

2016

Forensic Laboratories Annual Report

Sedgwick County, Kansas

Regional Forensic Science Center
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LABORATORY LEADERSHIP

All laboratory managers are case-working and proficiency tested scientists.

Director and Chief Toxicologist

Timothy P. Rohrig, Ph.D., F-ABFT

Chief of Criminalistics

Justin Rankin

Toxicology Lab Manager

Kimberly Stephens, M.S.

Forensic Biology/DNA Manager

Shelly Steadman, Ph.D.

Quality Assurance Manager

Robert Hansen, M.S.F.S.

LABORATORY MISSION

To serve the citizens of the Sedgwick County Kansas Region, by ethically providing accurate and unbiased scientific analysis of evidence to the law enforcement and judicial communities.

INTRODUCTION

The Regional Forensic Science Center officially opened on December 21st, 1995. The Center houses the Office of the District Coroner and the Forensic Science Laboratories [FSL]. The Forensic Science Laboratories are comprised of three major sections: Criminalistics, Forensic Biology/DNA and Forensic Toxicology. Within the Criminalistics Section are the Drug Identification Unit, Firearms / Tool Mark Unit, and the Trace (Fire Debris) Unit.

The FSL is staffed with highly-trained and experienced forensic scientists, many who have advanced scientific degrees [MS, MSFS, Ph.D.]. The technical staff has well over 200 years of combined professional experience. For 2016 laboratory staff consisted of 19 scientist and 3 support personnel.

In April of 1996, the Forensic Science Laboratories began accepting cases for firearms examinations. Three months later, the Biology Section provided forensic examinations for the identification of biological fluids. The Toxicology Laboratory began producing comprehensive examinations in post-mortem toxicology in support of the District Coroner in September of 1996. This was followed by the FSL providing forensic drug identification for local and regional law enforcement agencies. In November of 1996, fire debris analysis was added to the Criminalistics Section. In January of 1997, The Center opened the first STR DNA Laboratory in the State of Kansas.

Since 2003, the Forensic Science Laboratories have been accredited by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board [ASCLD/LAB] under the ASCLD/LAB-*Legacy* program.

In February 2014, the Laboratory Division was granted ASCLD/LAB-*International* accreditation for Forensic Testing Laboratories in the categories of Controlled Substances, Quantitative Analysis, Human Performance Forensic Toxicology, Post-Mortem Forensic Toxicology, DNA-Nuclear, Body Fluid Identification, Fire Debris,

Firearms, and Serial Number Restoration. The ASCLD/LAB-*International* accreditation program evaluates the laboratory's management system, and technical procedures and practices against criteria set forth in *ISO/IEC 17025:2005*, the testing laboratory requirements of the *ASCLD/LAB-International* Supplemental Requirements.

Striving for and meeting the requirements of the *ASCLD/LAB-International* program demonstrates the Center's commitment to excellence in the services we provide to our submitting agencies.

SIGNIFICANT ACHIEVEMENTS

- Publications:
 - Peace MR, Baird TR, Smith N, Wolf CE, Poklis JL, and Poklis A., "Concentration of Nicotine and Glycols in 27 Electronic Cigarette Formulations", *Journal of Analytical Toxicology*, 2016, vol. 40(6), 403-407.

- The laboratory presented :
 - T.P. Rohrig and C.M. Moore, "Road-Side Drug Testing: An Evaluation of the Alere DDS@2 - A Pilot Study", presented at the Kansas Drugged Driving Summit, October 2016; Topeka, KS.
 - T.P. Rohrig, "Oral Fluid: An Alternative Specimen for Drugged Driving Detection", presented in a Workshop at the Annual Meeting of the Midwestern Association of Forensic Scientists, October 2016; Branson, MO.
 - T.P. Rohrig, "Drugs and Driving: Don't Take the High Road", presented a Workshop at the Annual Meeting of the Midwestern Association of Forensic Scientists, October 2016, Branson MO.
 - S.C. Geering and S.A. Steadman, "Body Fluid Characterization and DNA Analysis Interpretations, conducted workshop at the KDIAM Meeting, March 2016; Wichita KS.
 - S.C. Geering and T.M. Gibler, "Body Fluid Characterization and DNA Analysis Interpretations, conducted workshops on site, July & August 2016; Wichita, KS.

- Laboratory Staff enhanced their technical and professional expertise by attending the following workshops and/or training sessions on site, at conferences, or via or webinar:
 - 22nd Annual National CODIS Conference
 - 3500 Genetic Analyzer Users Training
 - 47th Annual AFTE Training Seminar
 - ASCLD DNA Mixtures Webinar: Technical Overview
 - ASCLD Webinar Series: Firearms
 - Benelli Nova / Super Nova Armorer Course
 - Drugs and Driving: Don't Take the High Road and Oral Fluid: An Alternative Specimen for Drugged Driving Detection
 - Ethics in the Forensic Sciences: Value Based Decision Making
 - Ethics/Professional Responsibility
 - Familial Searching Workshop
 - From the Sample Tube to the Mass Spectrometer: A Comprehensive Look at Extracting Small Molecules from Complex Matrices and Subsequent Analysis
 - Glock Armorer's Course
 - Handgun Function and Repair
 - Launching Michigan's Oral Fluid Roadside Drug Analysis Pilot Program
 - Mid-America 2016 Forensic DNA Conference

- OSAC Public Status Reports and Open Discussion
 - Postmortem Cannabinoids: Issues of Analysis and Interpretation
 - Probabilistic Genotyping and Lab Retriever Training Workshop
 - Y-Screening and Direct Amplification of Sexual Assault Evidence Kit Samples
- 2016 Grant Funding:
 - Coverdell: \$13,500
 - Capacity Enhancement and Backlog Reduction: \$311,341
 - Justice Assistance General [JAG]: \$24,000

FORENSIC SCIENCE LABORATORIES SERVICE OVERVIEW

Case Submissions

The Forensic Science Laboratory continues to experience a significant demand for its expert services. The five year average of cases submitted is 4315. **Figure 1** illustrates the number of forensic laboratory cases submitted for examination for the past 5 years. As of December 31, 2016 the Forensic Laboratories had 30 day backlog of 1150 cases.

The Center has worked with our law enforcement contributors as well as attorneys to be mindful in the cases that are submitted to the laboratories for analysis. This is to better utilize our resources so that we can report case information that is critical to an investigation and/or prosecution in a more timely manner. As a result there has been a slight decrease in the number of cases submitted. However; with the increase in sexual assault cases and emerging designer drugs, the cases submitted have been increasingly complicated, each with more exhibits associated.

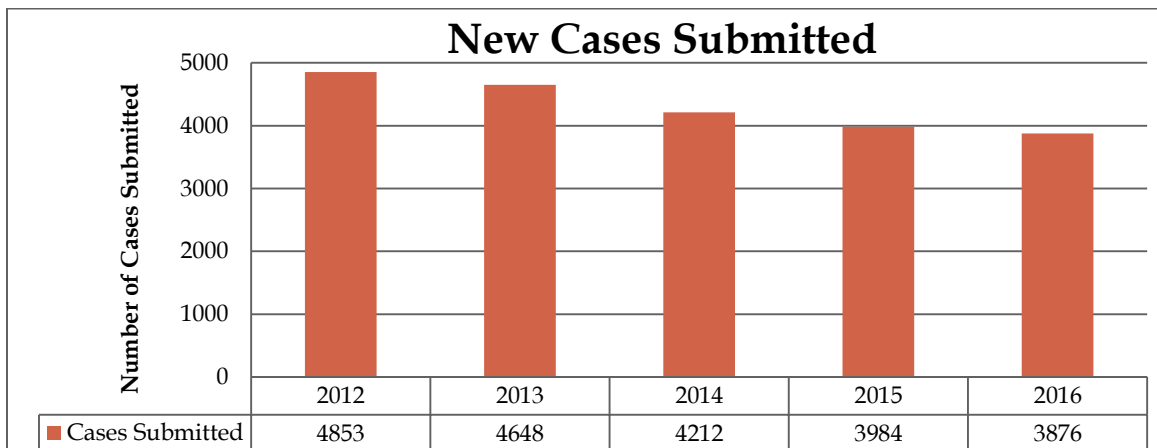


Figure 1 Number of forensic laboratory cases submitted for examination (law enforcement and District Coroner post-mortem evidence submissions).

2016 Case Submissions

Cases are submitted for forensic examination to our six analytical units, Biology / DNA, Drug ID, Firearms / Tool Marks, Fire Debris, Toxicology HPT (human performance testing), and Toxicology PM (post-mortem). Toxicology receives ante-mortem evidence from law enforcement through the evidence unit and post-mortem specimens directly from the District Coroner.

In addition to the 3876 cases reflected in **Figure 1**, there were case submissions from an additional 137 on-going cases that were originally submitted in previous years for a total of 4013 case submissions in 2016. For example, evidence from a case may have been submitted in 2016 for an on-going 2015 investigation.

Figure 2 illustrates the number of cases and the number of case submissions associated with each functional laboratory unit. The aggregate lab case number count encompasses the number of cases, regardless of the year the case was initially submitted, that were received for analysis per laboratory. The aggregate number encompasses the 4013 submissions and additionally accounts for the various types of testing requested. For example, evidence is submitted under a single case number, but may require both firearms and DNA analysis. **Figure 2** also illustrates the fact that cases often have multiple submissions.

Laboratory	Aggregate Lab Case Number Count	Aggregate Submission Count
Biology / DNA	357	508
Drug ID	2458	2709
Firearms / Tool Marks	197	208
Fire Debris	24	43
Toxicology HPT	293	303
Toxicology PM	824	828
Sum of Lab Case Number Count	4153	-
Sum of Submission Count	-	4599

Figure 2 Number of case submissions per laboratory section. The Criminalistics Section continues to receive the majority of evidence submitted.

Figure 3 illustrates the relative percentage of cases submitted to each analytical unit. The Criminalistics Section continues to receive the majority of evidence submitted, followed by submission to the Toxicology Laboratory.

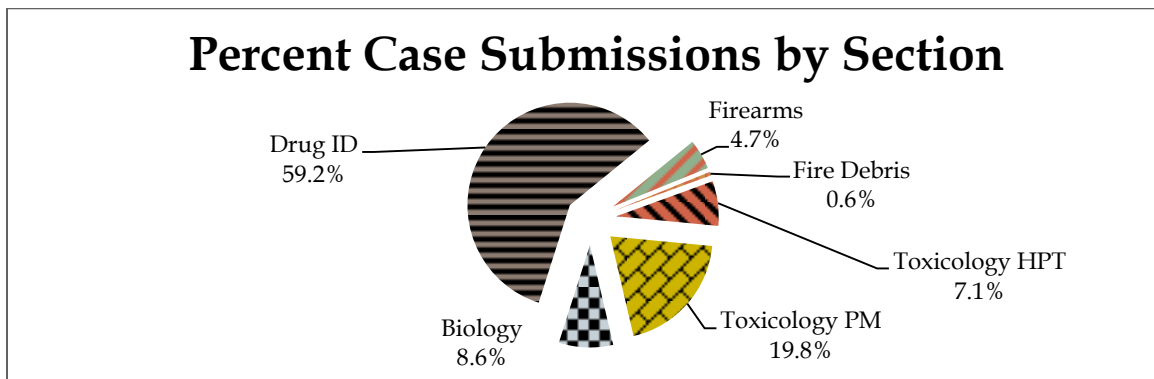


Figure 3 Percentage of case submissions per laboratory section. The Criminalistics Section continues to receive the majority of evidence submitted.

Expert Testimony

The professional staff is frequently called upon to present expert testimony in the courts. The amount of time spent by staff preparing for testimony, waiting to testify at courthouses, and time spent on the stand providing testimony is significant.

In 2016, the FSL received 1257 subpoenas for court appearances. The Center, in conjunction with the District Attorney’s Office, worked on having the DA’s Office only submit subpoenas for cases that have a high likelihood of needing expert testimony.

Agencies Served

The Forensic Science Laboratories provides expert testing services and consultation for a variety of law enforcement agencies within and outside Sedgwick County. In 2016, the FSL provided expert testing services and consultations to 48 Law Enforcement Agencies, Fire Departments, and District Coroners. **Figure 4** indicates [blue highlight] the counties within the state in which forensic laboratory services were provided.

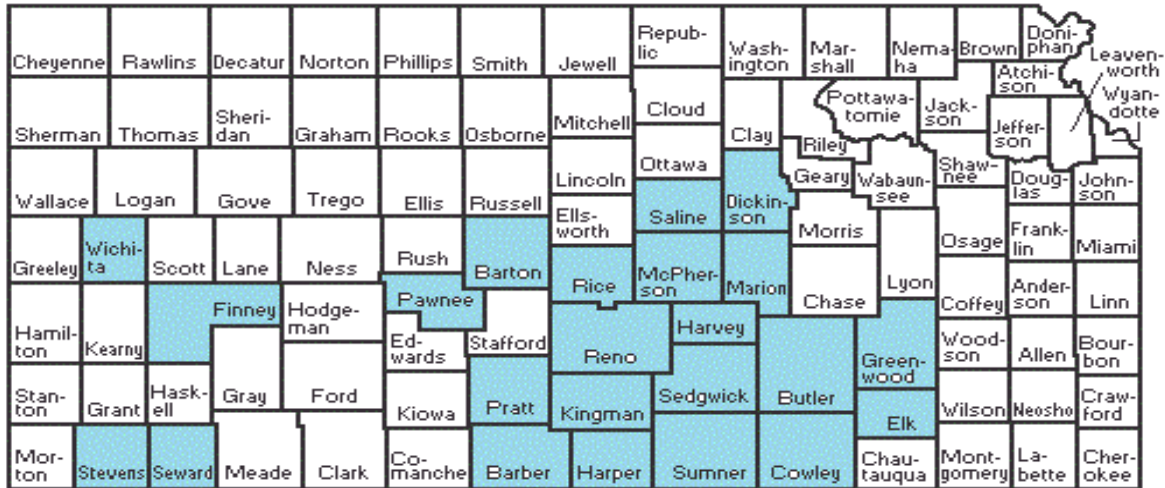


Figure 4 Counties that had forensic laboratory services provided to them by the Sedgwick County Regional Forensic Science Center in 2016 (highlighted).

Sedgwick County vs. Out-of-County Cases

The Sedgwick County Regional Forensic Science Center serves as the principle Forensic [Crime] Laboratory for all of Sedgwick County Law Enforcement Agencies and provides forensic services to many other counties and municipalities within the state of Kansas [Table 1]. However, the vast majority of forensic laboratory services were provided for Sedgwick County Law Enforcement agencies (~95%). A significant portion of the out-of-county cases was in support of the Sedgwick County Coroner’s out-of-county autopsies.

Alcohol Tobacco and Firearms	Haysville Police Department	Riley County Police Department
Barber County Coroner	Hutchinson Correctional Facility	Salina Police Department
Barton County Coroner	Kansas Bureau of Investigations	Sedgwick County Coroner
Bel Aire Police Department	Kansas Department of Revenue	Sedgwick County Sheriff
Butler County Coroner	Alcohol Beverage Control	Seward County Coroner
Cheney Police Department	Criminal Fraud Unit	Stevens County Coroner
Clearwater Police Department	Kansas Highway Patrol	Sumner County Coroner
Cowley County Coroner	Kingman County Coroner	Valley Center Police Department
Derby Police Department	Maize Police Department	Wichita County Coroner
Dickinson County Coroner	Marion County Coroner	Wichita Fire Department
Eastborough Police Department	McPherson County Coroner	Wichita Police Department
Eldorado Correctional Facility	McConnell Air Force Base	Wichita Public Schools (USD259)
Elk County Coroner	Mulvane Police Department	Wichita State Univ. Police Dept.
Finney County Coroner	Park City Police Department	Winfield Correctional Facility
Goddard Police Department	Pawnee County Coroner	
Greenwood County Coroner	Pratt County Coroner	
Harper County Coroner	Reno County Coroner	
Harvey County Coroner	Rice County Coroner	

Table 1: List of law enforcement agencies, fire departments, and county coroners for which the forensic laboratories provided services in 2016.

CRIMINALISTICS SECTION

The Criminalistics Section receives the majority of the cases submitted to the Forensic Laboratories. The Criminalistics Section provides forensic examinations in Drug Identification, Open Container [Beverage Alcohol] Analysis, Firearms & Tool Marks, Serial Number [Firearms] Restoration and Trace Evidence [Fire Debris]. **Figure 5** illustrates the trend in forensic case volume submitted to the Criminalistics Section. **Figure 6** illustrates the volume and percentage of cases submitted to each unit of the criminalistics section.

In 2013, the Drug ID Laboratory started actively working with the Wichita City Prosecutors Office and Wichita Police Department on being more selective on case submissions. Since that time, cases that are submitted are those requiring analysis for charging and/or prosecution. This change in policy is responsible for the decrease in case submissions [Figure 5]. The reduction in case submission has expedited turn-around time and makes more efficient use of laboratory resources.

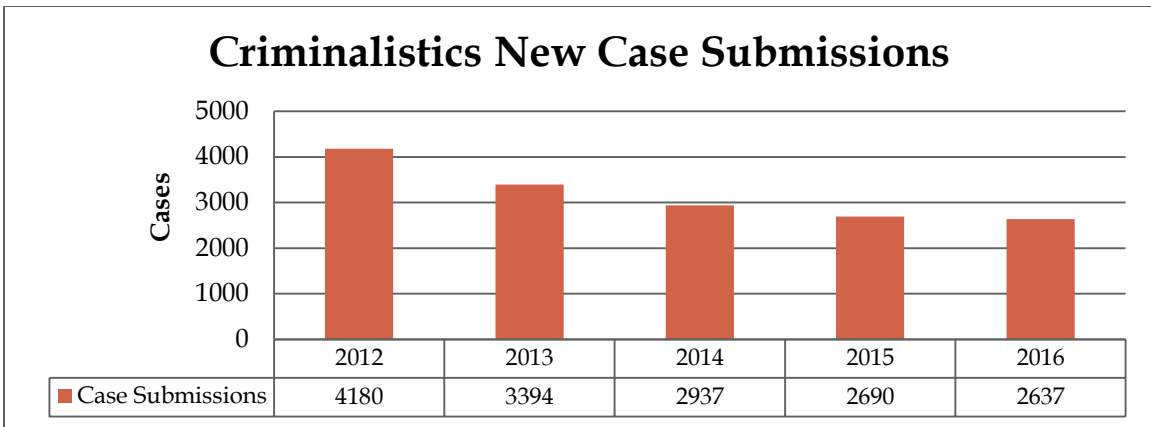


Figure 5 Number of cases submitted for analysis to the Criminalistics Section (Drug ID, Firearms/Tool Marks, and Fire Debris) over a five year period.

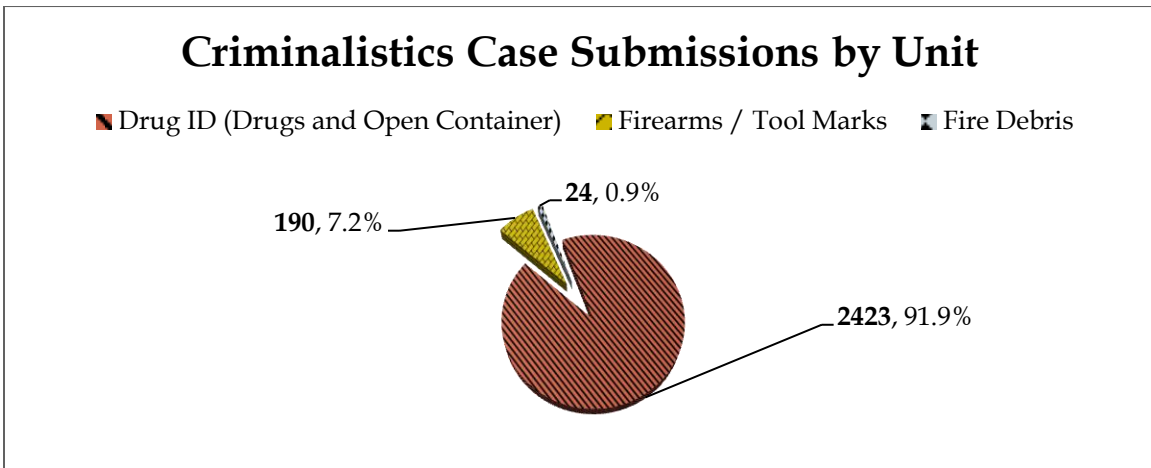


Figure 6 Volume and percentage of cases submitted for each Criminalistics Laboratory Section.

Drug ID Unit

The majority of cases submitted to the Criminalistics Section [Figure 6] are for illicit drug identification. Open Container cases are the second most abundant case type, accounting for approximately 11% of the cases submitted for analysis to the unit, and includes cases with and without associated drug evidence. Open container cases submitted without associated drugs accounted for 8.9% of total cases submitted to Drug ID.

The agency that submits the greatest volume of drug evidence is the Wichita Police Department [WPD]. This is apparent in Figure 7, as nearly 80% of cases received are from WPD. Agencies other than WPD and the Sedgwick County Sheriff's Office [SGSO] are responsible for approximately 9% of the total cases submitted.

Late in 2016, the Drug ID Unit filled a vacancy that had been open since mid-2015. Once the new chemist completes the necessary training, they should have a very positive impact on the backlog and TAT should drop significantly.

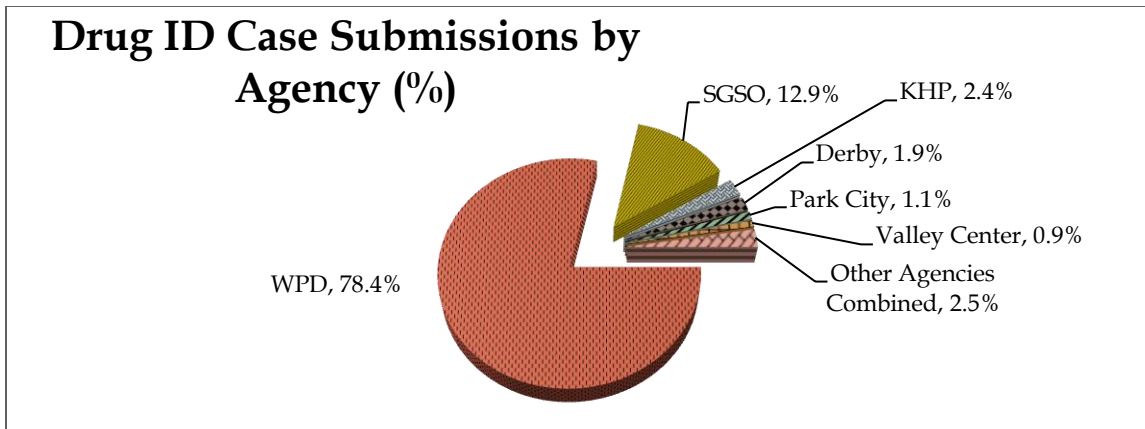


Figure 7 Percentages of Drug ID cases submitted from the largest contributing agencies.

The Drug ID Unit provides reports to law enforcement to support criminal drug trafficking and possession investigations. The unit saw a decrease in case reports issued compared to the previous year, due to time spent training a new chemist.

In 2016, the Drug Identification Unit examined thousands of exhibits for the presence of controlled substances. Consistent with years past, the majority of drug exhibits were identified as marijuana, cocaine, and methamphetamine. The unit continues to see a steady submission of synthetic cannabinoids (“K2”, “spice”, “potpourri”) and designer stimulants (substituted cathinones aka “bath salts”). There were 81 synthetic cannabinoids and 31 designer stimulants detected in 2016. Also, the unit performed 168 methamphetamine quantitations and 16 cocaine base / salt form determinations, which are required for federally charged cases.

Figure 8 illustrates the ten most commonly detected drugs by the Drug ID Unit. Marijuana with THC (MJ w/ THC) is the most commonly detected drug, while THC is the third most common. THC is the psychoactive component of cannabis and can be extracted out of the plant for use. It is often found in forensic samples as a residue or added to any other drug or material prior to being used by an individual. To be reported as MJ w/ THC the scientist must confirm the presence of marijuana by microscopically observing the specific characteristics of the plant.

Three Opioids (Heroin, Hydrocodone, and Oxycodone) are included in the ten most commonly detected drugs as well as the synthetic cannabinoid AB-FUBINACA.

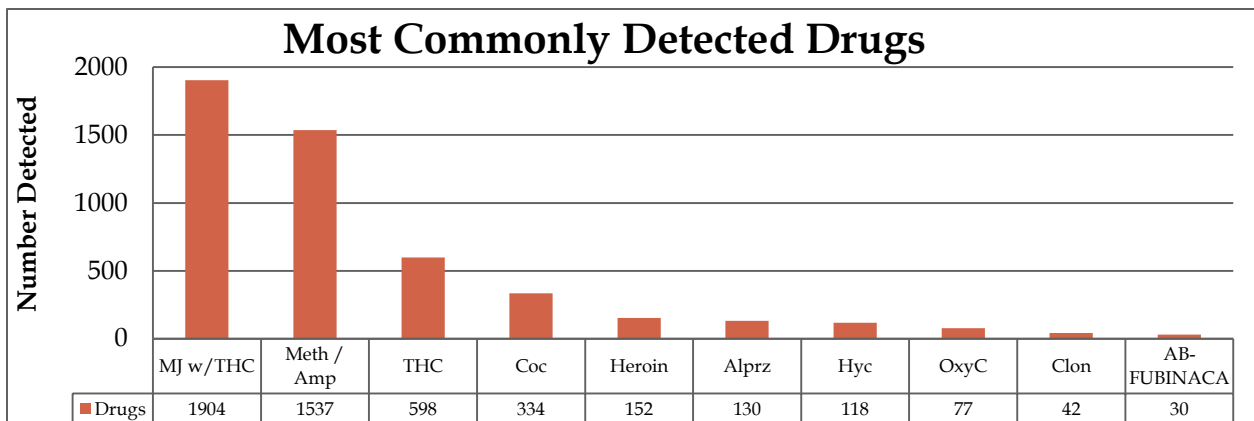


Figure 8 Ten (10) most commonly detected drugs from 2016 examinations were Marijuana containing Tetrahydrocannabinol (MJ w/ THC), Methamphetamine/ Amphetamine (Meth/ Amp), Tetrahydrocannabinol (THC), Cocaine (Coc), Heroin, Alprazolam (Alprz), Hydrocodone (Hyc), Oxycodone (OxyC), Clonazepam (Clon), and AB-FUBINACA.

Synthetic Cannabinoids have been detected in many of Drug ID casework samples in 2016. Often times these drugs are detected mixed with other drugs. **Figure 9** illustrates the five most commonly detected.

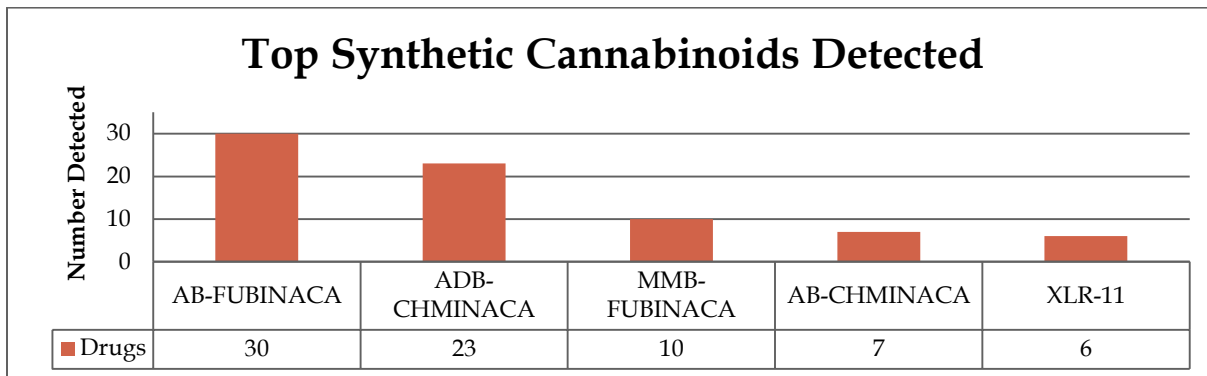


Figure 9 Five most common synthetic cannabinoids detected from 2016 examinations.

Open Container / Beverage Alcohol

Open Container/Beverage Alcohol analysis is conducted in support of criminal cases with associated drug charges, weapons violations, aggravated assaults and also to support the state and local DUI laws, prohibition of minors to possess alcohol, and other liquor law violations. **Figure 10** illustrates the number of open container cases submitted between 2012 and 2016.

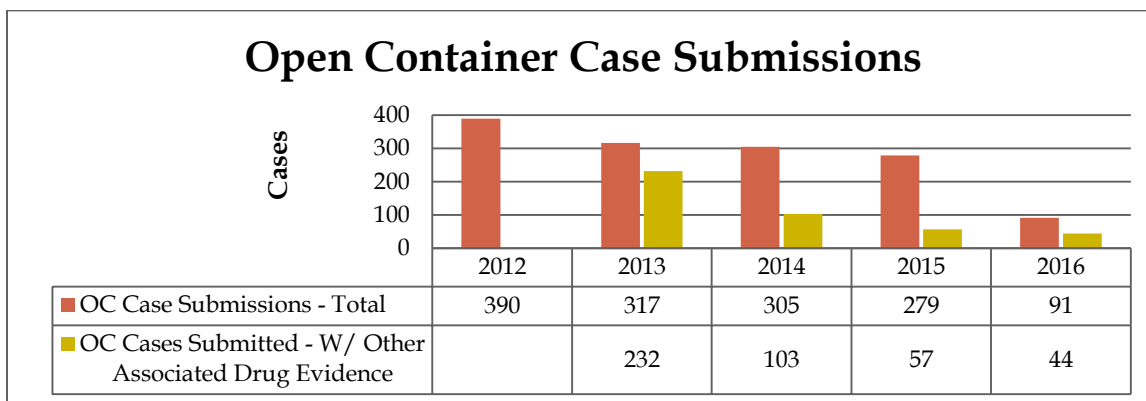


Figure 10 Number of open container cases submitted. Data for 2016 includes the number of open container cases submitted that also had other controlled substances submitted (i.e. marijuana, cocaine, etc.). Data concerning the number of cases accompanied by other controlled substances was not collected for 2012.

Trace Evidence Unit

The Trace Evidence Unit at the Center examines fire debris cases in support of fire investigations. The information provided to the investigator aides in determining if a fire was accidentally or intentionally set for purposes ranging from insurance fraud to homicide.

In 2016, the Fire Debris Laboratory received evidence from 24 cases. The trend of case submissions over the last five years is illustrated in **Figure 11**.

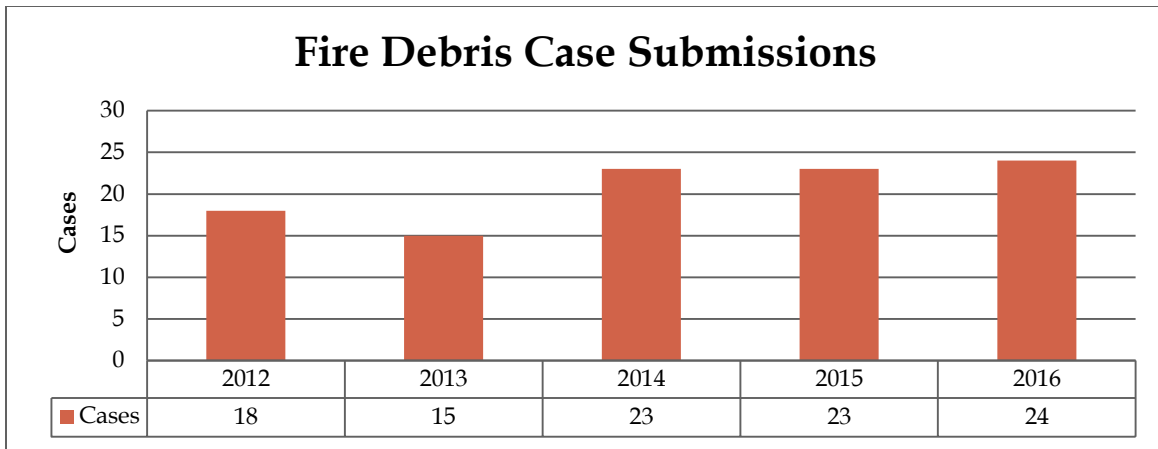


Figure 11 Number of fire debris cases submitted over a five year period.

Firearms/Tool Marks Unit

Firearm and Tool Mark examination is conducted in support of state and federal law enforcement. The Firearms/Tool Marks Unit conducts many types of forensic examinations. The majority of examinations involve operability (function) tests on the submitted firearms. Other exams performed by the Firearms and Tool Marks Unit include bullet comparisons, cartridge casing comparisons, and serial number restorations. As shown in **Figure 12**, the number of cases submitted to the unit has remained relatively constant over the last several years.

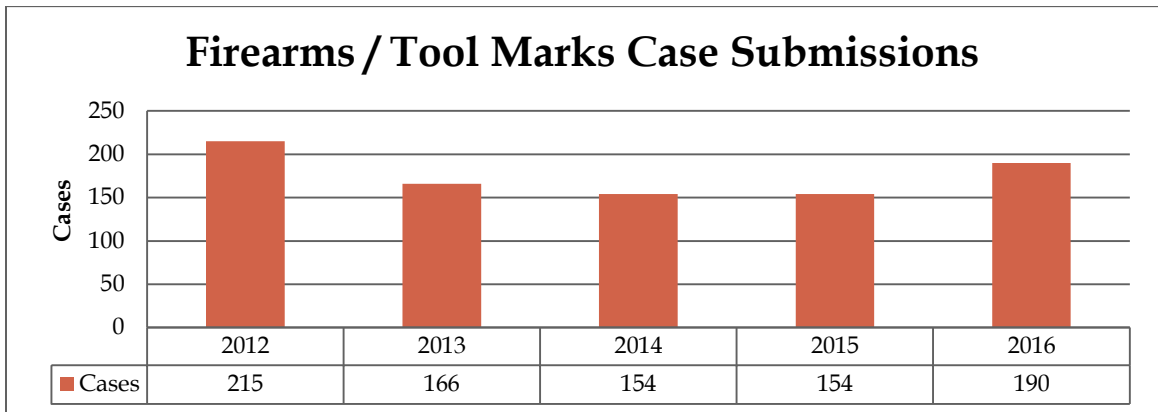


Figure 12 Firearm / Tool Mark case submissions from 2012 through 2016.

Examination types (test fire, bullet comparison, cartridge casing comparison, serial number restoration) that were performed during the year are illustrated in **Figure 13**.

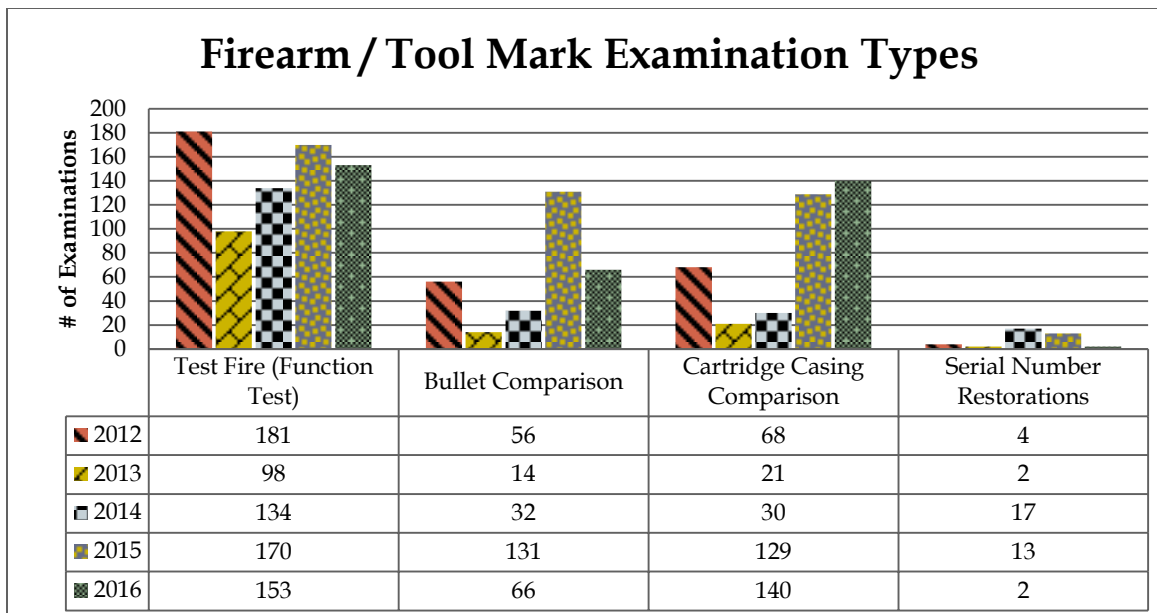


Figure 13 Case examination requests in the Firearms / Tool Marks unit; classified as test fires, bullet comparisons, cartridge case comparisons, and serial number restorations.

FORENSIC BIOLOGY/DNA SECTION

The Biology/DNA Section examines evidence from a variety of cases including sex crimes (rape, indecent liberties, incest, etc.), homicides, property crimes, assaults, and forensic identifications (unidentified bodies).

The section screens evidence for the presence of biological evidence (blood, semen, saliva, and feces). For DNA analysis, the section generates short tandem repeat (STR) profiles from biological material left at crime scenes. Once profiles are established from the scene exhibits, they can be compared to reference standards collected from individuals believed to have some association to the scene (victims, suspects, or other known individuals). Ultimately, results are interpreted and a conclusion drawn as to whether the reference standard profiles are consistent with or excluded from the crime scene profiles. The nature of forensic samples collected at crime scenes vary greatly. Under optimal circumstances (fresh blood stains), high quality single source profiles may result. Alternatively, the samples may have been left by multiple individuals or exposed to environmental elements (low quantity/degraded samples). All of these factors affect the laboratory's ability to obtain a comparable profile and statistical analysis is performed by analysts so that power of discrimination can be clearly presented to a jury when an association is made between a reference sample and a scene exhibit.

In 2016, the Biology/DNA section received 283 cases for forensic DNA examination. The trends of case submissions over the past five years are illustrated in **Figure 14**. Since 2014, there has been a steady increase in the number of cases submitted for analysis. Not only is there an increase in the number of cases, but the number of exhibits per case has increased, as has the complexity of the exhibits.

The challenging nature of the DNA samples submitted for DNA analysis is illustrated by the routine need to consume the evidence for testing due to the limited size and/or compromised nature of samples collected at crime scenes. In 2016, 20% of Biology Section cases involved consumptive testing and 18% of all forensic questioned exhibits

examined were consumed. Notification processes involved with consumptive testing lengthen the timeline for conducting the analysis, and the associated judicial processes generally commence after evidence has already been submitted to the lab.

Also, the number of CODIS entries, associated hits generated, and oversight of this database, entails a large amount of scientist time. Samples compared as a function of database management are not reflected in the number of cases submitted or accounted for as a separate “case type” in the figures below.

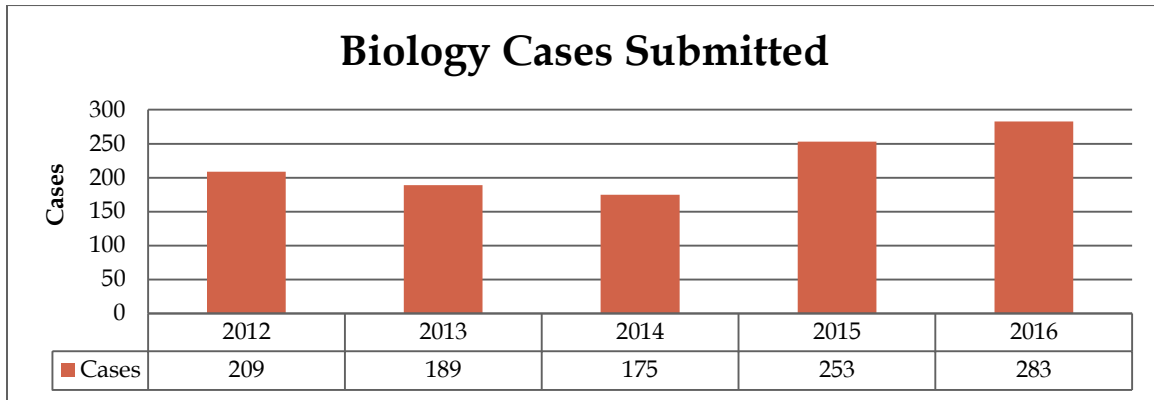


Figure 14 Number of cases submitted to the Biology / DNA Section over a five year period.

As depicted in **Figure 15**, over half of the cases submitted for biological examination are robbery/burglary with sex crimes being second overall.

Property crimes continue to be processed if the evidence submitted has a high likelihood of resulting in a profile suitable for CODIS entry. Given that these crimes have a high recidivism rate, they have an exceptional solvability factor when crime scene profiles are searched against the database.

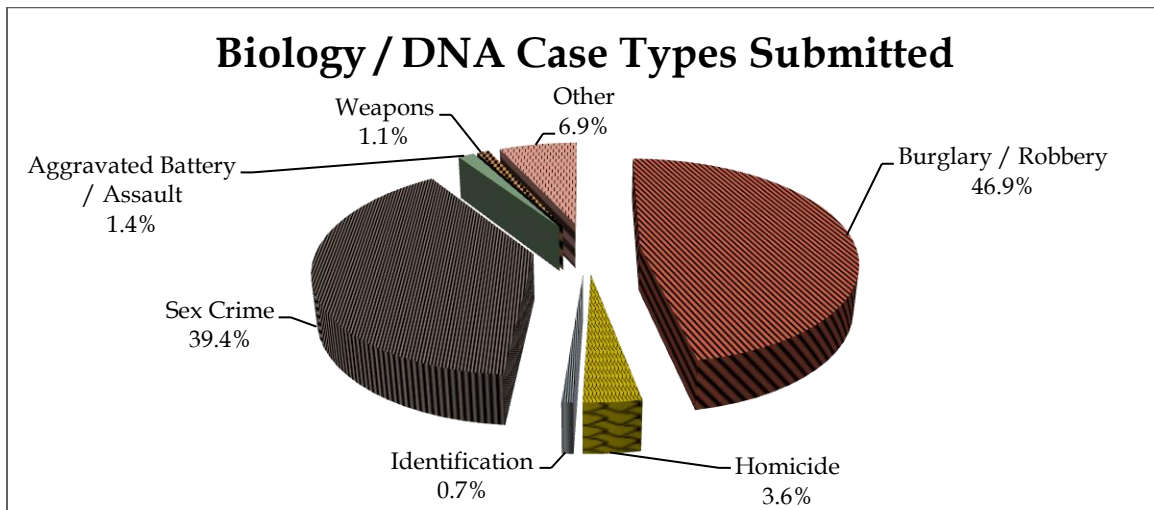


Figure 15 Classification of cases submitted for Biology/DNA analysis. Nearly 7 percent (7%) of the case types are categorized as other. This category may include cases involving attempted murder, auto theft, DUID, larceny, vandalism, narcotics, stalking, etc. The section identified human remain(s) in two (2) cases through Forensic DNA analysis.

Figure 16 illustrates the number of Sex Crime cases submitted to the Biology / DNA Laboratory over the last five years. In 2015, the laboratory saw a 100% increase in case submissions over the number submitted in 2014 and a 61% increase over the previous four year average. This increase in cases remained essentially unchanged for 2016.

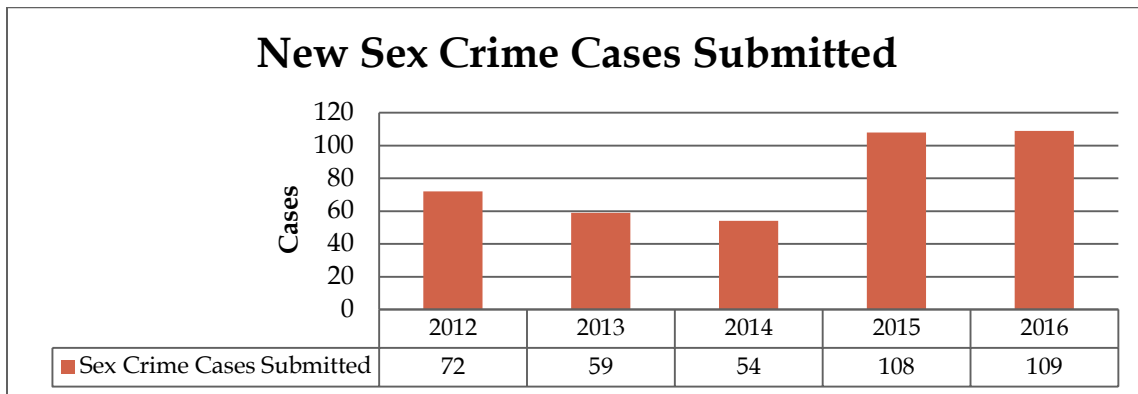


Figure 16 Number of Sex Crime cases submitted to the Biology / DNA Laboratory over the last five years.

CODIS

In 2007 Kansas became an all arrestee state, meaning that law enforcement will collect DNA samples for any person arrested for qualifying offenses. The DNA profile generated from the arrestee/offender is inputted into the state database (SDIS) in Topeka, KS and is available to be searched against the unknown profiles the section enters into our local database (LDIS). In late 2009, the Sedgwick County DNA Laboratory adopted new procedures for the release of investigative lead information, to include formal written and reviewed notifications for database associations.

Ultimately, the increased number of associations resulted in an increase in reports generated, as well as an increase in the number of known samples processed to confirm and prosecute these additional CODIS hits. All factors taken together caused a spike in workload that was realized in 2010 and continued throughout 2011. By 2012, the vast majority of the backlogged offender samples had been added to the database and the increase in workload due to CODIS investigative leads begins to level off. Trends in CODIS activity are illustrated in **Figure 17** and **Figure 18**.

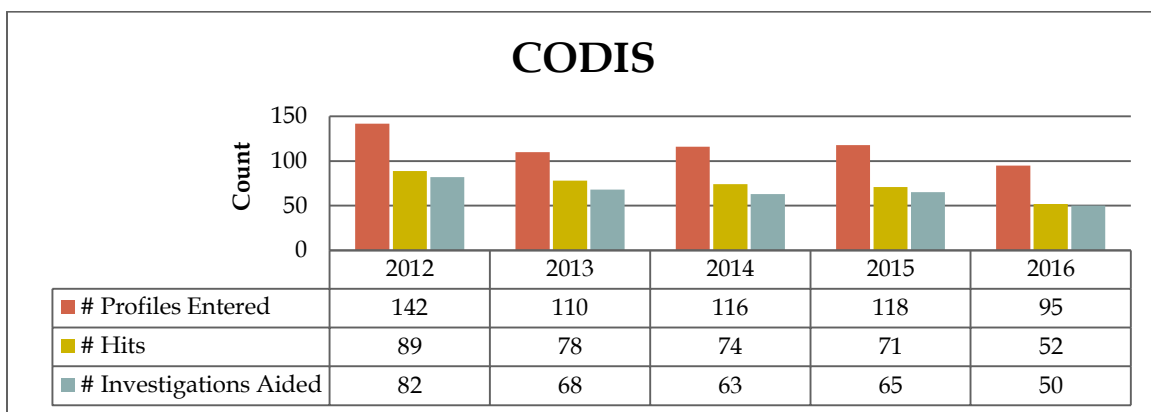


Figure 17 Five (5) year depiction of the number of DNA profiles entered into CODIS as well as the number of hits and number of investigations aided. The average number of case profiles entered into CODIS each year is 116, the number of hits each year average 73, and the number of investigations aided each year average 66.

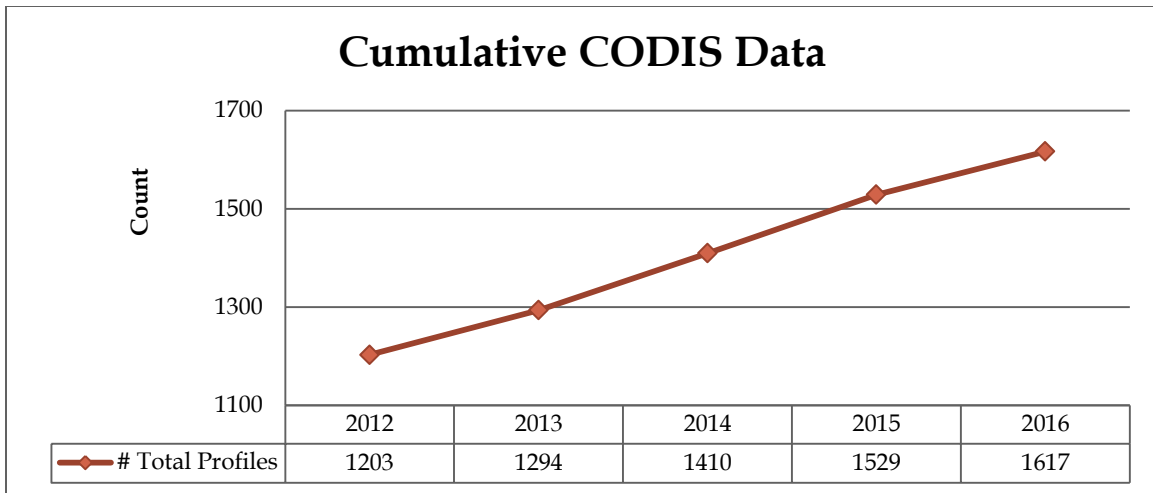


Figure 18 The graph and chart depicts total number of profiles residing in the database (LDIS) at the end of each year.

Biology/DNA Reporting

The Biology / DNA section issued 262 reports in 2016. A substantial number of these were related to associations made by the CODIS database. As outlined in **Table 2**, 43 were Offender Hit Notifications, which is when a forensic unknown sample hits to a convicted offender sample at the state or national level. Once an offender name is provided to law enforcement, standards are collected and submitted for analysis and comparison to all of the evidence in the case. In 2016, this resulted in 13 confirmation reports. Associations made within the Local DNA Index System (LDIS) resulted in a total of 11 additional notifications/reports.

Each report and associated case record goes through a review process. While the process has always included a technical review when a record contains technical data and an administrative review on all case records, accreditation requirements mandate that with each hit a formal notification be provided to the investigating agency. This requirement has increased the time spent reviewing case records substantially.

Table 2: CODIS Reporting

	Total Reports	Offender Hit Notifications	Confirmation Reports	LDIS Match Reports	LDIS / Offender Hit Notifications	LDIS / Confirmation Reports
2013	331	59	22	19	N/A	N/A
2014	299	55	25	31	N/A	N/A
2015	396	77	23	26	4	2
2016	262	44	11	7	4	2

Table 2: Total reports issued and the number of CODIS related reports / notifications for 2013 through 2016.

FORENSIC TOXICOLOGY SECTION

The Forensic Toxicology Section provides comprehensive examinations of post-mortem [autopsy] samples to assist in the determination of cause and manner of death. Specimens collected during the investigation of driving-under-the-influence-of-drugs/alcohol cases and drug-facilitated sexual assault cases are also examined by this section. The Toxicology Laboratory also provides drug testing on children removed from clandestine methamphetamine laboratories.

The section continues to expand the number of drugs and poisons it can detect and quantitate.

A significant portion of samples submitted are from post-mortem cases, the number of which is dependent upon the number of autopsies performed at the Center. The remainder of the cases are ante-mortem cases (DUI [Driving Under The Influence], DUID [Driving Under The Influence Of Drugs], DFSA [Drug Facilitated Sexual Assault], etc.) submitted by law enforcement. Illustrated in **Figure 19** is the total number of cases submitted to the Toxicology Laboratory.

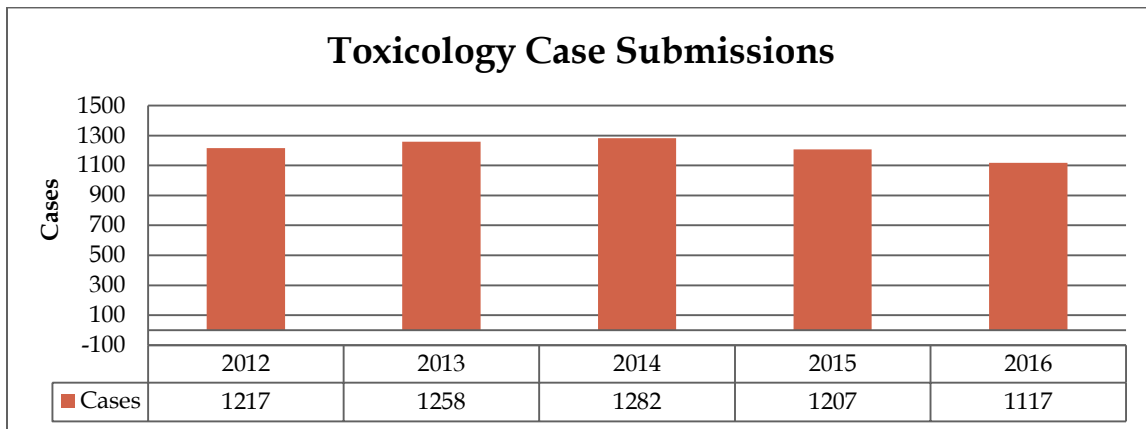


Figure 19 Number of cases submitted to the Toxicology Section for analysis over a five year period.

Figure 20 depicts the percentage of toxicology cases submitted by case type. Toxicological examinations in support of the District Coroner (PM) account for approximately 73% of the forensic case work performed by the section.

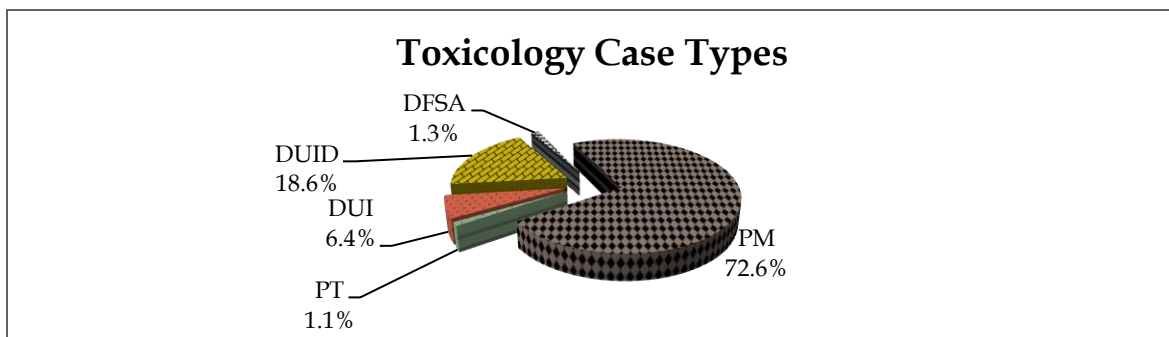


Figure 20 Submission of toxicology cases, sorted by case type. DUI (Driving Under the Influence of Alcohol), DUID (Driving Under the Influence of Drugs), PM (Post-Mortem), DFSA (Drug Facilitated Sexual Assault), and Proficiency Tests (PT).

Alcohol and Drugs

Alcohol continues to play a significant role in all of the FSL toxicology case types [Figure 21]. In approximately 59% of the alcohol positive DUI cases and 18% of the alcohol positive DUID cases, the driver was greater than twice the legal limit (0.08 gm%).

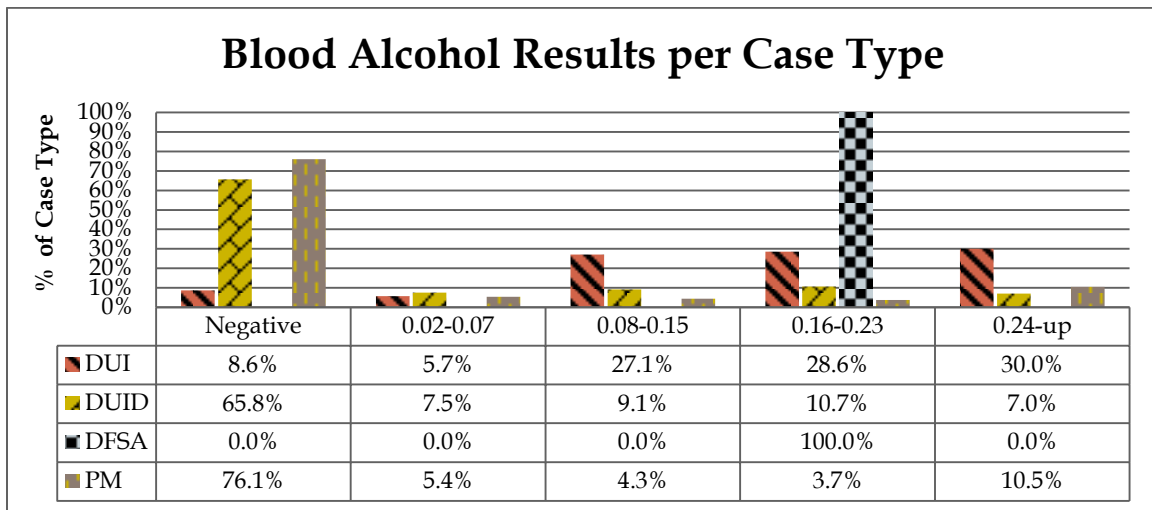


Figure 21 Percentage of alcohol test result ranges for each category of cases. One DFSA was tested for the presence of alcohol.

As illustrated in **Figure 22**, the vast majority of samples submitted in Driving-Under-the-Influence [DUI] cases were found to have alcohol concentrations at or above the legal limit of 0.08 gm%.

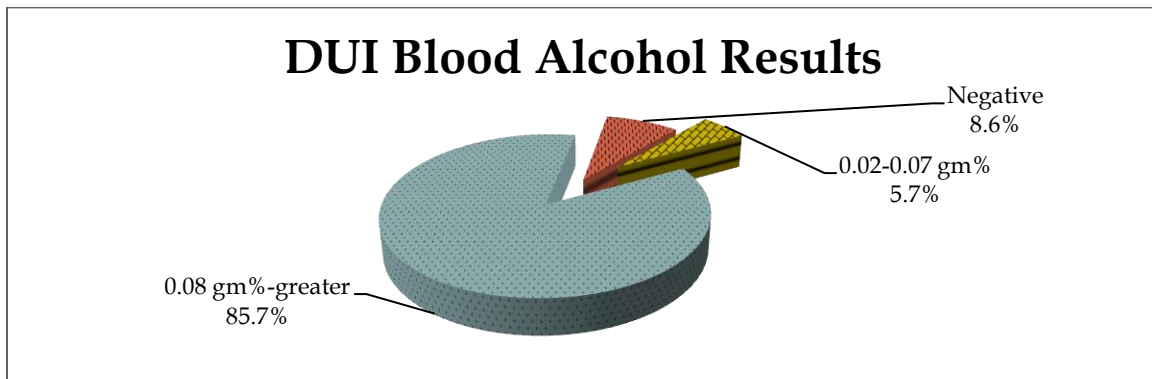


Figure 22 DUI blood alcohol results.

Many driving cases involve drivers that are under the influence of tetrahydrocannabinol (THC). **Figure 23** provides the number of positive THC results from DUID cases analyzed.

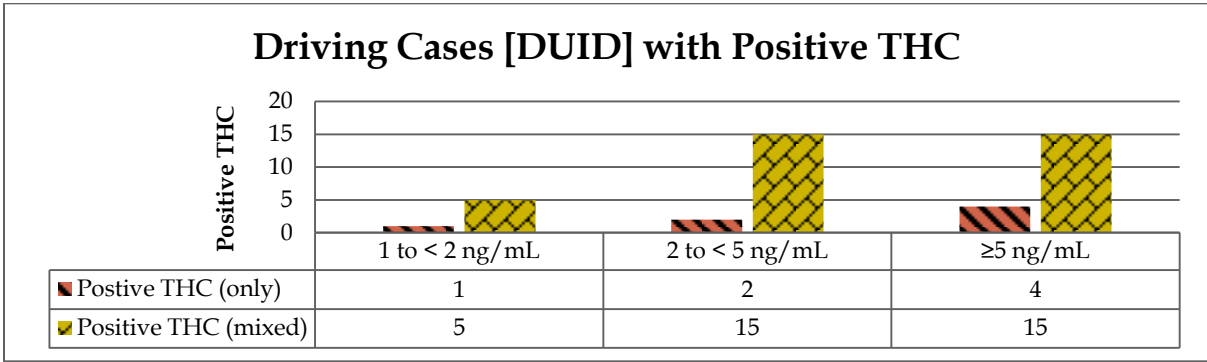


Figure 23 The number of positive tetrahydrocannabinol (THC) specimens analyzed from driving cases (DUID) in 2016. The table compares the number of drivers that tested positive for THC only and drivers that tested positive for THC mixed with any other drugs, including alcohol.

In approximately 24% of the postmortem (PM) case investigations there was a positive finding of alcohol [**Figure 24**].

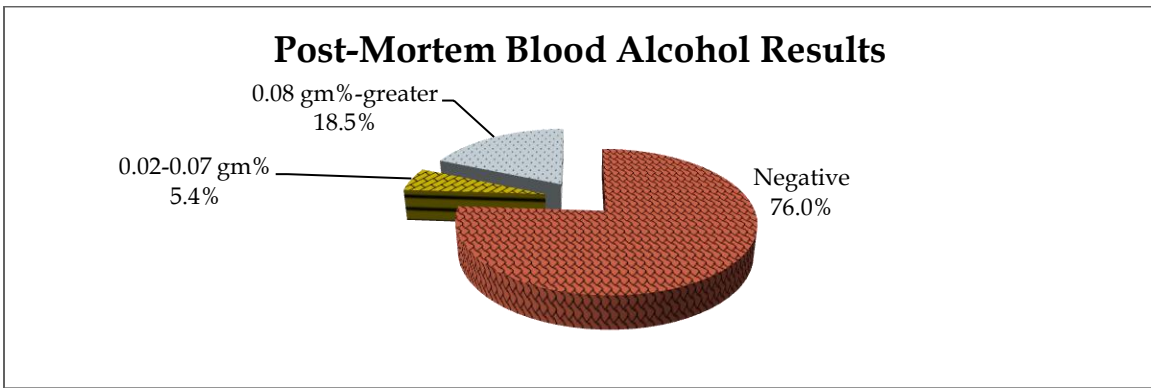


Figure 24 Post-mortem blood alcohol results for 2016.

Drug-Related Deaths

Opioids are drugs that include illegal drugs such as heroin and prescription pain relievers such as oxycodone. Continued use and abuse of these drugs can lead to physical dependence and can cause of death. Similar to the rest of the nation, the Sedgwick County Toxicology Laboratory has detected opioids in a high number of post-mortem cases. For cases submitted in 2016, 220 opioids were detected in 135 of the 716 post-mortem cases examined. The table [Table 3] below illustrates the number of cases that each opioid was detected.

Opioid	2012	2013	2014	2015	2016
6-Monoacetylmorphine	9	11	9	13	11
Buprenorphine	-	-	-	0	1
Codeine	45	56	41	14	7
Despropionylfentanyl	-	-	-	0	1
Dihydrocodeine	-	-	-	0	1
EDDP	-	-	-	2	3
Fentanyl	9	10	12	6	12
Furanyl-fentanyl	-	-	-	0	1
Hydrocodone	62	80	60	35	31
Hydromorphone	-	-	-	13	10
Loperamide	-	-	-	0	3
Methadone	30	46	46	29	15
Morphine	-	-	-	48	40
n,o-Didesmethyltramadol	-	-	-	1	0
Norbuprenorphine	-	-	-	0	1
o-Desmethyltramadol	-	-	-	4	4
Oxycodone	33	27	32	43	44
Oxymorphone	-	-	-	14	18
Propofol	-	-	-	0	3
Tramadol	4	10	12	8	13
U-47700	-	-	-	0	1

Table 3: Opioids detected in death cases over the last 5 years. Previous to 2015, data was captured in categories for Codeine/Morphine, Hydrocodone/Hydromorphone/Dihydrocodeine, Methadone/Normethadone/EDDP/EMDP, Oxycodone/Oxymorphone, and Tramadol/n-Desmethyltramadol/o-Desmethyltramadol instead of individually.

Aside from alcohol, tetrahydrocannabinol (THC) / carboxytetrahydrocannabinol [THC: psychoactive ingredient found in marijuana] is the most commonly found drug in post-mortem cases.

Hundreds of different drugs can be detected in post-mortem toxicology cases, including a wide range of illicit, prescription, and over the counter drugs. New drugs are constantly emerging on the illicit drug market providing a challenge to the toxicology laboratory. **Table 4** depicts the 10 most common drug findings in post-mortem toxicology cases [excluding ethyl alcohol] for 2016.

Alprazolam / a-Hydroxyalprazolam
Amphetamine / Methamphetamine
Cocaine / Benzoyllecgonine / Cocaethylene
Cyclobenzaprine
Diphenhydramine
Gabapentin
Hydrocodone / Hydromorphone
Morphine / Codeine
Oxycodone / Oxymorphone
Tetrahydrocannabinol / Carboxytetrahydrocannabinol

Table 4: The 10 most commonly detected drugs / metabolites (Post Mortem) detected in 2016.

Alcohol Positive Drivers

Alcohol plays a significant role in driving under the influence cases. In 2016, 50% of tested samples in DUI and DUID cases were negative for the presence of alcohol. **Figure 25** shows that approximately 86% of alcohol positive drivers were at or above “per se” limit of 0.08 gm%.

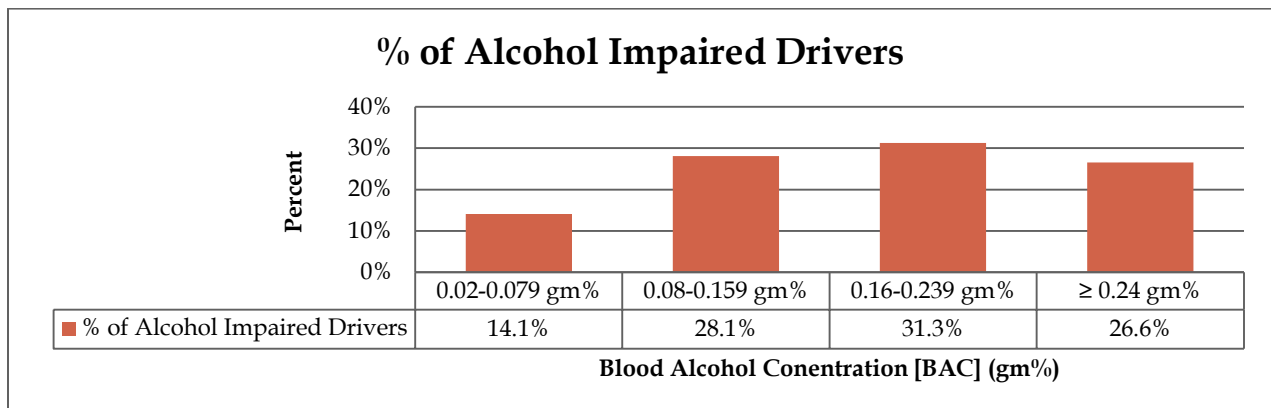


Figure 25 Alcohol test result ranges (gm%) of positively tested samples submitted for DUI and/or DUID.

Alcohol Positive Drivers – Under the Age of 21

The legal age for possession of alcohol is 21 years old. In 2016, 26.7% of all motor vehicle drivers testing positive for alcohol were under the age of 21. **Figure 26** illustrates the percentages of suspected alcohol impaired drivers by age and the blood alcohol levels for minors vs. legal drinking age.

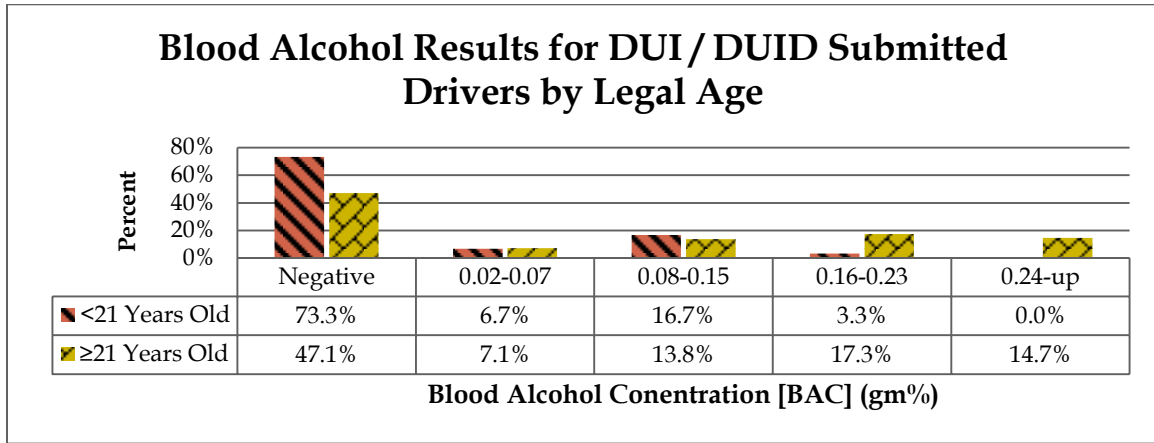


Figure 26 DUI and DUID results sorted by age (minors vs. 21 years and older). For drivers tested that were over 21 years old, approximately 46% had alcohol concentrations ≥ 0.08 gm%.

Drugs and Driving

Approximately 66% of DUID cases were found to be negative for alcohol upon pre-screening, 7.5% were cases involving blood alcohol levels at or below the legal limit and 27% of the cases were above the legal limit (0.08 gm% and up) [**Figure 27**].

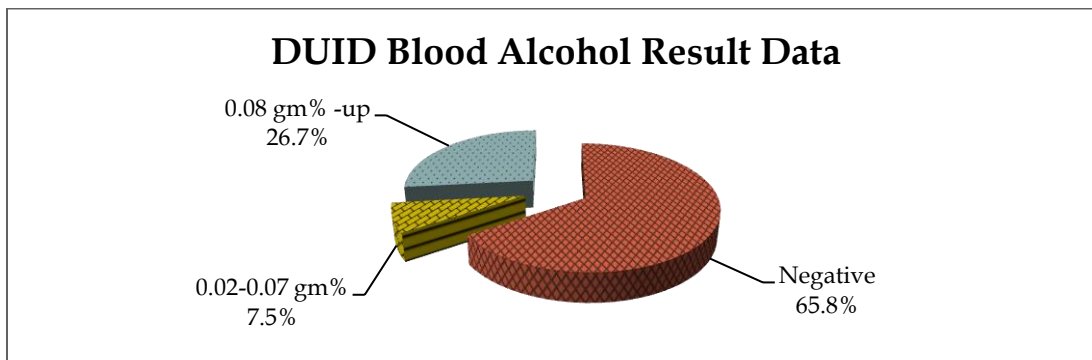


Figure 27 General alcohol testing result ranges for DUID submitted cases.

Drugs play a significant role in driving under the influence cases and can cause different levels of impairment. As depicted in **Figure 28**, the majority of DUID cases tested in 2016 were found to be positive for the presence of drugs.

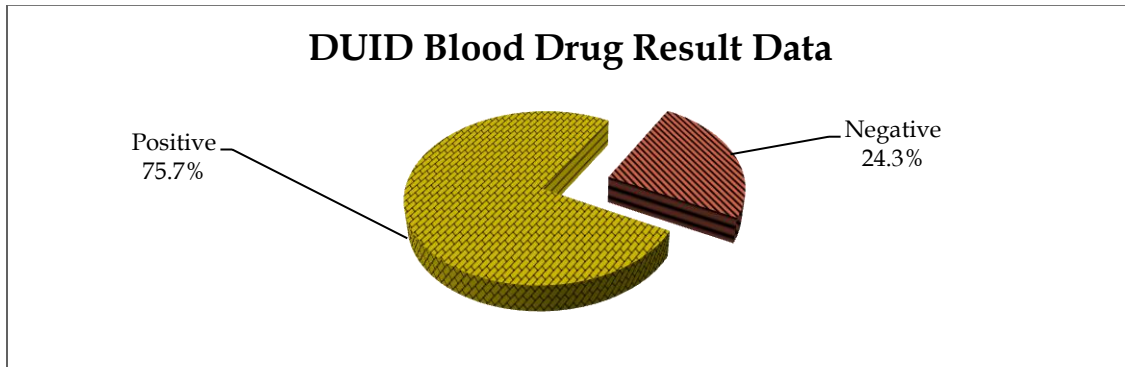


Figure 28 DUID blood drug results. It was concluded that 76% of individuals suspected of driving under the influence of drugs tested positive.

Driver Drug Usage

In DUID cases where drugs were detected, approximately 57% were prescription drugs and 43 percent were illicit. [Figure 29]. Although drugs are classified as prescription drugs, they can also be considered illicit in use. Prescription drugs can be abused by individuals with or without a prescription for the drug. The most commonly abused prescription drugs are Opioids and Benzodiazepines.

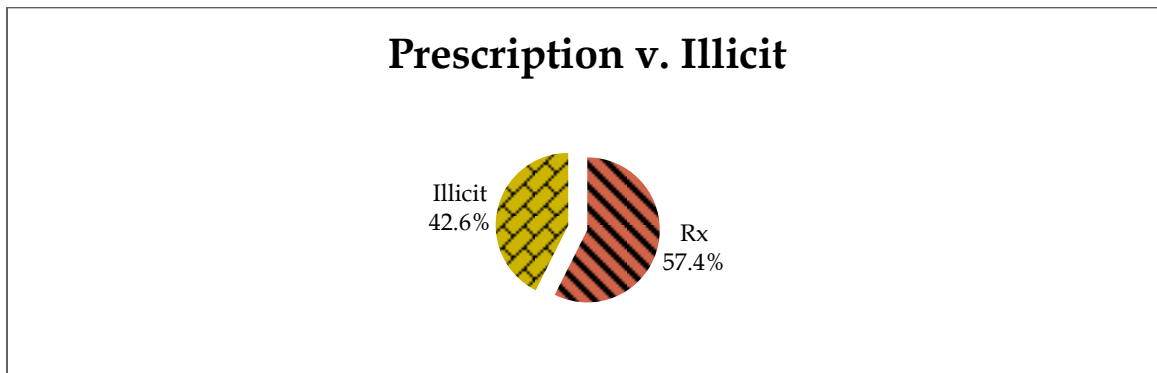


Figure 29 Percentage of prescription (Rx), and Illicit drugs detected in DUID.

Table 5 depicts the 10 most common drugs detected in driving-under-the-influence-of-drugs [DUID] toxicology cases [excluding ethyl alcohol] in 2016.

Alprazolam / a-Hydroxyalprazolam
Amphetamine / Methamphetamine
Carisoprodol / Meprobamate
Cocaine / Benzoylcegonine
Diazepam / Nordiazepam
Hydrocodone / Hydromorphone
Methadone
Phencyclidine
Tetrahydrocannabinol / Carboxytetrahydrocannabinol
Zolpidem

Table 5: The ten (10) most commonly detected drugs / metabolites detected in DUID cases in 2016.

Drug-Facilitated Sexual Assaults

Drug-Facilitated Sexual Assaults [DFSA] continue to be difficult forensic investigations. The cases often involve a perpetrator who will surreptitiously administer a drug to a victim to render them unconscious and sexually assault them. In 2016, the Toxicology Laboratory detected ethanol in all three DFSA cases worked. In DFSA cases, the drugs detected were benzoylcegonine and carboxytetrahydrocannabinol.

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