

2021

Forensic Science Laboratory Annual Report

SEDGWICK COUNTY, KANSAS

REGIONAL FORENSIC SCIENCE CENTER
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MISSION

The Forensic Science Center strives to provide the highest quality medicolegal and advanced forensic laboratory services to Sedgwick County. Death Investigation and Forensic Autopsy services are conducted in a compassionate and objective manner to achieve accurate certification of cause and manner of death. The Forensic Laboratory services provide unbiased and accurate analytical testing to support the resolution of criminal cases. As an independent agency operating under the Division of Public Safety, the Forensic Science Center collaborates with public health and criminal justice stakeholders to reduce crime and prevent deaths.

LABORATORY LEADERSHIP

Director

Shelly Steadman, Ph.D.

Quality Assurance and Compliance Manager, LIMS Administrator

Robert C. Hansen II, M.S.F.S

Toxicology Laboratory Manager

Kimberly Youso, M.S., D-ABFT-FT

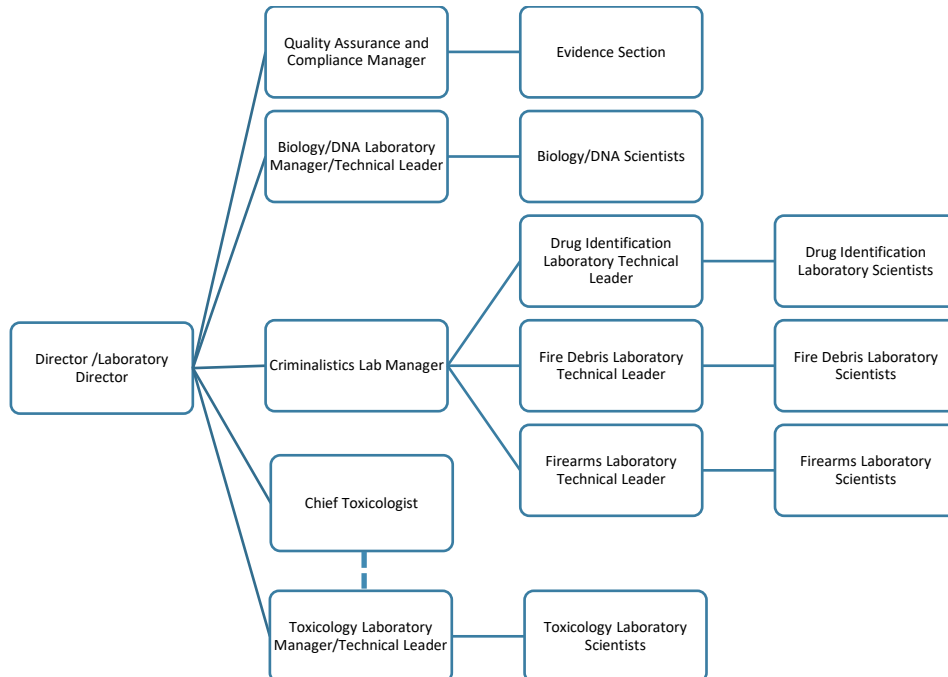
Criminalistics Laboratory Manager

Lana Goodson

Forensic Biology / DNA Laboratory Manager

Sarah Geering, M.S.

LABORATORY ORGANIZATION



INTRODUCTION

The Regional Forensic Science Center (RFSC) officially opened on December 21st, 1995. The Center houses the Office of the District Coroner and the Forensic Science Laboratories. The Forensic Science Laboratories are comprised of three major sections: Criminalistics (Drug Identification, Firearms, and Fire Debris), Biology/DNA, and Toxicology (Antemortem and Postmortem).

The Forensic Science Laboratory is staffed with highly-trained and experienced forensic scientists, many of whom have advanced scientific degrees (MS, MSFS, Ph.D.). The technical staff has well over 200 years of combined professional experience. For 2021, the laboratory staff consisted of 19 scientists and 3 support personnel.

In April of 1996, the Forensic Science Laboratory began accepting cases for firearms examinations. Three months later, the Biology Laboratory provided forensic examinations for the identification of biological fluids. The Toxicology Laboratory began producing comprehensive examinations in Postmortem Toxicology in support of the Sedgwick County District Coroner (District Coroner) in September of 1996. This was followed by the Forensic Science Laboratories 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 Biology/DNA Laboratory became the first short tandem repeat-deoxynucleic acid (STR-DNA) testing laboratory in the State of Kansas.

In 2003, the Forensic Science Laboratory first became accredited by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB) under the ASCLD/LAB-Legacy program.

In February 2014, the Forensic Laboratory was granted ASCLD/LAB-International accreditation for Forensic Testing Laboratories in the categories of Controlled Substances, Quantitative Analysis, Antemortem Toxicology, Postmortem 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, and the testing laboratory requirements of the ASCLD/LAB-International Supplemental Requirements.

In the 2018, the Forensic Science Laboratory completed an ANAB ISO/IEC 17025:2017, AR3125 full assessment. The laboratory was the first in the state and among the first in the nation to undergo assessment for these new international accreditation standards. This enhanced accreditation program is based upon the latest set of requirements against which a forensic testing laboratory can be evaluated.

In 2021, the Forensic Science Laboratory completed an ANAB ISO/IEC 17025:2017, AR3125 surveillance assessment. Also, the Biology/DNA Laboratory completed an internal FBI QAS Audit for forensic testing laboratories.

Striving for and meeting these accreditation requirements demonstrates the Forensic Laboratory's commitment to excellence in the services we provide to our submitting agencies.

SIGNIFICANT ACHIEVEMENTS

- **Publications:**
 - Tiscione N.B. and Rohrig T.P. "1,1-Difluoroethane Forensic Aspects for the Toxicologist and Pathologist", J. Analytical Toxicology 45:792-798, 2021
 - Rohrig T.P., Nash E., Osawa K.A., Shan X., Scarneo C., Youso K.B., et al. "Fentanyl and Driving Impairment", J. Analytical Toxicology 45:389-396, 2021
- **Professional Conference Presentations:**
 - S.C. Geering, "A CODIS Success Story", 27th Annual CODIS Conference, 2021.
- **Laboratory Staff enhanced their technical and professional expertise by attending the following workshops and/or training sessions on-site, at conferences, or via webinar:**
 - 2020 JAT Article 5: Time-Dependent Postmortem Redistribution of Opioids in Blood and Alternative Matrices
 - 2021 Annual Review of DNA Data Accepted at NDIS
 - 2021 Current Trends in Forensic Toxicology - Day 1
 - 2021 Current Trends in Forensic Toxicology - Day 2
 - 2021 Current Trends in Forensic Toxicology - Day 3
 - 2021 Current Trends in Forensic Toxicology - Day 4
 - 2021 Current Trends in Forensic Toxicology - Day 5
 - 2021 JAT Article: Nonsmoker Exposure to Secondhand Cannabis Smoke. III. Oral Fluid and Blood Drug Concentrations and Corresponding Subjective Effects
 - 2021 JAT Article: Smoked Cannabis' Psychomotor and Neurocognitive Effects in Occasional and Frequent Smokers
 - 2021 JAT Article: Long-Term Blood Alcohol Stability in Forensic Antemortem Whole-Blood Samples
 - 2021 JAT Article: Review of Caffeine-Related Fatalities along with Postmortem Blood Concentrations in 51 Poisoning Deaths
 - 3rd Annual Northeast Forensic Laboratory Probabilistic Genotyping Users Group Workshop
 - 7th Annual Workshop of STRmix Implementation and Casework Approach
 - 27th Annual CODIS Conference – General Session
 - 27th Annual CODIS Conference – National Technical Leader Virtual Summit
 - Advancing Fire Scene Investigations Through Field Portable Technologies
 - Bloodborne Pathogen
 - Building a Crime Gun Intelligence Capability
 - Fire Debris Analysis is Not Black Magic!
 - Harassment Training - Coverdell Grant and LEP
 - Hazard Communication Safety
 - Implementing a Y-Screening / Direct to DNA Workflow
 - Introduction to Drug Caused and Related Death Investigation:2021
 - IRT for Forensics: A re-analysis of the FBI "Black Box" Study
 - Midwest Firearm 2021 Virtual Training Seminar
 - Modern Firearm Manufacturing Techniques Course

- Novel Synthetic Opioids in Oral Fluid: Analytical Methods and Prevalence
 - Preemptive Approach to Combatting and Characterizing Emerging Synthetic Opioids
 - Recent Advances in Tandem Separation and Detection Techniques for the Analysis of Emerging Drugs
 - Reliable Quantification of THC in Chocolate and Identifying Fentanyl Analogs and Illicit Drugs using MassHunter - Archival
 - Session 1 of the Statistical Thinking for Forensic Practitioners Short Course
 - Session 2 of the Statistical Thinking for Forensic Practitioners Short Course
 - Session 3 of the Statistical Thinking for Forensic Practitioners Short Course
 - Specialized Forensic Toxicology, Pathology and Certification of Drug Related Death for Forensic Pathologists: 2021
 - Structural Characterization of Emerging Synthetic Drugs by Mass Spectrometry
 - Syva Viva-ProE System, System Overview Online Training
 - The Evaluation and Certification of Drug Caused and Related Deaths for Forensic Pathologists, Toxicologists and Death Investigators: 2021
 - Viva-ProE System Virtual Training
- **Grant Funding:**
 - 22-NFSIA-02 (2021 Coverdell) - \$40,500.00
 - 2021 Capacity Enhancement and Backlog Reduction (CEBR) - \$230,219.00
 - 2021 Justice Assistance Grant (JAG) - \$59,363.00
 - 2021 Crime Gun Intelligence Center - \$32,250.00

FORENSIC SCIENCE LABORATORIES SERVICE OVERVIEW

Case Submissions

The Forensic Science Laboratory continues to experience a significant demand for expert services. **Figure 1** illustrates the number of forensic laboratory cases first submitted for examination over the past 5 years, the average of which is 3334.

The Center has worked with law enforcement contributors and 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 was a slight decrease in the number of cases submitted between 2017 and 2019. However, with the increase in sexual assault cases and emerging designer drugs, the cases submitted have been increasingly complicated, often with more exhibits associated.

As illustrated in **Figure 1**, the laboratories received evidence for examination from 3317 newly generated cases in 2021.

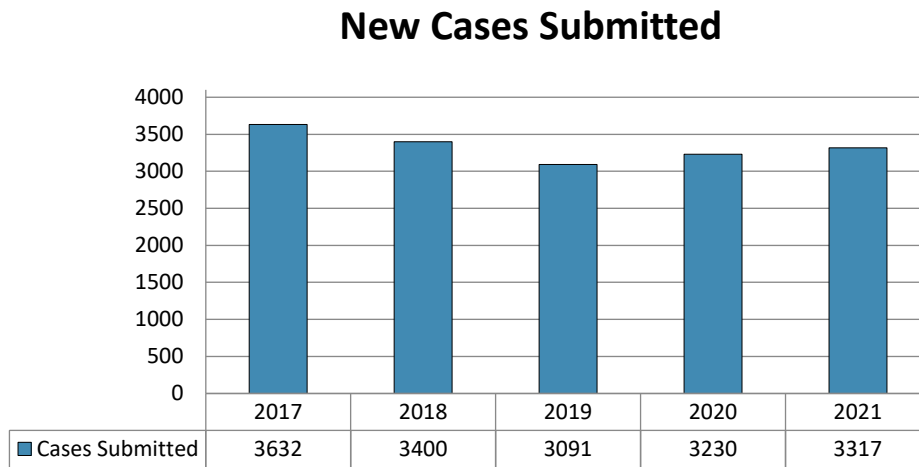


Figure 1: Number of initial forensic laboratory cases submitted for examination (law enforcement and District Coroner postmortem evidence submissions) from 2017 through 2021.

As illustrated in **Figure 2**, the number of exhibits examined by the Forensic Laboratory remained relatively flat in 2021 when compared to 2020, which was an all time high. Still in 2021, the laboratories examined approximately 15.6% more exhibits when compared to 2017.

Number of Exhibits Examined

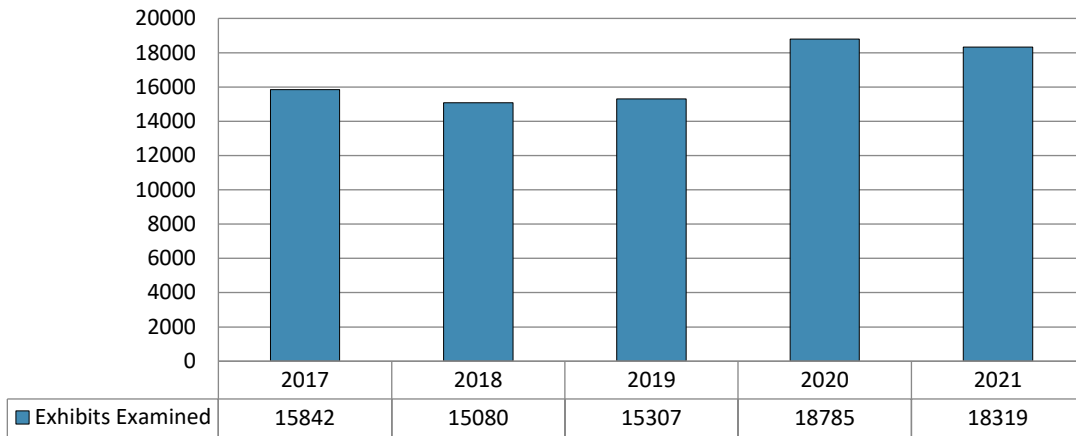


Figure 2: The number of forensic exhibits examined between 2017 and 2021.

Law enforcement agencies submit criminal cases to the Forensic Laboratory for analysis.

Figure 3 illustrates the number of cases submitted to the Forensic Laboratory for the first time in each year per laboratory section.

New Laboratory Cases Submitted

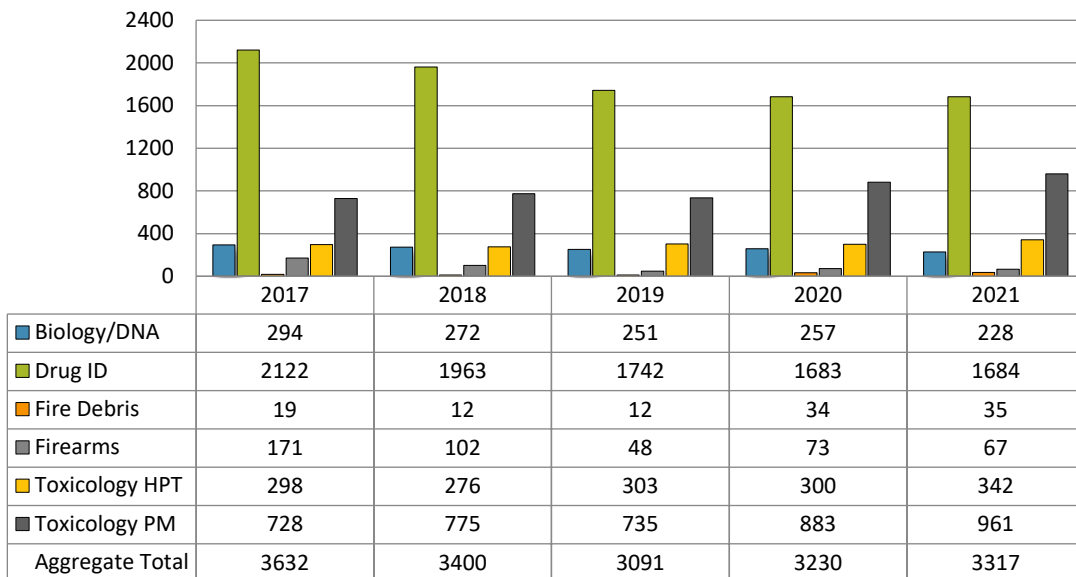


Figure 3: Number of cases submitted for the first time each year per laboratory section. Abbreviation Key (HPT = Human Performance Testing, PM = Postmortem).

A listing of the agencies that submitted evidence to the laboratory division for forensic analysis and the number of new cases that were submitted by each in 2021 is provided in **Figure 4**. The District Coroner’s Office submits evidence for analysis in support of the regional autopsy service. Out of county agencies that submit evidence for analysis are subject to a fee schedule set forth by the Sedgwick County Board of County Commissioners.

New Cases Submitted per Contributing Agency

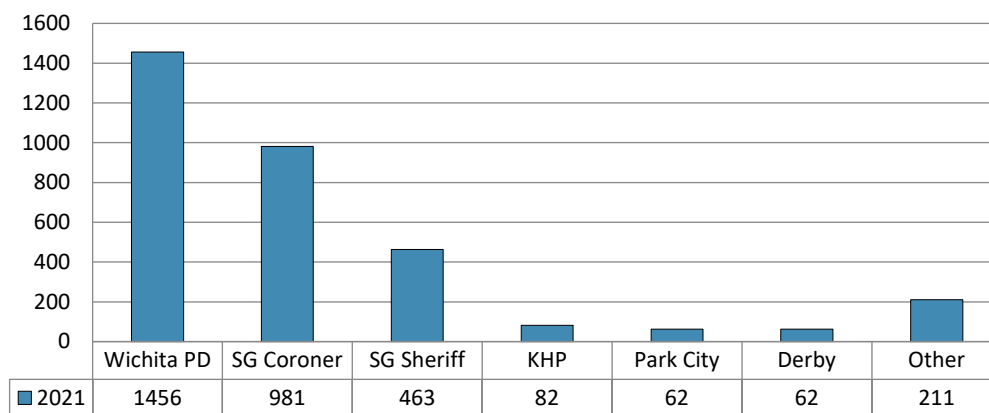


Figure 4: Count of new case submissions received from each contributing law enforcement agency. Abbreviation Key (PD = Police Department, SG = Sedgwick County, KHP = Kansas Highway Patrol).

Cases are submitted for forensic examination under five analytical disciplines, Biology / DNA, Drug ID, Firearms, Fire Debris, and Toxicology (postmortem and antemortem [HPT]). Toxicology receives antemortem evidence from law enforcement and postmortem specimens from the District Coroner.

The number of case submissions associated with each laboratory is illustrated in **Table 1**. The aggregate submission count of 4008 includes all submissions from contributing agencies, which includes submissions from the aggregated 3317 new cases (the sum of all new cases submitted to each laboratory) generated in year 2021 (see **Figure 3**) and submissions from cases generated in previous years in support of on-going investigations by law enforcement. This was an increase of 398 in case submissions compared to 2020.

Laboratory	2021 Aggregate Case Submissions Count
Biology / DNA	456
Drug ID	1,939
Firearms / Tool Marks	78
Fire Debris	37
Toxicology Antemortem	356
Toxicology Postmortem	1142
Sum of Submission Count	4008

Table 1: Number of case submissions per laboratory.

The relative percentage of cases submitted to each laboratory section is illustrated in **Figure 5**. The Drug Identification Laboratory continues to receive the majority of evidence submitted, followed by submissions to the Toxicology Laboratory, which in 2021, had all-time highs for both antemortem and postmortem case submissions.

Percentage Case Submissions per Laboratory

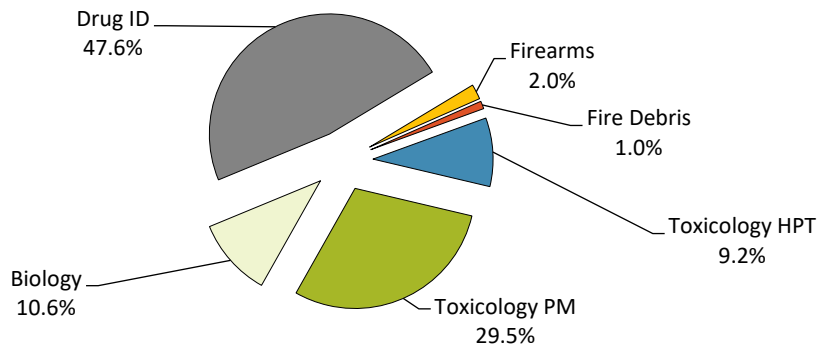


Figure 5: Percentage of case submissions per laboratory. The Criminalistics Section continues to receive the majority of evidence submitted.

Backlog

Nationally, the target turn-around time for case completion is 30 days from submission. The Forensic Laboratory has set an internal goal of 60 days, which is acceptable to the vast majority of our contributors according to our annual contributor surveys. As of December 31, 2021 the Forensic Laboratories had a 60 day backlog of 827 cases and a 30 day backlog of 1019 cases (see Figure 6).

End of the Year Backlog

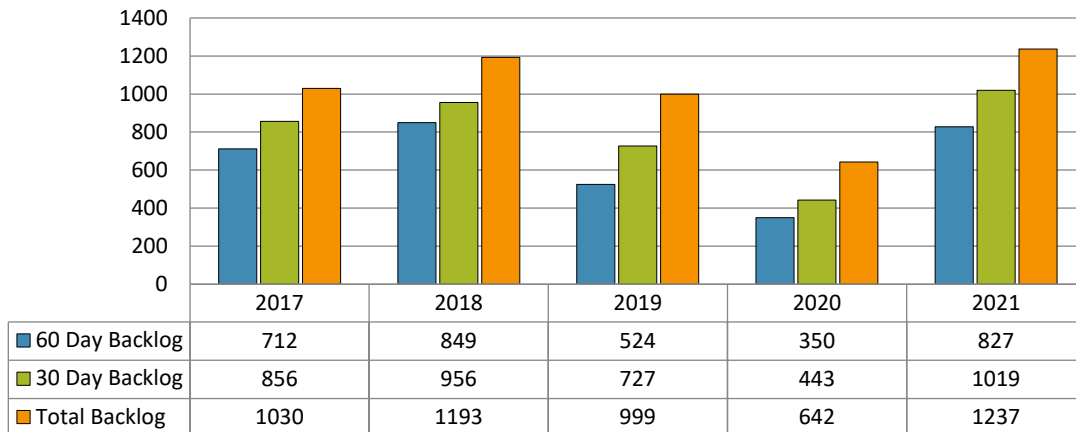


Figure 6: The number of the total, the 30 day, and the 60 day backlogged cases on December 31 of each of the last five years.

Expert Testimony

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

In 2021, the Forensic Science Laboratories received 497 subpoenas for court appearances. This resulted in laboratory staff providing expert testimony in 25 criminal cases.

Agencies Served

The Forensic Science Laboratory provides expert testing services and consultation for a variety of law enforcement agencies within and outside of Sedgwick County. In 2021, the Forensic Science Laboratory provided expert testing services and consultations to 46 law enforcement agencies, fire departments, and district coroners. In **Figure 7**, the shaded counties indicate jurisdictions within the state for which forensic laboratory services were provided.

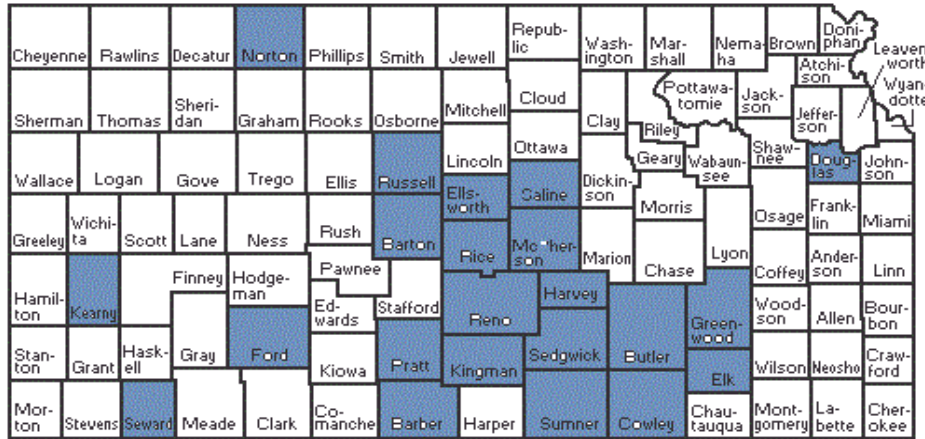


Figure 7: Counties that had forensic laboratory services provided to them by the Sedgwick County Regional Forensic Science Center in 2021 (shaded).

Sedgwick County vs. Out-of-County Cases

The Regional Forensic Science Center serves as the principle forensic (crime) laboratory for all Sedgwick County law enforcement agencies and provides forensic services to many other counties and municipalities within the state of Kansas; however, the vast majority of forensic laboratory services were provided for Sedgwick County law enforcement agencies and the Sedgwick County Coroner. A significant portion of the out-of-county casework was in support of the District Coroner’s out-of-county autopsies. Municipalities and counties served in 2021 are listed in **Table 2**.

Alcohol Tobacco and Firearms (ATF)	Garden Plain Police Department	Mulvane Police Department
Andale Police Department	Goddard Police Department	Park City Police Department
Barber County Coroner	Greenwood County Coroner	Pratt County Coroner
Barton County Coroner	Harper County Coroner	Reno County Coroner
Bel Aire Police Department	Haysville Police Department	Rice County Coroner
Bentley Police Department	Harvey County Coroner	Russell County Coroner
Butler County Coroner	Hutchinson Correctional Facility	Saline County Coroner
Cheney Police Department	Kansas Department of Corrections	Sedgwick County Coroner
Clearwater Police Department	Kansas Highway Patrol	Sedgwick County Fire Department
Cowley County Coroner	Kearny County Coroner	Sedgwick County Sheriff
Derby Police Department	Kechi Police Department	Seward County Coroner
Department of Homeland Security	Kingman County Coroner	Sumner County Coroner
Douglas County Coroner	Larned Correctional Facility	Valley Center Police Department
El Dorado Correctional Facility	Maize Police Department	Wichita Fire Department
Elk County Coroner	Marion County Coroner	Wichita Police Department
Ellsworth County Coroner	McPherson County Coroner	Wichita State University Police Department
Ford County Coroner	Mount Hope Police Department	Winfield Correctional Facility

Table 2: List of law enforcement agencies, fire departments, and county coroners for which the forensic science laboratories provided services in 2021.

Cases Completed

Cases completed every year may include cases that are submitted for the first time that year, or backlogged cases from previous years, or may be cases that were originally submitted in previous years, but have additional examination(s) requested. **Figure 8** illustrates the number of cases completed by the Forensic Science Laboratories in the given year.

The Forensic Laboratory has faced staffing challenges throughout 2018, 2019, 2020, and 2021. This was especially true for the Firearms, Drug Identification, and Toxicology Laboratories, which helps explain the noticeable drop in the number of cases completed for these years. However, in 2020 there was an increase in the total cases completed when compared to 2018 and 2019.

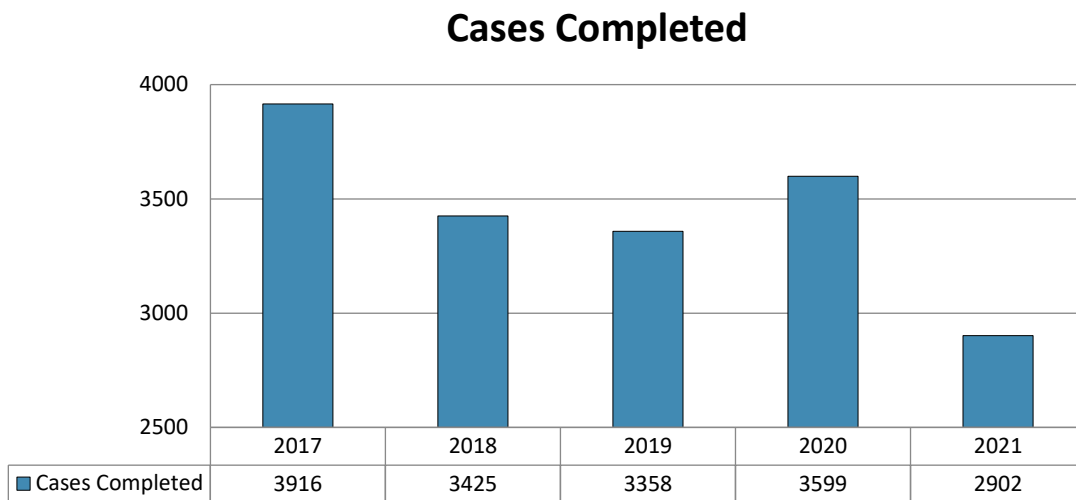


Figure 8: Number of cases completed per year.

Case Submission Turn-Around-Time

One metric of the Forensic Laboratory casework output is the amount of time it takes for a case to be completed following submission. As illustrated in **Figure 9**, 41% of cases submitted to the Laboratory Division in 2021 were completed within 60 days of submission.

Percentage of Laboratory Cases Completed Within 30, 60, or 90 Days of Submission

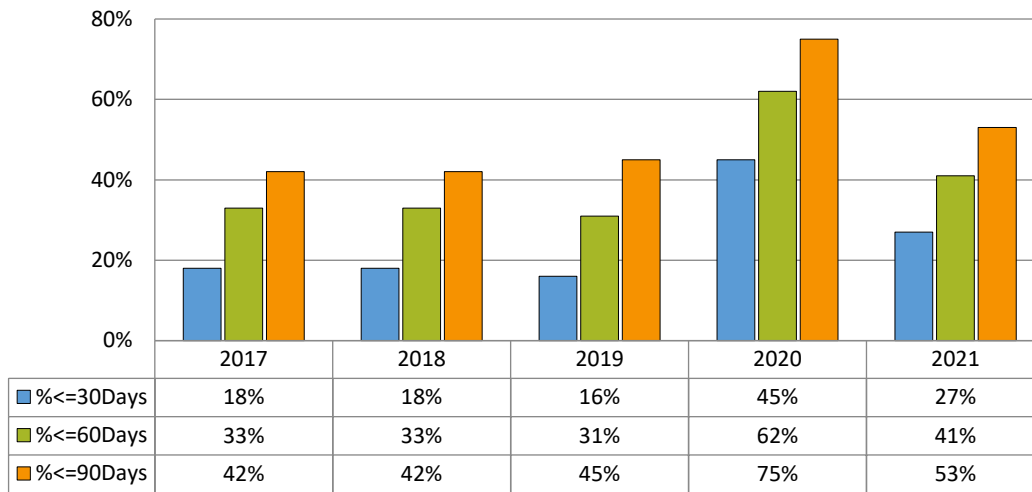


Figure 9: Percentage of laboratory cases completed within 30, 60, or 90 days of submission.

CRIMINALISTICS

The Criminalistics Unit receives the majority of the cases submitted to the Forensic Science Laboratories. The Criminalistics Unit provides forensic examinations in Drug Identification, Firearms, and Fire Debris. **Figure 10** illustrates the trend in forensic case volume submitted to the Criminalistics Unit, and **Figure 11** illustrates the number of exhibits examined by the Criminalistics Unit.

Criminalistics Case Submissions

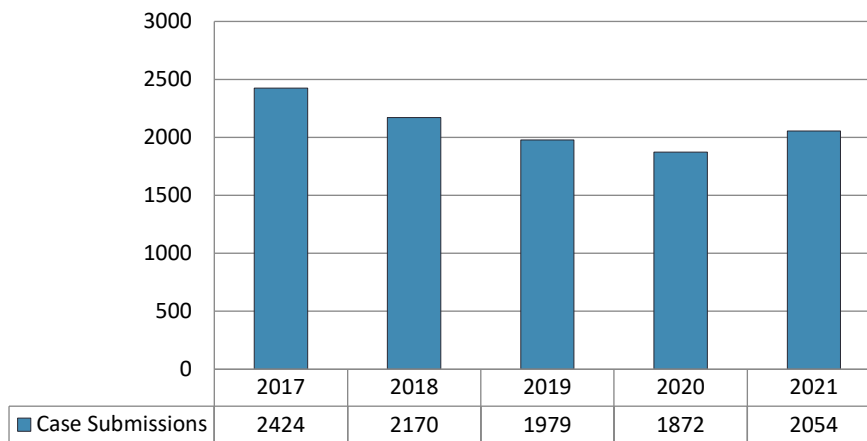


Figure 10: Number of case submissions to the Criminalistics Section (Drug ID, Firearms, and Fire Debris) over 5 year period from 2017 through 2021. These include all new cases submitted to the Center for the first time and submissions from cases with subsequent submissions.

Exhibits Examined by Criminalistics

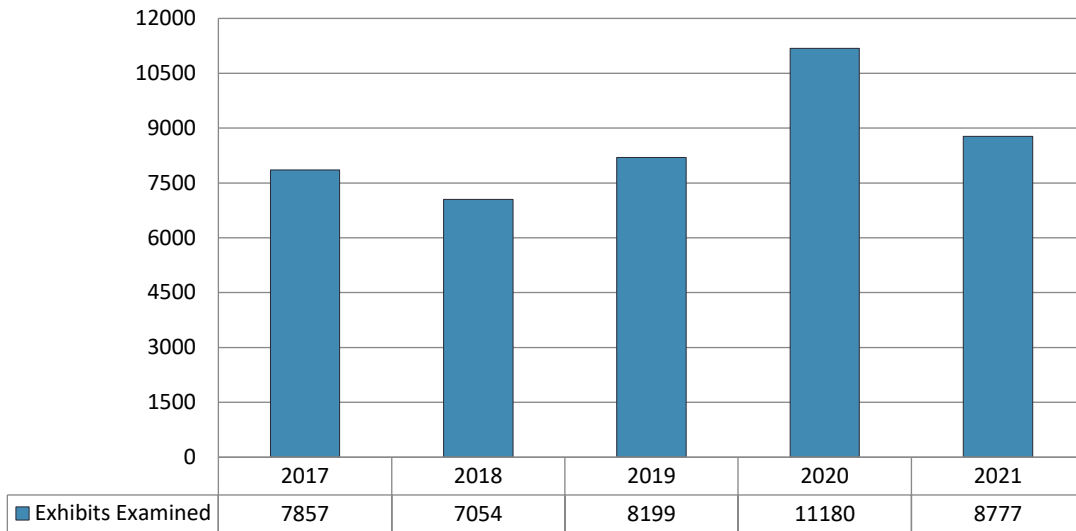


Figure 11: The number of exhibits examined from 2017 through 2021 by the Criminalistics Section (Drug ID, Firearms, and Fire Debris).

The volume and percentage of cases submitted to each laboratory of the criminalistics section is illustrated in **Figure 12**.

Criminalistics Case Submissions per Laboratory

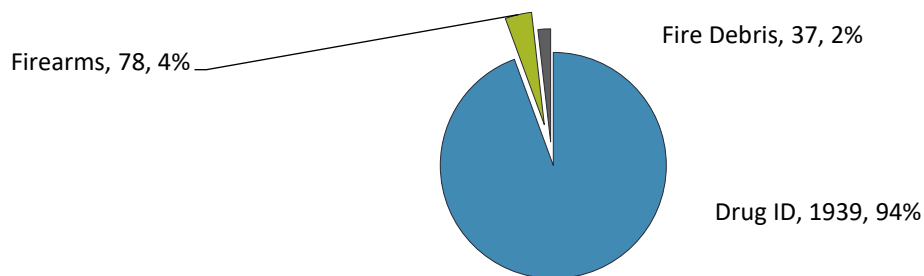


Figure 12: Volume and percentage of cases submitted to each Criminalistics Laboratory Unit.

DRUG ID

Examination requests for the identification of illicit drugs accounted for approximately 96% of the cases submitted to Criminalistics, as depicted in **Figure 12** above. Additionally, open container cases without any associated drugs accounted for 2% of the total submitted Drug ID cases. Casework requests for both illicit drug and open container examination accounted for another 2% of the total Drug ID submissions.

The agency that submits the greatest volume of evidence to Drug ID is the Wichita Police Department (WPD). This is apparent in **Figure 13**, as nearly 64% of cases received are from WPD. Agencies other than WPD and the Sedgwick County Sheriff's Office (SGSO) are responsible for approximately 16% of the total cases submitted.

Drug ID Case Submissions by Agency (%)

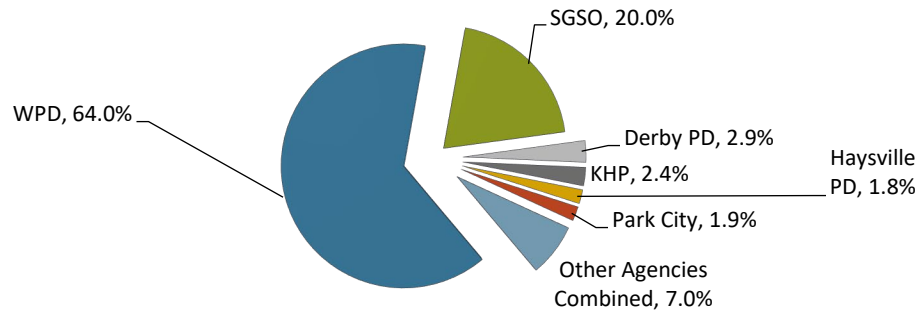


Figure 13: Percentages of Drug ID cases submitted per contributing agency.

The number of submissions, the number of cases submitted, and the number of new cases submitted to the Drug ID Laboratory over the last five years is illustrated in **Figure 14**.

Drug ID Case Submissions

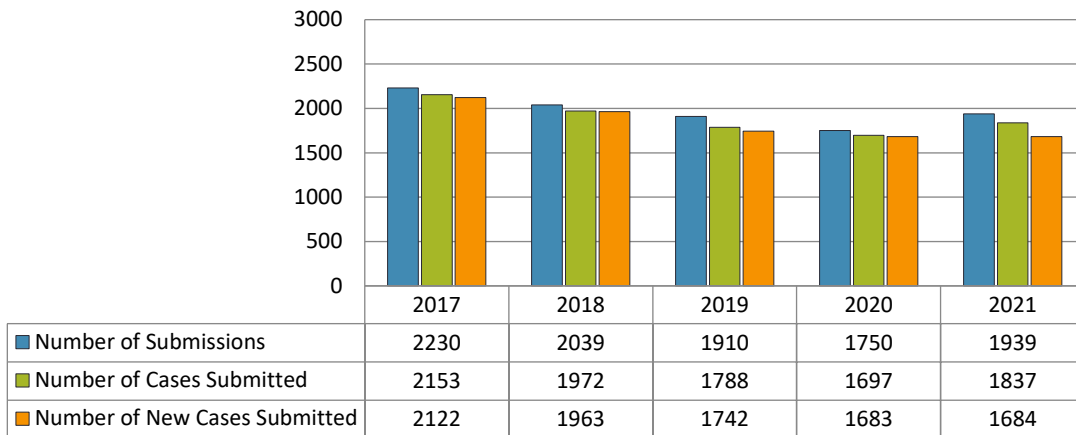


Figure 14: The number of case submissions to the Drug ID Laboratory over a five year period.

The number of cases completed by the Drug Identification Laboratory over the last 5 years is illustrated in **Figure 15**.

Drug ID Case Completed

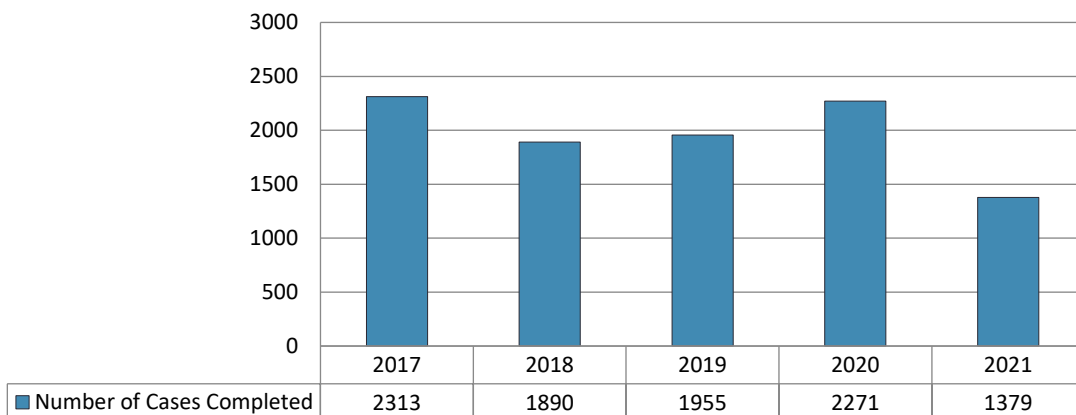


Figure 15: The number of cases completed by the Drug Identification Laboratory over the last 5 years.

In 2021, the Drug Identification Laboratory examined thousands of exhibits for the presence of controlled substances. Consistent with years past, the majority of drug exhibits were identified as methamphetamine, marijuana containing tetrahydrocannabinol (THC), THC, cocaine, and fentanyl. The Forensic Laboratory supported federal drug prosecution by performing methamphetamine quantitations, with an average purity of 75%, and cocaine base / salt form determinations.

The ten (10) most commonly detected drugs are illustrated in **Figure 16**. Methamphetamine is the most commonly detected drug, followed closely by marijuana (MJ) containing THC as the second most commonly detected drug. THC is the third most commonly detected drug.

THC is the psychoactive component of cannabis and can be extracted out of the marijuana 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 containing THC the scientist must confirm the presence of marijuana by microscopically observing the specific characteristics of the plant and confirm that the plant material is not hemp.

For the first time, fentanyl was detected by the Drug ID Laboratory as a top 5 most commonly detected drug. ANPP was also on the most commonly detected list for 2021. It is a precursor in fentanyl synthesis that can suggest certain fentanyl synthesis routes. Note that no other opioid was in the top 10 most commonly detected drug.

Synthetic cannabinoids, which are commonly known as K-2 or spice, were detected in many Drug ID casework samples in 2021. **Figure 16** illustrates that the 2 most commonly detected were, F-MDMB-PICA and MDMB-en-PINACA, respectively.

Most Commonly Detected Drugs

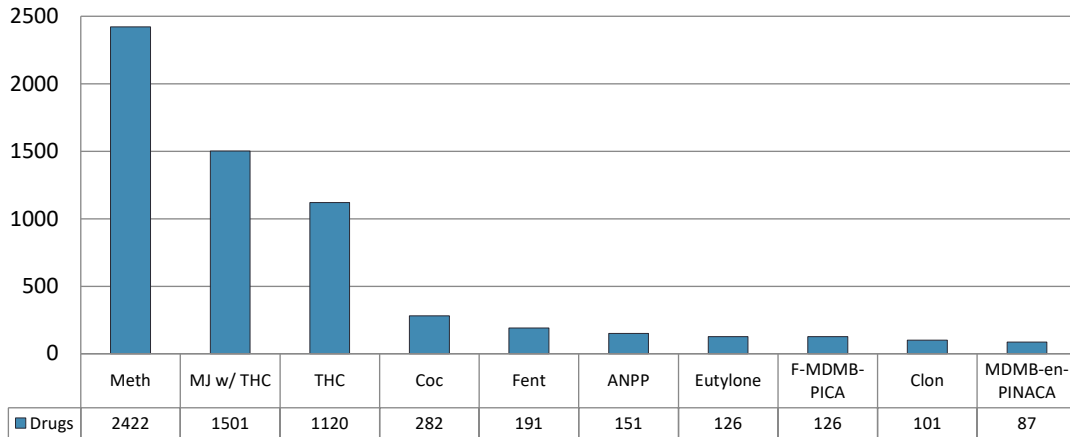


Figure 16: The ten (10) most commonly detected drugs from 2021 examinations. Drug Abbreviation Key (Meth = methamphetamine, MJ = marijuana, THC = tetrahydrocannabinol, Coc = cocaine, Fent = fentanyl, ANPP = 4-anilio-N-phenethyliperidine, Clon = Clonazolam).

Noteworthy Drug Trends

Below is drug trend information on several key drugs that were noted as a result of analysis by the RFSC Drug Identification Laboratory. Of interest were the trends observed during analysis of fentanyl, methamphetamine, cocaine, marijuana containing tetrahydrocannabinol, tetrahydrocannabinol, clonazolam, and eutylone.

Fentanyl

As illustrated in **Figure 17** the number of cases completed has increased from 2 in 2016 to 120 in 2021, which equates to an approximate 5,900% increase. Additionally, for the 1379 cases completed in 2021, 8.7% of them had at least 1 fentanyl positive exhibit.

Count of Cases with Fentanyl Detected per Case Completion Year

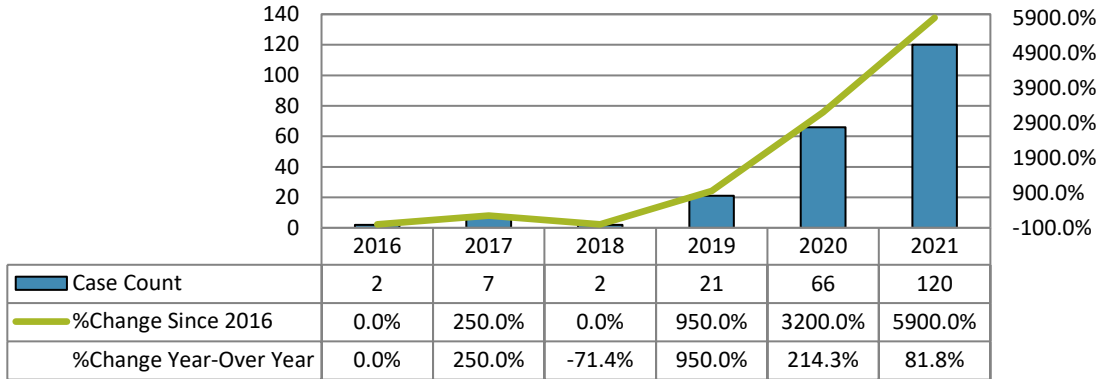


Figure 17: Graph depicting the number of cases that were completed that had at least one fentanyl positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 2 cases completed with at least one exhibit that had fentanyl detected.

As illustrated in **Figure 18** the number of cases submitted has increased from 4 in 2016 to 191 in 2021, which equates to an approximate 4,675% increase. Additionally, for the 1837 cases submitted in 2021 approximately 10.3% of them had at least 1 fentanyl positive exhibit.

Count of Cases with Fentanyl Detected per Case Submission Year

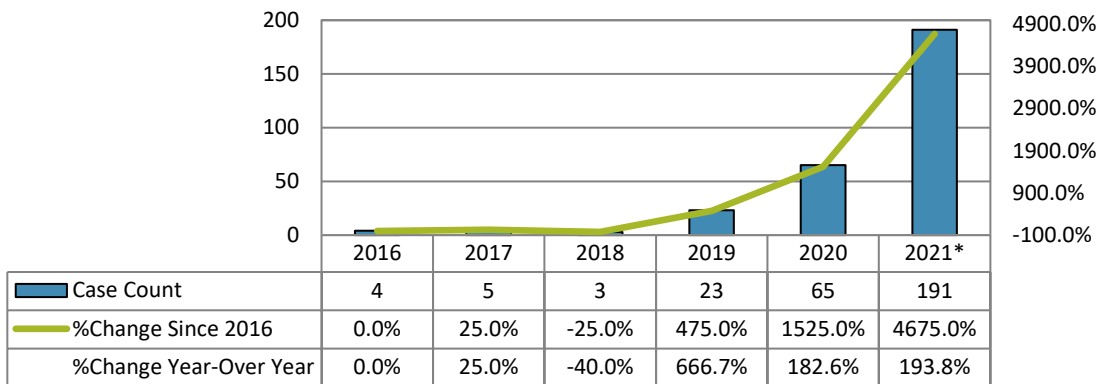


Figure 18: Graph depicting the number of cases that were submitted that had at least one fentanyl positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 4 cases submitted with at least one exhibit that had fentanyl detected.*Not all cases submitted in 2021 were completed as of the date of this report.

Methamphetamine

Methamphetamine is a highly addictive stimulant drug with a high risk for dependence. It can cause irregular heartbeat, delirium, panic, psychosis, and heart failure. It is a synthetic drug that takes the form of a white, odorless, bitter-tasting crystalline powder that easily dissolves in water or alcohol. It has more rapid and lasting effects than amphetamine, used illegally as a stimulant and as a prescription drug to treat narcolepsy and maintain blood pressure.

As illustrated in **Figure 19** the number of cases completed that had methamphetamine detected has decreased from 795 in 2016 to 734 in 2021, which equates to an approximate 7.7% decrease. Additionally, for the 1379 cases completed in 2021 approximately 53.2% of them had at least 1 methamphetamine positive exhibit.

Cases with Methamphetamine Detected per Case Completion Year

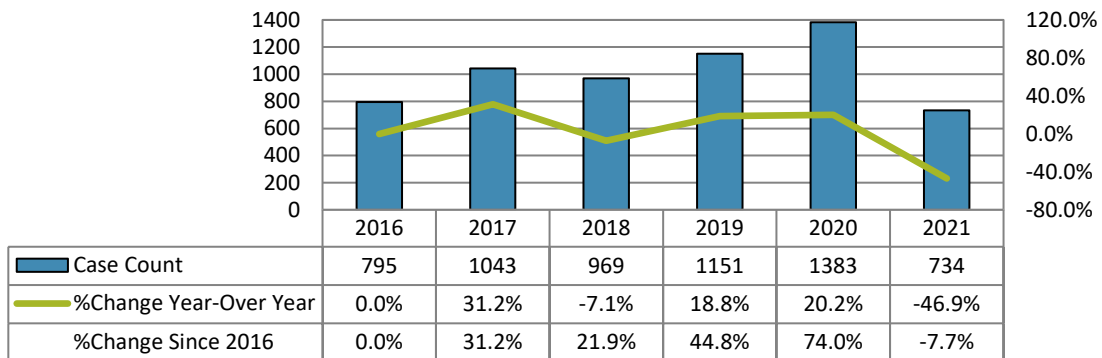


Figure 19: Graph depicting the number of cases that were completed that had at least one methamphetamine positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 795 cases completed with at least one exhibit that had methamphetamine detected.

As illustrated in **Figure 20** the number of cases completed that had methamphetamine detected has increased from 956 in 2016 to 1017 in 2021, which equates to an approximate 6.4% increase. Additionally, for the 1837 (**Figure 14**) cases submitted in 2021 approximately 55.3% of them had at least 1 methamphetamine positive exhibit.

Cases with Methamphetamine Detected per Case Submission Year

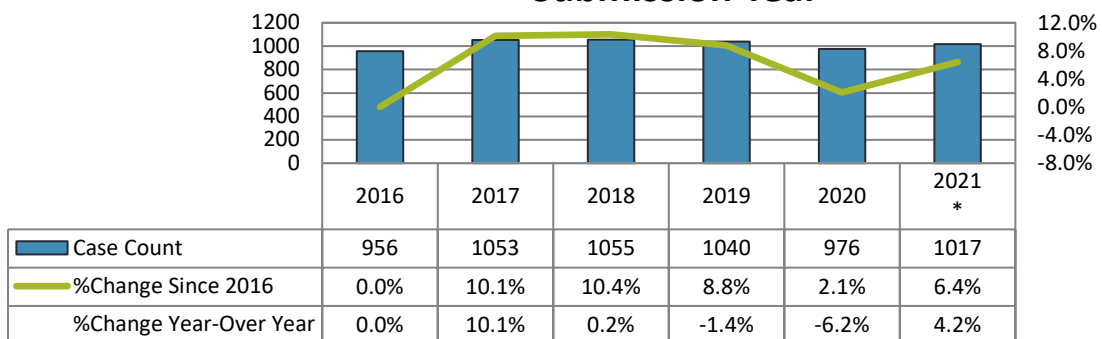


Figure 20: Graph depicting the number of cases that were submitted that had at least one methamphetamine positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 956 cases submitted with at least one exhibit that had methamphetamine detected. *Not all cases submitted in 2021 were completed as of the date of this report.

Cocaine

Cocaine is an addictive stimulant drug obtained from the leaves of two different coca plant species. It is submitted to the laboratory in the form of a white powder, or can be in the form that looks like a small irregularly shaped rock (cocaine base), or mixed with other illicit drugs. It speeds up the whole body making the abuser feel full of energy, happy, and excited; however, the person's mood might change and they can become angry, nervous, and afraid. It's long term adverse effects include heart attacks or strokes.

As illustrated in **Figure 21** the number of cases completed that had cocaine detected has decreased from 197 in 2016 to 146 in 2021, which equates to an approximate 25.9% decrease. Additionally, for the 1379 cases completed in 2021 approximately 10.5% of them had at least 1 cocaine positive exhibit.

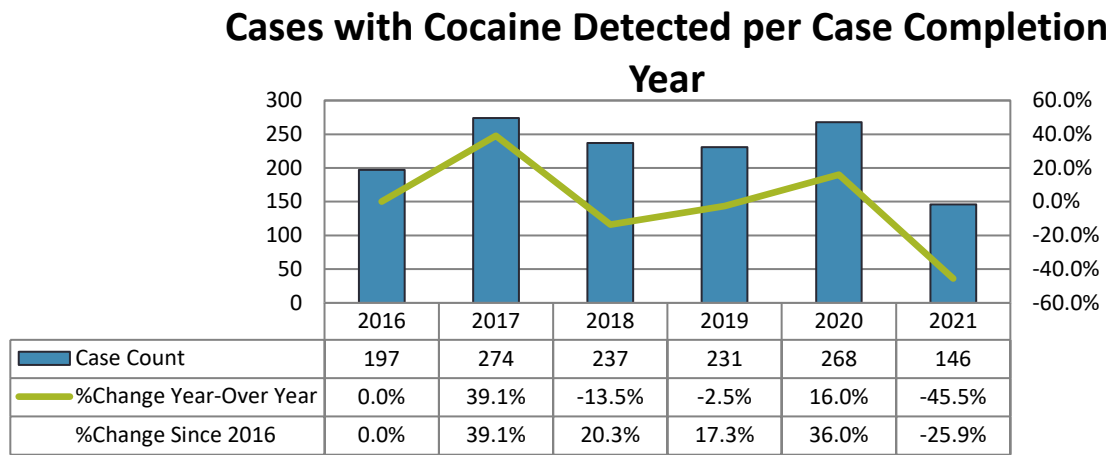


Figure 21: Graph depicting the number of cases that were completed that had at least one cocaine positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 197 cases completed with at least one exhibit that had cocaine detected.

As illustrated in **Figure 22** the number of cases submitted that had cocaine detected has decreased from 227 in 2016 to 202 in 2021, which equates to an approximate 11.0% decrease. Additionally, for the 1837 (**Figure 14**) cases submitted in 2021 approximately 10.9% of them had at least 1 cocaine positive exhibit.

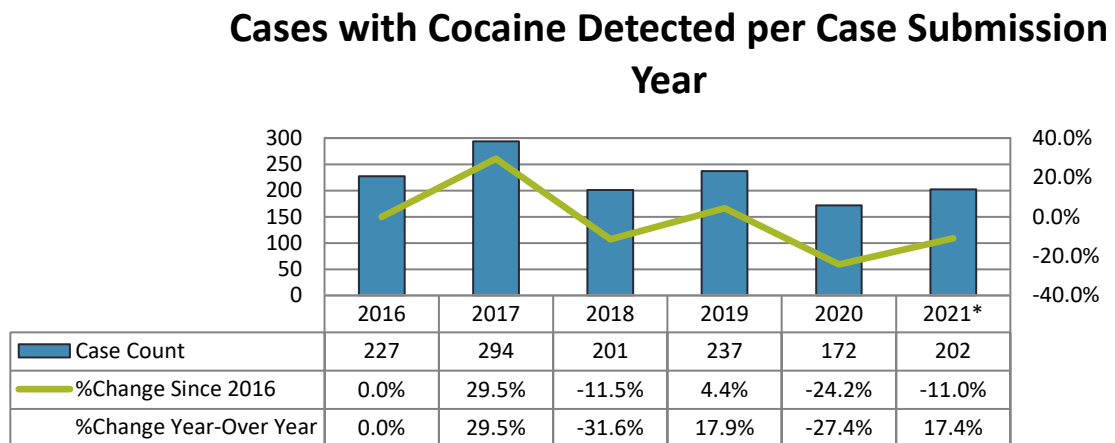


Figure 22: Graph depicting the number of cases that were submitted that had at least one cocaine positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 227 cases submitted with at least one exhibit that had cocaine detected. *Not all cases submitted in 2021 were completed as of the date of this report.

Marijuana containing Tetrahydrocannabinol

As illustrated in **Figure 23** the number of cases completed that had marijuana containing tetrahydrocannabinol detected has decreased from 858 in 2016 to 383 in 2021, which equates to an approximate 55.4% decrease. Additionally, for the 1379 cases completed in 2021 approximately 10.5% of them had at least 1 marijuana containing THC positive exhibit.

Cases with Marijuana containing THC Detected per Case Completion Year

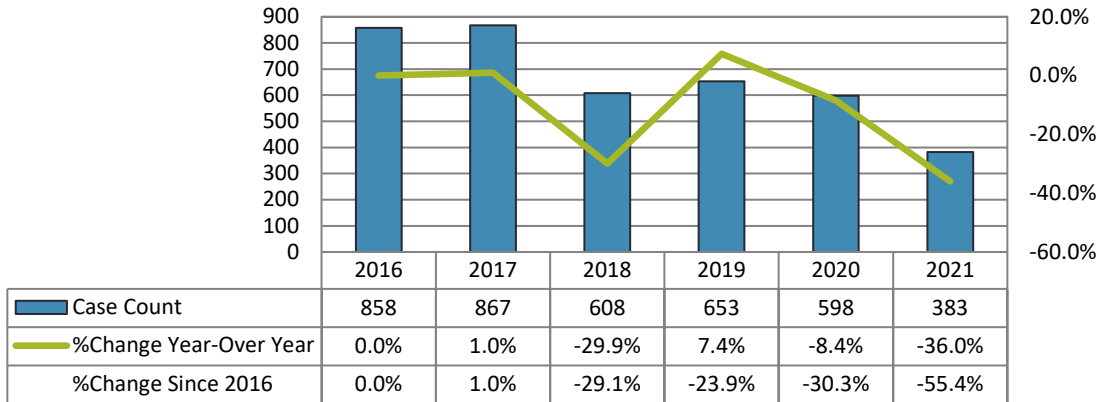


Figure 23: Graph depicting the number of cases that were completed that had at least one marijuana containing tetrahydrocannabinol positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 858 cases completed with at least one exhibit that had marijuana containing tetrahydrocannabinol detected.

As illustrated in **Figure 24** the number of cases submitted that had marijuana containing tetrahydrocannabinol detected has decreased from 920 in 2016 to 497 in 2021, which equates to an approximate 46.0% decrease. Additionally, of the 1837 (**Figure 14**) cases submitted in 2021 approximately 27.0% of them had at least 1 marijuana containing THC positive exhibit.

Cases with Marijuana containing THC Detected per Case Submission Year

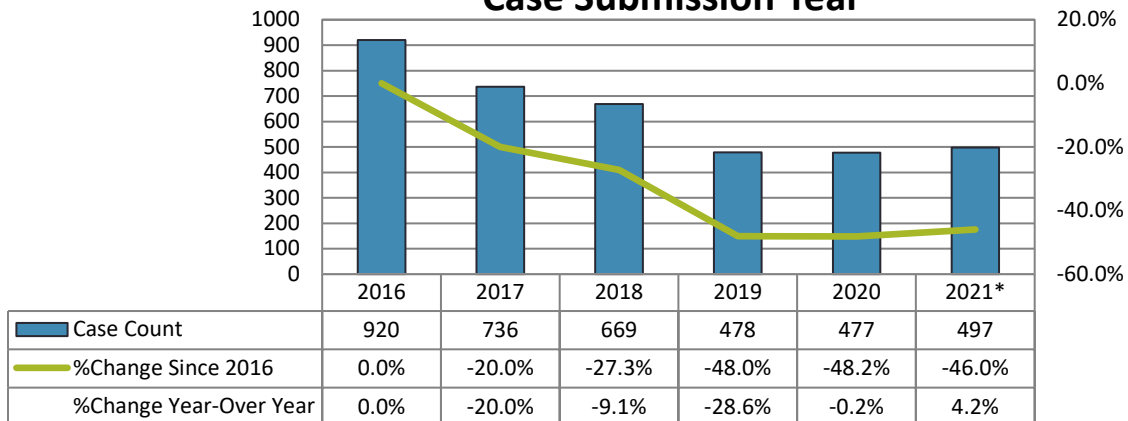


Figure 24: Graph depicting the number of cases that were submitted that had at least one marijuana containing tetrahydrocannabinol positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 920 cases submitted with at least one exhibit that had cocaine detected. *Not all cases submitted in 2021 were completed as of the date of this report.

Tetrahydrocannabinol

Tetrahydrocannabinol (THC) is a psychoactive substance found in the cannabis sativa plant, of which marijuana and hemp are two varieties. Typically, tetrahydrocannabinol is submitted to the laboratory in oil form or mixed with other drugs of abuse. THC can be confirmed by the laboratory even when marijuana is not able to be confirmed via microscopy.

As illustrated in **Figure 25** the number of cases completed that had THC detected has increased from 314 in 2016 to 430 in 2021, which equates to a 36.9% increase. Additionally, of the 1379 cases completed in 2021 approximately 31.1% of them at least 1 tetrahydrocannabinol positive exhibit.

Cases with Tetrahydrocannabinol Detected per Case Completion Year

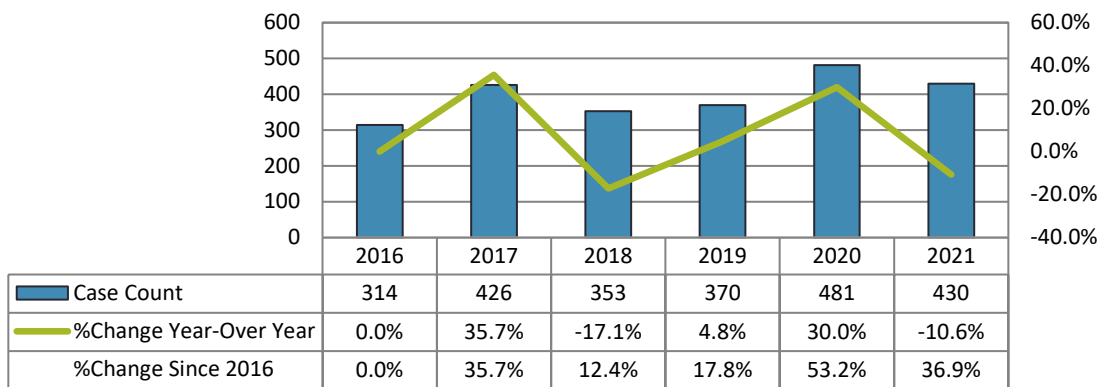


Figure 25: Graph depicting the number of cases that were completed that had at least one tetrahydrocannabinol positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 314 cases completed with at least one exhibit that had tetrahydrocannabinol detected.

As illustrated in **Figure 26** the number of cases submitted that had THC detected has increased from 397 in 2016 to 538 in 2021, which equates to an approximate 35.5% increase since 2016. Additionally, of the 1837 (**Figure 14**) cases submitted 29.2% of them at least 1 tetrahydrocannabinol positive exhibit.

Cases with Tetrahydrocannabinol Detected per Case Submission Year

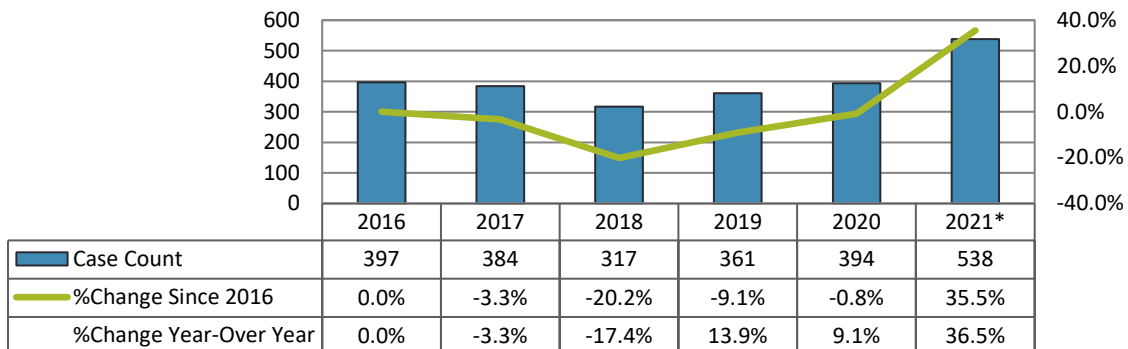


Figure 26: Graph depicting the number of cases that were submitted that had at least one tetrahydrocannabinol positive exhibit associated with it over the past 6 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2016, which had 397 cases submitted with at least one exhibit that had tetrahydrocannabinol detected. *Not all cases submitted in 2021 were completed as of the date of this report.

Clonazepam

Clonazepam is the most potent of a series of 1-4 triazolobenzodiazepines that may cause severe sedation. Clonazepam is a triazolo-analogue of the registered drug clonazepam. Clonazepam is sold in powdered form as well as in blotter, liquid, and tablet form. In recent years clonazepam has been increasingly sold as falsified designer benzodiazepines (commonly as diazepam and alprazolam).

As illustrated in **Figure 27** the number of cases completed that had clonazepam detected has increased from 0 in 2017 to 60 in 2021, which equates to a 6000.0% increase. Additionally, for the 1379 cases completed in 2021 approximately 4.3% of them had at least 1 clonazepam positive exhibit.

Cases with Clonazepam Detected per Case Completion Year

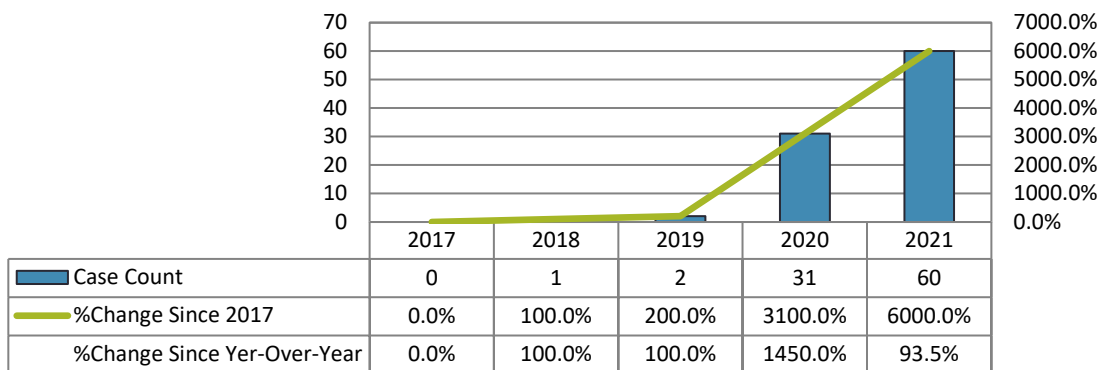


Figure 27: Graph depicting the number of cases that were completed that had at least one clonazepam positive exhibit associated with it over the past 5 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2017, which had 0 cases completed with at least one exhibit that had tetrahydrocannabinol detected

As illustrated in **Figure 28** the number of cases completed that had clonazepam detected has increased from 0 in 2017 to 75 in 2021, which equates to a 7500.0% increase. Additionally, for the 1837 (**Figure 14**) cases submitted in 2021 approximately 4.0% of them had at least 1 clonazepam positive exhibit.

Cases with Clonazepam Detected per Case Submission Year

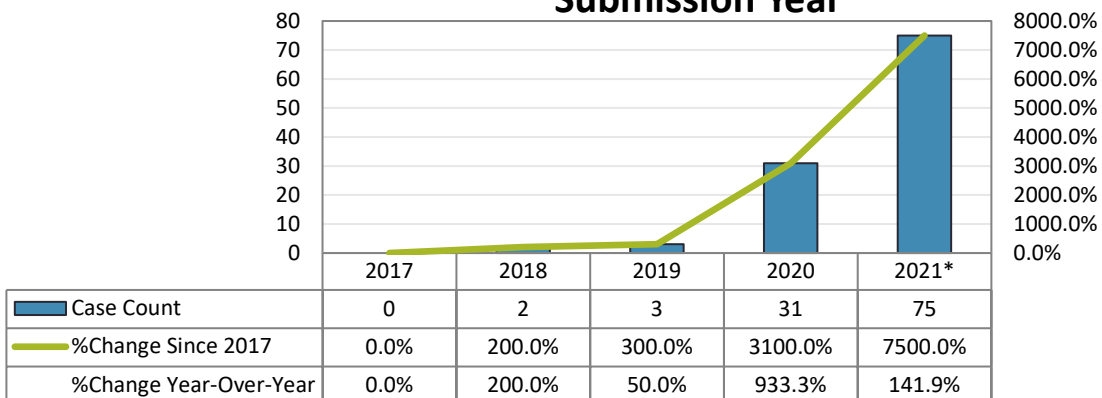


Figure 28: Graph depicting the number of cases that were submitted that had at least one clonazepam positive exhibit associated with it over the past 5 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2017, which had 0 cases submitted with at least one exhibit that had tetrahydrocannabinol detected. *Not all cases submitted in 2021 were completed as of the date of this report.

Eutylone

Eutylone is a substituted cathinone which is a category of drugs related to cathinone, which is found naturally occurring in the khat plant. Eutylone is an empathogen, which increases an individual's feeling of empathy and benevolence and increases the feeling of being socially accepted by and connected with others. It's effects are similar to other stimulant and empathogenic drugs such as MDMA, cocaine and amphetamines.

As illustrated in **Figure 29** the number of cases completed that had eutylone detected has increased from 0 in 2019 to 22 in 2021, which equates to a 2200.0% increase. Additionally, for the 1379 cases completed in 2021 approximately 1.5% of them had at least 1 eutylone positive exhibit.

Count of Cases with Eutylone Detected per Case Completion Year

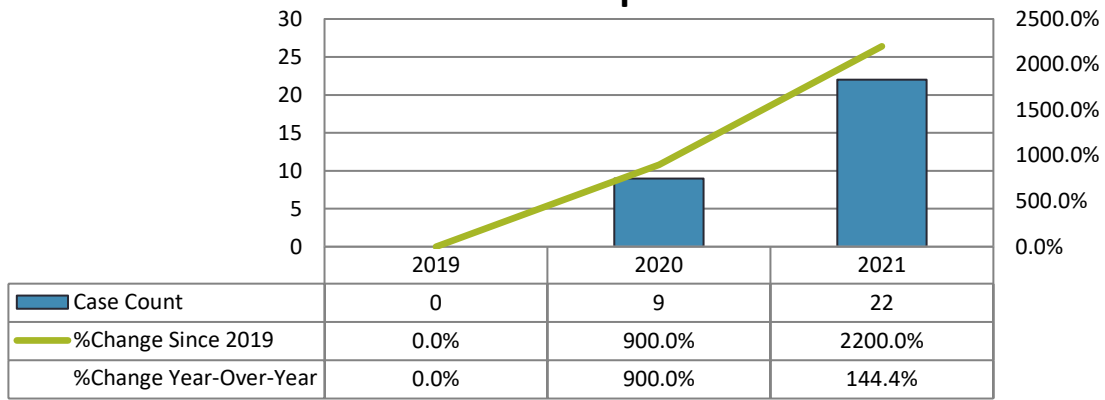


Figure 29: Graph depicting the number of cases that were completed that had at least one eutylone positive exhibit associated with it over the past 3 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2019, which had 0 cases completed with at least one exhibit that had eutylone detected.

As illustrated in **Figure 30** the number of cases completed that had eutylone detected has increased from 0 in 2019 to 23 in 2021, which equates to a 2300.0% increase. Additionally, for the 1837 (**Figure 14**) cases submitted in 2021 approximately 1.2% of them had at least 1 clonazepam positive exhibit.

Count of Cases with Eutylone Detected per Case Submission Year

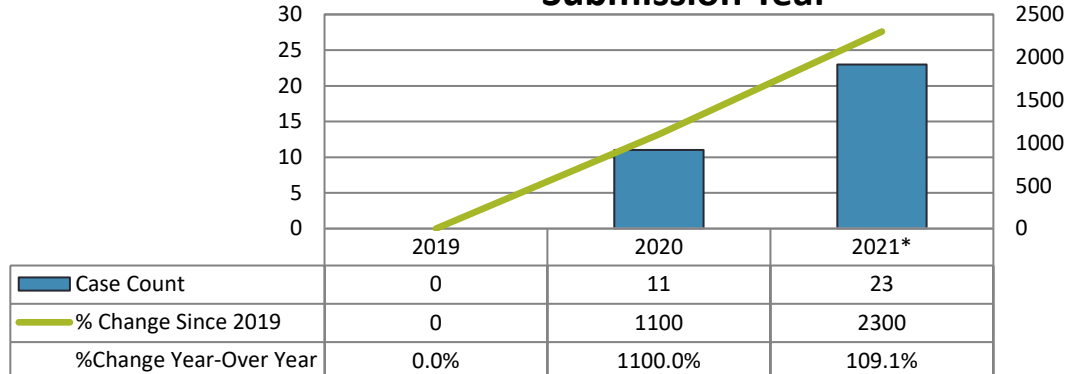


Figure 30: Graph depicting the number of cases that were submitted that had at least one eutylone positive exhibit associated with it over the past 3 years. Also, the graph depicts the % change year-over-year and the cumulative % change since 2019, which had 0 cases submitted with at least one exhibit that had tetrahydrocannabinol detected. *Not all cases submitted in 2021 were completed as of the date of this report.

FIRE DEBRIS

The Fire Debris Laboratory examines fire debris evidence 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 2021, the Fire Debris Laboratory received evidence from 35 cases with a total of 37 submissions. The trend of case submissions over the last five years is illustrated in **Figure 31**.

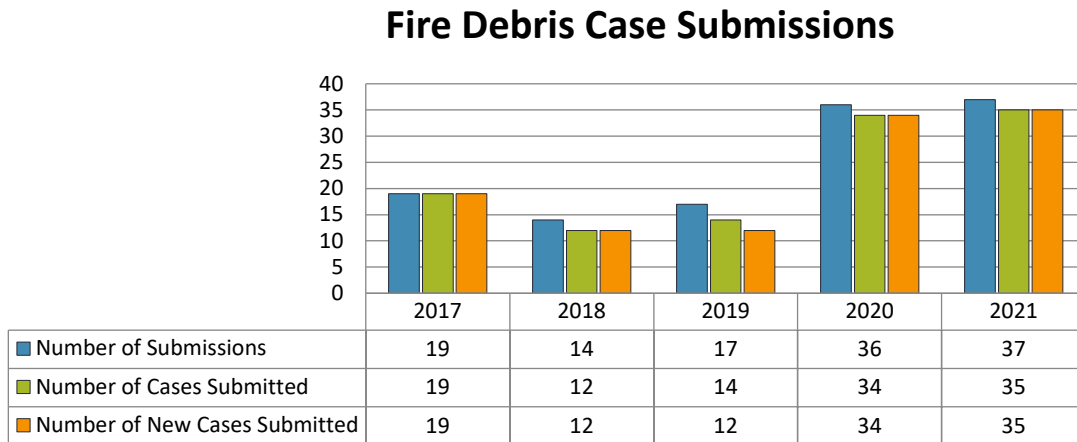


Figure 31: Number of fire debris cases submitted over a five year period.

FIREARMS

Firearm examination is conducted in support of state and federal law enforcement. The Firearms Laboratory conducts many types of forensic examinations. The majority of examinations involve operability (function) tests on the submitted firearms. Other exams performed by the Firearms Laboratory include bullet comparisons, cartridge case comparisons, and serial number restorations. In 2021, the Firearms Laboratory received evidence from 68 cases with a total of 78 submissions. The trend of case submissions over the last five years is illustrated in **Figure 32**. During 2019, the Center lost both qualified examiners, resulting in a decrease in submissions. However, the Center was able to hire two examiners, both of whom were qualified to perform function test casework, and one of whom was qualified to perform serial number restoration casework in 2021.

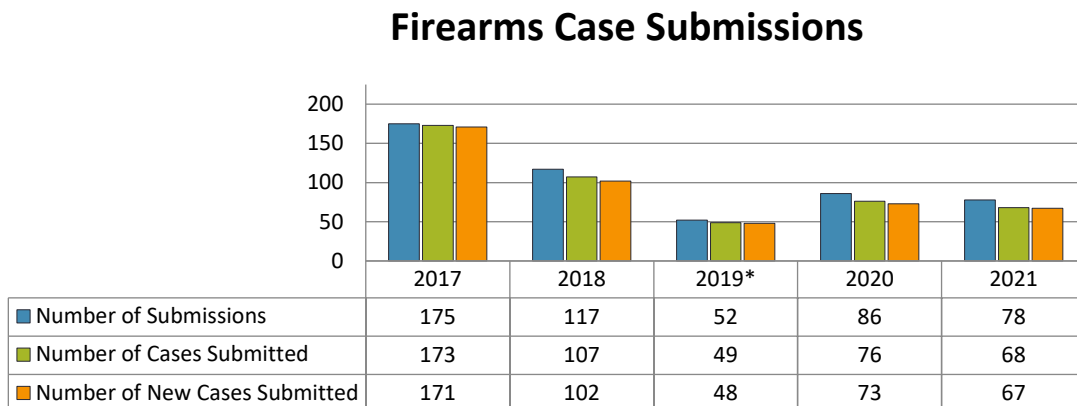


Figure 32: Firearm case submissions from 2017 through 2021. *In 2019, the Firearms Laboratory lost both qualified scientists. This required the laboratory to suspend receiving evidence for approximately 6 months.

Examination types (test fire, bullet comparison, cartridge case comparison, serial number restoration) that were performed during each of the last five years are illustrated in **Figure 33**.

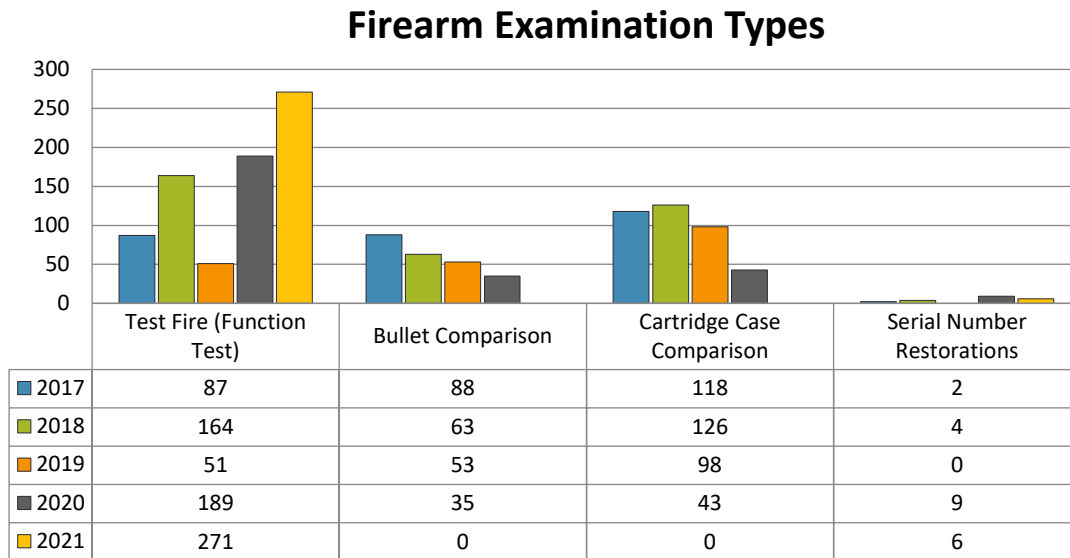


Figure 33: Case examination requests in the Firearms Laboratory; classified as test fires, bullet comparisons, cartridge case comparisons, and serial number restorations. In 2021, the scientist(s) in the Firearms Laboratory were qualified to perform function tests and serial number restorations.

BIOLOGY/DNA

The Biology/DNA Laboratory 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 laboratory screens evidence for the presence of biological material (blood, semen, saliva, and feces). For DNA analysis, the laboratory generates short tandem repeat (STR) profiles from the scene exhibits, those profiles can then be compared to reference standards collected from individuals believed to be associated to the scene (victims, suspects, or other known individuals). Ultimately, results are interpreted and a conclusion is 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, which can lead to low quantity/degraded samples. All of these factors affect the laboratory's ability to obtain a comparable profile. If a profile is suitable for comparison, statistical analysis may be 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 2021, the Biology/DNA Laboratory received evidence from 302 cases with a total of 456 submissions. The trends of case submissions over the past five years are illustrated in **Figure 34**.

Biology Case Submissions

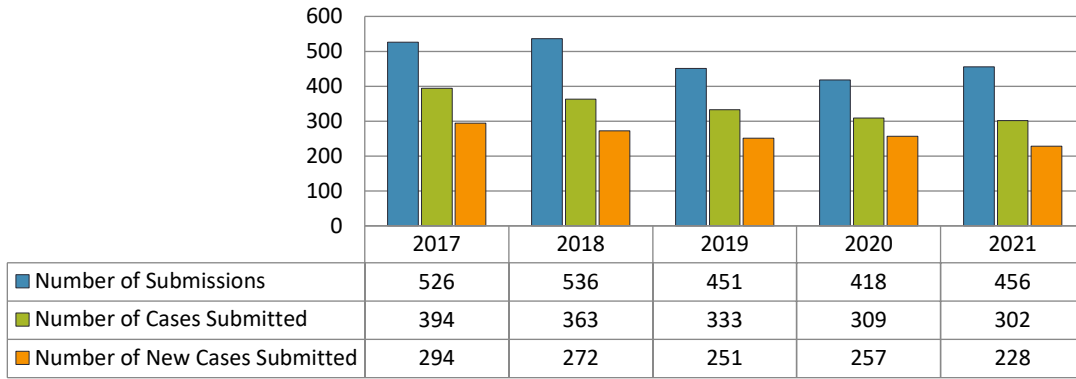


Figure 34: Number of cases submitted to the Biology/DNA Laboratory over a five year period.

Figure 35 illustrates the various case types commonly submitted for biological testing. Sex Crime cases were the most common case type submitted for examination. Property crimes continue to have 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. Approximately 1% of the case types are categorized as other. This category may include cases involving attempted murder, vandalism, narcotics, stalking, etc. The laboratory identified human remains for 14 non-homicide cases submitted by the District Coroner through forensic DNA analysis.

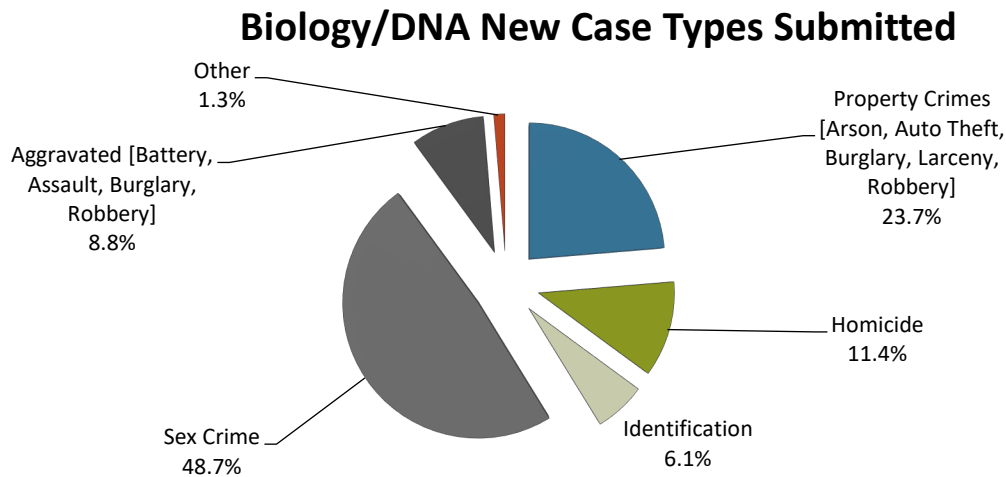


Figure 35: Classification of cases submitted for Biology/DNA analysis.

The number of sex crime cases submitted to the Biology/DNA Laboratory over the last five years is illustrated in Figure 36. In 2021, the Biology/DNA Laboratory received evidence from 154 sex crime cases with a total of 212 submissions, marking a record high for new case submissions in any single year, and continues the trend of an increase in sex crime case submissions.

Sex Crime Case Submissions

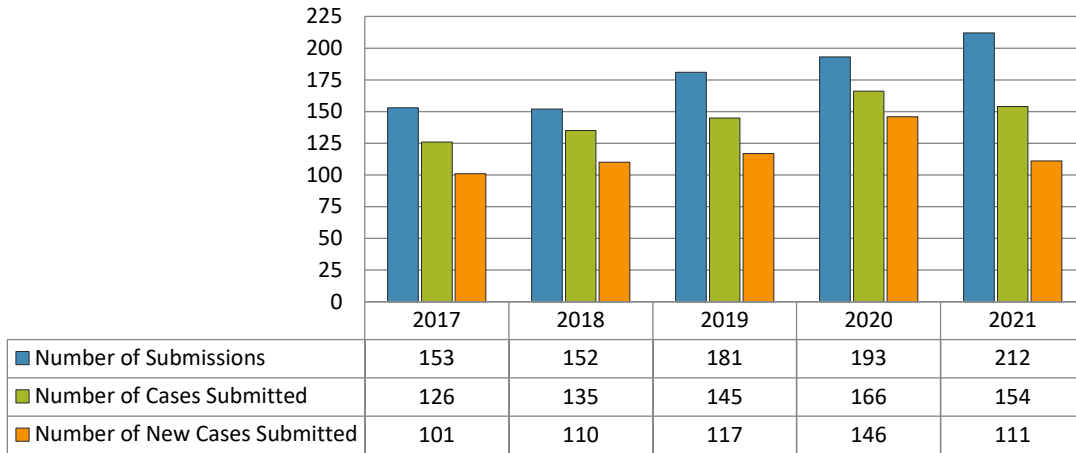


Figure 36: The number of sex crime case submissions to the Biology/DNA Laboratory over the last five years.

CODIS

The Combined DNA Index System (CODIS) is database software used to compare DNA profiles within and between crime laboratories throughout the nation. In 2007 Kansas became an all arrestee state, meaning that law enforcement collects DNA samples for any person arrested for qualifying offenses. The DNA profile generated from the arrestee/offender is entered into the state database (SDIS) in Topeka, KS and is available to be searched against the unknown profiles the laboratory enters into our local database (LDIS). In late 2009, the DNA Laboratory adopted new procedures for the release of investigative lead information to include formal written and reviewed notifications for database associations.

Over the years, the increased number of associations identified through CODIS resulted in an increase in reports generated, as well as an increase in the number of known samples processed to confirm these additional CODIS hits. 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 describing case submissions.

Trends in CODIS activity are illustrated in **Figure 37 and Figure 38**. In the last 5 years, the average number of case profiles entered into CODIS is 135, the average number of hits per year is 92, and the average number of investigations aided per year is 80.

CODIS

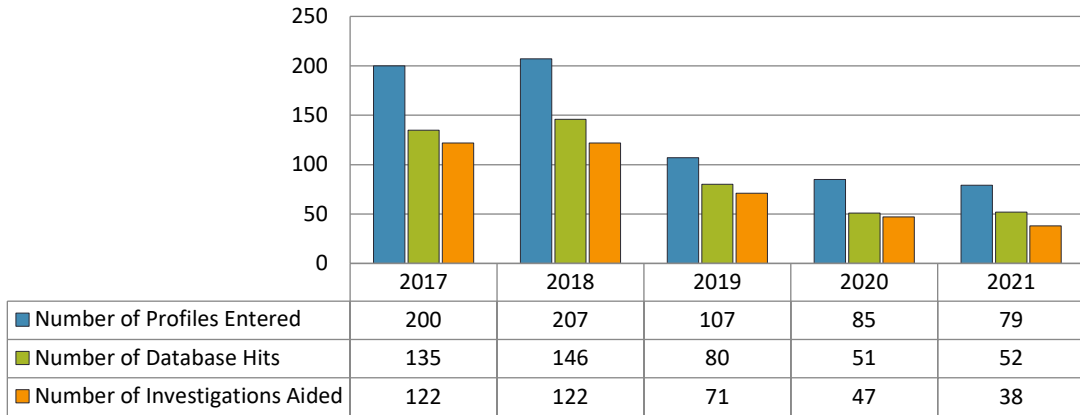


Figure 37: Five (5) year depiction of the number of DNA profiles entered into CODIS as well as the number of database hits and number of investigations aided.

Cumulative CODIS Data

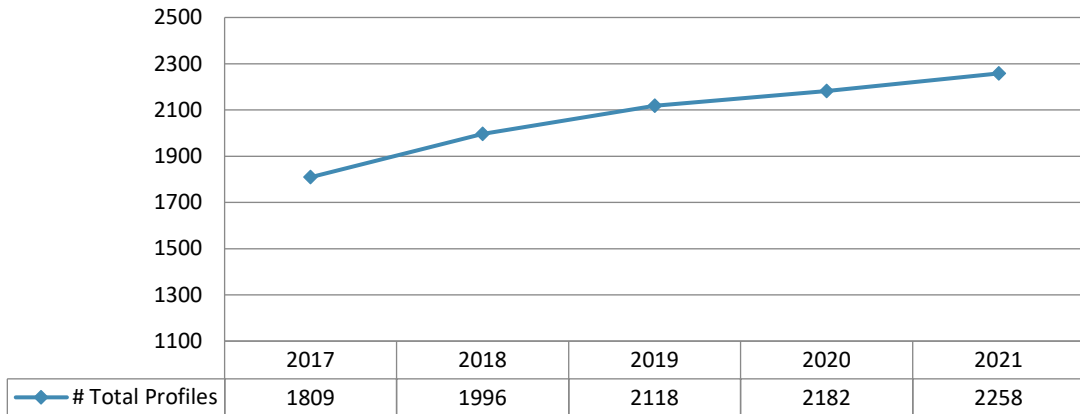


Figure 38: The graph and chart depicts total number of profiles residing in the database (LDIS) at the end of each year.

Unknown and Known Exhibits Examined

The Biology/DNA Laboratory examines unknown samples (Qs) from crime scene exhibits and known samples (Ks) collected from known individuals. The number of exhibits submitted in any given case can vary greatly. Some investigations may involve multiple scenes and individuals, while others require the testing of a single sample. Therefore, to reflect the workload of the section, it is often useful to also capture data involving the number of exhibits the section has tested or processed and the number of DNA profiles that required scientist interpretation and comparison.

Figure 39 below illustrates the number of unknown and known exhibits examined by the laboratory over the past five years. **Figure 40** below illustrates the number of DNA profiles generated by Polymerase Chain Reaction (PCR) from the unknown and known exhibits over the same period.

Number of Exhibits Examined

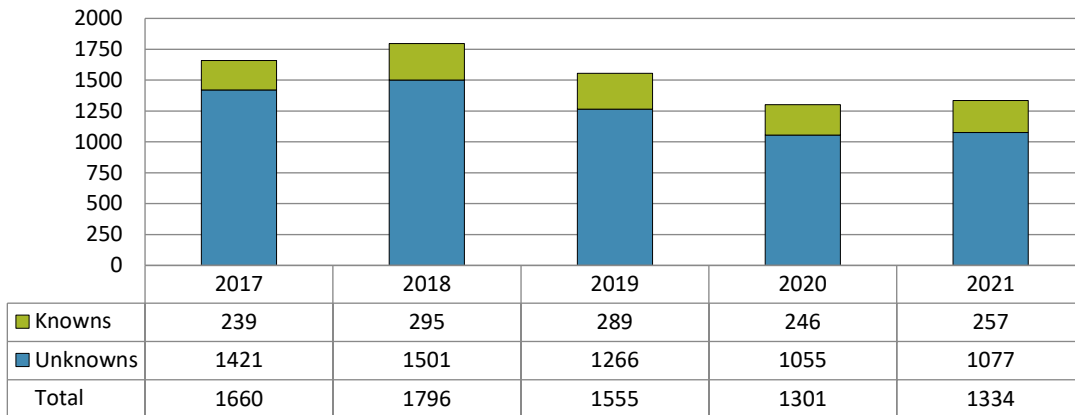


Figure 39: The number of unknown and known exhibits examined by the Biology/DNA Laboratory in each of the past five years.

Number of DNA Profiles Generated

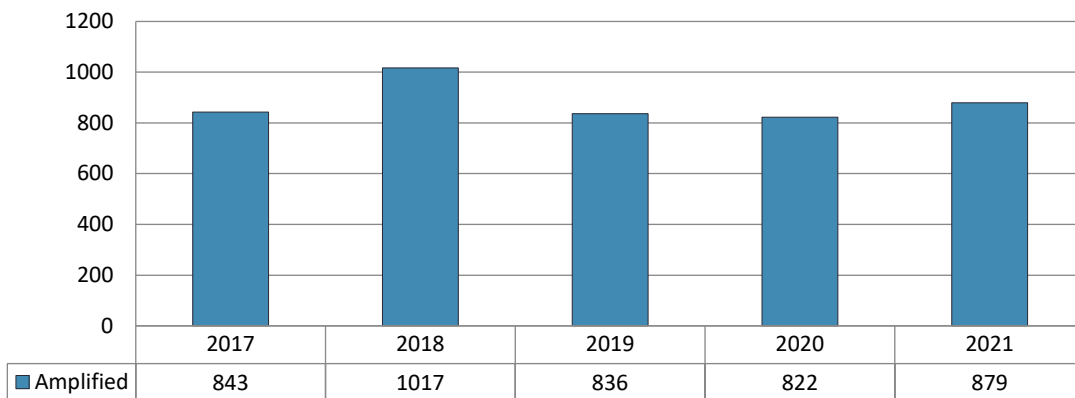


Figure 40: The number of profile generated from PCR amplification by the Biology/DNA Laboratory in each of the past five years.

TOXICOLOGY

The Toxicology Laboratory provides comprehensive examinations of postmortem (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 and/or alcohol cases and drug-facilitated sexual assault cases are also examined by the Toxicology Laboratory. The Toxicology Laboratory also provides drug testing on children removed from clandestine methamphetamine laboratories.

Due to the ever changing emerging drugs that are available for use and/or abuse, the laboratory is continuously expanding the number of drugs and poisons it can detect and quantitate.

A significant portion of samples submitted are from postmortem (PM) cases, the number of which is dependent upon the number of autopsies performed at the Center by the Pathology Division. The remaining portion of the cases are antemortem cases submitted for analysis by law enforcement agencies. These include DUI (driving under the influence), DUID (driving under the influence of drugs), DFSA (drug facilitated sexual assault) and other antemortem cases submitted by law enforcement agencies.

Illustrated in **Figure 41** is the total number of case submissions, the number of cases submitted, and the number of new cases submitted to the Toxicology Laboratory over a 5 year period. The average of new cases being submitted to the laboratory over the past 5 years is 1120.

Toxicology Case Submissions

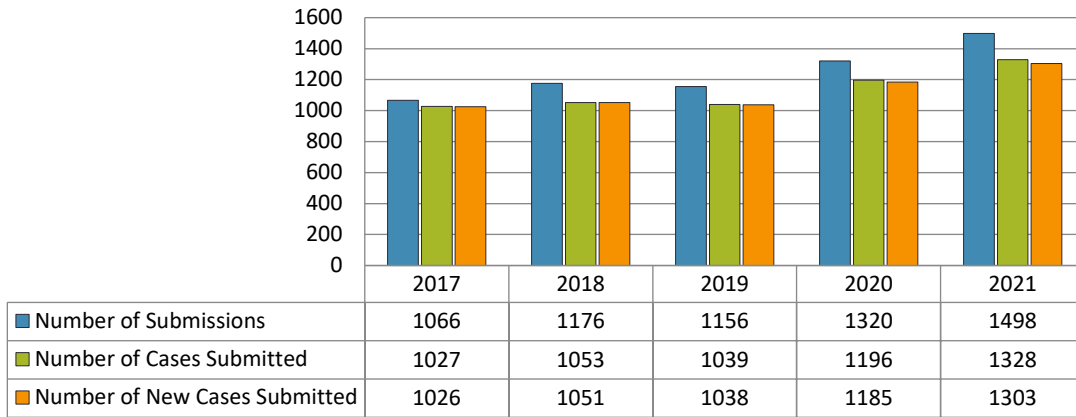


Figure 41: The number of case submissions, the number of cases submitted, and the number of new cases submitted to the Toxicology Laboratory for analysis over a five year period.

As illustrated in **Figure 42** the number of new postmortem case submissions has increased from 812 in 2016 to 961 in 2021, which equates to an increase of 18.3% of new postmortem case submissions since 2016.

Toxicology Postmortem New Case Submissions

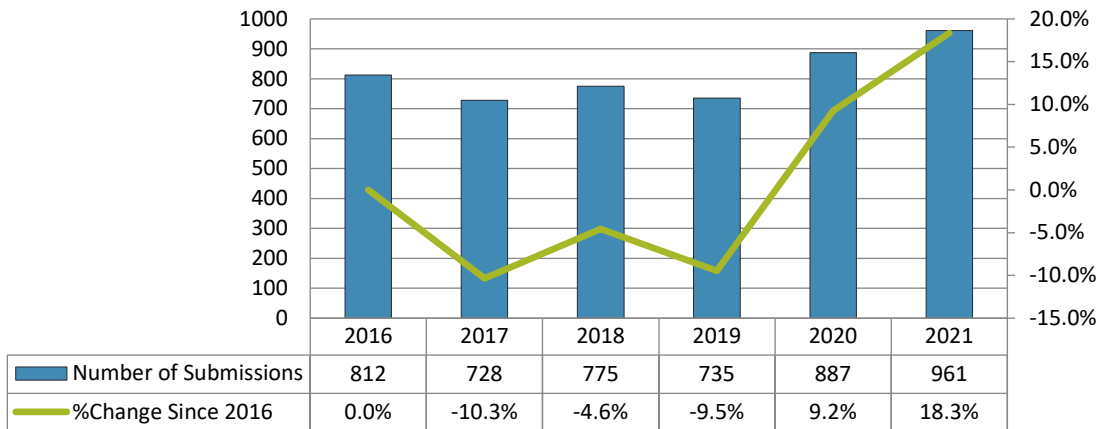


Figure 42: The graph depicts the number of new postmortem case submissions and the cumulative percent change since 2016.

As illustrated in **Figure 43** the number of new antemortem case submissions as increased from 288 in 2016 to 342 in 2021, which equates to an increase of 18.8% of new antemortem case submissions since 2016.

Toxicology Antemortem New Case Submissions

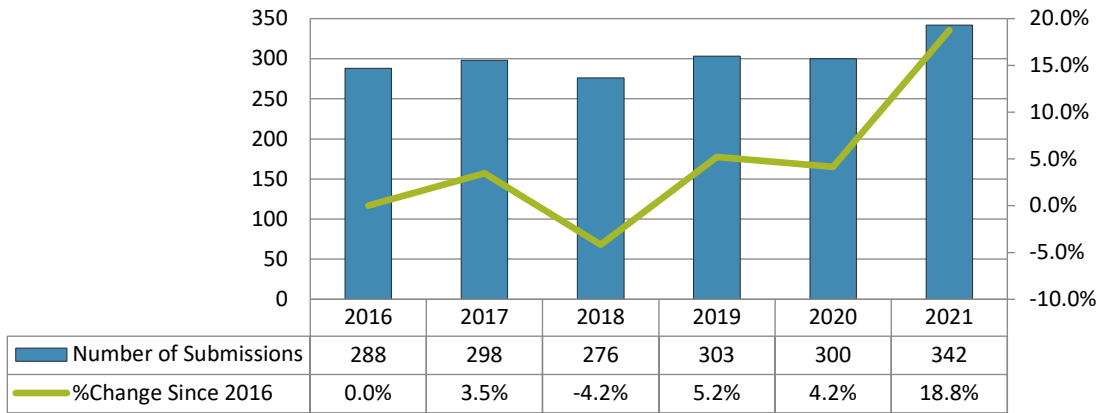


Figure 43: The graph depicts the number of new antemortem case submission and the cumulative percent change since 2016.

As illustrated in **Figure 44** the number of total new case submissions to the Toxicology Laboratory has increased from 1100 in 2016 to 1303 in 2021, which equates to an increase of 18.5% of new case submissions since 2016.

Total Toxicology New Case Submissions

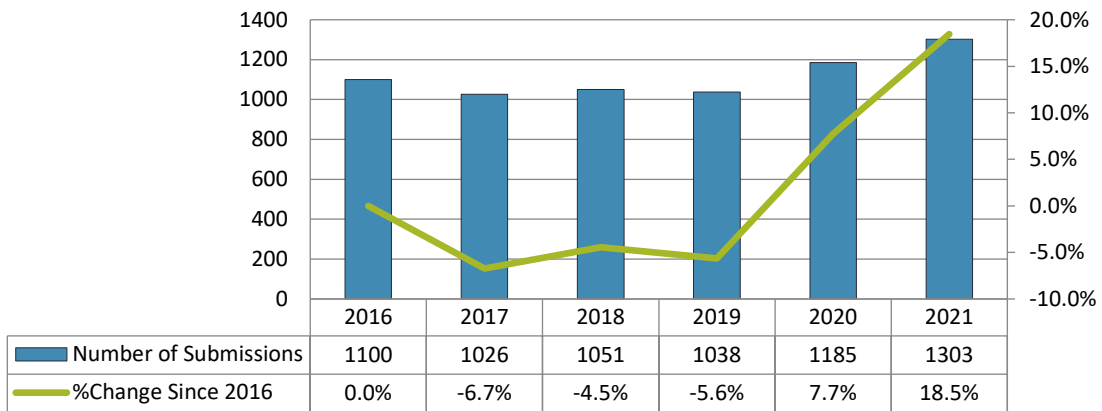


Figure 44: The graph depicts the number of total new case submissions to the Toxicology Laboratory and the cumulative percent change since 2016.

The percentage of toxicology cases submitted by case type is illustrated in **Figure 45**. Postmortem (PM) toxicological examinations in support of the District Coroner account for approximately 73.5% of the forensic case work performed by the laboratory.

Toxicology Case Types

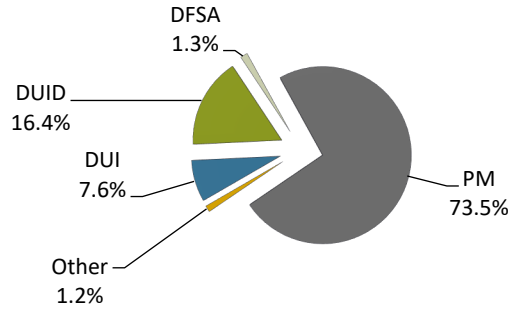


Figure 45: Submission of toxicology cases, sorted by case type. DUI (driving under the influence of alcohol), DUID (driving under the influence of drugs), PM (postmortem), DFSA (drug facilitated sexual assault), and Other (Aggravated Battery, Aggravated Assault, Drug, Homicide, and Undetermined).

Overdoses

Overdose deaths can be either accidental or intentional. Methamphetamine or an opioid are very commonly detected by the Toxicology Laboratory in the specimens collected at autopsy. In 2021, there were a total of 298 overdose fatalities, which equates to an approximate 132.8% increase from 2016 and a 52.8% increase from 2020 [Figure 46].

Count of Overdose Deaths per Submission Year

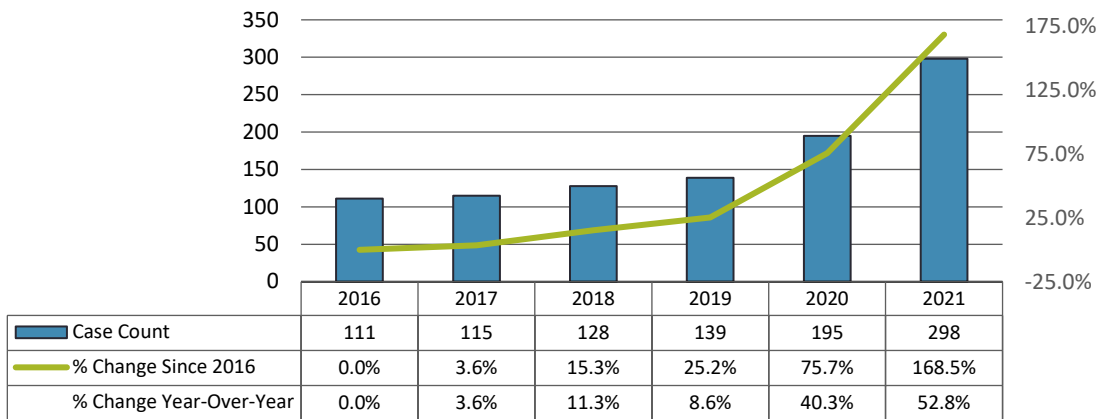


Figure 46: Percent change in overdose deaths year over year and the cumulative percent change for each year since 2016.

Opioid Related Deaths

Opioid deaths were at another record high in 2021 with a total of 259 (previous high was 180 in 2020). The range of opioid related deaths over the past seven years is 136 to 259 with an average of 165 deaths. **Figure 47** provides the count of opioid related deaths broken down into four categories (Fentanyl, Heroin, Oxycodone, and Other Opioids).

Opioid Related Deaths

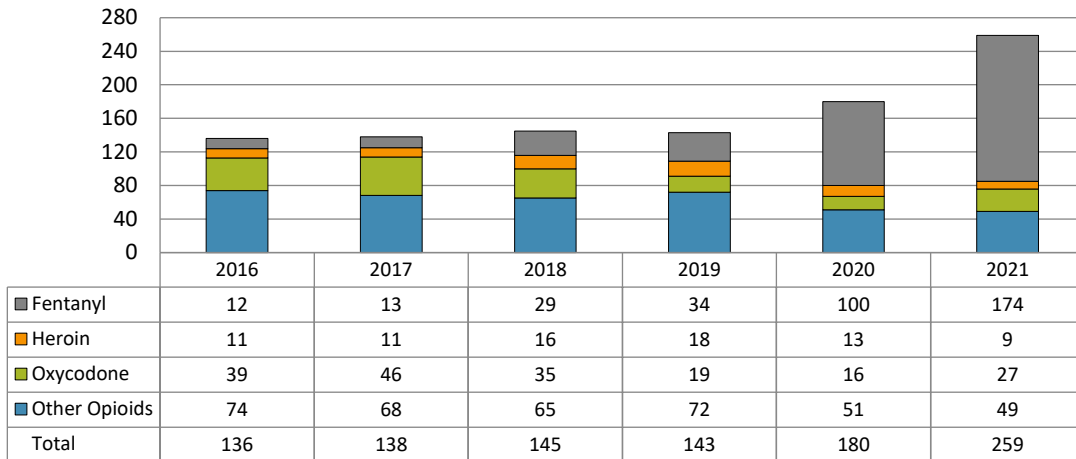


Figure 47: Opioid related deaths detected in Postmortem Toxicology cases.

Figure 48 illustrates the number of fentanyl related deaths, the percent change year-over-year, and the cumulative percent change since 2016 per submission year.

Count of Fentanyl Related Deaths per Submission Year

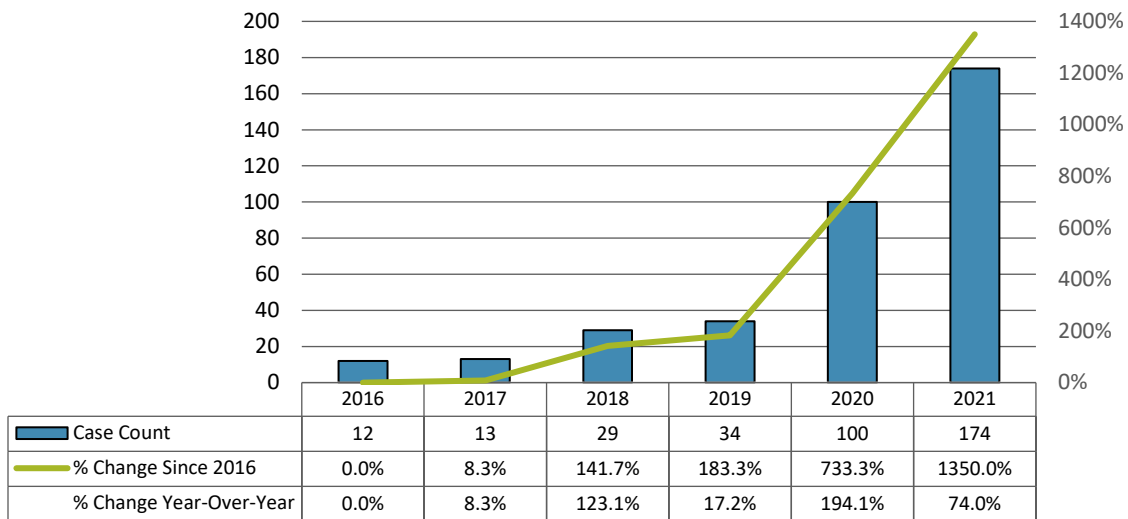


Figure 48: illustrates the number of fentanyl related deaths, the percent change year-over-year, and the cumulative percent change since 2016 per submission year.

Listed in **Table 3** is the number of cases that each opioid was detected in Postmortem Toxicology specimens per submission year. In 2021, the number of cases in which fentanyl was detected increased to 175, which is an increase of approximately 1246% from 2017.

Opioids Detected in Postmortem Specimens	2017	2018	2019	2020	2021
<i>4-Fluoro-isobutyryl fentanyl</i>	0	1	0	0	0
<i>6-Acetylmorphine (Heroin)</i>	12	16	17	22	20
<i>4-OH Mitragynine</i>	0	1	0	0	0
<i>Buprenorphine</i>	0	0	1	0	0
<i>Codeine</i>	5	10	7	6	11
<i>Dihydrocodeine</i>	0	0	0	0	5
<i>Fentanyl</i>	13	28	32	100	175
<i>Hydrocodone</i>	36	35	27	25	26
<i>Hydromorphone</i>	4	5	4	8	11
<i>Methadone</i>	21	18	21	11	16
<i>Mitragynine</i>	0	2	1	4	1
<i>Morphine*</i>	26	35	40	38	41
<i>n-Demethyltramadol</i>	0	0	0	0	2
<i>Norbuprenorphine</i>	0	0	0	0	8
<i>Norfentanyl</i>	0	1	3	78	141
<i>o-Desmethyltramadol</i>	0	0	0	0	6
<i>Oxycodone</i>	47	39	19	24	38
<i>Oxymorphone</i>	9	8	3	2	8
<i>Propofol</i>	0	1	2	0	1
<i>Tramadol</i>	9	11	10	9	10

Table 3: Opioids detected in death cases over the last 5 years. *Some positive morphine cases may be due to a delayed heroin related death.

Table 4 illustrates the count of fentanyl related deaths in 2021 within each age group and whether the death occurred within Sedgwick County or out of county. The greatest number of deaths related to fentanyl occurred in the 21 to 40 year old age group.

	Age Group	Number of Deaths (All Counties)	Number of Deaths (Sedgwick County)
2021	0-20	19	14
	21-30	45	35
	31-40	50	41
	41-50	29	26
	51-60	21	21
	61-70	9	8
	71-80	1	1

Table 4: Illustrates the number of fentanyl related deaths within each age group for all cases examined and how many of those were from Sedgwick County.

Table 5 illustrates the count of opioid related deaths per non-natural manner and cause of death. Additionally, there were 28 cases determined to be natural that the decedent had an opioid detected in their toxicology specimens.

	Manner of Death	Cause of Death	Number of Deaths
2021	Accidental	OD Substance Toxicity	189
	Accidental	Blunt Force Injuries	12
	Accidental	Other	1
	Accidental	Suffocation Asphyxia	1
	Accidental	Drowning	1
	Accidental	Thermal Injuries	1
	Homicide	Firearms Injuries	3
	Suicide	Firearms Injuries	6
	Suicide	OD Substance Toxicity	1
	Suicide	Hanging Asphyxia	1
	Undetermined	Other	7
	Undetermined	OD Substance Toxicity	2
	Undetermined	Blunt Force Injuries	1

Table 5: Number of non-natural opioid related deaths categorized by manner of death and cause of death.

Methamphetamine Related Deaths

Methamphetamine related deaths have also shown a steady increase over the last several years. In fact, methamphetamine was detected in the highest number of cases (183) ever recorded at the Center in 2021. The range of methamphetamine related deaths over the past six years is 76 to 183 with an average of 117 deaths. **Figure 49** illustrates the number of methamphetamine related deaths, the percent change year-over-year, and the cumulative percent change since 2016 per submission year.

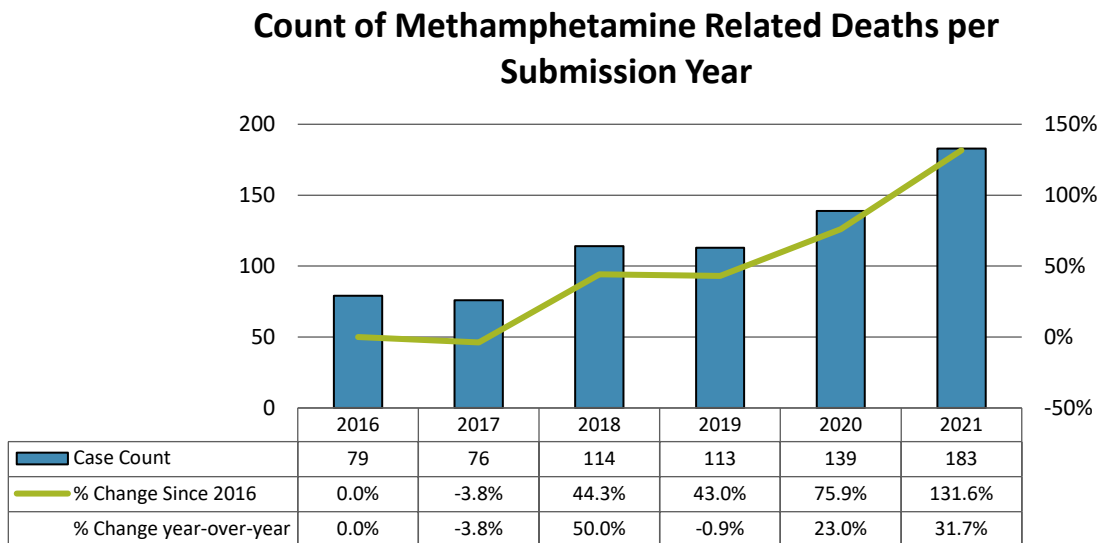


Figure 49: Illustrates the number of methamphetamine related deaths, the percent change year-over-year, and the cumulative percent change since 2016 per submission year.

Table 6 illustrates the count of methamphetamine related deaths per non-natural manner and cause of death. Additionally, there was one case determined to be natural where methamphetamine was detected in the decedent’s toxicology specimens.

	Manner of Death	Cause of Death	Number of Deaths
2021	Accidental	OD Substance Toxicity	126
	Accidental	Blunt Force Injuries	13
	Accidental	Thermal Injuries	3
	Accidental	Other	3
	Accidental	Hypothermia	2
	Accidental	Sharp Force Injuries	1
	Homicide	Firearms Injuries	9
	Homicide	Sharp Force Injuries	1
	Homicide	Blunt Force Injuries	1
	Suicide	Hanging Asphyxia	8
	Suicide	Firearms Injuries	6
	Suicide	OD Substance Toxicity	1
	Undetermined	Other	4

Table 6: The number of non-natural methamphetamine related deaths categorized by manner of death and cause of death.

Hundreds of different drugs can be detected in Postmortem 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 7** illustrates the number of 2021 Postmortem Toxicology cases where the most frequently detected drugs and/or metabolites were detected. Excluding Acetone and ethyl alcohol, there were a total of 103 different drugs and/or metabolites detected in 512 cases.

Drugs Detected in Postmortem Cases	Case Count	Percent of Case Detected
<i>Methamphetamine</i>	183	35.7
<i>Fentanyl</i>	173	33.7
<i>Amphetamine</i>	155	30.2
<i>Norfentanyl</i>	140	27.3
<i>Tetrahydrocannabinol</i>	130	25.3
<i>Benzoyllecgonine</i>	75	14.6
<i>Morphine*</i>	40	7.8
<i>Oxycodone</i>	37	7.2
<i>Cocaine</i>	33	6.4
<i>Carboxytetrahydrocannabinol</i>	30	5.8
<i>Alprazolam</i>	25	4.8
<i>Gabapentin</i>	22	4.2
<i>Cocaethylene</i>	20	3.9
<i>6-Acetylmorphine</i>	19	3.7
<i>7-Aminoclonazepam</i>	19	3.7
<i>Methadone</i>	14	2.7
<i>Codeine</i>	11	2.1
<i>Hydromorphone</i>	11	2.1
<i>Delta-9-tetrahydrocannabinol</i>	10	1.9
<i>Lorazepam</i>	10	1.9

Table 7: The most commonly detected drugs and/or metabolites detected in 2021 Postmortem Toxicology cases. Also, the percent of positive cases that each was detected. The remaining drugs and/or metabolites were detected in less than 10 cases. *Some positive morphine cases may be due to a delayed heroin related death.

Drugs and Alcohol in Driving Cases

Many driving cases involve drivers that are under the influence of drugs and/or alcohol (ethanol). **Table 8** provides the number of positively identified drugs from the 165 DUI/DUID (Driving Under the Influence of Drugs) cases that were completed in 2021. In total there were 34 different individual drugs, drug metabolites, and/or alcohol positively identified for a total of 256 drugs/alcohol from all completed cases.

Table 8 illustrates the number of driving case specimens tested positive for each listed drug, drug metabolite, and/or alcohol in 2021. In 2021 completed cases, 49.6% of cases tested positive for alcohol and 30.3% tested positive for tetrahydrocannabinol.

Completion Year	Drug Name	Number Detected
2021	Ethanol	83
	Tetrahydrocannabinol	51
	Methamphetamine	27
	Amphetamine	20
	Fentanyl	11
	Norfentanyl	11
	Alprazolam	9
	Benzoyllecgonine	5
	Methadone	4
	Morphine	3
	Nordiazepam	3
	Clonazepam	2
	Codeine	2
	Flubromazolam	2
	Hydrocodone	2
	o-Desmethyltramadol	2
	Zolpidem	2
	7-Aminoclonazepam	1
	Butalbital	1
	Carisoprodol	1
	Cocaine	1
	Difluoroethane	1
	Doxylamine	1
	Es/citalopram	1
	Etizolam	1
	Meprobamate	1
	Methylenedioxyamphetamine	1
	Methylenedioxymethamphetamine	1
	Norbuprenorphine	1
	Oxycodone	1
	Phencyclidine	1
	Sertraline	1
	Tramadol	1
	Venlafaxine	1

Table 8: List of the positively identified drugs and/or metabolite and the number of times the Toxicology Laboratory detected each drug, drug metabolite, and/or alcohol per case completion year.

Listed in **Table 9** are the drugs, drug metabolites, and/or alcohol detected from DUI/DUID cases submitted and compares how commonly the drug, drug metabolite, and/or alcohol was detected over the previous 5 years. In 2021 there were 285 cases submitted for examination that had positively detected drugs, drug metabolite, and/or alcohol. In total there were 35 individual drugs, drug metabolites, and/or alcohol detected for a total of 550 drugs, drug metabolite, and/or alcohol for cases submitted in 2021.

Drugs Detected in Antemortem Driving Cases	2017	2018	2019	2020	2021
<i>7-Aminoclonazepam</i>	4	6	8	9	6
<i>α-Hydroxyalprazolam</i>	2	0	0	0	0
<i>Alprazolam</i>	40	35	18	18	20
<i>Amphetamine</i>	30	28	40	43	40
<i>Benzoylcegonine</i>	18	9	9	9	21
<i>Bromazolam</i>	0	0	0	0	1
<i>Butalbital</i>	0	1	0	1	1
<i>Carbamazepine</i>	1	0	0	0	0
<i>Carboxytetrahydrocannabinol</i>	5	5	2	1	0
<i>Carisoprodol</i>	4	2	2	0	3
<i>Clonazolam</i>	0	0	0	3	0
<i>Clonazepam</i>	4	4	9	10	5
<i>Cocaethylene</i>	0	1	1	0	0
<i>Cocaine</i>	4	2	4	0	3
<i>Codeine</i>	2	1	0	0	2
<i>Desmethyl(es)-citalopram</i>	0	1	0	0	0
<i>Diazepam</i>	8	5	1	0	6
<i>Difluoroethane</i>	0	0	2	3	1
<i>Diphenhydramine</i>	0	4	0	0	0
<i>Doxylamine</i>	0	0	0	1	0
<i>Es/Citalopram</i>	1	1	0	1	0
<i>Ethanol</i>	135	107	115	106	125
<i>Etizolam</i>	0	2	1	3	0
<i>Fentanyl</i>	0	3	7	17	57
<i>Flualprazolam</i>	0	0	7	13	0
<i>Flubromazepam</i>	0	1	2	1	0
<i>Flubromazolam</i>	0	8	2	3	0
<i>Fluoxetine</i>	0	0	0	0	1
<i>Gabapentin</i>	0	1	1	1	2
<i>Hydroxyzine</i>	0	1	0	0	0
<i>Hydrocodone</i>	9	6	3	3	5
<i>Hydromorphone</i>	1	0	0	0	1
<i>Lamotrigine</i>	0	0	0	0	1
<i>Levetiracetam</i>	0	0	1	0	0
<i>Lorazepam</i>	1	3	2	0	2
<i>m-Chlorophenylpiperazine (m-CPP)</i>	0	1	0	0	0
<i>Meprobamate</i>	5	3	2	2	5
<i>Methadone</i>	8	7	8	8	13
<i>Methamphetamine</i>	35	28	34	52	60
<i>Methylenedioxyamphetamine</i>	0	0	0	2	1
<i>Methylenedioxymethamphetamine</i>	0	1	0	1	2
<i>Mitragynine</i>	0	0	1	0	0

<i>Morphine</i>	5		4	8	6
<i>Norbuprenorphine</i>	0	0	0	1	0
<i>Nordiazepam</i>	6	6	3	3	7
<i>Nordiphenhydramine</i>	0	2	0	0	0
<i>Norfentanyl</i>	0	0	1	14	49
<i>Norfluoxetine</i>	0	0	0	0	1
<i>o-Desmethyltramadol</i>	0	1	0	2	0
<i>Oxazepam</i>	2	0	1	1	0
<i>Oxycodone</i>	9	5	6	7	9
<i>Oxymorphone</i>	0	0	1	1	0
<i>Phenazepam</i>	0	0	1	0	0
<i>Phencyclidine</i>	14	7	3	5	5
<i>Phenobarbital</i>	0	0	1	0	0
<i>Phentermine</i>	1	0	0	0	0
<i>Quetiapine</i>	0	0	1	0	0
<i>Sertraline</i>	0	1	0	1	0
<i>Temazepam</i>	2	0	0	2	1
<i>Tetrahydrocannabinol</i>	55	57	74	81	84
<i>Tramadol</i>	1	2	0	1	0
<i>Trazodone</i>	0	1	0	0	1
<i>Venlafaxine</i>	0	0	0	1	0
<i>Zolpidem</i>	8	6	5	3	3

Table 9: List of the positively identified drugs, drug metabolites, and/or alcohol in driving cases and the number of times the Toxicology Laboratory detected each drug, drug metabolite, and/or alcohol per case submission year.

Drug-Facilitated Sexual Assaults

Drug-facilitated sexual assaults (DFSA) is a demanding type of forensic investigation. The cases often involve a perpetrator who will surreptitiously administer a drug to a victim to render them unconscious and sexually assault them. As illustrated in **Table 10**, in 2021 there were 17 DFSA cases submitted for analysis and the Toxicology Laboratory completed 15 DFSA cases.

Year	Cases Submitted	Cases Completed
2016	14	11
2017	15	22
2018	24	17
2019	26	28
2020	15	25
2021	17	15

Table 10: DFSA cases submitted and completed each year since 2016.

DFSA case specimens often have several different drugs present. **Table 11** illustrates the number of positively identified drugs, drug metabolites, and/or alcohol detected in DFSA specimens. For comparison purposes the number of positive results for the drugs, drug metabolites, and/or alcohol is provided for each of the last 5 years. It is noteworthy that the 4 most commonly detected drug, drug metabolite, and/or alcohol are the same for each of the last 5 years. In total there were 26 individual drugs, drug metabolites, and/or alcohol detected for a total of 61 drugs, drug metabolite, and/or alcohol for cases submitted in 2021.

Drugs Detected in Drug Facilitated Sexual Assault

Cases per Submission Year	2017	2018	2019	2020	2021
7-Aminoclonazepam	0	3	1	2	1
α-Hydroxyalprazolam	1	5	1	0	1
Alprazolam	0	5	1	0	0
Amitriptyline	0	0	1	0	0
Amphetamine	4	5	5	1	8
Anhydroecgonine methyl ester	0	1	0	0	0
Benzoylecgonine	0	5	3	3	4
Brompheniramine	1	0	0	0	0
Buprenorphine	1	0	0	0	0
Bupropion	1	1	0	0	0
Bupropion threo amino alcohol	1	1	0	0	1
Carboxytetrahydrocannabinol	4	11	13	5	9
Cetirizine	1	0	0	0	0
Chlorcyclizine	0	1	1	1	2
Clonazepam	0	1	0	1	0
Cocaethylene	0	1	0	0	1
Cocaine	0	2	0	0	2
Codeine	0	0	1	0	0
Cyclobenzaprine	0	1	0	0	0
Desmethyl(es)-citalopram	1	0	1	1	2
Desmethylsertaline	1	1	0	0	0
Dextromethorphan	0	1	0	0	0
Diazepam	1	0	0	0	0
Diphenhydramine	0	3	4	4	1
Duloxetine	0	1	0	0	0
Ecgonine ethyl ester	0	1	0	0	2
Ecgonine methyl ester	0	1	0	0	2
EDDP	0	1	0	0	0
Es/citalopram	1	0	1	1	2
Ethanol	4	8	8	5	4
Flubromazolam	0	0	1	0	0
Fluconazole	0	1	0	0	0
Fluoxetine	0	0	1	0	2
Gabapentin	1	0	2	0	0
Hydrocodone	2	2	0	0	1
Hydromorphone	1	1	0	0	1
Hydroxybupropion	1	1	0	0	0
Hydroxyzine	1	0	1	0	0
Lidocaine	0	0	0	1	1
Lorazepam	0	1	2	2	0
Meprobamate	0	1	0	0	0
Methadone	0	1	0	0	0
Methamphetamine	4	6	7	1	7
Morphine	1	0	1	0	0
n-Desmethyltramadol	0	0	1	0	0
Norbuprenorphine	1	0	0	0	0
Norcocaine	0	1	0	0	0

<i>Nordiazepam</i>	0	1	0	0	0
<i>Nordiphenhydramine</i>	1	1	3	4	1
<i>Norfentanyl</i>	0	1	0	0	1
<i>Norfluoxetine</i>	0	0	1	0	2
<i>Norquetiapine</i>	0	0	0	0	1
<i>o-Desmethyltramadol</i>	0	0	2	0	0
<i>o-Desmethylvenlafaxine</i>	0	0	0	0	1
<i>Oxazepam</i>	0	2	1	0	0
<i>Oxycodone</i>	1	1	1	0	0
<i>Oxymorphone</i>	0	1	1	0	0
<i>Phencyclidine</i>	0	1	0	1	0
<i>Pheniramixy</i>	0	1	0	0	0
<i>Phentermine</i>	0	2	0	0	0
<i>Promethazine</i>	2	0	2	2	0
<i>Quinine/Quinidine</i>	1	0	0	0	0
<i>Salicylic Acid</i>	0	1	1	0	0
<i>Sertraline</i>	1	0	1	0	0
<i>Temazepam</i>	1	1	1	0	0
<i>Tetrahydrocannabinol</i>	0	0	1	0	0
<i>Toluene</i>	0	0	0	1	0
<i>Tramadol</i>	1	0	2	2	0
<i>Trimethoprim</i>	1	0	0	0	0
<i>Venlafaxine</i>	0	0	1	0	1

Table 11: List of the positively identified drugs, drug metabolites, and/or alcohol in DFSA cases and the number of times the Toxicology Laboratory detected each drug, drug metabolite, and/or alcohol per case submission year.