who are subject to this subpart under the following conditions:
  >
  > (1) Pre-access. In order to grant initial, updated, or reinstated authorization to an individual, as specified in subpart C, "Granting and Maintaining Authorization," of this part;
  >
  > (2) For cause. In response to an individual's observed behavior or physical condition indicating possible substance abuse or after receiving credible information that an individual is engaging in substance abuse, as defined in 10 CFR 26.5;
  >
  > (3) Post-event. As soon as practical after an event involving a human error that was committed by an individual who is subject to this subpart, where the human error may have caused or contributed to the event. The licensee or other entity shall test the individual(s) who committed the error(s) and need not test individuals who were affected by the event whose actions likely did not cause or contribute to the event. The individual(s) who committed the human error(s) shall be tested if the event resulted in—
  >
  > (i) A significant illness or personal injury to the individual to be tested or another individual, which within 4 hours after the event is recordable under the Department of Labor standards contained in 29 CFR 1904.7, "General Recording Criteria," and subsequent amendments thereto, and results in death, days away from work, restricted work, transfer to another job, medical treatment beyond first aid, loss of consciousness, or other significant illness or injury as diagnosed by a physician or other licensed health care professional, even if it does not result in

death, days away from work, restricted work or job transfer, medical treatment beyond first aid, or loss of consciousness;

(ii) A radiation exposure or release of radioactivity in excess of regulatory limits; or

(iii) Actual or potential substantial degradations of the level of safety of the plant;

(4) Follow-up. As part of a follow-up plan to verify an individual's continued abstinence from substance abuse; and

(5) Random. On a statistically random and unannounced basis, so that all individuals in the population subject to testing have an equal probability of being selected and tested.

The terminology for administering drug and alcohol testing may vary in other countries; for instance, pre-employment drug screening might be similar to pre-access testing, probable cause and reasonable suspicion testing might be similar to for-cause testing, and spot testing might be similar to random testing.

2.1 Data Collection

The data collection effort was guided by the following considerations.

- *Language*: The data collection effort focused exclusively on publications in English.
- *Data sources and quality*: Wherever available, data were gathered from reputable and reliable sources such as government agencies, international nongovernmental organizations, and research organizations. Popular media sources such as newspapers and websites were also used to enrich the dataset.
- *Geographic location*: The project team divided the data collection effort by geographic regions. North America includes the United States, Canada, and Mexico. Europe includes the UK and other EU countries. Asia-Pacific includes India and Japan.
- *Countries' nuclear statuses*: Countries with nuclear power reactors constitute the pool of potential countries that might have programs similar to the FFD programs in the United States (see Appendix A).
- *Target sensitivity*: Certain sensitive countries[2] have been excluded from the data collection despite their nuclear country status.
- *Data sensitivity*: Data collection focused on publicly available information accessible through web-based searches executed through search engines such as Google™. The information compiled is intended for unlimited, public use.

It is important to note that data availability was a key limiting factor in the data collection effort. Certain countries not only have more data about drug and alcohol controls, workplace drug testing, and FFD, but such data also are published and readily available on the internet. In comparison, for some countries such data were not abundantly available in the public domain.

[2] This report follows the list of Sensitive Foreign Nations identified by the U.S. Department of Energy for operations and contracting. See DOE Attachment G – Sensitive Foreign Nations Control https://www.energy.gov/sites/prod/files/2017/02/f34/Part%20VII%2C%20SECTION%20J%20-%20List%20of%20Documents%2C%20Exhibits%2Cand%20Other%20Attachments%20%20Attachment%20G_0.pdf (Retrieved April 25, 2021).

In some cases, the project team was unable to retrieve information about certain topics for a country. The different degrees of data availability thus resulted in unevenness in information richness across the countries included in this study.

As Figure 2.1 shows, information potentially pertinent to the goal of the report which can be grouped into three categories, from the broadest to the most narrowly focused in scope:

- *Country-level drug and alcohol control regulations*: Information in this category focuses on a country's laws and regulations regarding drugs and alcohol controls, legality, restrictions on use, and penalties for violations. Where available, cultural and societal attitudes toward the use of these substances and how they interact with regulations also are included.
- *Workplace drug and alcohol testing programs*: Information in this category includes the permissibility of workplace drug and alcohol testing across different countries, conditions for testing, types of testing allowed, and the legal protections of individuals in the workplace. Where available, testing values also are collected.
- *Drug and alcohol testing programs at NPPs*: Information in this category is the most relevant to the NRC FFD programs. In addition to the NRC's FFD program, the PNNL project team attempted to identify similar programs in other countries to compare the test requirements.

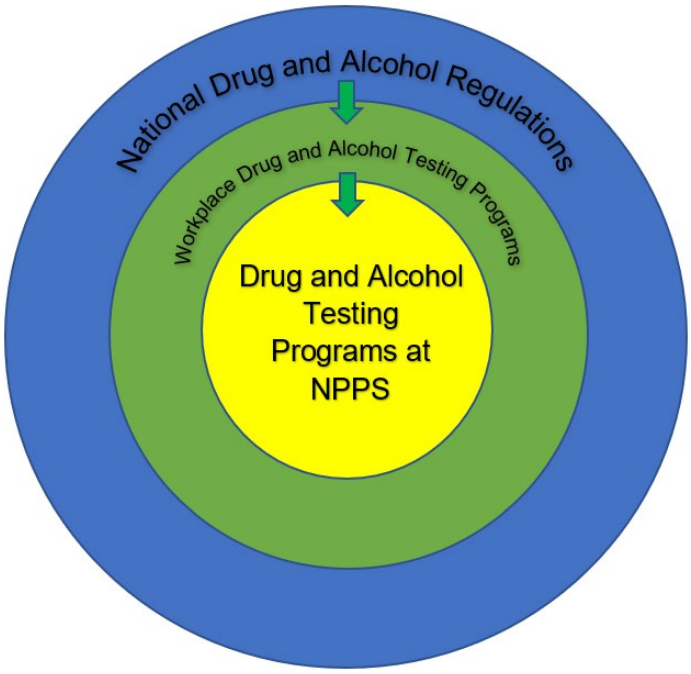

Figure 2.1 Information Gathering Approach

2.2 Data Integration and Analysis

To establish a measurable benchmark, data integration and comparison (Table 2.1) provides an overview of the data compiled. An "X" means the information is available. An "N" means the information has been confirmed to be unavailable or does not exist. A blank space means the information was not publicly available or could not be located.

Table 2.1. Drug and Alcohol Data Availability

Country	Policy and Regulation	Testing and Workers Rights	Drug and Alcohol Testing at Nuclear Power Plants	Testing Values
United States	x	x	x	x
Canada	x	x	x	x
Mexico	x	x		x
United Kingdom	x	x		x
Germany	x	x		x
Sweden	x	x		x
Finland	x	x		x
France	x	x		x
Italy	x	x		x
India	x	x		
Japan	x	x	N	

In addition to country-level policies and regulations, the project team gathered testing values for blood, breath, urine, hair, and oral fluid and sought to identify similarities across different countries and denote substantive differences or gaps in testing practices. A benchmark is plausible if a consensus-based standard testing approach can be identified based on the data gathered. In cases for which no consensus could be established, a host of underlying factors that could contribute to the variability warrants further exploration. Section 5.0 reports on the results of data integration and analysis and the identified benchmark.

3.0 Use of Impairing Drugs and Substances around the World

This section presents the use of impairing drugs and substances around the world. This is the first step in benchmarking international drug and alcohol testing regulations and programs to provide the NRC with comparative information regarding workplace drug and alcohol testing programs, testing methods, and workplace FFD programs. Evaluating the use of impairing drugs and substances around the world informs the research project of the drugs and substances prevalent in society. This section includes data specific to both countries with NPPs and those without NPPs to provide worldwide context for the use of impairing drugs and substances. This information has been narrowed to countries with NNPs in Section 4.0 of this report.

Prior to investigating the prevalence of drug and alcohol use in various countries, it is important to present a short summary of why certain drugs are controlled and why this is important to the scope of this work. The principal reasons to control illicit substances appear to be: 1) that the substances tend to highly addictive or cause significant impairment thereby directly impacting the health and welfare of the users, caregivers, and the medical communities serving the population; 2) the substances have no valid medical use, or if used without contemporaneous medical care, the substances may cause significant physical or psychological harm to the individual; 3) there is a strong link between substance abuse and crimes committed by the addicted individual to obtain funding to support their addiction; and 4) the production and distribution of illicit substances contributes to other criminal activities such as money laundering, human trafficking, and child labor.

Table 3.1 presents some of the impairing qualities of the substances controlled categorized based on the countries listed. The information presented in Table 3.1 is based on information from the National Institute on Drug Abuse (NIDA 2020) and National Institute on Alcohol Abuse and Alcoholism (NIAAA n.d.). More information about how drugs are classified into seven general categories (stimulants, depressants, cannabinoids, psychedelics, opioids, dissociatives, and empathogens) can be obtained from the Alcohol and Drug Foundation's Drug Facts: The Drug Wheel (ADF 2021).

The United Nations Office on Drugs and Crime (UNODC) tracks and reports illicit drug use on a global scale, reporting production, demand, and use statistics for opium/heroin, coca/cocaine, cannabis, and amphetamine-type stimulants in the World Drug Report (UNODC 2010).[3] The UNODC World Drug Report uses the words "drugs" and "drug use" to refer to a "substance controlled under the international drug control conventions, and their non-medical use" (UNODC 2020). The 2020 World Drug Report presented the 2018 world drug user estimates including 192 million cannabis users, 58 million opioid users, 27 million amphetamine and prescription stimulant users, 21 million Ecstasy users, and 19 million cocaine users (UNODC 2020). In 2018, the UNODC estimated that 269 million people, or 5.4 percent of the world's population, had used drugs at least once in the previous year (UNODC 2020).

[3] Information about drug use around the world was collected from the UNODC, which tracks illicit drug use around the world. The UNODC puts out an annual World Drug Report and the 2020 publication (UNODC 2010) was used to develop Section 3.0 of this report. Other sources of information used to develop Section 3.0 of this report include the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), Global Commission on Drug Policy (GCDP), U.S. Drug Enforcement Agency (DEA), HHS, National Drug Early Warning System (NDEWS), as well as relevant peer-reviewed publications.

Table 3.1 Physiological and Psychological Effects of Illicit Substances (NIDA 2020)

Substances	Possible Health Effects
Alcohol	*Short- and long-term health effects*: Interferes with communication pathways; changes in mood and behavior; adverse impact on thinking clearly and coordination heart damage (cardiomyopathy, arrhythmias); stroke; and high blood pressure.
Cocaine	*Short-term health effects*: Enlarged pupils; increased body temperature, heart rate, and blood pressure; headache; abdominal pain and nausea; euphoria; increased energy, alertness; insomnia, restlessness; anxiety; erratic and violent behavior, panic attacks, paranoia, psychosis; heart rhythm problems, heart attack; stroke, seizure, and coma.
Prescription opioids[4]	*Short-term health effects*: Pain relief, drowsiness, nausea, constipation, euphoria, slowed breathing, and death.
Amphetamines and methamphetamines	*Short-term health effects*: Increased alertness, attention, energy; increased blood pressure and heart rate; narrowed blood vessels; increased blood sugar; and opened breathing passages. *High doses*: Can cause dangerously high body temperature and irregular heartbeat; heart disease; and seizure.
Heroin	*Short-term health effects*: Euphoria; dry mouth; itching; nausea; vomiting; analgesia; and slowed breathing and heart rate.
Marijuana (Cannabis)	*Short-term health effects*: Enhanced sensory perception and euphoria followed by drowsiness/relaxation; slowed reaction time; problems with balance and coordination; increased heart rate and appetite; problems with learning and memory; and anxiety.
Ketamine	*Short-term health effects*: Problems with attention, learning, and memory; dreamlike states, hallucinations; sedation; confusion; loss of memory; raised blood pressure; unconsciousness; and dangerously slowed breathing.
Khat	*Short-term health effects*: Euphoria, increased alertness and arousal, increased blood pressure and heart rate, depression, paranoia, headaches, loss of appetite, insomnia, fine tremors, and loss of short-term memory.
Kratom	*Short-term health effects*: Nausea, dizziness, itching, sweating, dry mouth, constipation, increased urination, and loss of appetite. *Low doses*: Increased energy, sociability, and alertness. *High doses*: Sedation, euphoria, and decreased pain.
3,4-methylenedioxy-methamphetamine (MDMA) (Ecstasy)	*Short-term health effects*: Lowered inhibition; enhanced sensory perception; increased heart rate and blood pressure; muscle tension; nausea; faintness; chills or sweating; and sharp rise in body temperature leading to kidney failure or death.
Mescaline (Peyote)	*Short-term health effects*: Enhanced perception and feeling; hallucinations; euphoria; anxiety; increased body temperature, heart rate, blood pressure; sweating; and problems with movement.
Phencyclidine	*Short-term health effects*: Delusions, hallucinations, paranoia, problems thinking, a sense of distance from one's environment, and anxiety.

[4] The term opioids refer to all natural, semi-synthetic, and synthetic opioids. The term opiates refer to natural opioids (e.g., heroin, morphine, codeine) (CDC 2021).

Substances	Possible Health Effects
	Low doses: slight increase in breathing rate; increased blood pressure and heart rate; shallow breathing; face redness and sweating; numbness of the hands or feet; and problems with movement. *High doses*: nausea; vomiting; flicking up and down of the eyes; drooling; loss of balance; dizziness; violence; seizures, coma, and death.

Figure 3.1 illustrates the information of global drug use as percent of adults who use drugs, excluding alcohol (WHO 2018; UNODC 2020). The estimated number of global drug users had increased from 210 million to 269 million between 2009 and 2018, although the estimates should be interpreted cautiously because of wide error ranges and the estimated nature of the values (UNODC 2020).

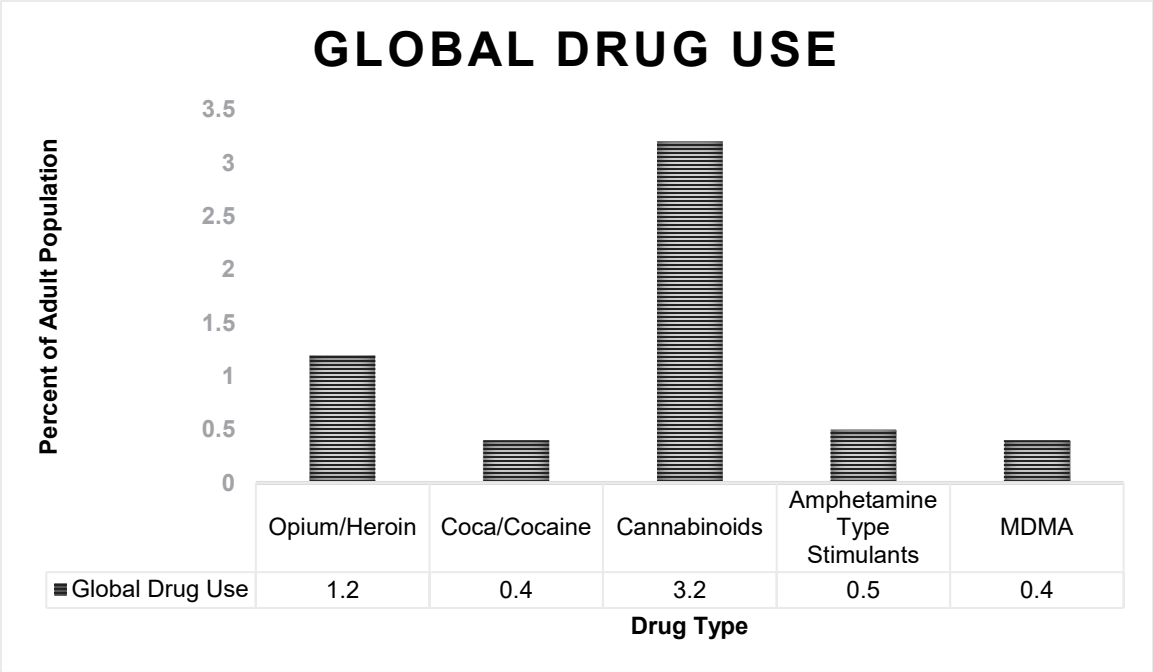

Figure 3.1. Percent of Adults Who Used Drugs over the Course of One Year (Data Excludes the Use of Alcohol) (Sources: WHO 2018; UNODC 2020)

There are drugs that are licit in one country and illicit in another country. For example, Khat is an example of a regional drug and is reported to be used regularly by 20 million people (El-Menyar et al. 2015). Khat is reported to be used in established cultural traditions in East Africa and the Arabian Peninsula (DEA 2020). Khat's main component is cathinone (with pharmacological effects similar to cocaine and amphetamines) and is also known by its street names as Abyssinian Tea, African Salad, Catha, Chat, Kat, and Oat (DEA 2020). Khat is part of Yemeni culture and is widely used during social occasions. Khat is considered a drug of abuse by the World Health Organization (WHO) and is a banned substance in most of Europe, Canada, the United States, and all Arab Gulf states except Yemen (El-Menyar et al. 2015). It is a licit substance in Somalia, Djibouti, Ethiopia, Yemen, and Israel (El-Menyar et al. 2015). The status of Khat as a banned substance varies from country to country; in the United States, it is classified as a Schedule 1 narcotic (similar to heroin and mescaline), while in the UK it is classified as a class C drug (see Section 4.1.3.1 for more information), which also includes anabolic steroids and ketamine (DEA 2020; El-Menyar et al. 2015). Synthetic cathinones, the

main component of Khat, are an emerging drug of abuse often sold as “bath salts” or “plant food,” which are labeled “not for human consumption” (El-Menyar et al. 2015). See Section 4.1 for an overview of country-specific drug and alcohol use regulation relevant to this study.

Other drugs which vary on licit or illicit status by region include those that have been traditionally used for cultural purposes and are referred to as “traditional drugs” (GCDP 2017). Examples of traditional drugs include betel nut, kava, opium, and the coca leaf (GCDP 2017). Marijuana is another example of a drug that is regulated differently based on location. In the United States, marijuana is Federally classified as a Schedule 1 drug, but within individual states, it is regulated differently. For example, some U.S. States have decriminalized marijuana for personal, recreational, or therapeutic use (HHS 2016). Alcohol is forbidden in several African and Asian countries on the basis of cultural and religious beliefs but is legal in most other countries (GCDP 2017). In places where these substances are legal or culturally and socially acceptable, there may be additional cultural sanctions if their use is problematic (GCDP 2017).

Similar to foreign countries, nationwide drug use and prevalence data are available for the United States, but these numbers vary across the country and the evaluation of regional drug use trends provides important supplemental information. The majority of information about drug use comes from large urban areas (Dombrowski et al. 2016). Methamphetamine was once a regional drug specific to southern California but now is found across the country and its largest impacts occur in rural States (Dombrowski et al. 2016). There is increased use of prescription opiates in both Nebraska and Missouri, with opiate-related overdose deaths are approaching (in case of Nebraska) or exceeding (in case of Missouri) the number of deaths due to automobile accidents reported in 2016 (Dombrowski et al. 2016).

One way to track regional drug use trends in the United States is through the NDEWS. NDEWS tracks drug trends, including emerging and changing use trends, in 12 sentinel community sites around the United States, which include sites such as King County (Seattle Area), Texas, Atlanta Metro, and New York City (NDEWS 2020). NDEWS also tracks the trends in admissions to programs treating substance use disorders for drugs in the sentinel communities. Figure 3.2 shows differences in admission rates for two communities tracked by NDEWS. The four evolving trends identified by NDEWS in 2020 are listed below.

1. Polysubstance use plays a prominent role in drug overdose deaths.
2. Increases in methamphetamine-related overdose deaths were reported in seven sites.
3. Fentanyl remains the most lethal drug in many NDEWS sites.
4. Minorities are becoming increasingly impacted by drug overdoses in some areas (NDEWS 2020).

The 12 most recent NDEWS reports for each sentinel community are discussed further in Appendix B.

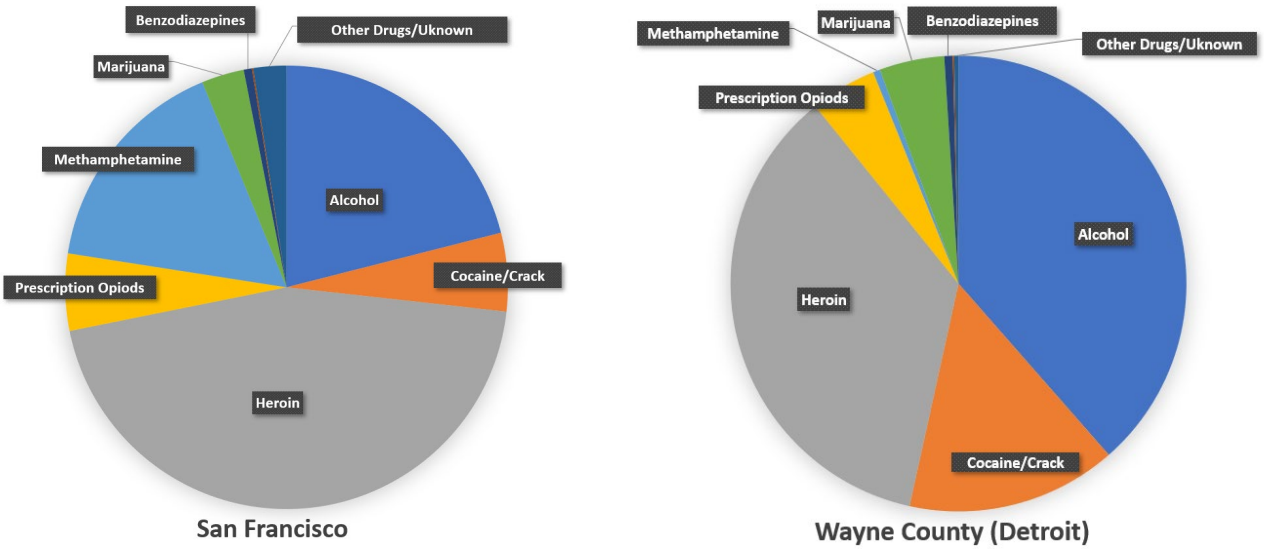

Figure 3.2. Admissions Rates by Drug to Programs Treating Substance Use Disorders for San Francisco and Wayne County Reported by NDEWS in 2019 (Sources: Arfken 2020; Coffin and Rowe 2020)

The following sections discuss specifics for use of impairing drugs and substances around the world. These include alcohol, opium/heroin, coca/cocaine, cannabis, amphetamine-type stimulants, and Ecstasy.

3.1 Alcohol

Worldwide, less than half the global population consumed alcohol in 2016, and 57 percent of the global population abstained from alcohol use (WHO 2018). WHO estimated that in 2018, there were 2.3 billion people in the world that consumed alcohol (WHO 2018). In North America, Europe, and the Western Pacific over half the population consumed alcohol (WHO 2018). Alcohol use in the past year was reported by 65.7 percent of Americans 12 years of age and older as surveyed by the *National Survey on Drug Use and Health* (HHS, 2016). In the United States, alcohol misuse contributed to 88,000 deaths a year (HHS 2016).

3.2 Opioids

The UNODC World Drug Report estimated that 57.8 million people, or 1.2 percent of the global population, ages 15–64 used opioids last year (not including licit use of prescribed opioids) (UNODC 2020). Opioids pose the greatest threat to human health of all drugs tracked by the UNODC because opioids account for 80 percent of the healthy life loss attributed to drugs or drug disorders (UNODC 2020). Opioid use varies based on region (as noted by percent of regional population): North America (3.6 percent), Australia and New Zealand (3.3 percent), the Near and Middle East and South-West Asia (2.6 percent), and South Asia (2.0 percent) (UNODC 2020). The Near and Middle East, Southwest Asia, and South Asia account for 60 percent of the global opiate users worldwide (UNODC 2020). There are limited data on opioid use in West, Central, and North Africa, but there is evidence of an increase in opiate use, specifically tramadol (UNODC 2020). North America is reporting new record levels of opioid overdoses with 10.3 million people (3.7 percent) of people over 12 years old misusing opioids in 2018 (UNODC 2020). In the United States, heroin was used by about 886,000 people above the

age of 12 in 2017 (HHS 2018). Opioid use also is reported to be increasing in Western Europe, Central Europe, and India (UNODC 2020). In the EU, 1.3 million adults are “high-opioid users,” and opioid misuse accounts for 82 percent of all fatal overdose cases (EMCDDA 2020).

In 2017 in the United States, 47,872 people were reported to have died from opioid overdoses (HHS 2018). The opioid crisis in the United States is credited to an increase in prescription opioid overdoses, increase in heroin overdoses, and an increase in synthetic opioid overdoses (HHS 2018).

3.3 Coca or Cocaine

The UNODC World Drug Report estimates that 19 million people, or 0.4 percent of the global population aged 15–64, used cocaine in 2018 (UNODC 2020). North America and Western and Central Europe continue to have the most cocaine use by population aged 15–64, with a prevalence of use of 2.1 percent and 1.4 percent, respectively. The highest prevalence of 2019 cocaine use has been reported to be in Australia and New Zealand, at 2.2 percent of the population aged 15–64 (UNODC 2020). Wastewater analysis in Western and Central Europe shows an increase in cocaine use since 2011 (UNODC 2020). An estimated 4.2 million adults used cocaine in 2019 in the EU (EMCDDA 2020). Wastewater analysis conducted in Australia revealed an increase in the use of cocaine, while household surveys indicate that 64 percent of cocaine users were sporadic users (once or twice a year) (UNODC 2020).

3.4 Cannabis

The 2020 UNODC World Drug Report estimated that 192 million people, or 3.2 percent of the world’s population, used cannabis in 2018 (UNODC 2020). In the United States, it was estimated that 12.3 percent of the population used cannabis in 2008 (UNODC 2010), and the percentage has been increasing steadily since 2007 (UNODC 2020). North and South America have the highest prevalence of cannabis use in the world (UNODC 2020). In 2018, 4.7 percent of the U.S. population that was 18 years of age or older used cannabis daily or nearly daily (UNODC 2020).

3.5 Amphetamine-Type Stimulants

The UNODC reports that 27 million people, or 0.5 percent of the global adult population, used amphetamine-type stimulants in the past year (UNODC 2020). Amphetamine use is high for people aged 15–64 years at 2.3 percent in North America and Australia and at 1.3 percent in New Zealand (UNODC 2020). There are differences in the amphetamine-type stimulants used in different regions around the world; North America use is dominated by pharmaceutical stimulants and methamphetamines, while in East Asia, Southeast Asia, and Oceania, methamphetamine use dominates (UNODC 2020). While in Western Europe, Central Europe, and in the Near and Middle East, amphetamine is the predominant amphetamine-type stimulant used (UNODC 2020). The number of people using amphetamine stimulants is increasing in North America but is reported to be stable in Western and Central Europe despite the increased level of consumption (UNODC 2020). In the EU, 0.6 percent of adults used amphetamines in 2019, while 3.7 percent of adults have used amphetamines once in their lifetime (EMCDDA 2020). Similarly, amphetamine-type stimulants are of concern in East and Southeast Asia and there appears to be an increase in methamphetamine use in Australia and New Zealand (UNODC 2020).

3.6 3,4-Methylenedioxymethamphetamine (MDMA) (Ecstasy)

The UNODC reports that 20.5 million people, or 0.4 percent of the global population between 15 and 64 years of age, used MDMA in the past year, and its use was mainly associated with nightlife and younger people (UNODC 2020). In the EU, 0.8 percent of adults used MDMA in 2019, while 4.1 percent of adults have used MDMA once in their lifetime (EMCDDA 2020). The UNODC reports that levels of MDMA in Ecstasy tablets has been increasing in Western and Central Europe (UNODC 2020). Ecstasy use has been rising in Germany, while a decline in its use has been reported in the Netherlands, the UK, and Australia (UNODC 2020).

4.0 Drug and Alcohol Testing Regulations and Programs

Policy, regulations, and programs related to drug and alcohol use and testing, related worker rights and protections, and workplace testing programs at NPPs are addressed in the following sections.

4.1 International Drug and Alcohol Use Policy and Regulation

This section provides an overview and comparison of the legal frameworks and policies[5] that govern illegal drug use in the countries included in this report. An overview of international drug control laws provides a high-level legal and country-specific context for understanding international approaches and standards regarding workplace drug testing, FFD drug-testing programs, and drug and alcohol testing methods described in the remaining sections of this document.

4.1.1 United States

In the United States, substances of concern are regulated under the Controlled Substance Act (CSA). The CSA designates controlled substances into five schedules (i.e., Schedules I through V) each with a decreasing level of abuse potential and risk for physical and psychological dependency. Schedule I drugs have no currently accepted medical use and have the highest potential for abuse (e.g., heroin and marijuana). The abuse potential and dependency risk remain high for Schedule II drugs (e.g., cocaine, methamphetamine, fentanyl, etc.) and moderate for Schedule III drugs (e.g., Tylenol® with codeine, testosterone, etc.). Schedule IV drugs (e.g., Xanax®, Ambien®) and Schedule V drugs (e.g., Robitussin AC®, Lyrica®) have comparatively lower potential for abuse and less risk of dependency (DEA n.d.-a). Substances not currently regulated under the CSA may nonetheless pose potential risk for abuse (e.g., dextromethorphan—an over-the-counter cough suppressant) (DEA n.d.-b).

Depending on whether Federal charges are involved and the State in which the crime occurs, a broad range of penalties are possible for illegal possession, use, trafficking, and sale of a controlled substance. The severity of the penalty also depends on other factors such as the type and form of drug in the individual's possession, the individual's past criminal history, and other circumstances. Penalties can include probation, rehabilitation programs, incarceration, and fines (Theoharis, n.d.). Intent to distribute and drug trafficking carry much heavier penalties than possession, and can result in a lengthy prison sentence, extensive fines, and probation (Theoharis, n.d.).

While considered illegal under the CSA, personal use of marijuana has been decriminalized by many States in the United States. In December 2020, the State of Oregon decriminalized possession of all drugs, and drug possession is now treated as a civil rather than criminal offense (Akins and Mosher 2020).

[5] Drug use policies vary across the globe, and cultural and regional factors influence the acceptability of drugs that are used for traditional purposes (i.e., khat, kava, betel nut, cannabis coca leaf, and opium) (GCDP 2017). Some countries where this traditional use occurs have banned these substances while others have not. Specifics associated with international laws banning or not banning these substances were not investigated in this report.

4.1.2 Other Countries in North America

Drug use policies in Canada and Mexico are influenced by the physical proximity to the United States, particularly relating to the production and transportation of drugs for sale in the United States. Additionally, changing societal norms have led to the legalization and decriminalization of certain drugs in recent years. Drug control laws and drug policies were explored in greater detail for both Canada and Mexico and described below.

4.1.2.1 Canada

Under the Canadian Controlled Drugs and Substances Act (CDSA 2019), there are nine schedule categories. Controlled substances are those included in Schedules I–V. Examples of the drugs listed under the various schedules and sanctions for possession of these controlled substances are listed below in Table 4.1. Sanctions for drugs in Schedules I–V are greater and can include life imprisonment for trafficking, importing, exporting, or production of controlled substances.

Table 4.1. Canadian Drug Schedule

Schedule	Examples (Non-Exhaustive)	Sanctions for Possession
Schedule I	Opiates, Cocaine, Fentanyl, Methamphetamine, Amphetamine	Up to 7 years imprisonment, fines up to $2,000
Schedule II	Synthetic cannabinoids (cannabis removed from Schedule II in 2018) (An Act respecting cannabis and to amend the Controlled Drugs and Substances Act, the Criminal Code and other Acts, 2018)	Up to 5 years imprisonment, fines up to $2,000
Schedule III	Psilocybin, mescaline	Up to 3 years imprisonment, fines up to $2,000
Schedule IV	Barbiturates, diazepam, anabolic steroids, salvia	Up to 18 months imprisonment
Schedule V	None	Not applicable (N/A)
Schedule VI	Pseudoephedrine, ephedrine, phosphorous	N/A
Schedule VII	Repealed in 2018	N/A
Schedule VIII	Repealed in 2018	N/A
Schedule IX	Devices used to produce tablets or capsules	N/A

Prescription opioids are classified as Schedule I drugs under the CDSA. Opioid use is legal when used as prescribed by a licensed practitioner. From 2008 to 2013, the rate of past-year use of opioid pain relievers decreased from 21.6 percent to 14.9 percent.

Prescription sedatives are classified as Schedule IV drugs under the CDSA. Their use is legal when used as prescribed. Prescription sedatives were used by 10.4 percent of the general population in 2013 and this rate has remained relatively stable.

Cannabis was legalized for nonmedical purposes in Canada in October 2018, and new classes of cannabis products, such as edibles, extracts, and topicals were legalized in October 2019 (CCSA 2015).

Alcohol sale and consumption is regulated in Canada; all jurisdictions have statutes prohibiting the sale of alcohol to minors; this limit is age 17 and under in Alberta, Manitoba, and Quebec,

and age 18 and under elsewhere. According to the Canadian Alcohol and Drug Use Monitoring Survey for 2012, 8.2 percent of respondents reported driving within an hour after consuming two or more drinks in the past year, and in a 2016 national public opinion poll, 21.6 percent of respondents reported driving after consuming any amount of alcohol in the past 30 days (CCSA 2017). Canada established a National Alcohol Strategy in 2007 and has developed a number of resources to support the implementation of various recommendations to address the harmful effects of alcohol.

4.1.2.2 Mexico

In Mexico, the sale of alcohol to persons under age 18 is prohibited (Estados Unidos Mexicanos 1984). Mexico conducted a national survey on drug, alcohol, and tobacco use in 2016 and 2017. The survey, titled the “Encuesta Nacional de Consumo de Drogas 2016-2017”, indicated that alcohol consumption increased between 2002 and 2011 among adolescents and adults, with 55.2 percent of the population beginning alcohol consumption at the age of 17 or younger and 71 percent of the population consuming alcohol in 2016. Alcohol was ranked third among substances for which users sought treatment, following marijuana and methamphetamine (Esbehidy Reséndiz Escobar 2018).

According to the survey, drug use other than alcohol was reported by 2.9 percent of individuals, and marijuana use was the most common drug used (2.1 percent). Heroin use was relatively low, with only 0.03 percent of the population indulging in its use.

Historically, Mexico has had low-level use of opioids due to low levels of prescriptions and relatively high costs; however, the rate of opioid use has been documented to be increasing due to Mexico’s location as a country from which illicit drugs are trafficked to the United States. In addition, pharmaceutical companies have begun to shift attention and increase advertising in emerging markets such as Mexico. Higher levels of injection drug use exist at Mexico’s northern border along drug trafficking routes to the United States (Goodman-Meza et al. 2019).

Mexico’s location as a drug supplier (as of 2017, it was the third largest producer of heroin in the world and the leading supplier to the United States) has also led to increasing use throughout the country (Goodman-Meza et al. 2019).

Mexico prohibits possession, cultivation, trade, and consumption of various narcotics, including opium, heroin, cannabis, and cocaine (Estados Unidoes Mexicanos, Presidencia de la Republica, 1984). Per the Mexico General Health Law, trade in narcotics can result in 4 to 8 years of imprisonment and possession can result in 10 months to 3 years of imprisonment. While possession of illegal drugs is generically a crime under Mexican law, possession of narcotics including opiates, cannabis, cocaine, and methamphetamines in small quantities (for personal consumption) is not criminally punishable (LOC 2020). Instead of criminal action, the ministerial authority in question has a responsibility to inform the consumer about medical treatment institutions or guidance for the prevention of pharmacodependence. The personal consumption limits have been described in Table 4.2 below.

Table 4.2. Mexican Narcotic Personal Consumption Limits (Article 479 of the Health General Act, 1984)

Narcotic	Amount
Opium	2 grams
Heroin	50 milligrams
Cannabis or marijuana	5 grams
Cocaine	500 milligrams
MDMA	40 milligrams of powder or granulate; 200 milligrams of tablets or capsules
Methamphetamine	40 milligrams of powder or granulate; 200 milligrams of tablets or capsules

4.1.3 Europe

The legal framework governing alcohol consumption and use of both legal and illegal drugs varies by country in Europe (Figure 4.1).

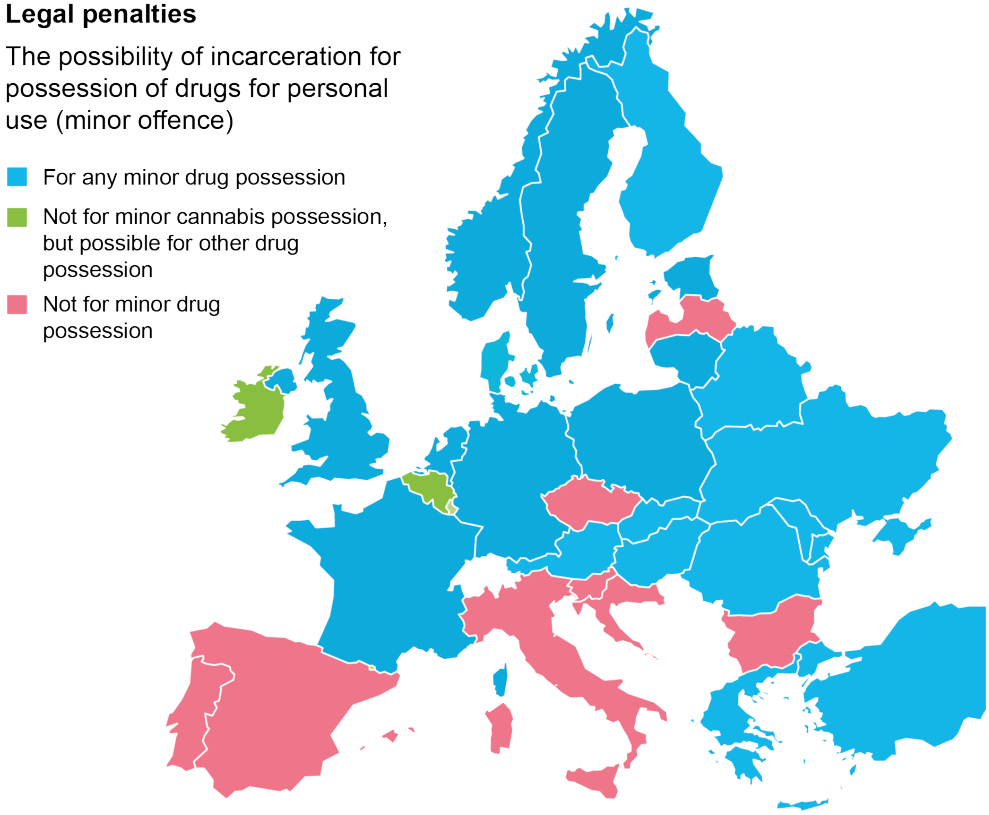

Figure 4.1. Overview of Legal Penalties for Possession of Drugs for Personal Use in Europe. Image taken from the from the EMCDDA France Country Drug Report (Source: Figure Modified from EMCDDA 2019b)

There are overarching requirements regarding controlled substances at the EU level. However, these requirements exist as guidance, and across Europe the drugs controlled and the penalties for use, possession, and supply vary by country (EMCDDA n.d.). The United Nations (UN) system for classifying drugs is implemented in accordance with three UN Conventions: 1) the

"UN Single Convention on Narcotic Drugs" of 1961, 2) the "Convention of Psychotropic Substances" of 1971, and 3) the "UN Convention Against the Illicit Traffic in Narcotic Drugs and Psychotropic Substances" of 1988 (EMCDDA n.d.). The "UN Single Convention on Narcotic Drugs" classifies narcotic drugs in four schedules based on their degree of addictiveness and potential for abuse, and those that have medical and therapeutic value (EMCDDA n.d.). Psychotropic substances are similarly classified by degree of harmfulness and degree of therapeutic or medical value and follow the "UN Convention on Psychotropic Substances" (EMCDDA, n.d.). The EU also has a pan-European system for adding new substances to these schedules and has added more than 25 substances since the program was implemented in 1997 (EMCDDA n.d.).

Drug use policies in Europe vary by country and are influenced by cultural and political traditions, which cause differing perspectives about whether drug use is viewed as a public health issue or a criminal justice issue. Harm-reduction drug policies, including decriminalization, are drug-control policies that are becoming more common in many European countries and are preferred over prohibitionist or punitive drug policies (Benfer et al. 2018). The drug-control laws and drug policies are explored in more detail below for the following European countries: UK, France, Germany, Italy, Sweden, and Finland. Even though they have not been included on the list of countries described in this report, it is important to note that Portugal and the Netherlands have the most lenient approaches in Europe (Benfer et al. 2018). In 2001, Portugal decriminalized all drug use, apart from production, sale, and distribution of all drugs (Laqueur 2015). The Netherlands decriminalized the use, possession, and sale of cannabis in small amounts as commonly occurs in licensed coffeeshops, but cultivation and supply are illegal (Chatwin 2016). The Netherlands also is viewed as having led the way on innovative harm-reduction programs such as needle exchange programs, maintenance treatment, legal prescriptions of heroin to dependent heroin users, and "safe user rooms" (Chatwin 2016). Other European countries that have taken a harm-reduction approach to marijuana use include Belgium, which tends to not prosecute marijuana possession, and Switzerland which has decriminalized marijuana use (Benfer et al. 2018).

Alcohol is legal in all European countries, and while there are concerns about public health policy issues associated with alcohol use in Europe and internationally, this subject has not been investigated in detail for this report (WHO 2012; GCDP 2017).

4.1.3.1 United Kingdom

The UK released a drug strategy in 2010 and again in 2017 that outlines the overall approach to reducing drug use and increasing the recovery rates for drug-dependent individuals (UK 2017). The strategy focuses on reducing demand, restricting supply, and building a recovery drug strategy. As part of that strategy, no changes were made to the Misuse of Drugs Act of 1971, which is the primary legislative framework for controlling drugs in the UK, and none of the controlled substances identified in the act were decriminalized as part of the updated 2017 strategy (UK 2017). As a whole, the UK drug policy is considered to be punitive and one without much focus on harm reduction (Ford et al. 2017; Holland 2020).[6] The UK has three laws governing drug control: the Misuse of Drugs Act 1971, the Misuse of Drugs Regulations 2001, and the Psychoactive Substances Act of 2016. The Misuse of Drugs Act establishes three classes of controlled drugs based on the potential danger they have to users and society. Class

[6] The UK's 2017 drug strategy and drug policy as a whole has been criticized by interest groups supporting harm reduction for not considering decriminalization and for not adequately considering harm-reduction strategies (Ford et al. 2017; Holland 2020).

A includes cocaine, methadone, morphine, MDMA, lysergic acid diethylamide (LSD), and heroin; Class B includes cannabis, codeine, some amphetamines, mephedrone, and synthetic cannabinoids; and Class C includes amphetamines, benzodiazepines, buprenorphine, gamma-hydrobutyrate/gamma-amniobutyrate, benzylpiperazome, and anabolic steroids. Higher penalties are set for drugs considered to be more dangerous. The law does not prohibit drug use, with the exception of prepared opium, which is prohibited, but it does penalize possession for personal use and for the intent to distribute. According to the UK's Department of Health and Social Care, the law has been amended twice to control for new drugs including psychoactive substances, "… synthetic cannabinoids, methoxetamine and other related compounds and O-desmethyltramadol desoxypipradrol, its related compounds and phenazepam, naphyrone and other synthetic cathinones, tapentadol, and amineptine" (UK DHSC 2015).

The Misuse of Drugs Regulations (2001) allow for the lawful possession and supply of controlled (illegal) drugs for legitimate purposes (Gallagher et al. 2020). There are five schedules. Schedule I has the most stringent controls and includes drugs considered to have no medical use such as cannabis and hallucinogens. Schedule II includes drugs that have a high potential for abuse and include most opiates and cocaine (Gallagher et al. 2020). Schedule III includes drugs that are thought to be less likely than those on Schedule II to be harmful if misused and include some barbiturates and some stimulants. Schedule IV includes benzodiazepines and anabolic steroids. Schedule V specifies preparations of certain drugs such as analgesics.

The recently enacted Psychoactive Substances Act of 2016 restricts and penalizes use and supply of new psychoactive substances also known as "legal highs" not already covered by the Misuse of Drugs Act (UK 2017). The Forensic Early Warning System supports the 2016 act by identifying emerging psychoactive substances in the UK (UK 2017).

4.1.3.2 Germany

Germany takes a prohibitionist approach to drug use but has begun treating drug use as a public health issue, instead of a criminal issue, by focusing on providing treatment for less serious offenses (Anderson 2012). The German Narcotic Drugs Act classifies controlled substances into three annexes (Gesley 2016). Annex I includes non-trafficable substances and illicit narcotics that have no medical benefit such as heroin and all Ecstasy-based drugs (Gesley 2016). Annex II includes trafficable substances that are not prescribed, which includes tetrahydrocannabinol (THC) and dexamphetamine (Gesley 2016). Annex IIII includes substances that are trafficked and prescribed, which includes medically approved narcotics such as opium, morphine, and methadone (Gesley 2016). Dealing in any narcotic without a prescription or a license is illegal and punishable. For narcotics identified on Annex I (which includes the cannabis plant), a license can be obtained from the Federal Institute for Drugs and Medical Devices for research purposes. There are exceptions for the need to obtain a license for pharmacies, physicians, dentists, and veterinarians who may dispense narcotic drugs listed in Annex III (Gesley 2016). Prosecutors have discretion regarding sanctions imposed on drug users depending upon the intended use of the narcotic. For example, in cases of personal use or if the offender is found to possess small quantities, court-approved treatment is recommended instead of prison (Anderson 2012). More severe infractions carry a heavier penalty ranging from 5 to 15 years of imprisonment. The German Narcotic Drugs Act also allows the establishment of drug consumption rooms in which narcotic drugs that have not been medically prescribed can be used by drug-addicted persons in a safe setting under medical supervision and without prosecution (Gesley 2016).

4.1.3.3 Sweden

Sweden is considered to have one of the most restrictive drug policies in Europe that has been described as “control oriented and moralistic” (Chatwin 2016; Goldberg 2004). With a goal of creating a drug-free society, national drug laws penalize both “soft” and “hard” drug use and possession, and the police target drug users and traffickers equally (Chatwin 2016). While Sweden has implemented some harm-reduction measures in response to EU requirements (e.g., maintenance treatment and needle distribution or exchange programs), these programs are “tightly restricted” and there is a prevailing preference for abstinence-based programs (Chatwin 2016). Swedish societal views about drug use and alcohol use are associated with cultural perceptions about the need for individual self-control, which promotes societal equality and cooperation for everyone’s benefit (Goldberg 2004). Swedish laws that pertain to controlled narcotic and non-narcotic drugs include the Narcotic Drugs Punishments Act of 1968, which defines narcotic drugs as those that “… are considered to be medicines or substances hazardous to health with addictive properties, or inducing a state of euphoria” (EMCDDA, 2021a). The Act on the Prohibition of Certain Substances which are Dangerous to Health identifies non-narcotic substances that are under control (EMCDDA 2021b). The Medical Products Agency identifies five lists of controlled substances:

- List I include drugs without medicinal use.
- List II includes drugs with a limited medicinal use and a high risk of addiction.
- List III includes drugs with medicinal use and a risk of addiction.
- List IV includes drugs with medicinal use and a low risk of addiction.
- List V includes drugs prohibited in Sweden but not internationally.

Sanctions against drug use are harsh and some offenses are punishable by up to 3 years of imprisonment. A petty offense depending upon the quantity or type of drug is punished by a fine or imprisonment up to 6 months. The Act on Penal Law on Narcotics (1968:64), s. 1 (6), s. 2. states that possession of drugs is punishable by up to 3 years of imprisonment (SFS 1968:64, 1968). A major offense that includes trafficking or distribution of large amounts or narcotics is punished by 2 to 10 years imprisonment. Treatment measures may be given as part of the sentence (EMCDDA 2021a).

4.1.3.4 Finland

Finland criminalized drug use in the 1970s and is considered to have a more prohibitionist drug policy culture but also one that offers some harm-reduction programs such as needle exchange programs and substitution and maintenance therapies (Tammi 2007, 2015). Finnish harm-reduction services were established in the late 1990s and the Government Resolution on the Action Plan to Reduce Drug Use and Related Harm 2016-2018 identifies additional harm-reduction interventions (EMCDDA 2019a).

Finland’s legal definition of controlled narcotic substances in the 1972 Narcotics Act are those identified in the “UN Single Convention on Narcotic Drugs” of 1961 and the “UN Convention on Psychotropic Substances” in 1971 (EMCDDA 2019e). The Narcotics Act was amended in 2014 to include psychoactive substances (EMCDDA 2019a). Drug use and possession of small quantities are punishable by a fine or a maximum of 6 months of imprisonment. If the offender

has pursued treatment or the offense is insignificant, punishment and sometimes prosecution can be waived (EMCDDA 2019a). Drug offenses also include possession for purposes of supplying, dealing, smuggling, or manufacturing and/or growing. Drug offense penalties "… range from a fine to a maximum of 2 years of imprisonment, while an aggravated drug offence is punishable by 1 to 10 years' imprisonment" (EMCDDA 2019a). Unauthorized supply and illegal import of psychoactive substances are both considered to be offenses that are punishable by up to 1 year in prison for the former and up to 2 years in prison for the latter (EMCDDA 2019a).

4.1.3.5 France

French drug policy used to be considered one of the stricter policies in Europe and penalties make no distinction between "hard" and "soft" drugs (EMCDDA 2019b). But recent changes since 2020 suggest that France is taking a more lenient approach in penalties for some drugs. In June 2020, France introduced a new law that immediately fines (€200, approximately $237.19) drug use offenders using cannabis or cocaine rather than imprisoning them (York 2020).

The Decree Law of 22 February 1990 categorizes illicit substances under lists:

- *List I*: Narcotic substances such as heroin, cocaine, cannabis, methadone, opium, etc.
- *List II*: Substances such as codeine, propiram, etc. (Lists I and II correspond to those in the Single Convention of 1961)
- *List III*: Psychotropic substances of the 1971 Vienna Convention, such as amphetamines, Ecstasy (MDMA), LSD, etc.
- *List IV*: Substances not controlled at the international level, such as MBDB, 4-methylthioamphetamine, ketamine, nabilone, THC, etc. (EMCDDA 2012a)

New psychoactive substances are controlled under the Criminal Code (EMCDDA 2019b). In 2012, cathinones ("bath salts") were banned followed by synthetic cannabinoids and 25 × NBOMe derivatives in 2015, and fentanyls and more cathinones in 2017 (EMCDDA 2019b).

The use and possession of illicit drugs are criminal offenses in France, and there is no distinction regarding what type of substance is involved or whether drug possession is for personal use or for trafficking (EMCDDA 2012a). Charges of use or trafficking are determined by the prosecutor based on the amount of drug found on the offender (EMCDDA 2019b). Penalties for personal use depend on the severity of the crime; penalties in some cases may be waived but could include a prison sentence of up to 1 year and a fine (EMCDDA 2019b). Penalties for supplying drugs include 5 to 10 years of imprisonment and a fine depending on severity. Drug trafficking has a more severe penalty and can include life imprisonment and a fine up to €7.5 million (EMCDDA 2019b).

4.1.3.6 Italy

In Italy, the legal framework for illegal drug control is established in the Consolidated Law, adopted by Presidential Decree No 309 on October 9, 1990 (EMCDDA 2017). Between 2006 and 2014, the Fini-Giovanardi law introduced harsher sanctions for both "soft" and "hard drugs" with prison sentencing of 6 to 20 years for marijuana users and harsher restrictions for dealers (Cruciata 2020). This law was found to be unconstitutional in 2014, but Italian law enforcement continues to criminalize marijuana possession and sale (Cruciata 2020). The Law 79 of May 16, 2014, added a new separate list for medicines, including those for pain management and

detoxification, and classifies controlled drugs into four lists (EMCDDA 2019c): List I includes cocaine, opiates, amphetamines, hallucinogens, and synthetic drugs (EMCDDA, 2019c); List II includes cannabis, List III includes barbiturates, and List IV includes benzodiazepines (EMCDDA 2019c). There are more serious sanctions for drugs considered to have higher impacts (i.e., those on Lists I and III) and less serious sanctions for those with lesser impacts (i.e., those on List II and IV) (EMCDDA 2019c).

Sanctions for drug use include 1–3 months of imprisonment, and possession carries a heavier sentence of imprisonment for 2–12 months (EMCDDA 2017). Sanctions for trafficking and supply depend on the type of drug and range from 2–20 years of imprisonment (EMCDDA 2017).

4.1.4 Asia-Pacific

This section discusses legal frameworks and policies that govern illegal drug use in India and Japan.

4.1.4.1 India

The Narcotic Drugs and Psychotropic Substances Act (1985) (the NDPS Act) extended greater power to India's central government to control drugs, established the criminal justice framework for dealing with drug offenses and drug-related crimes, and established the National Fund for the Control of Drug Abuse (Kumar and Tewari 1990).[7]

The NDPS Act regulates narcotic drugs and psychotropic substances such as the coca plant, opium poppy, and cannabis plant.[8] The Act criminalizes a wide range of illicit drug-related activities, including cultivating, manufacturing, possessing, selling, purchasing, transporting, warehousing, consuming, and importing and exporting regulated substances except for medical or scientific purposes both domestically and internationally (Sharma et al. 2017). The Act does not distinguish "soft" drugs (e.g., opium plant) from "hard" drugs (e.g., heroin) and does not penalize different classes of offenders differently (e.g., casual users, addicts, vendors). The Act specifies penalties commensurate with drug quantities. For small quantities, penalties include imprisonment for up to 1 year or a fine up to 10 thousand rupees (approximately $133) or both; for commercial quantities, penalties include imprisonment of more than 10 years but less than 20 years and a fine of more than one lakh (thousand) rupees (approximately $1333.50) but no more than two lakh rupees (approximately $2,667), and for intermediate quantities, penalties include up to 10 years in prison and a fine of up to one lakh rupees (approximately $1,333.50). Table 4.3 provides the quantity designations for the common drugs controlled by the Act. The 1989 amendment to the Act stipulates that repeated offenses could result in the death penalty in cases where the quantity of controlled substances involved exceeds a certain threshold (see Table 4.4) (George and Krishnan 2012).

[7] Another related legislation is the Prevention of Illicit Trafficking in Narcotic Drugs and Psychotropic Substances Act (1988), which authorizes detention of individuals involved in illicit trafficking of narcotic drug and psychotropic substances.

[8] The NDPS bans cannabis, including charas (resin from cannabis plant), ganja (flowering or fruit tops of cannabis plant), and any admixtures but excludes bhang (a drink made from the cannabis leaves) (Balhara and Mathur 2014).

Table 4.3. Common Drugs and Quantity Designations in Narcotic Drugs and Psychotropic Substances Act

Drugs	Small Quantity	Commercial Quantity
Heroin	5 grams	250 grams
Opium	25 grams	2.5 kilograms
Morphine	5 grams	50 grams
Ganja (flowering or fruit tops of cannabis plant)	1 kilogram	20 kilograms
Charas (resin from cannabis plant)	100 grams	1 kilogram
Coca leaf	100 grams	2 kilograms
Cocaine	2 grams	100 grams
LSD	2 milligrams	100 milligrams
Amphetamine	2 grams	50 grams

Table 4.4. NDPS Drugs and Quantity Limits for the Death Penalty (Source: NDPS Act)

	Narcotic Drugs/Psychotropic Substances	Quantity
i	Opium	10 kilograms
ii	Morphine	1 kilogram
iii	Heroin	1 kilogram
iv	Codeine	1 kilogram
v	Thebaine	1 kilogram
vi	Cocaine	500 grams
vii	Hashish	0 kilograms
viii	Any mixture with or without any neutral material of any of the above drugs	Lesser of the quantity between the quantities given against the respective narcotic drugs or psychotropic substances mentioned above forming part of the mixture
ix	LSD, LSD-25 (+) - N, N-diethyl lysergamide (d-lysergic acid diethylamide)	500 grams
x	THC (Tetrahydrocannabinols, the following Isomers: 6a (10a), 6a(7), 7, 8, 9, 10, 9(11) and their stereochemical variants)	500 grams
xi	Methamphetamine (+) -2-Methylamine-1-Phenylpropainge	1,500 grams
xii	Methaqualone (2-Methyl-3--0-tolyl-4-(3h-) quinazolinone)	1,500 grams
xiii	Amphetamine (+)-2-amino-1-phenylpropane	1,500 grams
xiv	Salts and preparations of the psychotropic substances mentioned in ix to xiii	1,500 grams

India's Constitution gives its States the power to regulate alcohol licensing, sale, and consumption (Pandey 2017). Due to the decentralized nature of such laws, the legal requirements regarding the legality of alcohol and the legal drinking age vary considerably from State to State. Among the 28 States and 8 Union Territories, alcohol is legal in all but five States including Bihar, Gujarat, Lakshadweep, Manipur, and Nagaland, collectively known as the dry States. In the States and Union Territories where alcohol is legal, there is no uniform legal drinking age limit. Various State laws set the legal drinking age anywhere between 18 and 25 years old. In one State, different age limits are set for different types of alcohol. The State of

Maharashtra sets no age limit for wine, but an individual must be at least 21 to legally consume beer, and 25 for other alcohol (e.g., liquor). In addition, local alcohol laws sometimes impose additional restrictions on alcohol consumption. For instance, for residents of and visitors to the Wardha District of Maharashtra, the legal drinking age is 30 (Pandey 2017). Despite the legal age limits, drinking is prevalent in Indian society and is common among minors.[9] On several national holidays such as Republic Day, Independence Day, and Gandhi Jayanti, alcohol sale is prohibited nationwide.

Drinking and driving in India is regulated by Section 185 of the Motor Vehicles Act (1988). The Act states that a blood alcohol level exceeding 30 mg per 100 mL of blood is considered drunk driving. Drunk driving is a punishable offense that can result in up to 6 months of imprisonment, or a fine of up to 2,000 rupees (approximately $27.40), or both, for the first offense; and for a subsequent offense committed within 3 years of the first offense the penalty is escalated to up to 2 years of imprisonment, or a fine of up to 3,000 rupees (approximately $41), or both (Vohra 2016).

4.1.4.2 Japan

Japan does not have a single comprehensive drug control law. Instead, drugs are regulated through six separate laws (Koto et al. 2020). With the exception of the Cannabis Control Act (1984), these laws apply to both substance use and possession and the penalties do not distinguish personal use from drug sale (Table 4.5).

[9] The Indian Penal Code and the Delhi Excise Act of 2009 establish the pecuniary and non-pecuniary penalties for public drinking (5,000 rupees), creating nuisance (10,000 rupees and up to 3 months of imprisonment), and permitting drunkenness or gathering unsocial elements (50,000 rupees and up to 6 months of imprisonment) (https://legodesk.com/legopedia/alcohol-drinking-in-public/).

Table 4.5. Drug Control Regulations in Japan

Law	Year of Enactment	Substance(s) Regulated	Proscribed Penalties
Cannabis Control Act	1948	Cannabis	Up to 5 years of imprisonment for use or possession
Poisonous and Deleterious Substances Control Act	1950	Use of organic solvent (e.g., paint thinners)	Up to 1 year of imprisonment or a fine of up to ¥500,000 or both for use or possession
Stimulants Control Act	1951	Amphetamine-type stimulants (e.g., methamphetamine)	Up to 10 years of imprisonment for use or possession
Narcotics and Psychotropics Control Act	1953	Narcotics (e.g., heroin cocaine, 3,4-methylenedioxy-methamphetamine [MDMA], magic mushrooms)	Heroin: Up to 10 years of imprisonment for use or possession Other narcotics: Up to 7 years of imprisonment for use or possession
Opium Act	1954	Opium	Up to 7 years of imprisonment for use or possession
Act on Securing Quality, Efficacy and Safety of Products Including Pharmaceuticals and Medical Devices	1960	Designer drugs	Up to 3 years of imprisonment or a fine of up to ¥3,000,000 or both

The Japanese government's approach to drug control focuses on criminalization and severe punishment of illicit drug use and trade. While recognizing the potential benefits of the harm-reduction approach to drug control, the Japanese government continues to voice strong opposition to harm reduction. The penalties associated with illicit drug use and trade can range from imprisonment and fines to life imprisonment for producing, importing, or exporting amphetamine-type stimulants and heroin. Unlike other Asian countries such as India, Japan does not impose capital punishment for illicit drug trade. The policy landscape of Japan's drug control laws is dynamic. New laws and regulations continue to be introduced and enacted in a patchwork fashion to control emerging drugs such as poppers (alkyl nitrites, a hallucinogen) and 5-methoxy-N,N-diisopropyltryptamine (a.k.a., Foxy Methoxy, a hallucinogen).

Alcohol consumption is legal in Japan, and the societal attitude toward drinking is highly tolerant (Louie 2019). Alcohol use and sale are regulated through four separate laws in Japan:

- Alcohol Business Act (2005)
- Liquor Tax Act (1953)
- Pharmaceutical and Medical Devices Act (1960)
- Fire Service Act (1948) (Umeda 2020).

Alcohol use while driving is regulated by the Road Traffic Act. The minimum legal drinking age in Japan is 20, and the national maximum legal blood alcohol concentration for operating a vehicle is 0.03 percent blood alcohol concentration (WHO 2018). Despite great social

acceptance of drinking, drunk driving is subject to severe punishment in Japan and the government has increasingly taken a zero-tolerance stance toward controlling drunk drinking. The threshold for DUI is 0.25 mg in 1 mL of blood or 0.15 mL in 1 L of breath, which could result in imprisonment or a fine. Table 4.6 provides more detail about alcohol concentration values and associated penalties for DUI and DWI (ATOM Legal Professional Corporation n.d.).

Table 4.6. Alcohol Concentration Values and Drunk Driving Penalties in Japan

Determination	Alcohol Concentration	Penalty
DUI	Equal to or more than 0.15 mg but less than 0.25 mg in 1 L of breath	Up to 3 years of imprisonment and a fine of up to ¥500,000
DWI	Equal to or more than 0.25 mg in 1 L of breath	Up to 5 years of imprisonment or a fine of up to ¥1,000,000.

4.2 Workplace Drug and Alcohol Testing and Worker Rights and Protections

The goal of this section is to describe general workplace testing requirements across select countries in the world, including relevant laws and policies governing workplace drug testing in the public and private sector, especially in safety- and security-sensitive industries. It is assumed that general testing requirements for "safety-sensitive" professions (e.g., aviation, transportation, defense, etc.) are likely to apply to the nuclear industry (e.g., NPPs and other facilities).

The legality and circumstances surrounding workplace drug and alcohol testing differ by country and are shaped by legal provision of worker privacy and the roles and responsibilities of employers and employees (ILO 2006). In the United States, pre- and during-employment drug testing, particularly in safety-sensitive workplace environments, is not prohibited. There also is variation regarding the acceptability of the type of workplace drug and alcohol testing (i.e., pre-employment, random, and for-cause) as well as the testing of which drugs and how they are tested (i.e., urine, hair, oral fluid, blood). Requirements may also vary depending on whether the workplace requirements are related to safety-sensitive workplace environments (Urban 2014). In addition, worker individual rights and employment-related protections differ across the different countries.

The sections below broadly lay out the circumstances and context surrounding workplace drug and alcohol testing around the world. Appendix C provides summary tables for the countries discussed in these sections as well as other countries that might be of interest.

4.2.1 United States

Workplace drug and alcohol testing is conducted across multiple industries in the United States. According to an analysis conducted by the American Addiction Centers using data harvested from Glassdoor,[10] the top three industries requiring regular drug testing include both public and private sectors: 1) health care and hospitals, 2) transportation and logistics, and 3) government (American Addict Center 2018).

In the public sector, Federal and State laws regulate workplace drug and alcohol testing. At the Federal level, workplace drug and alcohol testing as codified in U.S. Executive Order 12564 authorized the HHS to establish guidance for drug-testing programs for the Federal government. For regulatory and other agencies with public safety and national security responsibilities, extensive drug and alcohol testing policies and requirements also have been established to ensure the regulated industries and individuals are free from the influence of impairing substances, many of these programs implement or parallel the instructions provided in the Mandatory Guidelines and its associated guidance concerning medical review officer evaluation of drug test results and laboratory processes and procedures. Key examples of such polices include the NRC's drug and alcohol testing requirements in 10 CFR Part 26, which is applicable to individuals in the commercial nuclear power industry, including facilities that fabricate nuclear fuel. The DOT drug and alcohol testing requirements are provided in 49 CFR Part 40, "Procedures for Transportation Workplace Drug and Alcohol Testing Programs," which is required by the Omnibus Transportation Employee Testing Act of 1991 that requires testing of

[10] Glassdoor is a website (https://www.glassdoor.com/index.htm) that allows individuals to publicly comment on their current and former employers.

all operators of aircraft, railroad equipment, mass transportation vehicles, pipeline systems, and commercial motor vehicles. The DOT implements this act through its requirements in 49 CFR Part 40 and further defines the applicability of its drug and alcohol testing requirements to individuals in safety-sensitive positions. The Department of Defense (DoD) tests its service members including those in the U.S. Coast Guard, pursuant to DoD Instruction 1010.16, "Technical Procedures for the Military Personnel Drug Abuse Testing Program." Civilians working for DoD are tested under DoD Instruction 1010.09, "DoD Civilian Employee Drug-Free Workplace Program."

Most State governments' workplace drug and alcohol testing laws implement provisions that are generally similar to those in the Mandatory Guidelines or Federal requirements for drug and alcohol testing programs. These testing requirements are specific to the laws and statutes particular to the State and as to the individuals that may be subject to testing and the types of testing that may be conducted (e.g., pre-employment, random, suspicion) as described next. All States enable some sort of drug testing, but the test conditions are highly prescriptive to the particular State. Furthermore, many States require that employees be notified prior to the conduct of a test, that they sign a consent to test, and be provided information as to what the test results will be used for. In the private industry, drug testing is primarily regulated by State and local laws. Therefore, there is considerable variability in how a company may test its employees as it must meet the terms of the state laws' applicability, coverage, types of testing permitted (pre-employment and employee testing), and the conditions and methods allowed. For example, in Connecticut employee drug testing is limited to individuals performing safety-sensitive jobs or on the grounds of reasonable suspicion of drug-related performance impairment, while the Delaware State law does not impose employee testing restrictions. For job applicant testing, Idaho State law permits testing as a condition of employment, while many other State laws place fewer restrictions on pre-employment drug testing. The American Civil Liberty Union (2020) provides a State-by-State review of drug-testing statues or orders.

Individuals subject to workplace drug and alcohol testing are afforded legal protection to ensure drug testing is not conducted in a discriminatory manner and to strike a balance between individuals' rights to privacy and public security and safety (DeCew 1994). The relevant key laws and regulations providing certain legal protections to individuals in the workplace are provided in Table 4.7.

Table 4.7 Legal Protection Relevant to Workplace Drug and Alcohol Testing

Law	Applicability	Protection
Title VII of the Civil Rights Act of 1964 (Title VII of the Civil Rights Act of 1964, 1964)	Employers with 15 or more employees	Prohibits discrimination in employment on the basis of race, color, religion, national origin, and sex. Drug testing must be applied consistently across all employees and cannot target certain individuals or classes of employees based on their ascriptive traits.
Americans with Disabilities Act (Title I and V of the Americans with Disabilities Act of 1990)	Employers with 15 or more employees	Prohibits employers from discriminating against a qualified individual on the basis of a disability and generally requires employers to provide reasonable accommodations. The Americans with Disabilities Act does NOT protect illegal drug use.
Health Insurance Portability and Accountability Act (HIPAA) (Health Insurance Portability and Accountability Act of 1996, 1996)	Covered entities and business associates[11]	Requires health care providers to obtain employees' authorization before disclosing protected health information to the employer. A HIPAA release should generally be signed before an employee is subjected to drug testing so the test results can be disclosed to the employer in accordance with HIPAA requirements.
Occupational Safety and Health Administration Regulation at 29 CFR Part 1904, Recording and Reporting Occupational Injuries and Illness (29 CFR Part 1904, 2001)	Employers with more than 10 employees in most industries	Employers are required to • Document recordable employee injury and illness and provide additional details about each recorded case; • Prepare an annual summary report of all injuries and illnesses and display such information in the workplace; • Provide reasonable reporting procedures; and • Not discourage employees from reporting an injury or illness.

4.2.2 Other Countries in North America

For safety-sensitive jobs in Canada, pre-employment and for-cause testing can be done with routine justification, but random testing can only be done in rare cases with exceptional justification (e.g., a safety worker with a long history of abuse). In addition, Canada has nuclear-specific FFD regulations that include drug and alcohol testing as described in Section 4.3. In contrast, Mexico has fewer restrictions for workplace drug and alcohol testing. This section summarizes the available information.

4.2.2.1 Canada

Drug and alcohol testing is allowed for safety-sensitive jobs in a limited fashion in Canada (Screening 2019). Pre-employment screening is allowed only if there is a demonstrated safety risk associated with impairment. Reasonable cause and post-incident testing both require evidence of impairment. There are tight restrictions on random testing to protect worker privacy. Just being a safety-sensitive worker is not enough justification alone for random testing; there has to be a strong reason to warrant such testing (e.g., if a worker has a long-term history of

[11] The definitions and examples of covered entities can be found at https://www.hhs.gov/hipaa/for-professionals/covered-entities/index.html and the definition and examples of business associates can be found at https://www.hhs.gov/hipaa/for-professionals/privacy/guidance/business-associates/index.html.

abuse). A discussion of relevant Canadian programs specific to nuclear power plants is included in Section 4.3.2 below.

4.2.2.2 Mexico

Mexican law has few restrictions on the types of drug and alcohol testing that an employer may require. Employers can require testing via contractual agreement with employees and also have the legal right to require testing for safety-sensitive jobs (Demers et al. 2015; Practical Law 2020). Pre-employment and for-cause testing are allowed for all jobs, but random testing is only allowed for safety-sensitive jobs, including Mexico's nuclear industry, which consists of a single NPP (Laguna Verde). Specific drug and alcohol testing requirements for the Laguna Verde Power Plant could not be found online.

4.2.3 Europe

Alcohol and drug abuse are considered serious problems within the European workplace. The abuse correlates with health problems, more sick leave, greater number of worker conflicts, decreased level of performance, increased business damages, and safety risks (Eurofound 2012). The impacts of alcohol use are especially felt in the workplace in Europe with 10 percent of UK workers reported to have shown up at work drunk more than once a month and this percentage is higher in Ireland. Furthermore, in the EU, 9–14 percent of workers are reported to have shown up at work high on cannabis, and 1–5 percent of workers high on other narcotics at work in Europe (Eurofound 2012).

Deterrence is a goal of workplace drug-testing programs supported by many employers in Europe (Shahandeh and Caborn 2003).[12] The deterrence programs for addressing substance abuse mainly focus on preventative programs and rehabilitation centers and, to a lesser degree, on drug and alcohol workplace testing because of concerns regarding invasion of privacy (Eurofound 2012; HSE Network 2020). Research evidence gathered so far does not point to high financial costs associated with administering drug testing being a main barrier to conducting workplace drug and alcohol testing.

Balancing the need to help maintain public safety and protecting an individual's right to privacy has been an important consideration for workplace drug and alcohol testing programs in European countries. The tension caused by the efforts to meet both of these seemingly divergent considerations shapes the varying levels of legal privacy protection between countries and, not surprisingly, differences in legally permitted drug and alcohol testing in European workplaces.

European countries typically allow limited drug and alcohol testing for "safety-sensitive" jobs, which are not clearly defined and vary by country. Although the list of safety-sensitive jobs or industries is open to interpretation, it is assumed to apply to the nuclear industry.

There also is variability in the types of testing permitted. Italy has the strictest drug-testing laws that allow annual urine tests for all workers in safety-sensitive jobs and also allow for-cause and random testing (although discouraged by worker rights advocacy groups). In contrast, France has laws that favor worker privacy and limit the types of tests (e.g., for-cause testing is allowed but not random nor pre-employment testing) and prevent positive results from being directly

[12] The chief drivers of workplace drug testing in Europe include safety, morality—the notion that any drug use (i.e., drug use and abuse) is morally unacceptable—and privacy (Shahandeh and Caborn 2003).

transmitted to the employer. Positive test results in France are used in an overall health fitness evaluation that can deem an employee unfit for work, but the employer would not know if it was attributed to the use of drugs.

Among the different types of testing (e.g., pre-employment, probable cause, reasonable suspicion, testing on return from treatment), random testing has attracted the most controversy and is often restricted. Unions in Germany, Austria, and France strongly favor limiting testing to cases where there is reasonable suspicion. Different procedural restrictions also are notable. In France, the occupational physicians rather than the employer have the authority to determine if a drug test is warranted (Shahandeh and Caborn 2003).

Reconciling the tension between protecting an individual's right to privacy and public safety, European national laws generally require that individuals give consent prior to testing and have set strict requirements to protect sensitive data associated with drug testing, although many argue that given the nature of the employer-employee relationship, true consent cannot be obtained. Further measures have been implemented to protect sensitive data. In Finland, France, Belgium, Germany, and Austria, occupational doctors are legally required to keep the test results confidential and are permitted to only disclose to the employer whether the individual is fit to perform work, without communicating the test results (Shahandeh and Caborn 2003). In Spain, the testing rules require worker consent and employees with positive tests cannot be terminated unless the influence of drug use is affecting their job performance (Practical Law 2020).

Compared to testing for drugs in the workplace, alcohol testing seems less contentious. All EU countries have set legal alcohol limits for driving. Alcohol testing in the transportation industry is especially common. It is plausible that the comparatively relaxed attitude toward alcohol testing could be due to the well-established relationship between alcohol consumption and impaired driving and the indisputable linkage between impaired driving and risk to public safety. However, the same cannot be said about testing of other substances, as the International Labour Office (ILO 2003) states "Experts universally conclude that for drugs other than alcohol there is insufficient evidence relating drug test results to impairment." Nevertheless, different European countries have different alcohol testing restrictions. For example, random roadside testing is allowed and frequently performed in France, Belgium, and the Netherlands. In comparison, random roadside testing is not legal in the UK unless there is suspicion of impaired driving (ILO 2003).

Several workplace drug-testing guidance documents have been published by European organizations. Examples include the International Labour Office Guiding Principles on Drug and Alcohol Testing in the Workplace (1996) and the European Laboratory Guidelines for Legally Defensible Workplace Drug Testing (EWDTS 2002). These guidelines provide recommendations for testing effectiveness, legal and ethical issues associated with drug testing, drug-testing program elements, procedures, laboratory requirements, analysis procedures, quality assurance and quality control, and interpretation of test results.

In summary, European workplace drug-testing laws are variable, and in some cases, are less restrictive than those in the United States to protect worker privacy. For non-safety-sensitive jobs, many European countries only allow drug testing via contractual agreements with the employees (i.e., pre-employment drug screening); however, many countries require testing of individuals working in safety-sensitive jobs. The drug-testing requirements for safety-sensitive jobs might apply to the nuclear industry, but the data gathered on this topic was limited. Drug and alcohol use presents a serious workplace problem for Europe. To deter drug and alcohol

use, the main tactics have been to prohibit drug and alcohol use at work with more focus on prevention, early intervention, and rehabilitation (less on incarceration), while conducting testing pursuant to relevant laws and policies.

4.2.3.1 United Kingdom

In the UK, drug testing is allowed with employee consent for safety-sensitive jobs such as health, aviation, rail, shipping, heavy industry, energy (including nuclear), and others if safety and business concerns are justified (Practical Law 2020; UK DHSC 2015; UK Drug Testing 2020).

Contractual agreements between an employer and employee allow pre-employment, for-cause, and random testing. The list of commonly tested substances includes cannabis, cocaine, amphetamine, opiate, methamphetamine, methadone, and benzodiazepines (UK Drug Testing 2020). Employees are allowed to refuse tests but can be disciplined for doing so. Positive tests can result in termination only if there is evidence that drug use is impairing the worker's job performance.

Drug testing is considered to have some deterrent effect on drug abuse in the workplace. The Health, Safety, and Environmental Network, an organization consisting of safety-sensitive businesses, embraces the position that random testing is an effective deterrent for drug use (HSE Network 2020). Other deterrent strategies include identifying why people are using drugs on the job (e.g., to combat fatigue or stress) and providing nonjudgmental treatment options (UK Drug Testing 2020).

4.2.3.2 Germany

In Germany, drug testing is only allowed for occupational and safety-sensitive jobs (Eurofound 2012; Practical Law 2020). Random testing is strictly prohibited and only pre-employment and for-cause testing is allowed (EWDTS 2003). Positive tests cannot be transmitted to the employer but can cause a worker to be classified as "unfit for duty" by the company doctor as part of a broader health inspection (Eurofound 2012). The German National Strategy on Drug and Addiction Policy specifies the following four pillars of its drug reduction efforts: 1) prevention, 2) counseling, 3) treatment, and 4) supply reduction (EMCDDA 2019b; Wicks 2019).

Nuclear-specific testing regulations could not be found for Germany, but the general safety-sensitive testing requirements listed above would likely apply (i.e., no random testing).

4.2.3.3 Sweden

There is no law in Sweden that regulates drug testing. Workplace drug testing is allowed only if agreed upon during collective bargaining (EWDTS 2003; Practical Law 2020). The Swedish Labour Court does, however, allow testing in workplaces with justified needs such as those related to safety-sensitive jobs, but it requires that employees be notified well before the test (Wicks 2019). Random testing is not conducted in safety-sensitive jobs because this could constitute discrimination (Wicks 2019). Sweden, like most European countries, seeks to deter drug and alcohol use by using preventative programs and treatment centers (Wicks 2019).

Regarding the nuclear industry, the general drug-testing requirements listed above likely would apply. Although there was no information online about drug-testing requirements specific to the nuclear industry for Sweden, there was one case where a labor court in Sweden ruled that a worker at an NPP is subject to testing based on reasonable suspicion of drug use even though the worker did not hold a safety-sensitive position. The court sided with the employer and

upheld the company policy requiring drug testing for all NPP staff, including those whose job duties are not typically considered safety sensitive (Shahandeh and Caborn 2003).

4.2.3.4 Finland

Finish law requires pre-employment drug testing for health- and safety-sensitive industries and also allows for-cause testing, but random testing is prohibited to ensure worker privacy (Rodrigues and Martins 2007; Practical Law 2020; Finland Occupational Safety and Health Administration 2021). These pre-employment and for-cause tests require strong justification that there could be a health or safety issue. Finland's National Drug Strategy deterrence goals are prevention, early intervention, treatment, and harm reduction (EMCDDA 2019).

Nuclear-specific testing regulations could not be found for Finland, but the general safety-sensitive testing requirements listed above likely would apply (i.e., no random testing).

4.2.3.5 France

Pre-employment drug testing is prohibited in France unless recommended by an occupational physician in rare cases (Rodrigues and Martins 2007; Wicks 2019; Practical Law 2020). For-cause drug testing is allowed during employment for safety-sensitive jobs, but the laws prohibit routine testing without evidence or justification (e.g., random drug and alcohol testing). Positive tests cannot be transmitted to the employer but can cause a worker to be classified as "unfit for duty" by an occupational doctor (Law 2020; Practical Law 2020).

Nuclear-specific testing regulations could not be found for France, but the general safety-sensitive testing requirements listed above would likely apply (i.e., no random testing).

4.2.3.6 Italy

Italy has stricter drug-testing laws compared to many other countries in Europe, especially regarding random testing. A list of prescribed drug-testing laws for safety-sensitive jobs establishes rules for which types of drug tests can be conducted (EMCDDA 2017; Wicks 2019; Practical Law 2020). For-cause testing is allowed, but pre-employment testing is prohibited. Random testing is allowed but discouraged by the Italian Authority for Protection of Personal Data (Rodrigues and Martins 2007; Vignali 2013).

Italy started to require an annual urine drug test for all safety-sensitive jobs for common drugs of concern (e.g., cannabis, cocaine, opiates, speed, etc.) in late 2007 (Vignali 2013). Positive tests can result in the worker being suspended, sent to treatment, and being subjected to more frequent testing. The positive test rates steadily decreased in the 4 years after the annual urine test was required, but this trend could be due to employees learning to counter the test because it requires a 24-hour pre-notification (Vignali 2013). The main deterrents to drug use in Italy include annual testing and rehabilitation (EMCDDA 2017; Vignali 2013).

The general testing laws and requirements listed above applied to the Italian nuclear industry before nuclear power was completely phased out in 2018. These laws apply to all safety-sensitive jobs and would apply to nuclear power if it ever became re-established in Italy.

4.2.4 Asia-Pacific

Most Asian-Pacific countries only allow drug and alcohol testing via contractual agreement due to concerns about worker privacy. Pre-employment drug screening and testing during employment are increasingly being conducted in India because drug abuse has become rampant in the past decade. Similarly, in response to rising drug abuse in recent years, workplace drug testing is increasingly being conducted in Japanese companies although a legitimate reason for testing and consent is required. In the sections below we provide more information about workplace drug-testing requirements and practices in India and Japan. Additional information about other Asia-Pacific countries are summarized in Appendix C.

4.2.4.1 India

Although data on drug use and abuse in India remains somewhat limited, the 2019 national drug use survey sponsored by the Indian Ministry of Social Justice and Empowerment reported that substance use and abuse was a common phenomenon (Ambekar et al. 2019). At the national level, the most frequently used substances among individuals aged 10 to 75 included alcohol (14.6 percent), cannabis products (2.8 percent), opioids (2.1 percent), sedatives (1.08 percent), and inhalants (0.7 percent). The reported use of cocaine (0.1 percent), amphetamine-type stimulants (0.18 percent), and hallucinogens (0.12 percent) was relatively low.

Despite the prevalent use and abuse of potentially impairing substances, workplace drug testing in India is not yet a common practice, which might be attributed to the wide availability and legal status of substances that are otherwise prohibited outside of India or limited substance abuse counseling and rehabilitation services in the country (Urban 2014). At the national level, India does not have regulations mandating workplace drug testing for the public sector workforce. Drug screening associated with employment is not prohibited by law in India. Background checks and pre-employment screening (which may include drug testing) are required in certain safety- or security-sensitive industries such as military service, law enforcement, national security agencies, hospitals, educational institutions, financial institutions, and transportation (Furtado 2016). For example, drug testing in aviation is mandatory in India and there is zero tolerance for blood alcohol content for pilots on scheduled flights. Additionally, there is a crew-wide ban on the use of alcohol and other potentially impairing drugs such as sedatives and narcotics within 12 hours prior to a flight taking off (Wicks 2020).

With a growing workforce in business process outsourcing and information technology in India, companies in these sectors are increasingly requiring drug testing as part of employment screening. It was estimated that 1 out of 10 business process outsourcing and information technology employers require drug screening before making a hire (Trehan 2018). These companies also provide training to employees to raise awareness about drug use and its impact on the workplace in hopes of maintaining a drug-free work environment. Parallel to the growing demand for employment drug screening, the number of employment verification or drug-testing service providers in India is also growing considerably. For example, Sterling RISQ, an international drug-testing service provider, offers drug-screening services in locations such a Mumbai, Goa, Delhi, Kolkata, Pune, Bangalore, Cochin, Hyderabad, and Chennai. The company tests up to 10 drugs and contracts with licensed physicians as medical review officers to review test results. Drug-screening services offered include new hire and re-hire screening and return-to-work testing (Steringy RISQ 2020). AuthBridge, a background check/digital onboarding service provider in India, contracts with laboratories and offers fast drug-screening services (“within a matter of hours”) and notes that their “… whole process is confidential and designed within the legal and compliance framework in India” (AuthBridge n.d.).

While there are few specific employment screening laws or regulations, certain legal provisions exist to protect individuals with regard to workplace drug and alcohol testing. The legal protection afforded to employees is rooted in Article 21 of the Indian Constitution, which guarantees an individual's right to life and liberty, and the Supreme Court of India has established that such guarantee extends to individuals' right to privacy (Jain 2015). In practice, individual consent is required for pre-employment drug screening and testing. Testing must be relevant to the job or meet the operational safety needs. To address privacy concerns, employees' drug-testing data must be protected (Practical Law 2020). If found positive for drug testing, an individual might be penalized in accordance with the Narcotic Drugs and Psychotropic Substances Act (Srivastava 2016).

4.2.4.2 Japan

Although the number of drug users remains low in Japan, studies have reported increasing abuse of methamphetamine (Yamamoto 2004), cannabis, and Ecstasy in the general population over the past decade (Wada 2011; Randox Toxicology 2018; Shimane et al. 2020). According to a 2016 report by The Mainichi, a major newspaper in Japan, the annual number of individuals committing drug-related violations exceeded 10,000 (The Mainichi 2016). Alcohol use is ubiquitous in Japanese society and post-work social drinking is considered a normal business practice (West 2020). Binge drinking and episodic heavy drinking remain prevalent. According to a 2013 nationwide survey of alcohol use, 12 percent of men and 2.2 percent of women reported binge drinking and as much as 30.5 percent of men and 7.2 percent of women reported episodic heavy drinking (Osaki et al. 2016).

No specific law or regulation mandates workplace drug testing in the public sector in Japan, but available information seems to imply that urine testing might be required for certain segments of the public workforce (e.g., law enforcement, unformed members of the National Defense Forces) (Kageura 2002). For the private sector, the Japanese Ministry of Health, Labour, and Welfare generally prohibits drug or alcohol testing of job applicants and current and former employees by an employer unless the employer can demonstrate an adequate business justification for requiring testing and the individuals subject to testing give consent (Fujii 2020; Tsanaclis 2018). In response to the growing drug abuse problems, an increasing number of employers in Japan are requiring drug testing. LSI Medience, a major drug-testing service provider in Japan, is reported to have conducted "several tens of thousands drug tests" in the fiscal year 2015, nearly doubling the number conducted in 2006, and many of the employers that requested drug testing were in the transportation (e.g., railway, bus, airline, etc.) and shipping industries (The Mainichi 2016).

Studies have identified multiple limitations of the current workplace drug-testing practices in Japan. Kageura (2002) stated that urine testing of public employees (e.g., law enforcement officers) did not follow strict testing procedures and that quality control for drug-testing laboratories was lacking. In addition, workplace drug-testing approaches in many private sector companies seem to be reactive, concerned primarily with maintaining their corporate image than preventing drug abuse with a focus on deterrence. The Mainichi (2016) reported that some companies would test all employees of the company in response to one employee being arrested for drug violations as a show of "purification" without any follow-up action, which could render testing "meaningless."

Protecting individuals' privacy is a key consideration for workplace drug and alcohol testing in Japan. Article 13 of Japan's Constitution guarantees individuals' right to life, liberty, and the pursuit of happiness as long as it "… does not interfere with the public welfare," and the judicial

interpretation of Article 13 by Japan's Supreme Court has long recognized its applicability to individuals' right to privacy (Umeda 2012). Article 5-4(i) of the Employment Security Law stipulates that an employer must have a legitimate reason and must obtain an individual's consent before they can legally collect, store, or use personal information of job applicants (Fujii 2020). Of note, Japan's disability law does not recognize alcohol or chemical dependency as a disability and thus individuals with drug addiction problems in Japan are not afforded employment-related accommodations (Heyer 2000).

4.3 Workplace Drug and Alcohol Testing Programs at Nuclear Power Plants

While many countries have varying levels of workplace drug and alcohol testing, fewer countries have incorporated this testing into a nuclear-specific FFD program. The PNNL project team found only two countries, the United States and Canada, that have developed drug and alcohol-specific FFD programs. The FFD requirements concerning drug and alcohol testing in these countries at NPPs are discussed in this section. As described below, while the Canadian nuclear workplace drug and alcohol testing program shares similarities with the NRC FFD programs in the United States, some key differences exist (cf. trustworthiness and reliability in U.S. FFD programs, "… physically, physiologically, and psychologically capable" in the Canadian FFD program). In addition to the requirements issued by the nuclear regulatory authorities in these countries, drug and alcohol testing requirements also are published by the International Atomic Energy Agency (IAEA), an international nongovernmental organization. The IAEA has issued detailed information relevant to the establishment of drug and alcohol testing programs at NPPs.

4.3.1 United States

As the regulator of the U.S. nuclear industry, NRC has established extensive drug and alcohol testing requirements in the Fitness for Duty Rule originally published in 1989 and updated in 2008 (73 FR 16966, 2008) with minor changes made over time. The performance objectives of the NRC FFD programs include providing reasonable assurance "… that nuclear facility personnel are trustworthy and reliable," "… that individuals are not under the influence of any substance, legal or illegal, or mentally or physically impaired from any cause, which in any way adversely affects their ability to safely and competently perform their duties," and "… that the [nuclear workplace is] free from the presence and effects of illegal drugs and alcohol."

Through 10 CFR Part 26, the NRC requires that NPP licensees and entities implement an FFD program for personnel having access to protected areas and other types of access. The NRC FFD program includes an alcohol and drug use testing program, described in 10 CFR 26.31. Drug and alcohol testing may be conducted on individuals for conditions of pre-access, for-cause, post-event, follow-up, and random, using cutoff levels for drugs and drug metabolites established by the HHS. At a minimum, licensees and other entities are required to test for "… marijuana metabolite, cocaine metabolite, opiates (codeine, morphine, 6-acetylmorphine, amphetamines (amphetamine, methamphetamine), phencyclidine, adulterants, and alcohol," and may determine whether other drugs with potential for abuse may also be tested for. HHS guidance has been central to the FFD program's technical requirements for specimen collection, testing, and evaluation as well as certification of laboratories that can be permitted to conduct specimen analyses and reporting.

10 CFR Part 26 requires licensees and other entities to administer sanctions under 10 CFR 26.75 for FFD policy violations. An FFD policy violation occurs when an individual fails to follow the FFD policy and procedures. The minimum contents of a licensee's FFD policy (as implemented through procedures) has been described in 10 CFR 26.27, "Written policy and procedures," and includes, but is not limited to:

(1) Describe the consequences of the following actions:

(i) the use, sale, or possession of illegal drugs on or off site;

(ii) the abuse of legal drugs and alcohol; and

(iii) the misuse of prescription and over-the-counter drugs.

(2) Prohibit the consumption of alcohol, at a minimum—

(i) within an abstinence period of 5 hours preceding the individual's arrival at the licensee's or other entity's facility, except as permitted in § 26.27(c)(3); and

(ii) during the period of any tour of duty.

(3) Address other factors that could affect FFD, such as mental stress, fatigue, or illness, and the use of prescription and over-the-counter medications that could cause impairment;

(4) Provide a description of any program that is available to individuals who are seeking assistance in dealing with drug, alcohol, fatigue, or other problems that could adversely affect an individual's ability to safely and competently perform the duties that require an individual to be subject to this subpart; and,

(5) Describe the consequences of violating the policy.

4.3.2 Canada

The Canadian Nuclear Safety Commission (CNSC) has developed and published a protocol for managing alcohol and drug testing as part of an FFD program. First published in November 2017, "REGDOC-2.2.4, Fitness for Duty, Volume II: Managing Alcohol and Drug Use" outlines requirements and guidance for managing the FFD of workers associated with alcohol and drug use at high-security sites (REGDOC-2.2.4 Fitness for Duty, Volume II: Managing Alcohol and Drug Use, 2021). This guidance is intended to be included as part of the conditions associated with a nuclear license. The Canadian Nuclear Safety and Control Act requires that all workers comply with measures established by the licensee to protect the environment and the health and safety of persons and requires that license applications include measures to ensure workers' FFD.

The CNSC defines FFD as "a condition in which workers are physically, physiologically, and psychologically capable of competently and safely performing their tasks," and states that implementing a FFD program related to drugs and alcohol provides reasonable assurance that the workers competently and safely perform the duties of their position without a safety or security risk.

The CNSC published a new version (Version 3) of REGDOC-2.2.4 in January 2021. Version 3 revisions allow for additional drug-testing methodologies to be used by licensees, including random testing, oral fluid testing, and point-of-collection testing.

Per the CNSC guidance, licensees' alcohol- and drug-related policy statements should do the following:

1. Prohibit reporting to work or remaining at work under the influence of alcohol, cannabis, cannabis-derived products, or illicit drugs.
2. Prohibit bringing, keeping, or consuming alcohol, cannabis, cannabis-derived products, illicit drugs, drug paraphernalia or prescribed medications without a legal prescription on the grounds of the high-security site.
3. Reinforce the responsible use of prescription or over-the-counter medications, or mood-altering substances, and define the process to follow if a worker uses medication that impairs or has the potential to impair an individual's ability to perform their duties competently and safely.
4. Describe the responsibilities of workers, supervisors, oversight personnel, and escorts to report FFD concerns related to alcohol and drug use and abuse.
5. Describe the expectations regarding the reasonable length of time that workers should abstain from the use of alcohol and/or drugs prior to reporting to work, with due consideration of longer-term impairing effects.

Drug and alcohol testing is considered under the following circumstances: placement testing (prior to progressing to a safety-critical position); reasonable grounds testing; post-incident testing; follow-up and return-to-duty testing; and random testing (as described in the Version 3 concurrence draft of the guidance).

Drug types addressed include the following: cocaine metabolite (benzoylecgonine); opiates; including morphine, codeine, hydromorphone, hydrocodone, oxymorphone, oxycodone, and 6-acetylmorphine; amphetamines; cannabinoids; benzodiazepines; and methadone metabolite (EDDP).

4.3.3 International Atomic Energy Agency

Additionally, the PNNL project team investigated publicly available documentation published by the IAEA to ascertain whether information, guidance, or requirements are published for member countries in the establishment of a drug and alcohol testing programs at commercial nuclear power reactor facilities throughout the world. The guides relevant to drug and alcohol testing programs summarized in Table 4.8 were reviewed.

Table 4.8 International Atomic Energy Agency Guidance and Requirements regarding Drug and Alcohol Testing Programs at Commercial Nuclear Power Plants

International Atomic Energy Agency (IAEA) Document	Drug and Alcohol Testing Program Requirements
IAEA. (2001). The Operating Organization for Nuclear Power Plants. Safety Standards Series No. NS-G-2.4.	This Safety Guide recommends that nuclear operating organizations create fitness for duty policies, including "… [e]stablishing and implementing an appropriate policy on an individual's suitability for duty, addressing adequate physical and mental fitness and aspects such as the illicit use of drugs or tobacco and alcohol abuse, in consonance with national regulations. This policy should be addressed to all employees, contractors and visitors, as applicable."
IAEA. (2002). Recruitment, Qualification and Training of Personnel for Nuclear Power Plants. Safety Standards Series No. NS-G-2.8.	This Safety Guide provides recommendations on the recruitment, selection, qualification, training, and authorization of personnel working in all safety related functions and at all levels of nuclear power plants. Pertinent recommendations include: *2.10*. In addition to complying with the State's regulatory provisions and practices that are applicable to industrial health and safety, the operating organization should ensure that all operating staff whose duties have a bearing on safety be medically examined at the time of recruitment and periodically thereafter, to ensure that their state of health is suitable for the duties and responsibilities assigned to them. Aptitude tests should be used where applicable. For key and critical positions, operating organizations may also conduct psychological tests. Medical fitness for duty requirements should be clearly defined for each position. All site personnel who may be occupationally exposed to radiation at the plant should be subject to initial and periodic medical examinations as appropriate. *2.11*. A programme to identify personnel with a tendency towards drug or alcohol abuse should be established. Personnel prone to drug or alcohol abuse should not be employed for safety related tasks. Furthermore, it provides considerations for selection of safety related personnel, including applying the requirements for medical and psychological fitness for duty in that position.
IAEA. (2008). Conduct of Operations at Nuclear Power Plants. Safety Guide No. NS-G-2.14.	This Safety Guide identifies the main responsibilities and practices of nuclear power plant operations departments in relation to their responsibility for the safe functioning of the plant. It recommends that administrative controls should be established to allow the fitness for duty of shift personnel to be observed, verified and controlled. Elements of such administrative controls should include the identification of drug or alcohol abuse by personnel, monitoring of the psychological state of personnel, restrictions on excessive overtime and mandatory requirements for rests between shifts. It recommends that supervisors should routinely evaluate their crew members as early as possible at the beginning of each shift or period of work.
IAEA. (2017). Self-Assessment of Nuclear Security Culture in Facilities and Activities. IAEA Nuclear Security Series No. 28-T.	These publications define the basic concepts and elements of nuclear security culture, with the aim of providing Member States with international consensus guidance on planning and implementing a programme to improve nuclear security culture and make such a culture sustainable. They recommend that nuclear power plants develop effective processes for the determination of trustworthiness and for the mitigation of insider threats.

International Atomic Energy Agency (IAEA) Document	Drug and Alcohol Testing Program Requirements
	These processes should be capable of identifying specific security risk factors, including drug/alcohol abuse, and should address factors that might lead to degradation of trustworthiness such as substance abuse.
IAEA. (2016). Safety of Nuclear Power Plants: Commissioning and Operation. IAEA Safety Standards Series No. SSR-2/2 (Rev. 1)	This publication describes the requirements to be met to ensure the safe commissioning, operation, and transition from operation to decommissioning of nuclear power plants. It includes requirements of setting policies on fitness for duty. Section 3.13 requires that "[a] staff health policy shall be instituted and maintained by the operating organization to ensure the fitness for duty of personnel. Attention shall be paid to minimizing conditions causing stress, and to setting restrictions on overtime and setting requirements for rest breaks. The health policy shall cover the prohibition of alcohol consumption and drug abuse.

5.0 Benchmarking Drug and Alcohol Testing

Drug and alcohol testing have become a means for detecting and deterring substance abuse in the workplace in both the United States and internationally, yet the guidelines and requirements vary for the implementation of programs, specifics of testing, and target populations. This section describes the types of tests, similarities and trends across locales, application in the workplace and within the nuclear power industry.

5.1 Types of Drug and Alcohol Tests

Drug and alcohol testing involve collecting a specimen (e.g., blood, breath, urine, hair, oral fluids, etc.) from an individual donor and then analyzing the specimen for specific analytes. Collection of specimens for analysis have typically been breath and blood samples for alcohol, and blood or urine samples for other drugs. More recently, drug testing has expanded to other matrices such as hair and oral fluids. Each matrix has pros and cons associated with the detection of alcohol and drugs present in the individual being tested. For example, blood testing requires specimen collection by a trained medical professional as well as collection in a designated facility, and urine testing has the potential of sample substitution and adulteration. The specimens collected have varying rates and durations of detectability related to which the drugs can be detected when in a body, as shown in Figure 5.1 (Pirone 2020; Hadland and Levy 2016). Different types of substances have different detection windows for different testing methodologies (Hadland and Levy 2016):

- Hair tests generally can detect a substance up to 90 days after its consumption.
- Urine tests can detect alcohol for up to 10–12 hours after its consumption but can be used to detect marijuana up to 30 days after its consumption. Other drugs have a range of detection windows below 7 days.
- Oral fluid can be used to detect alcohol and cannabis for up to 24 hours; amphetamines and methamphetamine for up to 48 hours; and cocaine, codeine, morphine, and heroin for up to 36 hours.
- Sweat tests can detect certain drugs between 7 and 14 days after consumption.

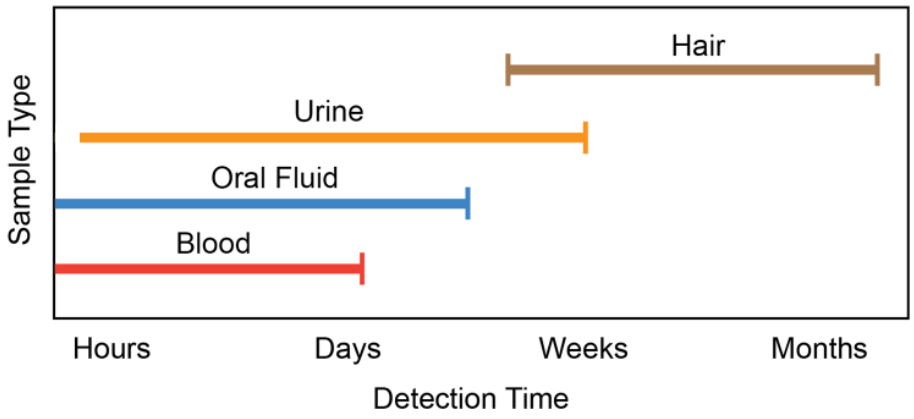

Figure 5.1. Specimen Collection Material Varies in Time for Detection of Drugs (Source: Modified from Pirone 2020).

5.1.1 Blood Testing

Blood testing is the best understood and most well-established method for alcohol and drug testing in humans (Hadland and Levy 2016) and is considered the “gold standard” (Reinstadler et al. 2019). The relationship between the concentration of alcohol or a specific drug (or metabolite) to impairment or accident risk is generally the best understood through blood sample analyses and is particularly strong for blood alcohol concentration and accident risk (Smith et al. 2021). Unlike other drug-testing methods, blood testing generally involves detection of the drug compounds rather than their metabolites and it can be used to detect substance use that has occurred within 2 to 12 hours of specimen collection, indicating recent use (Hadland and Levy 2016). Blood testing for drug use has many limitations including expense, limited window of detection, invasive sampling, and the requirement for trained personnel to collect the samples (Hadland and Levy 2016). While blood testing is widely used as a diagnostic procedure in health care and in anti-doping programs, it is infrequently used in workplace drug testing.

5.1.2 Breath Testing

Breath tests, such as the breathalyzer test, can be used to assess how much alcohol is in a subject’s blood at the time of the test (NIDA 2016). Breath tests give quick, accurate results and are more convenient than blood or urine tests, allowing administration of the test in law enforcement traffic stops. When a subject consumes alcohol, it is absorbed into the blood and some of the absorbed alcohol is transferred through the alveoli into the lungs where its presence can then be measured using a breath test (NIDA 2016). While there are inexpensive systems for convenient testing, the detection period for ethyl alcohol in the breath is typically hours, and the results do not provide as strong a correlation to impairment as blood testing (SAMHSA 2012). Currently this type of test is used solely for alcohol, but as noted by the National Institute of Health on Drug Abuse, work is being conducted to develop breath tests for marijuana (NIDA 2016). The Canadian screening levels are shown in Table 5.1; they are the same as those in the United States (49 CFR Part 40).

Table 5.1. Drug-Testing Screening and Confirmation Cut-off Values for Breath for Canada (Source: REGDOC-2.2.4 Fitness for Duty, Volume II: Managing Alcohol and Drug Use, 2021)

Canadian Breath Testing for a Substance		
Screening Cut-off Value (mg/100mL	**"Action Level" Licensees shall prohibit the worker (mg/100mL)**	**Positive Test and fitness for duty policy violation (mg/100 mL**
20	20–39	40

5.1.3 Urine

Urine testing is common around the world and has been prevalent for the past 30–35 years as a form of drug testing in the workplace (Fraser 2014). Urine testing is used to evaluate the presence of drug metabolites to forensically determine recent drug use. Urine drug testing cannot measure immediate drug use or to determine when or how much of a drug a subject consumed (Fraser 2014). The advantages of urine testing include the volume of samples available, the higher concentrations of parent drugs or metabolites than are found in blood and having well-established testing methodologies (Hadland and Levy 2016). The disadvantages of urine drug testing include a relatively short window of detection, the potential for adulterating a sample, and the potential invasive nature of sample collection if the sampling process has to be observed (Hadland and Levy 2016). A comparison of drug-testing screening and confirmation cut-off values in shown in Table 5.2.

Table 5.2. Comparison of Drug-Testing Screening and Confirmation Cut-off Values (Urine) (REGDOC-2.2.4 Fitness for Duty, Volume II: Managing Alcohol and Drug Use, 2021) (Sources: 73 FR 16966, 2008; EWDTS, 2015b; 82 FR 7941, 2017)

	Canada		EWDTS		NRC		SAMHSA	HHS/DOT
Substance	**Screening Value (ng/mL)**	**Confirmation Value (ng/mL)**	**Screening Value (ng/mL)**	**Confirmation Value (ng/mL)**	**Screening Value (ng/mL)**	**Confirmation Value (ng/mL)**	**Screening Value (ng/mL)**	**Confirmation Value (ng/mL)**
Amphetamines	500	250	500	200	1000	500	500	250
Barbiturates			200	150				
Benzodiazepines	100	50	200	100				
Buprenorphine			5	2				
Cannabinoids (THC-Carboxylic Acid)	50	15	50	15	50	15		15
Cocaine Metabolite (Benzoylecgonine)	150	100	150	100	300	150	150	100
EDDP (or Methadone)			100 (300)					
Lysergic acid diethylamide (LSD) or metabolites			1	1				
Opiates	10–2000	10–2000	300	300	2000	10–2000		
Morphine, Codeine	2000	2000					2000	2000
6-Acetylmorphine	10	10		10				10
Phencyclidine (PCP)			25	25	25	25	25	25
Propoxyphene or Metabolites			300	300				
Methadone Metabolite (EDP)	100	100		75–250				

EWDTS = European Workplace Drug Testing Society; NRC = U.S. Nuclear Regulatory Commission; SAMHSA = Substance Abuse and Mental Health Services Center; HHS/DOT = U.S. Department for Health and Human Services and the U.S. Department of Transportation

5.1.4 Hair

Hair is "… a keratin-containing appendage that grows from a root located in a cavity of the skin called the follicle" (UNODC 2014). It has a crystalline-oriented polymeric network that is capable of binding small molecules (UNODC 2014). There are four prevailing theories of how drugs are incorporated into hair, but no definite mechanism has been identified (UNODC 2014). Drugs could be incorporated into/onto hair either by passive diffusion from the blood supply to the hair follicle, from sweat and secretions from the apocrine glands, contamination through exposures during drug use, or contamination from the skin to the area of hair synthesis (UNODC 2014). Using hair for drug testing offers the benefits of having a long window of detection, being noninvasive, and being difficult to adulterate (Hadland and Levy 2016). The limitations of using hair for drug testing include the expense associated with analysis, the difficulty of interpreting results, the availability of hair to sample, and the bias associated with hair color (Hadland and Levy 2016). A comparison of drug-testing screening and confirmation cut-off values for hair is shown in Table 5.3.

Table 5.3. Drug-Testing Screening and Confirmation Cut-off Values in Hair for Europe (Source: EWDTS 2015a)

European Workplace Drug Testing Society		
Substance	**Initial Cut-off Value (pg/mg)**	**Confirmation Test Value (pg/mg)**
Amphetamines	200	200
Methamphetamine	200	200
MDMA (3,4-methylenedioxy-methamphetamine)	200	200
MDEA (methyl diethanolamine)	200	200
MDA (3,4-Methylenedioxyamphetamine)	200	200
Cocaine	500	500
Benzoylecgonine		50
Cocaethylene		50
Norcocaine		50
THC (Tetrahydrocannabinol)	100	50
THC-COOH (11-Nor-9-carboxy-THC)		200
Opiates	200	
Morphine		200
Codeine		200
6-MAM (6-Monoacetylmorphine)		200
Methadone	200	200
EDDP (2-Ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine)		50
Buprenorphine	10	10
Norbuprenorphine		10
Ketamine	500	500
Norketamine		100
Benzodiazepines/z-drugs	50	50

5.1.5 Oral Fluid

Oral fluid or saliva can be used to test for drugs. Benefits of oral fluid testing can target either the drug metabolite or the drug itself in samples, can be collected non-invasively, can offer quick results, and have reduced risk of adulteration (Hadland and Levy 2016). Furthermore, oral fluid samples require less time to collect compared to urine samples, which reduce the costs to the employer and the time needed for the employee to be away from work (Pirone 2020). Oral fluid testing has limitations, including a short window of detection, limited specimen volume, and the potential for contamination in the mouth that cannot be correlated with substance presence in the blood (Hadland and Levy 2016).

Acceptance of oral fluid testing for drugs for workplace and roadside evaluations has been slowed by initial studies that demonstrated the testing systems were not sensitive enough to be adequate for use in law enforcement (Beirness and Smith 2017; Platt 2018). The Driving under the Influence of Drugs, Alcohol, and Medicines study (known as the DRUID study) commissioned by the EU included an evaluation of roadside testing of “on-site” oral fluid screening devices of 23 substances Table 5.4).

Table 5.4. Core Substance List and Equivalent Analytical Cut-off Values. Note: THC-COOH Cannot be Detected in Oral Fluid with Commonly Available Toxicological Methods (Source: EMCDDA 2012).

Substance	Whole Blood (ng/mL)	Oral Fluid (ng/mL)
Ethanol	0.1 g/l	0.082 g/l
6-acetylmorphine	10	16
7-aminoclonazepam	10	3.1
7-aminoflunitrazepam	8.5	1.0
Alprazolam	10	3.5
Amphetamine	20	360
Benzoylecgonine	50	95
Clonazepam	10	1.7
Cocaine	10	170
Codeine	10	94
Diazepam	140	5.0
Flunitrazepam	5.3	1.0
Lorazepam	10	1.1
3,4-methylenedioxyamphetamine (MDA)	20	220
3,4-methylenedioxy-N-ethylamphetamine (MDEA)	20	270
3,4-methylenedioxy-N-methylamphetamine (MDMA)	20	270
Methadone	10	22
Methamphetamine	20	410
Morphine	10	95
Nordiazepam	20	1.1
Oxazepam	50	13
Tetrahydrocannabinol (THC)	1.0	27
Tramadol	50	480
Zolpidem	37	10
Zopiclone	10	25

Between 2007 and 2009, eight devices were further evaluated in Finland, the Netherlands, and Belgium. Substance classes tested include amphetamine(s), methamphetamine, MDMA, cannabis, cocaine, illicit opioids, and benzodiazepines (EMCDDA 2012b). The results of the study indicated that the target for sensitivity, specificity, and accuracy (80 percent) was not reached by the tests. The tests were inconclusive for methamphetamine, MDMA, or PCP due to a lack of positive tests (EMCDDA 2012b). The study also established recommendations for cut-off levels for nations that want to determine cut-off levels in the development of DUI legislation (Table 5.4).

Additional studies have demonstrated that the reliability of several commercial devices for oral fluid specimen collection is improving and these devices are able to achieve the criteria discussed in Table 5.4. (Beirness and Smith 2017). This has led to the passage of more driving laws allowing the use of oral fluids for the presence of THC in Canada (Platt 2018) and for THC, methamphetamine, and MDMA in Victoria, Australia (ADF 2019).

5.2 Similarities and Trends Across Locales

Across locales similarities and trends exist for sample collection, test methods used, and other testing innovations. Improvements in drug and alcohol testing are adding to the acceptance of new matrices and collection methods.

5.2.1 Collection Locale

In 10 CFR 26.87, the requirements for the FFD programs' collection sites are detailed including the need for necessary personnel, materials, equipment, facilities, and supervision (73 FR 16966, 2008). Changes in the types of biological material/matrices collected from an individual for drug testing have also changed the potential collection location of material. Urine and blood sample collection generally requires dedicated collection locations or specifically qualified collectors while samples such as breath, sweat, and oral fluid may not require dedicated collection locations or highly qualified collectors.

Roadside drug testing or point-of-collection testing, is focused on the identification of substances that cause impairment, applying a *per se* cutoff, and then subjecting the individual to a field sobriety test or a physiological testing and subsequent laboratory testing. This type of testing by law enforcement is gaining traction around the world. The benefits of roadside testing are that it does not have to be administered at a specific collection location, provides rapid results, and is ideally easy to administer. Roadside drug testing has been deployed in Scotland to test drivers for cannabis and cocaine using a form of mouth swab that provides rapid results (BBC 2019). Roadside testing serves as a screening test and any positive tests would result in a person being taken to the police station for a confirmatory blood drug test (BBC 2019). A similar procedure is used in Australia where police can use a roadside oral fluid test to screen for cannabis, methamphetamine, and MDMA but a positive result would need to be confirmed by a laboratory test before the individual can be charged (ADF 2019). Roadside testing of oral fluid is becoming more popular; Canada also began using oral fluid roadside testing in a pilot program in 2018 using a device which was already approved for use in the UK and Germany (Platt 2018). Furthermore, devices such as the SoToxa™ mobile testing system, are an example of a portable technology that allows for drug testing to be conducted rapidly (within minutes) using an oral fluid sample and provide an immediate print out of the results (Abbott n.d.).

While roadside testing offers many benefits, it also has been found that these devices can return both false positives and false negatives. A study conducted at the University of Sydney in Australia of two common point-of-collection testing devices for THC found that neither testing methodology demonstrated the recommended sensitivity of greater than 80 percent, and the accuracy of the tests ranged from 5–10 percent false positives and 9–16 percent false negatives (Arkell et al. 2019). The State of Michigan conducted a pilot program in which it deployed oral test kits for roadside drug testing administered by officers who were trained to identify drivers under the influence (Grisolano 2021). The pilot program found that 24 percent of all positive roadside results were later overturned by negative blood test results, leading to concern about the oral test kits' accuracy (Grisolano 2021). The pilot program concluded that the oral fluid testing was not as reliable as blood testing but could be used for roadside screening (Grisolano 2021).

In the United States, law enforcement officials and other individuals responsible for public health and safety may take classes to learn the physiological and psychological signs associated with impairing substances. A first level of training is attending and passing the Standardized Field Sobriety Testing (SFST) program which has been developed by the National Highway Traffic

Safety Administration (NHTSA 2015). This is the traditional roadside test performed on individuals who demonstrate degraded motor, verbal, coordination, and cognitive skills caused by alcohol impairment. However, during the SFST, the official administering the test may observe different indicators not associated with alcohol. To help resolve these situations, many police jurisdictions offer their staff supplemental training called ARIDE (Advanced Roadside Impaired Driving Enforcement) (NHTSA 2018a). As stated by NHTSA, the ARIDE program "… provides officers the ability to build on the knowledge gained through their training and experience related to the SFSTs" (NHTSA 2018b). ARIDE provides "… additional information which can assist the officer in effective observation and interview techniques related to driving while impaired by alcohol, drugs, or a combination of both, and make an informed decision to arrest or not arrest a subject for impaired driving" (NHTSA 2018c). A third stage of training is to become a Drug Recognition Expert by attending a Drug Evaluation and Classification Program, passing a written test, and by completing annual training credits (IACP 2020). With Drug Recognition Expert certification an individual is able to observe the signs of impairment and make an educated/informed decision as the substances causing the physiological and psychological indications. This knowledge therefore not only significantly contributes to an SFST, but also aids emergency medical technicians if called to respond to the scene (Looby et al. 2007).

5.2.2 Test Methods

Drug-testing methods include the collection, processing (e.g., documentation, chain of custody, and shipping), analyses, and safeguarding of a biological specimen collected from an individual. Each matrix requires a different analytical protocol for drug testing, as would be expected based on the means by which drugs and metabolites are absorbed and stored in the body.

The approach to drug testing using urine, oral fluid, or hair will typically involve two steps. For urine, first the initial analysis typically[13] involves an immunoassay and then a confirmatory analysis if the immunoassay is positive (Hadland and Levy 2016). Immunoassay is a qualitative test; a drug or its metabolite is either present or absent. The confirmatory analysis is completed by gas chromatography-mass spectrometry and provides results that are comparable to predetermined thresholds (cut-off levels). The two steps for urine drug testing are similar to those of the approach used for alcohol testing: a breathalyzer test is followed by blood test. Oral fluid analyses also are conducted with an initial (or screening) and confirmatory testing approach, which can lead to lower costs (SAMHSA 2012; Hadland and Levy 2016).

Drug testing in the workplace is far less standardized and more controversial in Europe and other countries than in the United States. In general, the regulations and policies for drug testing and associated methods are not as proscriptive as those used in the United States. However, Smith et al. (2021) state that shifts in attitudes in many European countries is likely to lead to greater acceptance of workplace drug testing, similar to the United States.

[13] The word "typically" is meaningful because an initial or screening test need not be done (i.e., is not required to be done) by immunoassay. Immunoassay testing is typically used because its throughput is higher than other analytical methods, it has acceptable accuracy and repeatability for screening or initial testing, and its cost is substantially less than forensic testing by gas chromatography/mass spectroscopy, gas chromatography–tandem mass spectrometry, or liquid chromatography with tandem mass spectrometry.

5.2.3 Other Innovations in Drug and Alcohol Testing

Testing for illicit substances is becoming more innovative using non-traditional technologies and being used in public, private, and government institutions. Some of the new drug-testing methods include testing of fingerprint sweat and pupillometer drug screening. Fingerprint testing involves testing the small amount of sweat on a subject's finger to screen for drug use. The test involves a subject placing his/her finger on a cartridge to collect the sample, and results of the screening can be available within 10 minutes (The Recovery Village 2021). Fingerprint testing has been used for screening of THC, cocaine, opiates, and amphetamine with good agreement between the fingerprint testing and analysis of fingerprints using liquid chromatography with tandem mass spectrometry analysis (Hudson et al. 2019). Another innovative new illicit substance test is pupillometer drug screening, which has the subject undergo a computerized test to examine the subject's eyes to measure involuntary reflexes and compare them to the subject's baseline negative response (Fazari 2011). This drug-testing methodology has been implemented in the Lucas Country Ohio Court as a cost-saving measure (Sukosd 2020). Another innovation in drug testing is the ability to monitor communities through wastewater sampling and analysis. Analysis of wastewater from a community can be used to monitor changing patterns in consumption and use of some illicit substances in a community but cannot be tied back to individual subjects (Sulej-Suchomska et al. 2020).

5.3 Workplace Drug and Alcohol Testing

As a response to drug-related risks to safety and productivity, there has been global growth in the use of workplace drug testing (Dinis-Oliveira and Magalhaes 2020). This section discusses positivity rates and current research linking drug and alcohol use to significant incidents.

5.3.1 Drug Positivity Rates

5.3.1.1 Drug Positivity Rates: General U.S. Workforce

The overall positive rate of drug testing in the United States for all job types has been increasing, growing from 3.5 percent in 2010 to 4.5 percent in 2019 (a 29 percent increase), which was mainly attributed to an increase in positive tests of marijuana (Figure 5.2). Positive rates for marijuana increased again in 2020 by 16.1 percent in urine tests, 35.2 percent in oral fluid testing, and 22.5 percent in hair testing (AAMRO 2021).

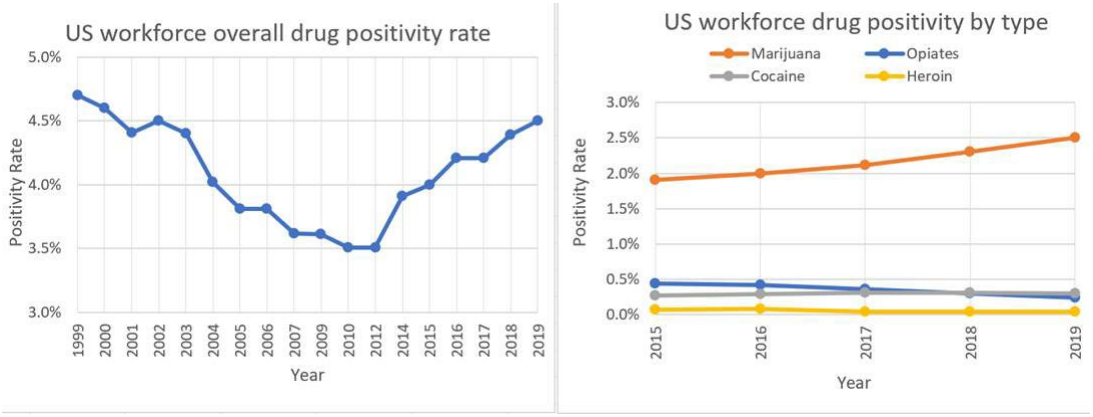

Figure 5.2. Positive Drug Test Rates in the U.S. Workforce since 2001 for All Drugs Combined and since 2015 for Marijuana, Cocaine, Opiates, and Heroin (Data Sources: Souergel 2019; Steele 2020)

According to statistics based on publicly available data provided by Quest Diagnostics (Steele 2020; Quest Diagnostics 2021), the positive rates for cocaine have remained relatively low and stable at ~0.3 percent. The positive test rates for opiates have declined from ~0.45 percent in 2015 to ~0.3 percent in 2019, which represents a 33 percent decrease. The positive rates for heroin remain consistently low at less 0.1 percent per year.

The overall positive drug rates vary by State (Souergel 2019) but are at 3 percent and higher for all States except North Dakota and Wyoming. These overall positive drug test rate results are mainly driven by marijuana. It was observed that there were some notable differences in workplace drug-testing positive rates for marijuana depending on the legalization or decriminalization of marijuana use in that State (i.e., medical, recreational) (AAMRO 2021). For instance, the overall positive drug rates are typically highest in States that allow recreational marijuana use (e.g., Oregon, Maine, and Vermont) (Souergel 2019), but this is not always the case (e.g., the overall positive drug rates in Washington and California remain relatively low). Note, in 2020 and 2021, the COVID-19 pandemic has had a discernable influence on workplace drug testing. For example, Quest Diagnostics reported that in 2020, the percentage of pre-employment drug testing for federally mandated safety-sensitive positions declined while the percentage for random drug testing increased (AAMRO 2021).

5.3.1.2 Drug Positivity Rates: Federally Mandated Testing for Safety-Sensitive Jobs in the United States

The positive drug rates for safety-sensitive jobs, as mandated by relevant Federal regulations and policies, are considerably lower than the rates for the general workplace. For instance, the

positive drug test rate of marijuana in safety-sensitive jobs was 0.9 percent in 2019 (Quest Diagnostics 2021) compared to 2.5 percent for the general workforce (Figure 5.2). Positivity rates for other drugs for safety-sensitive jobs in 2019 remained low overall and are lower compared to the general workforce: cocaine was 0.25 percent, PCP was 0.01%, semi-synthetic opiates (hydrocodone/hydromorphone) were 0.35 percent, and opiates (oxycodone/oxymorphone) was 0.26 percent (Quest Diagnostics 2021).

Regarding marijuana use in the safety-sensitive workforce, the positive rate decreased by 10.2 percent from 2019 to 2020. This is counter to the trend in the general workplace with positive drug test rates for marijuana increasing year after year (AAMRO 2021).

5.3.1.3 Drug Positive Rates: Global

Information on the positive drug rates in the global workforce is scarce due to strong worker privacy laws and a lack of testing requirements (Eurofound 2012). As discussed in the section on global workplace testing requirements (Section 4.3), there are several countries where doctors cannot disclose positive tests even to employers (part of an overall fitness evaluation).

A summary of the limited information of positive rates in the European general workforce included the following highlights (Eurofound 2012):

- *Italy*: Drug use by workers in past year – 13.5 percent marijuana, 4.5 percent cocaine, 1 percent opiates.
- *Netherlands*: Drug abuse by workers in past year – 0.6 percent abused illegal drugs.
- *UK*: Drug use by workers in past year – 13 percent used illegal drugs.
- *Spain*: Drug use by workers in the past year – 11 percent marijuana, 8 percent cocaine.
- *France*: Survey data showed 25 percent of workers perceived marijuana use at work is concerning.

5.3.2 Significant Drug or Alcohol-Related Incidents

The correlation between drug and alcohol use and injuries and accidents is well documented. Use of alcohol and illicit substances such as marijuana and cocaine was found to be related to general, intentional, and/or violent injuries (Vitale and Mheen 2006; MacDonald 1999). A higher frequency of illicit drug use was found to correlate with an elevated rate of emergency room visits (Vitale and Mheen 2006).

Considerable amount of research has been conducted and reported with focus on establishing the link between alcohol use, impaired driving, and traffic accidents (for example, see Dry et al. 2012, Williams 2006, and Mitchell 1985). Growing research evidence also indicates that using illicit drugs such as marijuana, Ecstasy, cocaine, and amphetamines can impair a driver's psychomotor function and lead to traffic accidents (Vitale and Mheen 2006; Hindmarch et al. 1991). In commercial aviation, a study analyzing the relationship between drug violations and aviation accidents reported that between 1995 and 2005, 91 counts of drug violations were reported in 4,977 post-accident tests and 7,211 drug violations in 1,129,922 random drug tests. The results showed a significant relationship between illicit drug use (i.e., marijuana, amphetamines, opiates, phencyclidines) by aviation employees and risk of accidents. However, because the prevalence of drug violations was low (1.83 percent for post-accident testing; 0.64 percent for random testing), the authors estimated that about 1.2 percent of aviation accidents

were directly related to drug violations (Li et al. 2011). It is worth noting that flight crews, flight instructors, and air traffic controllers were among the employee groups with the lowest positive drug test results while the highest drug violation rates were found in aircraft maintenance workers and flight attendants. In a 2016 study, the Bioaeronautical Sciences Research Laboratory performed toxicological analyses of 277 fatal and nonfatal accidents involving drivers, operators, or pilots in aviation, highway, marine, and rail transportation to test for the presence of drugs (Cliburn et a. 2016). The analysis identified 122 drugs and metabolites, including over-the-counter medications, prescription medications, and controlled substances. In 155 of such cases, the presence of at least one drug was found, including 103 cases of prescription medications, 63 cases of over-the-counter medications, and 63 cases of illicit or controlled substances. In 106 cases the presence of two or more drugs was found, and in 23 cases the presence of five or more drugs was found. A 2017 study based on the National Transportation Safety Board Aviation Accident Database examined the association between drug use by pilots and fatal civil aviation accidents. The study found that of the 633 incidents associated with 646 fatalities between 2012 and 2014, 42.1 percent of the pilots had drugs in their systems. Drugs found in the fatally injured pilots included prescription drugs, over-the-counter drugs, opioids, and other controlled substances or potentially impairing drugs (Akparibo and Stolfi 2017).

Although drug and alcohol-related impairment could be one of the many contributing factors to an accident, investigations of the recent significant nuclear reactor accidents found virtually no connection between drug and alcohol use and the accidents. The 1986 Chernobyl nuclear reactor accident in Kyiv Oblast, Ukraine, resulted in explosions, fatalities, and long-term environmental contaminations. Post-accident analysis suggests that reactor design flaws and human error were the root causes of the accident (NEI 2019). The Chernobyl reactor operators violated the plant's operating procedures and ran the plant without sufficient safety precaution and communication with the safety staff. Drug or alcohol use was not mentioned as a contributing factor of the accident. In the 1979 Three Mile Island accident near Middletown, Pennsylvania, although operator error (e.g., lack of familiarity with the incident scenario, improvising actions) was part of the root cause of the accident, drug or alcohol use was not mentioned as a contributing factor in the accident analysis literature (Rosztoczy 2019). The 2011 Fukushima Daiichi accident was the result of a host of factors ranging from natural disasters (i.e., earthquake and tsunami), the plant owner's negligence (i.e., failure to implement protective plans for critical safety equipment against flooding), and the operators' lack of adequate emergency response training (Committee on Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of U.S. Nuclear Plants 2014). Again, drug and alcohol use was not found to be a contributor to the accident. Last, the collapse of a temporary overhead crane at the Arkansas Nuclear One Power Plant in London/Russellville, Arkansas, on March 31, 2013, caused significant property damage, the death of one worker, and injuries to eight other workers (see Figure 5.3). The primary cause of the collapse was a flaw in the structural design of the temporary overhead crane, with contributing causes attributed to poor engineering reviews and failure to conduct a load test.[14] The licensee conducted post-event drug and alcohol testing of individuals who may have caused or contributed to the event. Drug and alcohol use or abuse were not identified.

[14] U.S. Department of Labor, Occupational Safety and Health Administration, Directorate of Construction, "Investigation of the March 31, 2013, Temporary Overhead Crane Collapse at Arkansas Nuclear One Power Plant in London/Russellville, Arkansas," report dated August 13, 2103.

Figure 5.3. Turbine Building of Unit 1 Incident at the Arkansas Nuclear One Power Plant in London/Russellville, Arkansas on March 31, 2013 (Source: DOL 2013).

6.0 Conclusions

This study's objective is to benchmark international drug and alcohol testing regulations and programs to provide the NRC with comparative information regarding workplace drug and alcohol testing programs, testing methods, and workplace FFD programs. Based on a set of search criteria, the PNNL project team identified the following three types of information:

1. International drug and alcohol use policies
2. Workplace drug and alcohol testing programs
3. Drug and alcohol testing programs at NPPs

The information search resulted in 11 countries from three regions being included in the analysis:

1. North America – United States, Canada, and Mexico
2. Europe – UK, Germany, Sweden, Finland, France, and Italy
3. Asia-Pacific – India and Japan

To the extent possible, the PNNL project team reviewed the different drug-testing matrices, similarities and trends in testing methods, and cutoff values to identify an international benchmark for drug and alcohol testing.

Specifically, the research effort was directed at addressing the following three questions:

1. What policies and regulatory controls are in place for drug and alcohol use across the country's populace?
2. What drug and alcohol restrictions and testing practices apply to workplace testing?
3. What are the regulatory controls and testing used for the nuclear workforce?

Conclusions drawn for each of these questions are summarized below.

6.1 Existing Policies and Regulatory Controls

The PNNL project team explored international laws governing illegal use of drugs and controlled substances as well as the overall drug policy/approach taken regarding penalties for personal use, sale of drugs, and drug trafficking. All countries have regulatory controls for controlled substances that generally correspond to those controlled by the CSA in the United States in terms of the categories of substances that are regulated.

Abuse potential and dependency risk are the primary reasons substances are controlled and are not influenced by the social or cultural acceptability of use, with the exception of some drugs used for traditional purposes such as kava and betel nut. The deterrence approaches taken by each country vary depending on whether the drug use is viewed as a crime requiring punishment, as a health issue requiring treatment and depending upon the substance and the nature of its use (i.e., personal use, sale of, or drug trafficking). Some countries that take a more prohibitionist approach also may employ harm-reduction strategies for less-serious offenses; this is true in Sweden and Germany where needle exchange and maintenance treatment options are available. Other countries have decriminalized the use and possession of some "soft" drugs. An example is marijuana in Canada and the Netherlands where it is technically still

illegal but its use is tolerated. Penalties also vary depending upon the seriousness of the offense with drug trafficking being the most serious offense. Penalties include fines; imprisonment for varying durations, including for life; and the death penalty. Alcohol is legal in the countries examined in this report with the exception of several States in India.

6.2 Drug and Alcohol Restrictions and Testing Applicable to Workplace Testing

The PNNL team explored the general workplace drug and alcohol testing laws, regulations, and practices in the public sector and in various industries, including safety- and security-sensitive industries, across different countries.

Most countries included in this study allow workplace drug and alcohol testing under certain circumstances. Pre-employment drug screening typically is permitted in many industries and testing of workers in safety-sensitive jobs (e.g., transportation, aviation, etc.) generally is allowed. In terms of the conditions for testing, pre-employment testing, for-cause, and reasonable suspicion testing are the most commonly reported. Random testing, although regarded by some as having some deterrent effect on workplace drug abuse problems (e.g., HSE Network 2020), is less common outside the United States. In some countries such as France, workplace drug testing is limited to for-cause testing only and random testing is prohibited. One notable exception is Italy where random testing and annual drug testing of workers are conducted in safety- and security-sensitive industries.

The research also revealed that there is no universal standard for which industries qualify as being safety- and security-sensitive. For the countries studied, industries such as transportation, law enforcement, and national defense could be generally regarded as being safety- or security-sensitive. Workplace drug and alcohol testing is not uncommon for workers in these industries. The lack of clear qualification of “safety- and security-sensitive” makes it difficult to determine if workplace drug and alcohol testing is required on the basis of the industry alone. Certain jobs that have potential safety and security impacts on the public, which might require drug testing in one country, could be deemed as lacking safety interest to necessitate drug testing in another country.

With regard to whether the nuclear industry is considered safety-sensitive outside the United States, the data gathered by the PNNL project team indicate that it is the case for Italy, Canada, and the United States. While the team did not obtain similar information for other countries, the testing requirements for workers in safety- and security-sensitive industries in a country could be assumed to apply to the nuclear industry, although the specifics about the programs (e.g., test frequency, test conditions, drug panel, personnel qualification, etc.) are likely to differ.

Privacy is an important consideration for drug-testing programs. In many European and some Asian countries, provisions limiting invasion of individual privacy constrains the types of testing that can be conducted in the workplace. To strike a balance between individual privacy and public safety as well as business interests, employers typically are required to demonstrate sufficient justification for requiring drug testing of workers and obtaining informed consent from individuals subject to testing. The right to privacy was found to be rooted in the constitutions of these countries and other laws (e.g., laws mandating protection of sensitive individual health data). Regardless of differences in drug-testing requirements, workplace drug testing invariably is required to be conducted in a manner compatible with the prevailing legal and policy framework of each country.

Drug testing is a component of deterrent programs used by employers in some countries to address the potential impact of drug and alcohol abuse on the workplace and public health and safety. Although the effectiveness of workplace drug testing as a deterrent is difficult to measure, some research conducted in Europe provides evidence of a persistent decline in positive rates after workplace drug-testing programs were introduced (Shahandeh and Caborn 2003). In addition to drug testing, prevention. And rehabilitation also have attracted attention as useful deterrent strategies.

Lastly, although the cost of conducting workplace drug testing could escalate quickly at scale, the PNNL project team was unable to find any sources of information that identify high financial costs of conducting drug and alcohol testing as being a main constraint of testing and privacy remains the main barrier.

6.3 Regulatory Controls and Testing used for the Nuclear Workforce

For the nuclear industry, only two countries (the United States and Canada) are known to have developed nuclear-specific drug and alcohol workplace testing programs. The Canadian nuclear workplace drug and alcohol testing program was updated in 2021 and, is in large part similar to the program used in the United States. However, while the U.S. program defines FFD using the phrase “trustworthiness and reliability,” the Canadian drug and alcohol testing program defines FFD as “… a condition in which workers are physically, physiologically, and psychologically capable of competently and safely performing their tasks.”

The PNNL project team was unable to find information regarding nuclear-specific drug and alcohol testing programs in other countries. This may either be because such programs do not exist or because information may not be publicly available in English. Because limited information was identified, the PNNL project team was unable to gather data related to whether drug or alcohol impairment has resulted in safety- or security-significant events or human performance issues, and information related to positive test rates.

6.4 Benchmark: Testing and Matrices Conclusions

The practice of workforce drug and alcohol testing is increasing in multiple countries, but it is not as common as with the variety of workplace drug and alcohol testing in the United States. This conclusion is partly based on the difficulty in finding specific information about drug and alcohol testing in the workplace globally, although recent reviews support this conclusion (Dinis-Oliveira and Magalhaes 2020).

The most common matrices tested in the United States are the same as those that are tested globally, which include:

- breath and blood for alcohol,
- urine specimens for drugs of concern, and
- new collection matrices including hair, sweat, and oral fluids are increasingly becoming more common (However, these are not yet formally accepted by the NRC FFD program).

Drugs targeted by these different matrices vary by testing organization but generally cover U.S. CSA Schedule 1 substances and the cutoff values are comparable.

For the nuclear power industry, regulations and requirements are clear for drug and alcohol testing of safety- and security-related positions. For other countries, there are regulations and requirements for safety- and security-related positions for the workplace that appear to apply to the nuclear industry but more specific information was not available through the data collection process (Section 2.1) used in this report.

7.0 References

This reference section includes all references in both the main report and the appendices.

29 CFR 1904. January 19, 2001. “Recording and Reporting Occupational Injuries and Illness”. *Federal Register*. Department of Health and Human Services.

42 CFR 23.5. February 27,1980. “42 CFR 23.5”. *Federal Register*. Department of Health and Human Services.

49 CFR Part 40. December 19, 2000. “49 CFE Part 40”. *Federal Register*. Department of Health and Human Services.

53 FR 11979. April 11, 1988. “Mandatory Guidelines and Proposed Revisions to Mandatory Guidelines for Federal Workplace Drug Testing Programs”. *Federal Register*. Department of Health and Human Services.

73 FR 16966. March 31, 2008. “10 CFR Part 26”. *Federal Register*. Department of Health and Human Services.

82 FR 7920-7970. January 23, 2017. “Mandatory Guidelines for Federal Workplace Drug Testing Programs.” *Federal Register*. U.S. Department of Health and Human Services.

84 FR 57554-57600. October 25, 2019. “Mandatory Guidelines for Federal Workplace Drug Testing Programs— Oral/Fluid.” *Federal Register*. U.S. Department of Health and Human Services.

85 FR 56108- 56151. September 10, 2020. "Mandatory Guidelines for Federal Workplace Drug-Testing Programs." *Federal Register*. U.S. Department of Health and Human Services.

Abbott. n.d. Roadside Drug Testing: The Long Road Ahead to Better Roadside Drug Testing. Retrieved from https://www.globalpointofcare.abbott/en/knowledge-insights/stories/roadside-drug-testing.html

ACLU (American Civil Liberty Union). (2020) State-by-State Workplace Drug Testing Laws Retrieved from https://www.aclu.org/sites/default/files/FilesPDFs/testing_chart.pdf

ADF (Alcohol and Drug Foundation). (2019). Roadside Drug Testing. Retrieved from https://adf.org.au/insights/roadside-drug-testing/

ADF (Alcohol and Drug Foundation). (2021). Drug Facts: The Drug Wheel. Retrieved from https://adf.org.au/drug-facts/#wheel

Akins, S., & Mosher, C. (2020). Oregon Just Decriminalized All Drugs - Here's Why Voters Passed This Groundbreaking Reform. Retrieved from https://www.usnews.com/news/best-states/articles/2020-12-10/oregon-just-decriminalized-all-drugs-heres-why-voters-passed-this-groundbreaking-reform

Akparibo, I., & Stolfi, A. (2017). Pilot Certification, Age of Pilot, and Drug Use in Fatal Civil Aviation Accidents. Aerospace. *Medicine and Human Performance*, 88(10):931-936. Retrieved from https://pubmed.ncbi.nlm.nih.gov/28923142/

Ambekar, A., Agrawal, A., Rao, R., Mishra, A. K., Khandelwal, S. K., & Chadda, R. K. (2019). Magnitude of Substance Use in India. Indian Government Ministry of Social Justice and Empowerment New Delhi, India. Retrieved from http://socialjustice.nic.in/writereaddata/UploadFile/Magnitude_Substance_Use_India_REPORT.pdf

American Addict Center. (2018). An Analysis of Employer Drug Testing in the United States. Retrieved from https://americanaddictioncenters.org/learn/analysis-employer-drug-testing/#:~:text=The%20results%20of%20our%20study,of%20jobs%20higher%20than%202.4%25.

AAMRO (American Association of Medical Review Officers). (2021). MRO Alert. May 2021 Volume XXXII, No. 4. American Association of Medical Review Officers. Retrieved from www.aamro.com

Anderson, S. (2012). European Drug Policy: The Cases of Portugal Germany and The Netherlands. *The Eastern Illinois University Political Science Review*,1(Spring): 1-15.

An Act respecting cannabis and to amend the Controlled Drugs and Substances Act, the Criminal Code and other Acts. 2018. *Parliament of Canada*. Bill C-45.

Arfken, C. L. (2020). National Drug Early Warning System (NDEWS) Wayne County (Detroit Area) Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

Arkell, T., Kevin, R., Stuart, J., Lintzeris, N., Haber, P., Ramaekers, J. & McGregor, I. (2019). Detection of Δ 9 THC in Oral Fluid Following Vaporized Cannabis with Varied Cannabidiol (CBD) Content: An Evaluation of Two Point-of-collection Testing Devices. *Drug Testing and Analysis*, 11.10 (2019): 1486–1497. Available from https://pubmed.ncbi.nlm.nih.gov/31442003/

ATOM Legal Professional Corporation. (n.d.). What is the Legal Limit for Drunk Driving in Japan, and What Happens if I Drive under the Influence? Retrieved from https://englishlawyersjapan.com/what-is-the-legal-limit-for-drunk-driving-in-japan-and-what-happens-if-i-drive-under-the-influence/

AUTHBRIDGE. (n.d.). Why Drug Screening of Employees at Regular Intervals is the Need of the Hour. Retrieved from https://authbridge.com/blog/why-drug-screening-employees-regular-intervals-need-hour

Banta-Green, C. (2020). National Drug Early Warning System (NDEWS) Seattle Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

BBC (British Broadcasting Corporation). 2019. Police Scotland Unveil New Drug-Driving Detection Kits. October 11, 2019. Retrieved from https://www.bbc.com/news/uk-scotland-49999561

Beirness, D. & Smith, D. (2017) An Assessment of Oral Fluid Drug-Screening Devices, *Canadian Society of Forensic Science Journal*, 50(2): 55-63.

Benfer, I., Zahnow, R., Barratt, M. J., Maier, L., Winstock, A., & Ferris, J. (2018). The Impact of Drug Policy Liberalisation on Willingness to Seek Help for Problem Drug Use: A Comparison of 20, *Countries. Int J Drug Policy*, 56: 162-175.

Brecht, M. L. (2020). National Drug Early Warning System (NDEWS) Los Angeles County Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

CCSA (Canadian Centre on Substance Use and Addiction). (2017). Canadian Drug Summary: Alcohol. Canadian Centre for Substance Abuse and Addiction.

CCSA (Canadian Centre on Substance Use and Addiction). (2015). Canadian Drug Summary: Cannabis. Canadian Centre on Substance Use and Addiction.

CDC (Centers for Disease Control and Prevention). (2021). Opioid Basics: Commonly Used Terms. Retrieved from https://www.cdc.gov/opioids/basics/terms.html.

Certiphi Screening. (2019). Drug and Alcohol Testing in Canada. Retrieved from https://www.certiphi.com/resource-center/occupational-health-screening/drug-and-alcohol-testing-in-canada/

Chatwin, C. (2016). Mixed Messages from Europe on Drug Policy Reform: The Cases of Sweden and the Netherlands. Journal of Drug Policy Analysis, 11. doi:10.1515/jdpa-2015-0009

Cliburn, K., Craft, K., Hunn, H., Thompson, K., Ritter, R., Saenz, S., Barrett, J., Angier, M., Caldwell, D., Griffin, A., Hickerson, J., Hileman, C., Lewis, R., Soper J., Williamson, K., Kemp, P. (2016). Drug and Alcohol: Forensic Toxicology Annual Report 2016. Federal Aviation Administration. DOT/FAA.AM-20/13. Retrieved from https://www.faa.gov/data_research/research/med_humanfacs/oamtechreports/2020s/media/202013.pdf

Coffin, P. O., & Rowe, C. (2020). National Drug Early Warning System (NDEWS) San Francisco Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

Committee on Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of U.S. Nuclear Plants; Nuclear and Radiation Studies Board; Division on Earth and Life Studies; National Research Council. Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants. Washington (DC): National Academies Press (US); (2014). Available from: https://www.ncbi.nlm.nih.gov/books/NBK253939/ doi: 10.17226/18294

Controlled Drugs and Substances Act. September 19, 2019. Government of Canada. S.C. 1996, c.19. Retrieved from https://laws-lois.justice.gc.ca/eng/acts/c-38.8/FullText.html

Cruciata, G. (2020). The Crisis of Marijuana and Hash Criminalization in Italy. Retrieved from https://filtermag.org/criminalization-italy-marijuana-hash/

DEA (Drug Enforcement Administration). (2020). Khat Drug Fact Sheet. In Department of Justice/ Drug Enforcement Administration. Retrieved from https://www.dea.gov/sites/default/files/2020-06/Khat-2020_0.pdf

DEA (Drug Enforcement Administration). (n.d.-a). Drug Scheduling. Retrieved from https://www.dea.gov/drug-scheduling

DEA (Drug Enforcement Administration). (n.d.-b). Drugs of Concern. Retrieved from https://www.dea.gov/taxonomy/term/311

DeCew, J. W. (1994). Drug testing: Balancing privacy and public safety. The Hastings Center Report, 24(2), 17-23. Retrieved from https://search.proquest.com/scholarly-journals/drug-testing-balancing-privacy-public-safety/docview/222375680/se-2?accountid=28112

Demers, D., Caldwell, F., & Kenney, K. (2015). Global Workplace Testing: Legal Aspects and Data Protection Review. Paper presented at the International Forum for Drug & Alcohol Testing, San Diego, CA.

Dew, B. J., C Golubovic, N., & Castleberry, J. (2020). National Drug Early Warning System (NDEWS) Atlanta Metro Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

Dinis-Oliveira, R, & Magalhaes, T. (2020). Abuse of licit and illicit psychoactive substances in the workplace: Medical, Toxicological, and forensic aspects. Journal of Clinical Medicine. 9:770. Doi:10.3390/jcm9030770

DOL (U.S. Department of Labor). (2013). Investigation of the March 31, 2013, Temporary Overhead Crane Collapse at Arkansas Nuclear One Power Plant in London/Russellville, AR. Retrieved from https://www.osha.gov/sites/default/files/2019-12/2013_r_04.pdf

Dombrowski, K., Crawford, D., Khan, B., & Tyler, K. (2016). Current Rural Drug Use in the US Midwest. Journal of Drug Abuse, 2(22), 1-8. doi:10.21767/2471-853X.100031

Dry, M., Burns, N., Nettelback, T., Farquharson, A., & White, J. (2012). Dose-Related Effects of Alcohol and Cognitive Functioning. Plos One. https://doi.org/10.1371/journal.pone.0050977

El-Menyar, A., Mekkodathil, A., Al-Thani, H., & Al-Motarreb, A. (2015). Khat Use: History and Heart Failure. Oman Med J, 30(2), 77-82. doi:10.5001/omj.2015.18

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2012a). Country Legal Profiles: France. Retrieved from https://www.emcdda.europa.eu/html.cfm/index5174EN.html?pluginMethod=eldd.countryprofiles&country=FR

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2012b). Driving Under the Influence of Drugs, Alcohol and Medicines in Europe--findings from the DRUID project. Retrieved from https://www.emcdda.europa.eu/publications/thematic-papers/druid_en

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2017). Italy Country Drug Report 2017. Retrieved from https://www.emcdda.europa.eu/system/files/publications/4519/TD0616150ENN.pdf

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2019a). Finland Country Drug Report 2019. Retrieved from https://www.emcdda.europa.eu/system/files/publications/11336/finland-cdr-2019_0.pdf

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2019b). France Country Drug Report. Retrieved from https://www.emcdda.europa.eu/system/files/publications/11335/france-cdr-2019_0.pdf

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2019c). Germany Drug Country Report. Retrieved from https://www.emcdda.europa.eu/system/files/publications/11334/germany-cdr-2019_0.pdf

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2019d). Penalties for Drug Law Offences at a Glance -Italy. Retrieved from https://www.emcdda.europa.eu/publications/topic-overviews/content/drug-law-penalties-at-a-glance_en

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2019e). Penalties for Drug Law Offences at a Glance for Finland. Retrieved from https://www.emcdda.europa.eu/publications/topic-overviews/content/drug-law-penalties-at-a-glance_en

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2020). European Drug Report: Trends and Developments. Retrieved from Luxembourg: https://www.emcdda.europa.eu/system/files/publications/13236/TDAT20001ENN_web.pdf

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2021a). Country Legal Profiles: Sweden. Retrieved from https://www.emcdda.europa.eu/html.cfm/index5174EN.html?pluginMethod=eldd.countryprofiles&country=SE

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2021b). Penalties for Drug Law Offences at a Glance: Sweden. Retrieved from https://www.emcdda.europa.eu/publications/topic-overviews/content/drug-law-penalties-at-a-glance_en

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (2021c). Penalties for Drug Law Offences in Europe at a Glance-Sweden Drugs Controlled. Retrieved from https://www.emcdda.europa.eu/publications/topic-overviews/content/drug-law-penalties-at-a-glance_en

EMCDDA (European Monitoring Centre for Drugs and Drug Addiction). (n.d.). Classification of Controlled Drugs. Retrieved from https://www.emcdda.europa.eu/publications/topic-overviews/classification-of-controlled-drugs/html_en

Esbehidy Reséndiz Escobar, M. N. B. G., Roxana Mujica Salazar, Itzia Sayuri Soto Hernández, Vianey Cañas Martínez, Clara Fleiz Bautista, María de Lourdes Gutiérrez López, Nancy Amador Buenabad, María Elena Medina-Mora, Jorge Ameth Villatoro Velázquez. (2018). National Trends in Alcohol Consumption in Mexico: Results of the National Survey on Drug, Alcohol and Tobacco Consumption 2016-2017. Salud Mental, 41(1). Available from https://www.researchgate.net/publication/323456947_National_trends_in_alcohol_consumption_in_Mexico_results_of_the_National_Survey_on_Drug_Alcohol_and_Tobacco_Consumption_2016-2017

Estados Unidoes Mexicanos, Presidencia de la Republica. (1984). Ley General de Salud (General Health Law). Retrieved from http://dof.gob.mx/nota_detalle.php?codigo=4652777&fecha=07/02/1984#:~:text=%2DLa%20presente%20Ley%20reglamenta%20el,Federaci%C3%B3n%20y%20las%20entidades%20federativas

Eurofound (European Foundation for the Improvement of Living and Working Conditions). (2012). Use of Alcohol and Drugs at the Workplace. Retrieved from https://www.eurofound.europa.eu/sites/default/files/ef_files/docs/ewco/tn1111013s/tn1111013s.pdf

EWDTS (European Workplace Drug Testing Society). (2002). European Laboratory Guidelines for Legally Defensible Workplace Drug Testing. Retrieved from http://www.ewdts.org/data/uploads/documents/ewdtsguidelines.pdf

EWDTS (European Workplace Drug Testing Society). (2003). Workplace Drug Testing in Europe: Survey Results. Retrieved from http://www.ewdts.org/wdt-in-europe.html

EWDTS (European Workplace Drug Testing Society). (2015a). European Guidelines for Workplace Drug and Alcohol Testing in Hair. Version 2.0. November 01, 2015. European Workplace Drug Testing Society.

EWDTS (European Workplace Drug Testing Society). (2015b). European Guidelines for Workplace Drug Testing in Urine. Version 2.0. November 01, 2015. European Workplace Drug Testing Society.

Executive Order 12564. September 15, 1986. “Drug Free Federal Workplace”. *Federal Register*. 51 FR 32889. Department of Health and Human Services.

Fazari, G. (2011). Testing the Validity of Pupillometer Technology Against Traditional Drug Screening Instruments. *Federal Probation*, 75(3):37-44. Retrieved from https://www.ojp.gov/ncjrs/virtual-library/abstracts/testing-validity-pupillometer-technology-against-traditional-drug

Finland Occupational Safety and Health Administration. (2021). Drug Testing in Finland. Retrieved from https://www.tyosuojelu.fi/web/en/employment-relationship/rights-and-responsibilities-at-work/privacy-protection/drug-testing

Ford, C., Nutt, D., Eastwood, N., Gold, D., Jolly, J., Murphy, F., Halliday, K., & Bridge, J. (2017). Is the UK's 2017 Drug Strategy Fit for Purpose? BMJ, 358, j4405. doi:10.1136/bmj.j4405. Available from https://pubmed.ncbi.nlm.nih.gov/28963111/

Fraser, A. (2014). Urine Drug Testing Practices. Canadian Nuclear Safety Commission. RSP-0314

Fujii, M. (2020). At a Glance: Hiring Employees in Japan. Retrieved from https://www.lexology.com/library/detail.aspx?g=0b29615c-935b-43c3-b669-8c9c48e2039b

Furtado, R. (2016). What Is The Legal Validity of Pre-Employment Screening Policy? IPleaders. Retrieved from https://blog.ipleaders.in/legal-validity-pre-employment-screening-policy/

Gallagher, C. T., Atik, S. K., Isse, L., & Mann, S. K. (2020). Doctor or Drug Dealer? International Legal Provisions for the Legitimate Handling of Drugs of Abuse. Drug Science, *Policy and Law*, 6:1-9. Retrieved from https://journals.sagepub.com/doi/pdf/10.1177/2050324519900070

GCDP (Global Commission on Drug Policy). (2017). The World Drug Perception Problem: Countering Prejudices About People Who Use Drugs. Retrieved from https://www.globalcommissionondrugs.org/reports/changing-perceptions.

George, J., & Krishnan, A. (2012). Loopholes in the Narcotic Drugs and Psychotropic Substances Act, 1985. SSRN. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2021750

Gesley, J. (2016). Decriminalization of Narcotics: Germany. Retrieved from https://www.loc.gov/law/help/decriminalization-of-narcotics/germany.php

Goldberg, T. (2004). The Evolution of Swedish Drug Policy. *Journal of Drug Issues*, 34(3): 551-576. doi:http://dx.doi.org/10.1177/002204260403400305

Goodman-Meza, D., Medina-Mora, M. E., Magis-Rodriguez, C., Landovitz, R. J., Shoptaw, S., & Werb, D. (2019). Where Is the Opioid Use Epidemic in Mexico? A Cautionary Tale for Policymakers South of the US-Mexico Border. *Am J Public Health*, 109(1): 73-82.

Grisolano, G. 2021. Roadside Drug Testing Pilot Program Results Fall Below 'Gold Standard'. LandLine. Retrieved from https://landline.media/roadside-drug-testing-pilot-program-results-fall-below-gold-standard/

Hackworth, B. (2020). National Drug Early Warning System (NDEWS) Southeastern Florida Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

Hadland, S. E., & Levy, S. (2016). Objective Testing: Urine and Other Drug Tests. *Child and Adolescent Psychiatric Clinics of North America*, 25(3): 549-565. doi:10.1016/j.chc.2016.02.005

Health Insurance Portability and Accountability Act of 1996. 1996. Public Law 104-191. U.S. Department of Health and Human Services.

Heyer, K. (2000). From Special Needs to Equal Rights: Japanese Disability Law. *Asian-Pacific Law & Policy Journal*, (7): 1-14. Retrieved from http://blog.hawaii.edu/aplpj/files/2011/11/APLPJ_01.1_heyer.pdf

HHS (U.S. Department of Health and Human Services). (2016). The Surgeon General's Report on Alcohol, Drugs, and Health: Facing Addiction in America. Department of Human and Health Services, Washington, DC.

HHS (U.S. Department of Health and Human Services). (2018). The Surgeon General's Spotlight on Opioids. Department of Human and Health Services, Washington, DC.

Hindmarch, I., Kerr, J.S., Sherwood, N., (1991). The Effects of Alcohol and Other Drugs on Psychomotor Performance and Cognitive Function. *Alcohol and Alcoholism*, 26(1): 71-79. https://doi.org/10.1093/oxfordjournals.alcalc.a045085

Holland, A. (2020). An Ethical Analysis of UK Drug Policy as an Example of a Criminal Justice Approach to Drugs: A Commentary on the Short Film Putting UK Drug Policy into Focus. *Harm Reduct J*, 17(1), 97. doi:10.1186/s12954-020-00434-8

HSE Network. (2020). The Value of Random Drug Testing. Retrieved from https://www.hse-network.com/the-value-of-random-drug-testing/

Hudson, M., Stuchinskaya, T., Ramma, S., Patel, J., Sievers, C., Goetz, S., Hines, S., Menzies, E., & Russell, D. A. (2019). Drug Screening Using the Sweat of a Fingerprint: Lateral Flow Detection of Delta9-tetrahydrocannabinol, Cocaine, Opiates and Amphetamine. *J Anal Toxicol*, 43(2): 88-95. doi:10.1093/jat/bky068

IACP (International Association of Chiefs of Police). (2020). The International Standards of the Drug Evaluation and Classification Program. Retrieved from https://www.codot.gov/safety/dre/assets/international-standards-of-the-decp.pdf

IAEA (International Atomic Energy Agency). (2001). The Operating Organization for Nuclear Power Plants. Safety Standards Series No.NS-G-2.4. Retrieved from https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1115_scr.pdf

IAEA (International Atomic Energy Agency). (2002). Recruitment, Qualification and Training of Personnel for Nuclear Power Plants. Safety Standards Series No.NS-G-2.8. Retrieved from: https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1140_scr.pdf

IAEA (International Atomic Energy Agency). (2008). Conduct of Operations at Nuclear Power Plants. Safety Guide No.NS-G-2.14. Retrieved from https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1339_web.pdf

IAEA (International Atomic Energy Agency). (2010). Licensing Process for Nuclear Installations. Specific Safety Guide No. SSG-12. Retrieved from https://www-pub.iaea.org/MTCD/publications/PDF/Pub1468_web.pdf

IAEA (International Atomic Energy Agency). (2016). Safety of Nuclear Power Plants: Commissioning and Operation. IAEA Safety Standards Series No. SSR-2/2 (Rev. 1). Retrieved from: https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1716web-18398071.pdf

IAEA (International Atomic Energy Agency). (2017). Self-Assessment of Nuclear Security Culture in Facilities and Activities. IAEA Nuclear Security Series No. 28-T. Retrieved from https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1761_web.pdf

ILO (International Labour Organization). (2006). Coming Clean: Drug and Alcohol Testing in the Workplace. Retrieved from http://www.ilo.org/global/regions/WCMS_082253/lang--en/index.htm

Jain, R. (2015). Article 21 of the Constitution of India – Right to Life and Personal Liberty. Academike. Retrieved from https://www.lawctopus.com/academike/article-21-of-the-constitution-of-india-right-to-life-and-personal-liberty/

Kageura, M. (2002). Continuous Challenges in Japanese Forensic Toxicology Practice: Strategy to Address Specific Goals. Nihon Hoigaku Zasshi, 56(2-3), 219-228.

Koto, G., Tarui, M., Kamioka, H., & Hayashi, K. (2020a). Drug Use, Regulations and Policy in Japan, Japan Advocacy Network for Drug Policy. Retrieved from http://files.idpc.net/library/Drug_use_regulations_policy_Japan.pdf

Laqueur, H. (2015). Uses and Abuses of Drug Decriminalization in Portugal. *Law & Social Inquiry*, 40(03): 746-781. doi:10.1111/lsi.12104

Li, G., Baker, S., Zhao, Q., Brady, J., Lang, B., Rebok, G., & DiMaggio, C. (2011). Drug Violations and Aviation Accidents: Findings from the US Mandatory Drug Testing Programs. *Addiction*. 106:1287-1292. doi:10.1111/j.1360-0443.2011.03388.x

Lim, S. (2020). National Drug Early Warning System (NDEWS) Philadelphia Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

LOC (Library of Congress). (2020). Decriminalization of Narcotics: Mexico. Retrieved from https://www.loc.gov/law/help/decriminalization-of-narcotics/mexico.php

Looby, A., Earleywine, M., & Gieringer, D. (2007). Roadside Sobriety Tests and Attitudes toward a Regulated Cannabis Market. *Harm Reduction Journal*. 4:4. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1796871/pdf/1477-7517-4-4.pdf

Louie, S. (2019). Japanese Alcohol Culture. *Psychology Today*. Retrieved from https://www.psychologytoday.com/us/blog/minority-report/201905/japanese-alcohol-culture

MacDonald, S., Wells, S., Giesbrecht, N., Cherpitel, C. (1999). Demographic and Substance Use Factors Related to Violent and Accidental Injuries: Results from an Emergency Room Study. Available from https://pubmed.ncbi.nlm.nih.gov/10402149/(Retrieved 6/10/2021).

Manning, S., Rash, C, LeDuc, P., Noback, R., and McKeon, J. (2004) The Role of Human Causal Factors in U.S. Army Unmanned Aerial Vehicle Accidents. Available from https://apps.dtic.mil/sti/pdfs/ADA421592.pdf (Retrieved 6/10/2021).

Maxwell, J. C. (2018). National Drug Early Warning System (NDEWS) State of Texas Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2018. Retrieved from https://ndews.org/publications/site-reports/

Meng, J. (2013). Chinese Drug Laws: Police-Controlled Approach to Drug Abuse. NIDA International Drug Abuse Research Abstract Database. Retrieved from https://www.drugabuse.gov/international/abstracts/chinese-drug-laws-police-controlled-approach-to-drug-abuse

Mitchell, M.C. (2015). Alcohol-Induced Impairment of Central Nervous System Function: Behavioral Skills involved in Driving. *Journal of Studies on Alcohol and Drugs*. s10:109-116. https://doi.org/10.15288/jsas.1985.s10.109

NDEWS. (2020). Highlights from NDEWS Sentinel Community Site 2020 Reports. Retrieved from https://ndews.org/publications/site-reports/

NEI (Nuclear Energy Institute). (2020). World Nuclear Generation and Capacity. Retrieved from https://www.nei.org/resources/statistics/world-nuclear-generation-and-capacity

NHTSA (National Highway Traffic Safety Administration. (2015). DWI Detection and Standardized Field Sobriety Testing (SFST) Participant Manual. Refresher. Retrieved from https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/sfst_pm_full_manual.pdf

NHTSA (National Highway Traffic Safety Administration). (2018a). Advanced Roadside Impaired Driving Enforcement Participant Manual. Retrieved from https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/aride_participant_manual-tag.pdf

NHTSA (National Highway Traffic Safety Administration. (2018b). DWI Detection and Standardized Field Sobriety Testing (SFST) Instructor Guide. Retrieved from https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/sfst_refresher_full_instructor_manual_2018.pdf

NHTSA (National Highway Traffic Safety Administration). (2018c). Advanced Roadside Impaired Driving Enforcement Instructor Guide. Retrieved from https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/aride_instructor_guide-tag.pdf

NIAAA (National Institute on Alcohol Abuse and Alcoholism). (n.d.) Alcohol's Effects on the Body. Retrieved from https://www.niaaa.nih.gov/alcohols-effects-health/alcohols-effects-body

NIDA (National Institute on Drug Abuse). (2020). Commonly Used Drugs Charts. Retrieved from https://www.drugabuse.gov/drug-topics/commonly-used-drugs-charts#alcohol

NIDA (National Institute on Drug Abuse). (2016). The Science of Drug Testing: How Alcohol Breath Tests Work. Retrieved from https://archives.drugabuse.gov/blog/post/science-drug-testing-how-alcohol-breath-tests-work#:~:text=The%20Breathalyzer%2C%20the%20most%20famous,blood%20alcohol%20concentration%20(BAC).

NRC (Nuclear Regulatory Commission). (2021). Presentation to the Drug Testing Advisory Board (HHS/SAMHSA): NRC Update on The Program and Items of Interest. March 2,2021. ML21063A138

Osaki, Y., Kinjo, A., Higuchi, S., Matsumoto, H., Yuzuriha, T., Horie, Y., Kimura, M., Kanda, H., & Yoshimoto, H. (2016). Prevalence and Trends in Alcohol Dependence and Alcohol Use Disorders in Japanese Adults; Results from Periodical Nationwide Surveys. *Alcohol and Alcoholism, 51*(4): 465-473.

Ouellet, L. J. (2020). National Drug Early Warning System (NDEWS) Chicago Metro Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

Pandey, A. (2017). All You Need to Know about Alcohol Laws in India. IPleaders. Retrieved from https://blog.ipleaders.in/alcohol-laws/

Pirone, J. (2020). An Overview of SAMHSA's New Oral Fluid Testing Guidelines. *Occupational Health & Safety*, 89(2): 14-18.

Platt, B. (2018). Federal Government Set to Approve First Device for Testing Driver's Saliva for Cannabis. *National Post*. Retrieved from https://nationalpost.com/cannabis/federal-government-approves-first-device-for-testing-drivers-saliva-for-cannabis

Practical Law. (2020). Drug/Substance Abuse Testing of Employees: Global Guide to Employment and Employee Benefits. Thomson Reuter. Retrieved from https://uk.practicallaw.thomsonreuters.com/3-541-0547?transitionType=Default&contextData=(sc.Default)&firstPage=true&comp=pluk&bhcp=1

Quest Diagnostics. (2021). Marijuana Drug Test Positivity Continues Double Digit Increases to Increase Overall Drug Positivity Rates at Historically High Levels. Retrieved from https://www.questdiagnostics.com/home/physicians/health-trends/drug-testing/

Randox Toxicology. (2018). Drug Use in Japan Reaches New Highs. Retrieved from https://www.randoxtoxicology.com/drug-use-in-japan-reaches-new-highs/

Reinstadler, V., Lierheimer, S., Boettcher, M., & Oberarcher, H. (2019). A Validated Workflow for Drug Detection in Oral Fluid by Non-Targeted Liquid Chromatography-Tandem Mass Spectrometry. *Analytical and Bioanalytical Chemistry*, (411):867-876.

Rodrigues, M. and Martins, L. (2007). Drug Testing in the Workplace: Inventory of European National Legislations. Council of Europe. Retrieved from https://rm.coe.int/1680745fba

Rorke, M. (2020). National Drug Early Warning System (NDEWS) Denver Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

Rosztoczy, Z. (2019). Root Causes of the Three Mile Island Accident. *ANS Nuclear News*. Available from https://ssl.ans.org/cms/media/?m=993&n=Root+Causes+of+the+Three+Mile+Island+Accident.pdf (Retrieved 6/10/2021).

SAMHSA (Substance Abuse and Mental Health Services Administration). (2012). Clinical Drug Testing in Primary Care. SAMHSA Technical Assistance Publication Series TAP 32. Available from https://store.samhsa.gov/sites/default/files/d7/priv/sma12-4668.pdf

Soergel, A. (2019). USNEWS and World Report 2019. Available from https://www.usnews.com/news/best-states/articles/2019-10-07/workforce-drug-tests-have-higher-rates-of-positive-results-reports-show

Shahandeh, B., & Caborn, J. (2003). Ethical Issues in Workplace Drug Testing in Europe. Retrieved from http://www.alcoholdrugsandwork.eu/resources/ilo-ethical-issues-in-workplace-drug-testing-in-europe.pdf

Sharma, S., Kumar, K., & Singh, G. (2017). An Overview on Narcotic Drugs and Psychotropic Substances Act, 1085. *Journal of Forensic Sciences and Criminal Investigation*, 4(3):1-4. Retrieved from https://juniperpublishers.com/jfsci/pdf/JFSCI.MS.ID.555644.pdf

Shimane, T., Qiu, D., & Wada, K. (2020). Current Situation of Cannabis Use in Japan: Based on Data from the Nationwide General Population Survey on Drug Use in Japan 2017. *Yakugaku Zasshi : Journal of the Pharmaceutical Society of Japan*, 140(2):173-178. doi:10.1248/yakushi.19-00195-1

Smith, D. E., Marzilli, L., & Davidson, L. D. (2021). Strategies of Drug Prevention in the Workplace: An International Perspective of Drug Testing and Employee Assistance Programs.

In: el-Guebaly N., Carrà G., Galanter M., & Baldacchino A.M. (eds), Texbook of Addiction Treatment. Springer, Cham.

Sorg, M. H. (2020). National Drug Early Warning System (NDEWS) Maine Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

Srivastava, P. (2017). Drug Testing India: Chasing the Corporate Culture. Retrieved from https://backgroundscreening.in/industry-insights/drug-testing-india/

Steele, A. (2020). Positive Drug Test among U.S. Workers Reach Highest Level in 16 Years. *Wall Street Journal*. Retrieved from https://www.wsj.com/articles/american-workers-testing-positive-for-drugs-reach-highest-level-in-16-years-11598347802

Sterling RISQ. (2020). India | Drug Screening Can Be Done Without Stepping Out Of Your Doorstep. Retrieved from https://www.sterlingrisq.com/blog/india-drug-screening-can-be-done-without-stepping-out-of-your-doorstep

Strang, J., Groshkova, T., & Metrbian, N. (2012). New Heroin-Assisted Treatment: Recent Evidence and Current Practices of Supervised Injectable Heroin Treatment in Europe and Beyond. Retrieved from https://www.emcdda.europa.eu/system/files/publications/690/Heroin_Insight_335259.pdf

Sukosd, C. (2020). Court Tries Eye Exams as Drug-Testing Alternative. Retrieved from http://www.courtnewsohio.gov/bench/2020/lucasCPRetinaScan_091720.asp#.YItASLVKjqa

Sulej-Suchomska, A. M., Klupczynska, A., Dereziński, P., Matysiak, J., Przybyłowski, P., & Kokot, Z. J. (2020). Urban Wastewater Analysis as an Effective Tool for Monitoring Illegal Drugs, including New Psychoactive Substances, in the Eastern European Region. Nature Scientific Reports, 10(1). Available at https://www.nature.com/articles/s41598-020-61628-5

Tammi, T. (2007). Medicalising Prohibition Harm Reduction in Finnish and International Drug Policy. Retrieved from Vaajakoski: https://www.julkari.fi/bitstream/handle/10024/75412/Tu161-Tammi.pdf

Tammi, T. (2015). Finnish Drug Policy. Retrieved from https://paihdelinkki.fi/en/info-bank/articles/substance-use-and-society/finnish-drug-policy#:~:text=In%20addition%20to%20the%20policy,the%20community%2C%20and%20the%20society.

Theoharis, M. (n.d.). Possession of a Controlled Substance: Drug Possession Laws. Retrieved from https://www.criminaldefenselawyer.com/crime-penalties/federal/Possession-Controlled-Substance.htm

The Mainichi. (2016). Number of Drug Tests Carried Out on Employees Doubles. *The Mainichi*. Retrieved from https://mainichi.jp/english/articles/20160522/p2a/00m/0na/003000c

The Recovery Village. (2021). Fingerprint Drug Tests. Retrieved from https://www.therecoveryvillage.com/drug-addiction/news/drug-fingerprint-test/

Title I and V of the Americans with Disabilities Act of 1990. 1990. *Federal Register*. U.S. Equal Employment Opportunity Commission.

Title VII of the Civil Rights Act of 1964. 1964. U.S. Equal Employment Opportunity Commission Statutes. Retrieved from https://www.eeoc.gov/statutes/title-vii-civil-rights-act-1964.

Trehan, A. (2018). Why India Inc. Should Take Drug Abuse Screening Seriously. Retrieved from https://www.peoplematters.in/article/life-at-work/why-india-inc-should-take-drug-abuse-screening-seriously-19376

Tsanaclis, L. (2018). Workplace Testing and the Global Workforce: Where You Can and Can't Do Drug and Alcohol Testing. Retrieved from https://blog.cansfordlabs.co.uk/workplace-testing-and-the-global-workforce-where-you-can-and-cant-do-drug-and-alcohol-testing

UK Government. (2017). Drug Strategy 2017. United Kingdom. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/628148/Drug_strategy_2017.PDF

UK DHSC (United Kingdom Department of Health and Social Care). (2015). 2010 to 2015 Government Policy: Drug Misuse and Dependency. Available from https://www.gov.uk/government/publications/2010-to-2015-government-policy-drug-misuse-and-dependency

UK Drug Testing. (2020). Workplace & Employment Drug Testing Kits ~ Information for UK Employers. Retrieved from https://www.ukdrugtesting.co.uk/pages/workplace-employment-drug-alcohol-testing-kits-information-for-employers

Umeda, S. (2012). Online Privacy Law: Japan. Library of Congress. Retrieved from https://www.loc.gov/law/help/online-privacy-law/2012/japan.php#:~:text=Privacy%20and%20the%20Right%20to%20Control%20One's%20Own%20Information&text=%5Ba%5Dll%20of%20the%20people,and%20in%20other%20governmental%20affairs.

Umeda, S. (2020). Japan: Alcohol Regulation Tentatively Eased for Disinfectant Production due to COVID-19 Pandemic. Library of Congress Global Legal Monitor. Retrieved from https://www.loc.gov/law/foreign-news/article/japan-alcohol-regulation-tentatively-eased-for-disinfectant-production-due-to-covid-19-pandemic/

UNODC (United Nations Office on Drugs and Crime). (2010). Drug Statistics and Trends. Retrieved from https://www.unodc.org/documents/wdr/WDR_2010/2.0_Drug_statistics_and_Trends.pdf

UNODC (United Nations Office on Drugs and Crime). (2014). Guidelines for Testing Drugs under International Control in Hair, Sweat and Oral Fluid. Retrieved from https://www.unodc.org/unodc/en/scientists/guidelines-for-testing-drugs-under-international-control-in-hair-sweat-and-oral-fluid.html

UNODC (United Nations Office on Drugs and Crime). (2020). Drug Use and Health Consequences. Retrieved from Vienna, Austria: https://wdr.unodc.org/wdr2020/field/WDR20_Booklet_2.pdf

Urban, D. (2014). U.S. Drug-Testing Rules Do Not Translate Overseas. *Global HR*. Retrieved from https://www.shrm.org/resourcesandtools/hr-topics/global-hr/pages/us-drug-testing-rules.aspx

Vignali, C., Stramesi,C., Morini, L., Pozzi, F., Collo, G., & Groppi, A. (2013). Workplace Drug Testing in Italy - Critical Considerations. *Drug Testing and Abuse*, 5:208-212. Retrieved from https://click.endnote.com/viewer?doi=10.1002%2Fdta.1458&token=WzMyNjM2NDMsIjEwLjEwMDIvZHRhLjE0NTgiXQ.rSakgCt7TcSgLlFjKa16eGAYd8M

Vitale, S., & Mheen, D. (2006). Illicit Drug Use and Injuries: A Review of Emergency Room Studies. *Drug and Alcohol Dependence*. 82(1):1-9.

Vohra, B. (2016). Alcohol Laws in India. Retrieved from https://www.lawfarm.in/blogs/alcohol-laws-in-india

Wada, K. (2011). The History and Current state of Drug Abuse in Japan. *Ann N Y Acad Sci, 1216*: 62-72. doi:10.1111/j.1749-6632.2010.05914.x

Warren, E. C., Mantha, S., Tuazon, E., & Paone, D. (2020). National Drug Early Warning System (NDEWS) New York City Sentinel Community Site (SCS) Drug Use Patterns and Trends, 2020. Retrieved from https://ndews.org/publications/site-reports/

West, M. D. (2020). *Drunk Japan: Law and Alcohol in Japanese Society*. New York, NY: Oxford University Press.

WHO (World Health Organization). (2012). Alcohol in the European Union_consumption harm and policy approaches.

WHO (World Health Organization). (2018). Global Status Report on Alcohol and Health. Switzerland.

Wicks, J. (2019). The Workplace Drug Testing Rules Around Europe. Retrieved from https://blog.cansfordlabs.co.uk/workplace-drug-testing-rules-around-europe#:~:text=Sweden,the%20test%20well%20in%20advance.

Wicks, J. (2020). Drug Testing for Pilots: The Rules around the World. Retrieved from https://blog.cansfordlabs.co.uk/drug-testing-for-pilots-the-rules-around-the-world

Williams, A., (2006). Alcohol-Impaired Driving and Its consequences in the United States: The Past 25 years. *Journal of Safety Research*, 37(2):123-138.

Workplace Fairness. (n.d.). Your Rights: Drug Testing. Retrieved from https://www.workplacefairness.org/drug-testing-workplace#1

Yamamoto, J. (2004). Recent Trends of Drug Abuse in Japan. *Ann N Y Acad Sci, 1025*:430-438. doi:10.1196/annals.1316.053

York, J. (2020). France Introduces €200 Spot Fine for Drug Use from Today. The Connexion French News and Views. Retrieved from https://www.connexionfrance.com/French-news/France-introduces-200-spot-fine-for-drug-use-from-today

Appendix A – Countries with Nuclear Power Reactors

The following table was downloaded from the International Atomic Energy Agency's Power Reactor Information System in 2020 at https://pris.iaea.org/PRIS/WorldStatistics/OperationalReactorsByCountry.aspx.

Country	Number of Reactors	Total Net Electrical Capacity (megawatt [MW])
Argentina	3	1,641
Armenia	1	375
Belarus	1	1,110
Belgium	7	5,930
Brazil	2	1,884
Bulgaria	2	2,006
Canada	19	13,554
China	49	46,518
Czech Republic	6	3,932
Finland	4	2,794
France	56	61,370
Germany	6	8,113
Hungary	4	1,902
India	22	6,255
Iran, Islamic Republic of	1	915
Japan	33	31,679
Korea, Republic of	24	23,172
Mexico	2	1,552
Netherlands	1	482
Pakistan	5	1,318
Romania	2	1,300
Russia	38	28,578
Slovakia	4	1,814
Slovenia	1	688
South Africa	2	1,860
Spain	7	7,121
Sweden	7	7,740
Switzerland	4	2,960
Ukraine	15	13,107
United Arab Emirates	1	1,345
United Kingdom	15	8,923
United States of America	94	96,553
Total	442	392,335

Appendix B – U.S. Regional Drug Use Rates

One way to track regional drug use trends in the United States is through the National Drug Early Warning System (NDEWS). NDEWS tracks drug trends, including emerging and changing use trends, in 12 sentinel community sites around the U.S. NDEWS also tracks the trends in admissions to programs treating substance use disorders for drugs in the sentinel communities. The four evolving trends identified by NDEWS is 2020 are "… (1) polysubstance use plays a prominent role in drug overdose deaths, (2) increases in methamphetamine-related overdose deaths were reported in 7 sites, (3) fentanyl remains the most lethal drug in many NDEWS sites, (4) minorities are becoming increasingly impacted by drug overdoses in some areas" (NDEWS 2020). The 12 most recent NDEWS reports for each sentinel community site have been discussed below.

B.1 Atlanta

Fentanyl use associated with overdose deaths has increased to its highest level on record; prescription opiate use has been increasing since 2011 (mixed trends by year) in Atlanta, Georgia (Dew et al. 2020). Methamphetamine use appears to be stable or decreasing, but its use within populations is shifting from being predominantly confined to Atlanta's white population to African American and Hispanic populations (Dew et al. 2020). Heroin-associated overdose deaths are at a 4-year low, but heroin indicators more generally are mixed (Dew et al. 2020). In Atlanta, the rates of cocaine or crack use that previously were dominant are now stable below that of methamphetamine use (Dew et al. 2020). Alprazolam and benzodiazepines use indicators show that their use was down in 2019 compared to the 2015–2018 time period (Dew et al. 2020).

B.2 Chicago

"Fentanyl or its analogues were present in the majority of opioid-related overdoses, which rose again in 2019 and appear to be rising in 2020" in Chicago, Illinois (Ouellet 2020). Methamphetamine use is spreading in Chicago. Frequently the use of methamphetamine overlaps the use of opioids in rural southern Illinois (Ouellet 2020). Cocaine use in Chicago appears to be stable (Ouellet 2020). There is an increase in seizures of unsecured marijuana through traffic stops (Ouellet 2020). There is an increase in the amount of 3,4-methylenedioxy-methamphetamine (MDMA) contained in Ecstasy, and methamphetamines are more commonly being found in Ecstasy (Ouellet 2020). Ethylone (a substitute cathinone) is the most common cathinone in the Chicago area (Ouellet 2020).

B.3 Denver

Opioids are related to 60 percent of all drug-related fatalities, and prescription opioids were involved in 41 percent of drug-related fatalities in 2019 in Denver, Colorado (Rorke 2020). "Polysubstance-related deaths continue to be the norm in Denver County, with 54% of deaths involving three or more drugs and 18% of deaths involving five or more drugs" (Rorke, 2020). Fentanyl and fentanyl analog fatalities are increasing (accounting for 25 percent of drug-related deaths in 2019, up from 8 percent in 2018) (Rorke 2020). Alcohol is the most common substance of admission to authorized programs treating substance use disorders in Denver Metro Area residents, followed by heroin, methamphetamine, marijuana, prescription opioids, cocaine or crack, other drugs/unknown, benzodiazepines, synthetic stimulants, and MDMA (Rorke 2020).

B.4 Detroit

Fentanyl is the drug most commonly associated with overdose death in Wayne County, which encompasses Detroit, Michigan (Arfken 2020). While heroin is declining as the most common drug in treatment admissions and cause of death, cocaine is rising and appears to now be the primary drug in treatment admissions and cause of death (Arfken 2020). Polysubstance drug abuse is common in drug overdose deaths (Arfken 2020). Alcohol is the most common substance of admission to authorized programs treating substance use disorders in Wayne County residents, followed by heroin, cocaine or crack, prescription opioids, marijuana, benzodiazepines, methamphetamine, other drugs/unknown, synthetic stimulants, and synthetic cannabinoids (Arfken 2020).

B.5 Los Angeles

In Los Angeles, California methamphetamine was the drug detected most commonly in the toxicology cases by the medical examiner followed by narcotic analgesics, tetrahydrocannabinol (THC), cocaine, and heroin or morphine (Brecht 2020). In point control systems reports, methamphetamine was the most common illicit drug followed by marijuana, fentanyl, heroin, and cocaine. The National Drug Early Warning System found that methamphetamine was a major drug, as was heroin but at consumption rates lower than methamphetamine (Brecht 2020). Prescription opioids are showing increased use with indicators and continue to be of public concern, but they have only a small presence in treatment centers (Brecht 2020).

B.6 Maine

In Maine, fentanyl use is driving fatal overdoses, while deaths due to heroin and pharmaceutical opioids are decreasing (Sorg 2020). There has been an increase in deaths involving buprenorphine or naloxone, which is usually combined with fentanyl or heroin (Sorg 2020). Early 2020 data for the region show an increase in fatal overdoses for all drug categories except heroin (Sorg 2020). Polysubstance abuse is noted in the increasing number of arrests for cocaine and methamphetamine, which are used with fentanyl or other nonpharmaceutical opioids (Sorg 2020).

B.7 New York City

Fentanyl was the most common substance involved in overdose deaths in 2018 (present in 60%) in New York City; opioids in general were involved in 80 percent of overdose deaths (Warren et al. 2020). Alcohol is the most common substance of admission to authorized programs treating substance use disorders in New York City residents, followed by heroin, cocaine or crack, other drugs/unknown, prescription opioids, methamphetamine, benzodiazepines, synthetic cannabinoids, and MDMA and synthetic stimulants (Warren et al. 2020).

B.8 Philadelphia

Opioids were detected in 84 percent of overdose deaths, stimulants in 62 percent of overdose deaths, and both opioids and stimulants in 48 percent of overdose deaths in 2019 in Philadelphia (Lim 2020). Overdose deaths related to fentanyl, cocaine, and methamphetamine increased in 2018 and 2019, while overdose deaths related to heroin and pharmaceutical opioids decreased (Lim 2020). Heroin is the most common substance of admission to authorized programs treating substance use disorders in Philadelphia residents, followed by alcohol, cocaine or crack, other drugs/unknown, marijuana, prescription opioids, benzodiazepines, and methamphetamine (Lim 2020).

B.9 San Francisco

Fentanyl is the driving force in a dramatic increase in drug overdose deaths involving opioids and simulants in San Francisco, California (Coffin and Rowe 2020). Methamphetamine is a growing problem based on hospitalizations, emergency room visits, and overdose deaths (Coffin and Rowe 2020). The use of cannabis is not yet associated with an increase in morbidity, mortality, or treatment utilization (Coffin and Rowe 2020). Heroin is the most common substance of admission to authorized programs treating substance use disorders in San Francisco residents, followed by alcohol, methamphetamine, cocaine or crack, prescription opioids, marijuana, other drugs/unknown, benzodiazepines, and MDMA and synthetic stimulants (Coffin and Rowe 2020).

B.10 Seattle

In Seattle, Washington methamphetamine and heroin are the most mentioned substances, accounting for over half the calls to a recovery hotline, and other calls are related to marijuana, cocaine, and prescription-type opioids (Banta-Green 2020). Evidence seized by police most commonly tested positive for methamphetamine followed by heroin between 2016 and 2019 (Banta-Green 2020). There was a “substantial increase” in fentanyl and non-prescription benzodiazepine use in the fourth quarter of 2019 in Seattle as well as other Washington State counties (Banta-Green 2020). Methamphetamine-involved deaths increased and methamphetamine was the most common drug detected in deaths in 2019, followed by heroin and fentanyl (Banta-Green 2020). Alcohol is the most common substance of admission to authorized programs treating substance use disorders in the Seattle area, followed by heroin, methamphetamine, marijuana, prescription opioids, and cocaine or crack (Banta-Green 2020).

B.11 Southeastern Florida (Miami Area)

Fentanyl and its analogs had the highest number of occurrences among deceased persons in Southeastern Florida between 2015 and 2019, followed by morphine, heroin, and three other prescription opioids (Hackworth 2020). Cocaine-related deaths are stable following a sharp decrease in deaths between 2017 and 2018 in Southeast Florida (Hackworth 2020). Polysubstance abuse patterns have been noted as part of the opioid epidemic in the region and methamphetamine deaths are projected to be increasing (Hackworth 2020). “Nonpharmaceutical fentanyl from foreign clandestine laboratories is the major factor for the dramatic increase in opioid deaths” (Hackworth 2020). The synthetic cathinone with the highest prevalence in both the region and State for 2019 was eutylone (Hackworth 2020).

B.12 Texas

In Texas, the top five drug threats based on poison control call, treatment admissions, deaths, and toxicology reports on substances seized and identified were ranked from highest to lowest by the Drug Enforcement Administration for Dallas, Houston, and El Paso. For Dallas, the largest threat was methamphetamine, followed by cocaine, pharmaceuticals, heroin, and cannabis (Maxwell 2018). For Houston, the largest drug threat was methamphetamine, followed by cannabis, cocaine, heroin, and pharmaceuticals (Maxwell 2018). For El Paso, the largest drug threat was methamphetamine, followed by heroin, cocaine, cannabis, and pharmaceuticals (Maxwell 2018). The admissions to treatment facilities between 2013 and 2017 for substance use disorders had the highest admissions for alcohol, followed by marijuana, methamphetamine, heroin, cocaine or crack, prescription opioids, other drugs/unknown, benzodiazepines, synthetic cannabinoids, and synthetic stimulants (Maxwell 2018).

Appendix C – Summary Tables of Workplace Drug and Alcohol Testing Laws

C.1 Other North American Countries

Country	Drug and Alcohol Testing Laws
Canada	Testing is only legal for safety-sensitive jobs, which allows testing for pre-employment, post-incident, and reasonable cause. Random testing is also permissible, but there must be strong justification that an employee is abusing drugs or alcohol and causing workplace danger. Post-incident testing can only be done when there is evidence that an employee caused an accident. Reasonable cause requires evidence of impairment while working.
Mexico	Testing is allowed before and during employment for all safety-sensitive jobs and for all jobs when substance abuse is suspected, but all require the consent of employees.
Sources: Practical Law 2020; NEI 2020; Demers and Faye Caldwell 2015; Certiphi Screening 2019.	

C.2 Europe

Country	Drug and Alcohol Testing Laws and Worker Rights
Germany	Mandatory testing is prohibited, but with exemptions for occupational or safety reasons for before and for reasonable suspicion. Random testing is prohibited. Positive tests cannot be transmitted to the employer but can cause a worker to be classified as “unfit for duty.”
Spain	Testing is only allowed with employee consent. Employees cannot be terminated for positive tests unless it is proven drugs and alcohol impair their job performance.
Switzerland	Mandatory testing is only allowed with a demonstrated need, which can be done before or after hire.
Sweden	Testing is allowed only if agreed upon during collective bargaining and can be done before hire or after hire only when there is suspected influence or cause. Courts have repeatedly blocked mandatory testing proposals and find it preferable for labor markets to regulate themselves.
England/UK	Mandatory testing is only allowed for health- or safety-sensitive jobs, but contractual testing via employee consent also is allowed.
France	Mandatory testing is only allowed for safety-sensitive jobs before hire and for-cause. Contractual testing is allowed, but only after hire when there is suspected influence that can cause a safety threat. Positive tests cannot be transmitted to the employer but can cause a worker to be classified as “unfit for duty.”
Ukraine	Mandatory testing is allowed for safety-sensitive jobs, but otherwise only via employee consent.
Belgium	Permissible only if relevant to their position, with employee consent, and with advance written notice to the employee.
Finland	Mandatory testing is allowed for safety-sensitive jobs before hire, but also after hire if there is evidence of substance abuse.
Ireland	Testing can be part of worker contracts, but there are no legal mandates for mandatory testing.
Italy	Italy has the strictest workplace testing laws in Europe that allows mandatory testing before and after hire.
Sources: Practical Law 2020; UK DHSC 2015; NEI 2020; EWDTS 2003.	

C.3 Asia-Pacific

Country	Drug and Alcohol Testing Laws
Australia	Testing is allowed only via contractual agreements but is usually required in contracts for safety-sensitive jobs.
China	There are no workplace testing laws but public drug raids are conducted during which property can be searched and suspects can be detained for mandatory drug testing. There are severe penalties if drugs are detected, even if the drugs were consumed in a different country.
India	Testing can only be done via contractual agreement but only for safety-related jobs before and during employment. Companies rarely tested employees in the past, but testing is rapidly increasing (1 in 10 companies) because drug abuse has become rampant with an estimated 10 million addicts.
Japan	Testing is allowed before and during employment. Japan has the harshest drug laws of any advanced democracy that include imprisonments up to 5 years for marijuana, 10 years for stimulants, and 7 years for opiates, cocaine, and psychotropics.
South Korea	Testing can be done via contractual agreements; however, there are strong anti-drug laws similar to those in Japan.
Russia	Testing can only be done via contractual agreements.
Taiwan	Testing can be done via contractual agreement. Mandatory testing is only allowed for jobs where drugs are encountered such as the police. Health checks are required for all new employees, but do not allow drug or alcohol testing.

Sources: Practical Law 2020; NEI 2020; Meng 2013; Srivastava 2017; Trehan 2018; Koto et al. 2020.

Pacific Northwest National Laboratory

902 Battelle Boulevard
P.O. Box 999
Richland, WA 99354
1-888-375-PNNL (7665)

www.pnnl.gov **|** ***www.nrc.gov***