2022

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

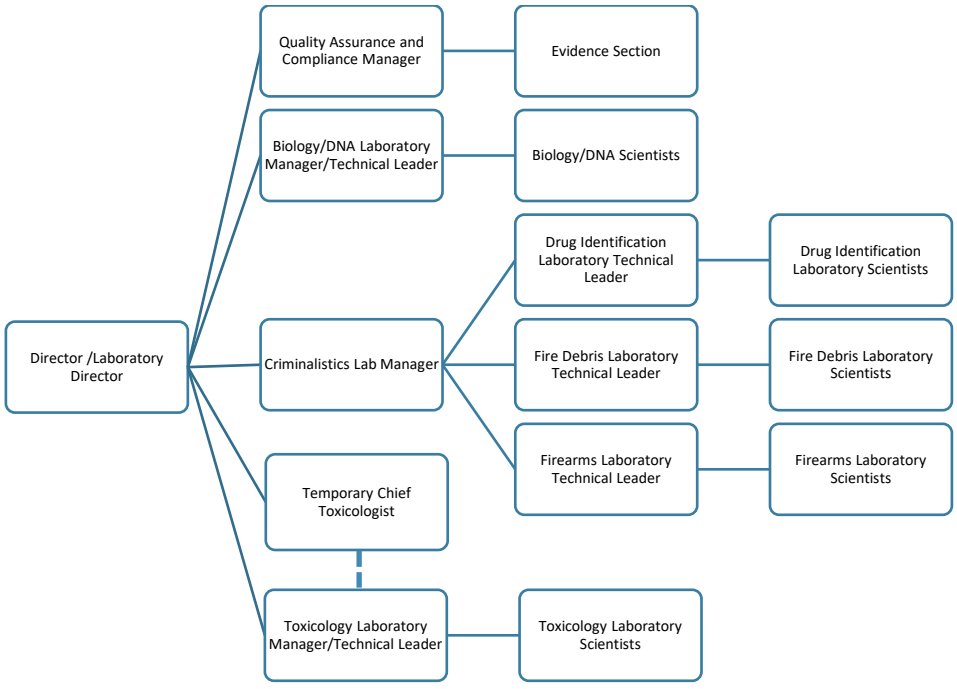
Criminalistics Laboratory Manager

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 2022, the laboratory staff consisted of 21 scientists and 2 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 2022, the Forensic Science Laboratory completed an ANAB ISO/IEC 17025:2017, AR3125 full on-site assessment. This assessment also included an external Biology/DNA Laboratory 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.

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 3078.

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. 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 2750 newly generated cases in 2022.

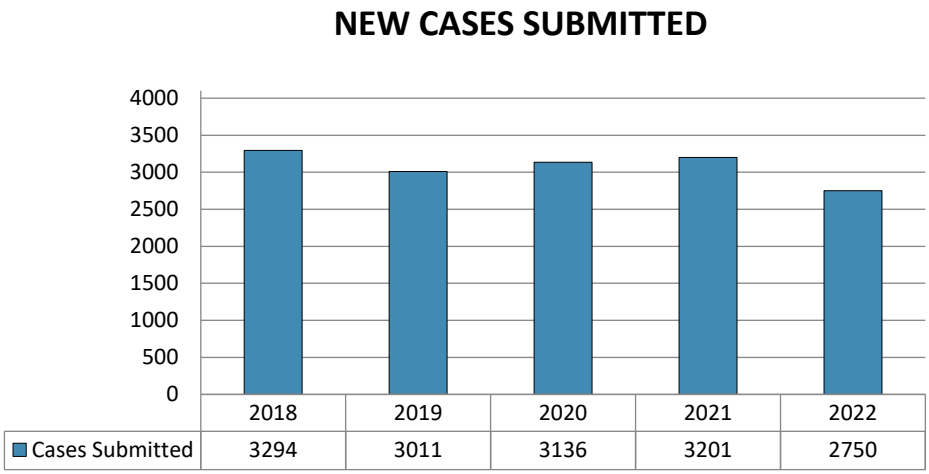


Figure 1: Number of initial forensic laboratory cases submitted for examination (law enforcement and District Coroner postmortem evidence submissions) from 2018 through 2022.

As illustrated in **Figure 2**, the number of exhibits examined by the Forensic Laboratory was slightly down in 2022 when compared to 2020 and 2021, both of which were all time highs. Still in 2022, the laboratories examined approximately the same number of exhibits when compared to 2018 and 2019.

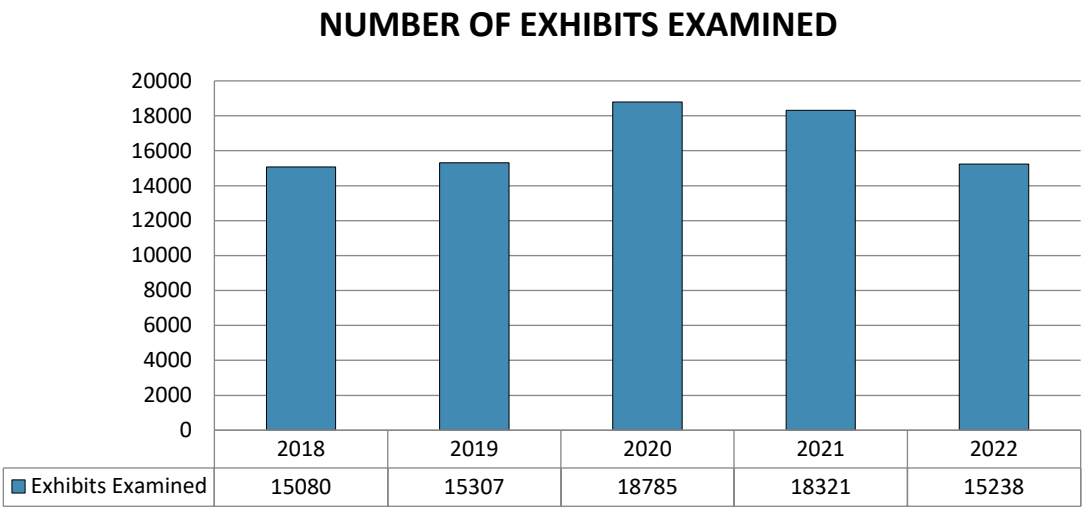


Figure 2: The number of forensic exhibits examined between 2018 and 2022.

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.

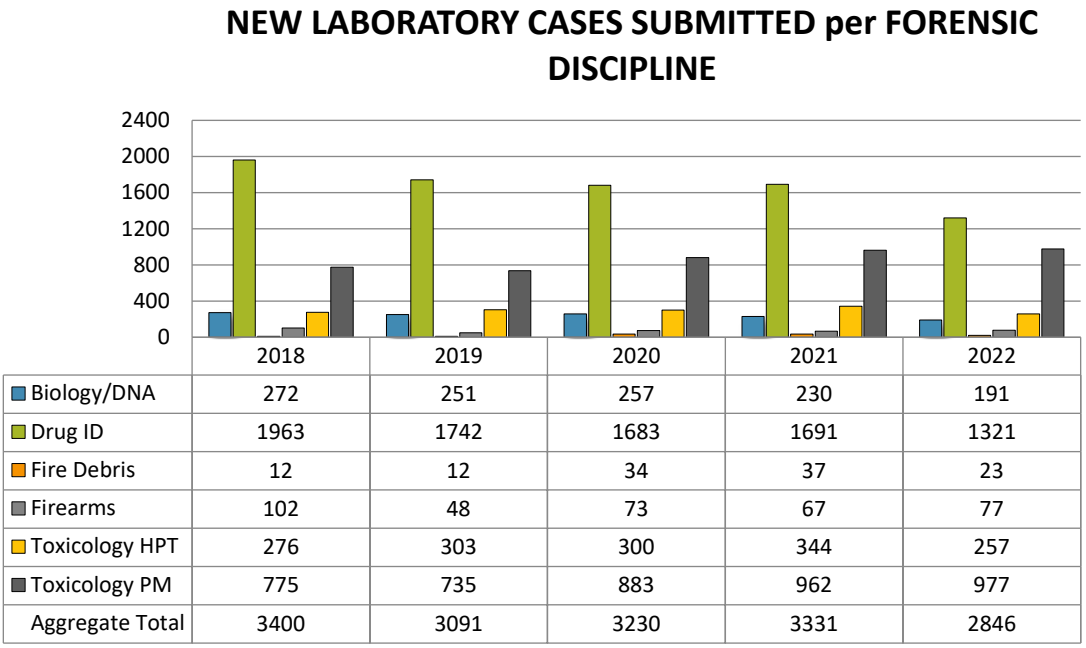


Figure 3: Number of cases submitted for the first time each year per laboratory section. Abbreviation Key (HPT = Human Performance Testing, PM = Postmortem).

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 2022 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.

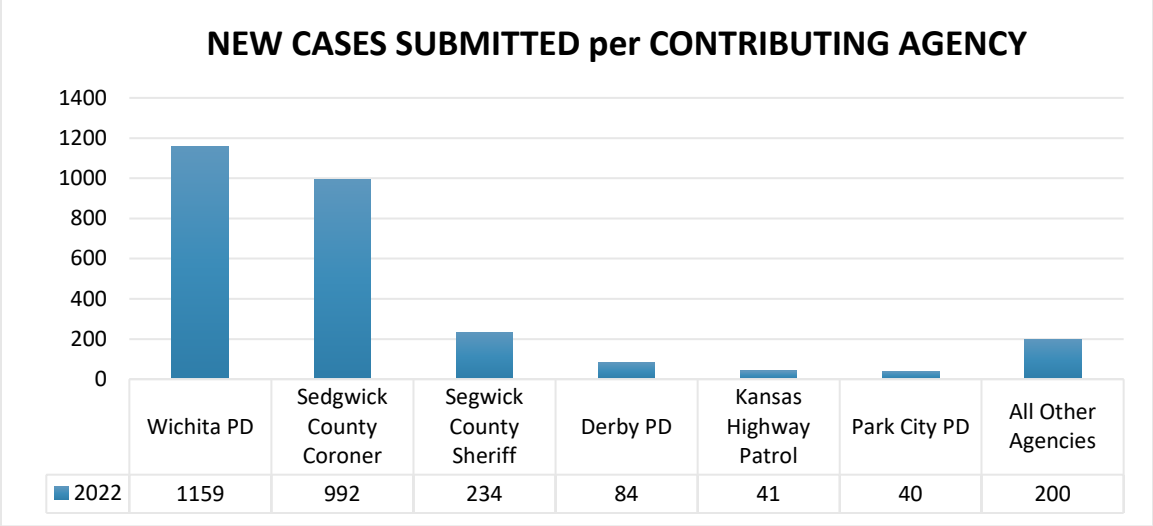


Figure 4: Count of new case submissions received from each contributing law enforcement agency. Abbreviation Key (PD = Police Department, SG = Sedgwick County, KHP = Kansas Highway Patrol).

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 3353 includes all submissions from contributing agencies, which includes submissions from the aggregated 2750 new cases (the sum of all new cases submitted to each laboratory) generated in year 2022 **(see Figure 3)** and submissions from cases generated in previous years in support of on-going investigations by law enforcement.

Laboratory	2022 Aggregate Case Submissions Count
Biology / DNA	498
Drug ID	1,429
Firearms / Tool Marks	111
Fire Debris	23
Toxicology Antemortem	259
Toxicology Postmortem	1033
Sum of Submission Count	3353

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 2022, had all-time highs for postmortem case submissions.

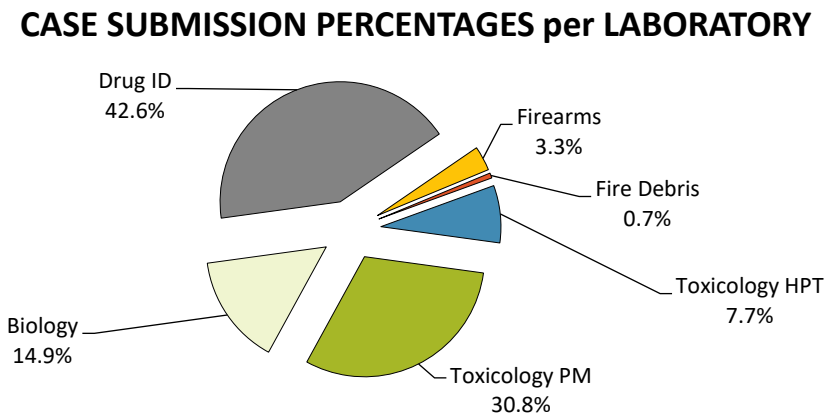
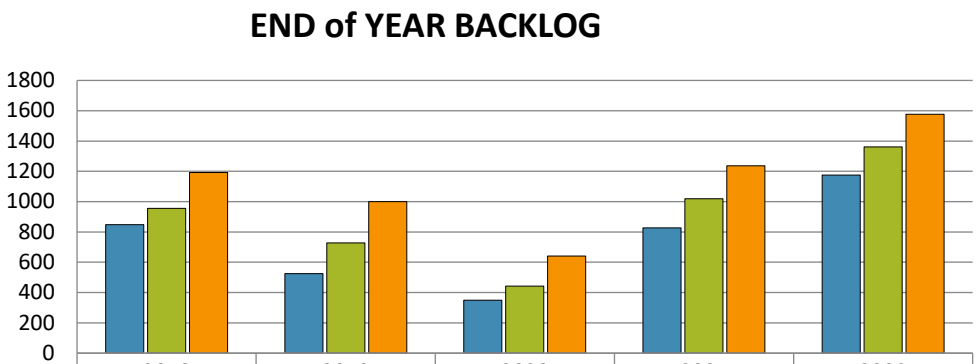


Figure 5: Percentage of case submissions per laboratory.

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, 2022 the Forensic Laboratories had a 60 day backlog of 1176 cases and a 30 day backlog of 1361 cases **(see Figure 6)**.



	2018	2019	2020	2021	2022
60 Day Backlog	849	524	350	827	1176
30 Day Backlog	956	727	443	1019	1361
Total Backlog	1193	999	642	1237	1577

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 2022, the Forensic Science Laboratories received 232 subpoenas for court appearances. This resulted in laboratory staff appeared in court to provide expert testimony in 44 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 2022, the Forensic Science Laboratory provided expert testing services and consultations to 40 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.

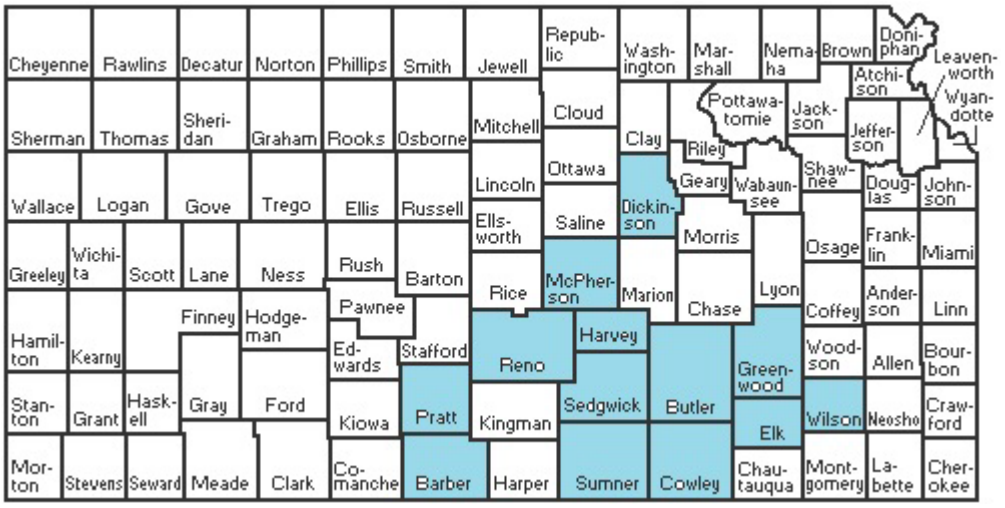


Figure 7: Counties that had forensic laboratory services provided to them by the Sedgwick County Regional Forensic Science Center in 2022 (shaded).

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 2022 are listed in **Table 2**.

Barber County Coroner	Goddard USD 265 Police Department	Sedgwick County Coroner
Bel Aire Police Department	Greenwood County Coroner	Sedgwick County Courthouse Police Department
Bentley Police Department	Haysville Police Department	Sedgwick County Fire Department
Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)	Harvey County Coroner	Sedgwick County Sheriff
Butler County Coroner	Kansas Department of Corrections	Sumner County Coroner
Butler County Sheriff's Office	Kansas Highway Patrol	United States Probation
Clearwater Police Department	Kechi Police Department	Valley Center Police Department
Cowley County Coroner	Maize Police Department	Wichita Fire Department
Derby Police Department	Marion County Coroner	Wichita Police Department
Dickinson County Coroner	McPherson County Coroner	Wichita State University Police Department
Drug Enforcement Agency (DEA)	Mount Hope Police Department	Wilson County Coroner
Elk County Coroner	Mulvane Police Department	
Garden Plain Police Department	Park City Police Department	
Goddard Police Department	Pratt County Coroner	
	Reno County Coroner	

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 the past five years. 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.

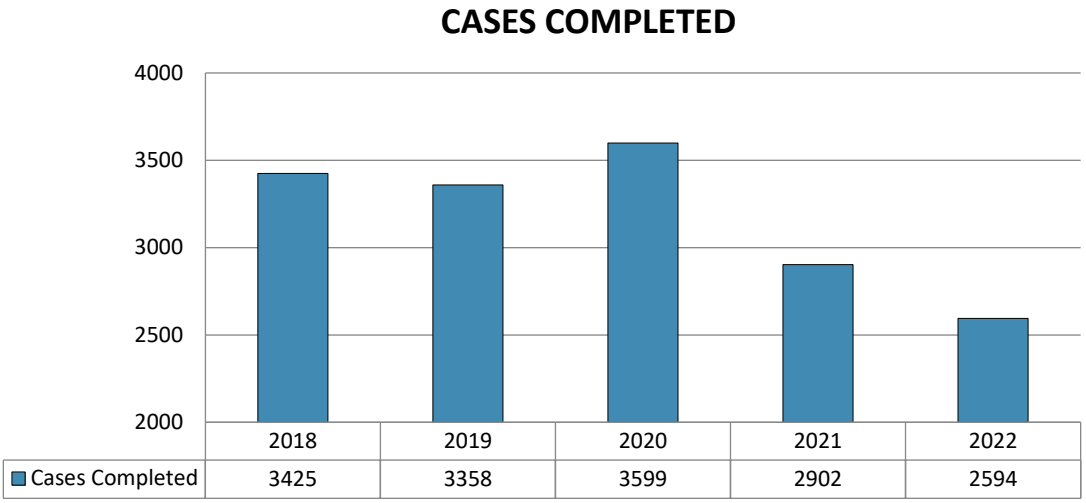


Figure 8: Number of cases completed per year.

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**, 22% of cases submitted to the Laboratory Division in 2022 were completed within 60 days of submission.

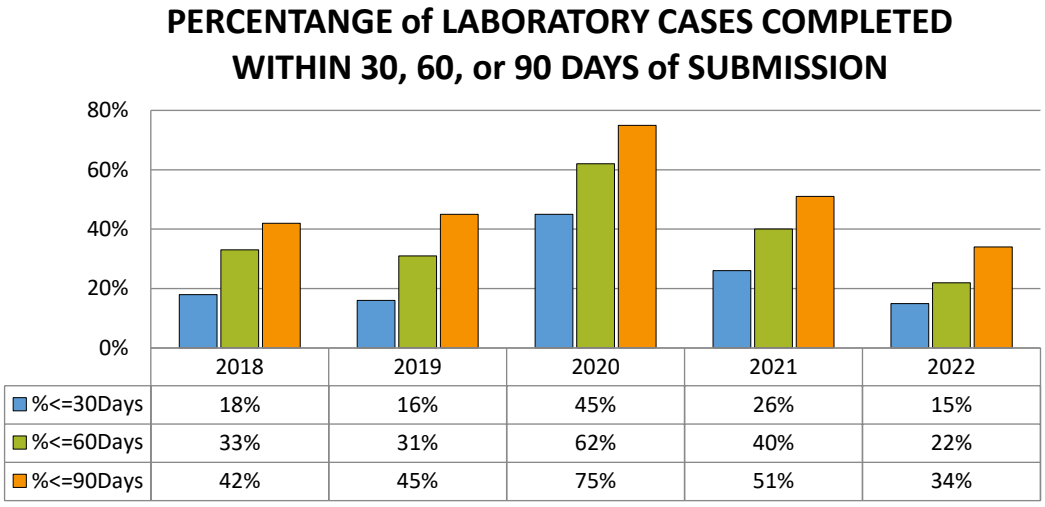


Figure 9: Percentage of laboratory cases completed within 30, 60, or 90 days of submission.

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.

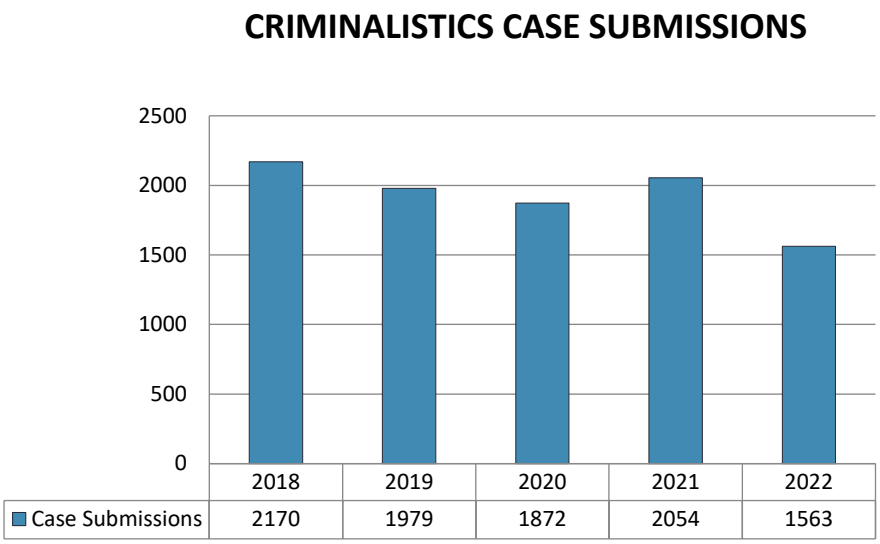


Figure 10: Number of case submissions to the Criminalistics Section (Drug ID, Firearms, and Fire Debris) over 5 year period from 2018 through 2022. These include all new cases submitted to the Center for the first time and submissions from cases with subsequent submissions.

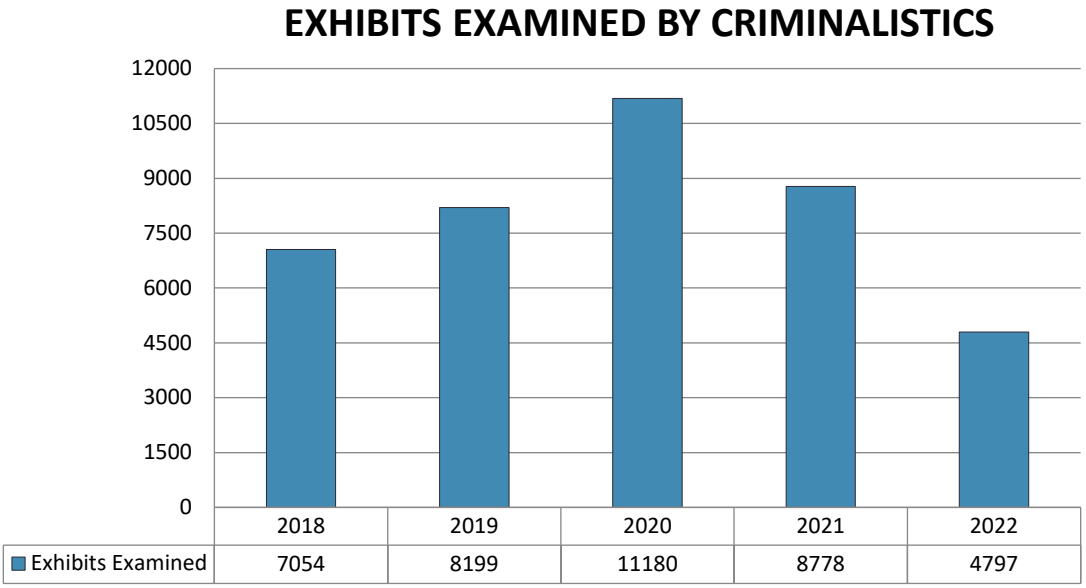


Figure 11: The number of exhibits examined from 2018 through 2022 by the Criminalistics Section (Drug ID, Firearms, and Fire Debris).

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

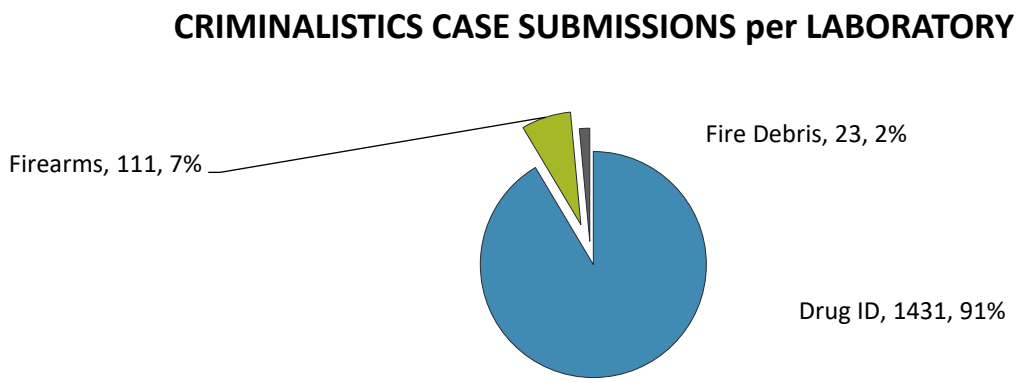


Figure 12: Volume and percentage of cases submitted to each Criminalistics Laboratory Unit.

DRUG ID

Examination requests for the identification of illicit drugs accounted for approximately 91% of the cases submitted to Criminalistics, as depicted in **Figure 12** above.

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 68% of cases received are from WPD. Agencies other than WPD and the Sedgwick County Sheriff's Office (SGSO) are responsible for approximately 21% of the total cases submitted.

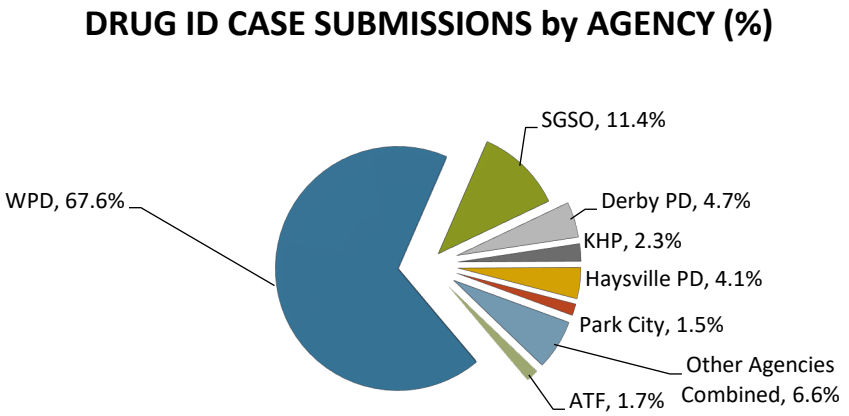
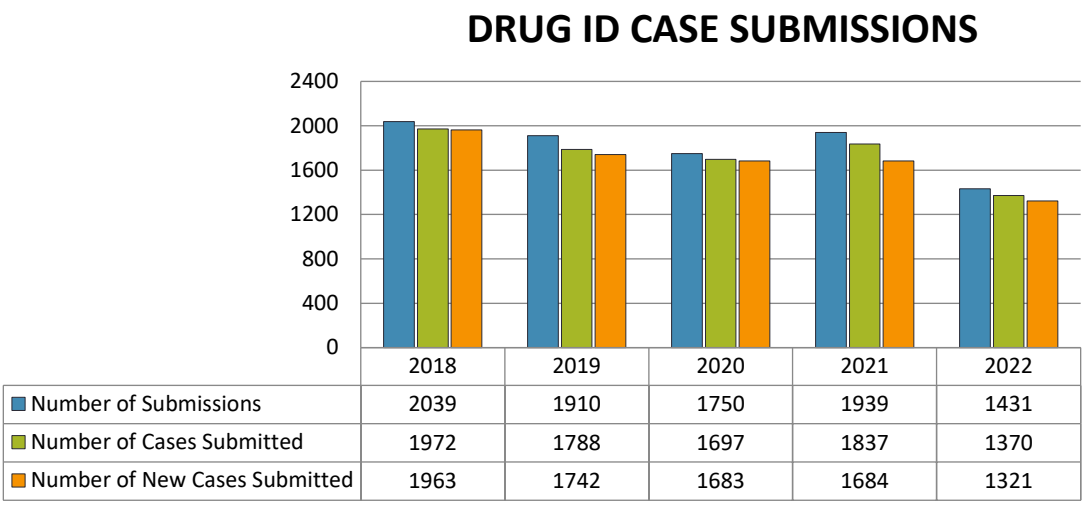


Figure 13: Percentages of Drug ID cases submitted per contributing agency.

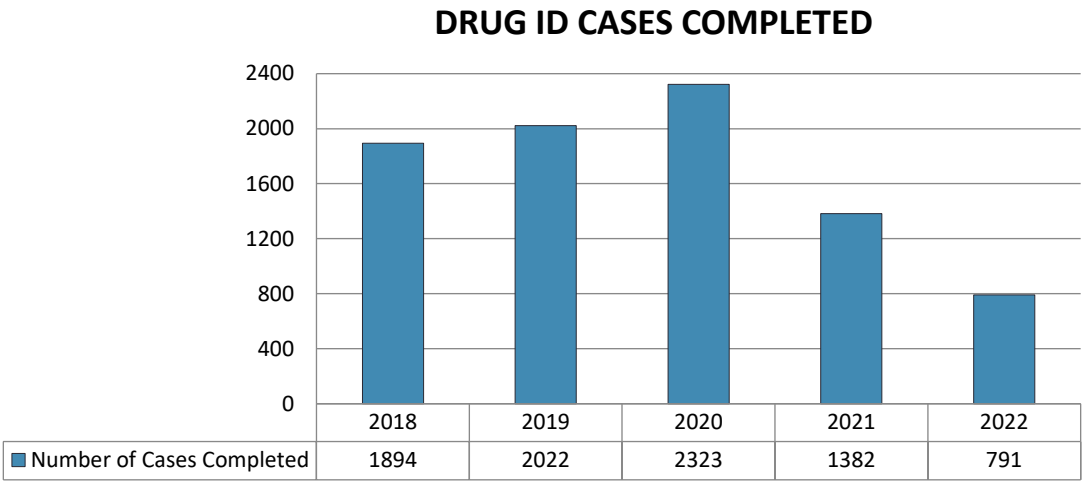
The number of submissions, the number of cases submitted, and the number of new cases submitted to the Drug ID Laboratory over the last five years is illustrated in **Figure 14**.



	2018	2019	2020	2021	2022
Number of Submissions	2039	1910	1750	1939	1431
Number of Cases Submitted	1972	1788	1697	1837	1370
Number of New Cases Submitted	1963	1742	1683	1684	1321

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**.



	2018	2019	2020	2021	2022
Number of Cases Completed	1894	2022	2323	1382	791

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

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 that had fentanyl detected increased from 2 in 2018 to 150 in 2022, which equates to an approximate 7,400% increase. Additionally, for the 791 cases completed in 2022, 18.9% of them had at least 1 fentanyl positive exhibit.

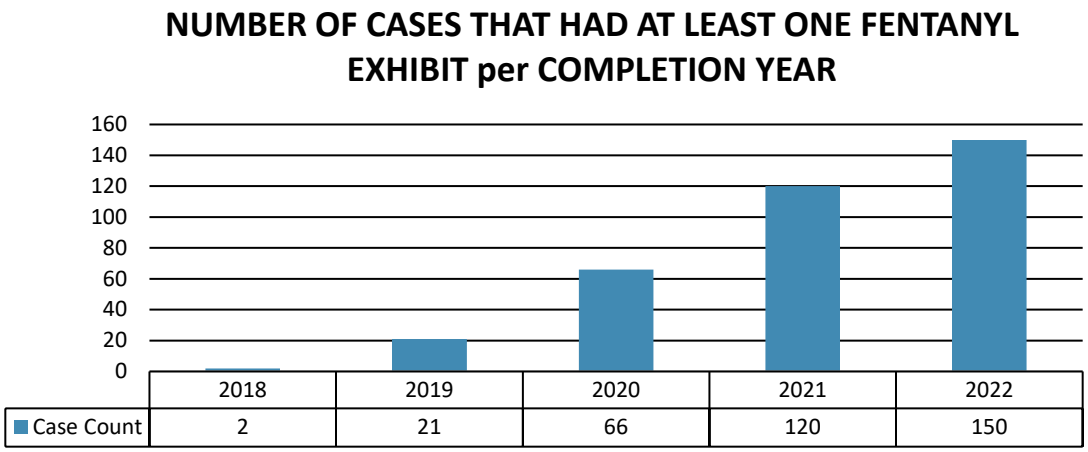


Figure 16: Graph depicting the number of cases that were completed that had at least one fentanyl positive exhibit associated with it over the past 5 years.

As illustrated in **Figure 18** the number of cases submitted has increased from 3 in 2018 to at least 269 in 2022, which equates to an approximate 8,866% increase. Additionally, for the 1370 cases submitted in 2022 approximately 19.6% of them had at least 1 fentanyl positive exhibit.

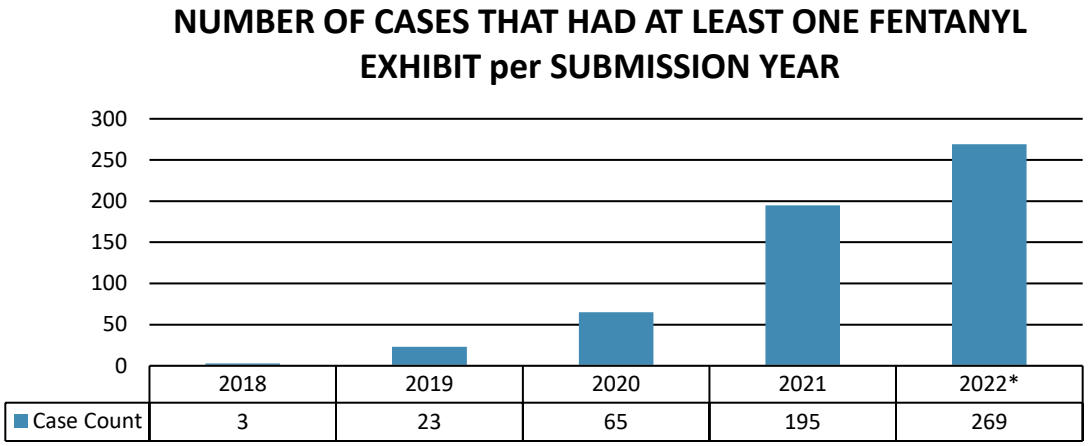


Figure 17: Graph depicting the number of cases that were submitted that had at least one fentanyl positive exhibit associated with it over the past 5 years.*Not all cases submitted in 2022 were completed as of the date of this report.

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 969 in 2018 to 467 in 2022, which equates to an approximate 107% decrease. Additionally, for the 791 cases completed in 2022 approximately 59.0% of them had at least 1 methamphetamine positive exhibit.

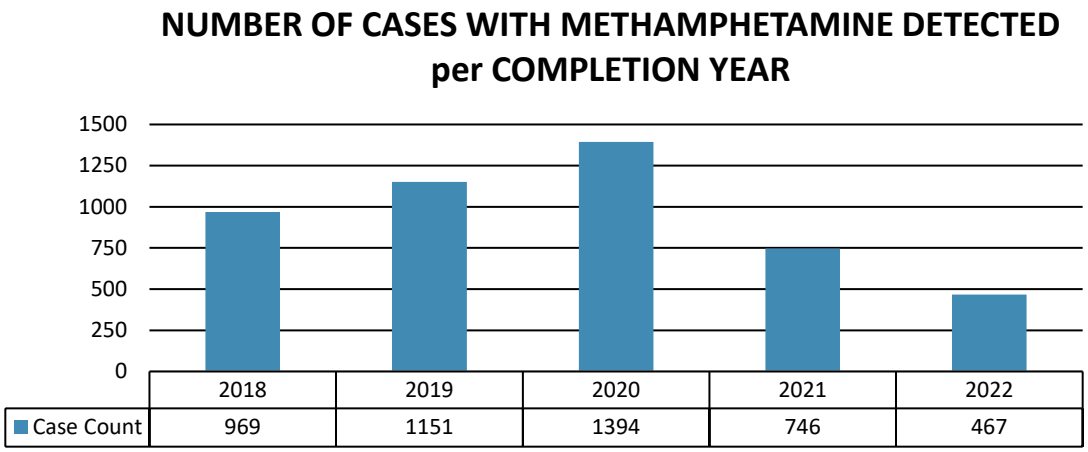


Figure 18: Graph depicting the number of cases that were completed that had at least one methamphetamine positive exhibit associated with it over the past 5 years.

As illustrated in **Figure 20** the number of cases completed that had methamphetamine detected has generally stayed consistent from 2018 through 2021. In 2022, the number of cases with methamphetamine decreased; however, not every case submitted in 2022 had been completed at the time of this report. Additionally, for the 1370 (**Figure 14**) cases submitted in 2022 approximately 48.5%, at a minimum, had at least 1 methamphetamine positive exhibit.

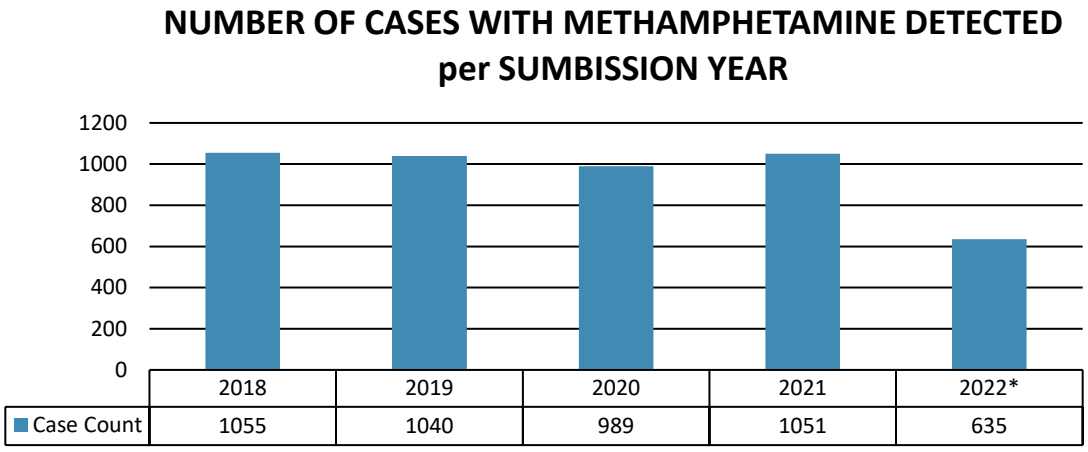


Figure 19: Graph depicting the number of cases that were submitted that had at least one methamphetamine positive exhibit associated with it over the past 5 years. *Not all cases submitted in 2022 were completed as of the date of this report.

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 237 in 2018 to 116 in 2022, which equates to an approximate 51.0%

decrease. Additionally, for the 791 cases completed in 2022 approximately 14.6% of them had at least 1 cocaine positive exhibit.

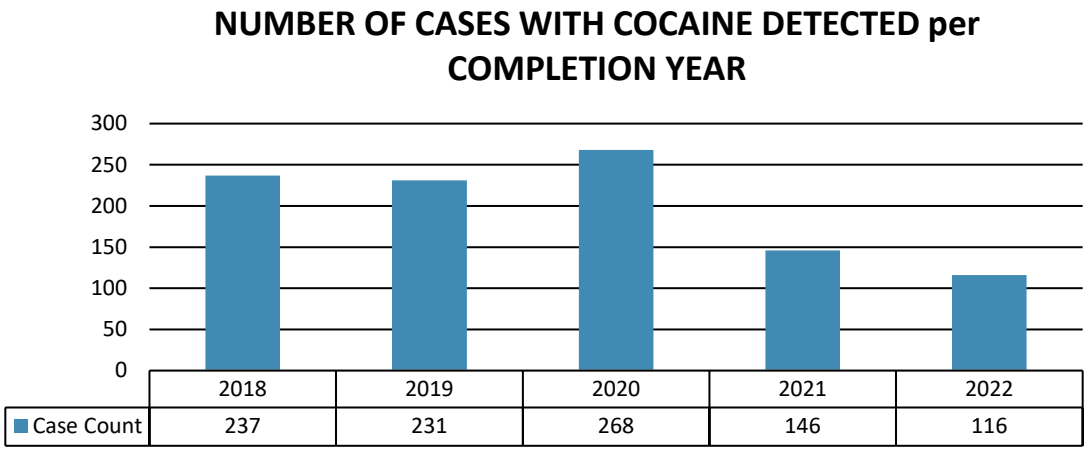


Figure 20: Graph depicting the number of cases that were completed that had at least one cocaine positive exhibit associated with it over the past 5 years.

As illustrated in **Figure 22** the number of cases submitted that had cocaine detected has decreased from 201 in 2018 to 136 in 2022, which equates to an approximate 32.3% decrease. Additionally, for the 1370 (**Figure 14**) cases submitted in 2022 approximately 9.9% of them had at least 1 cocaine positive exhibit.

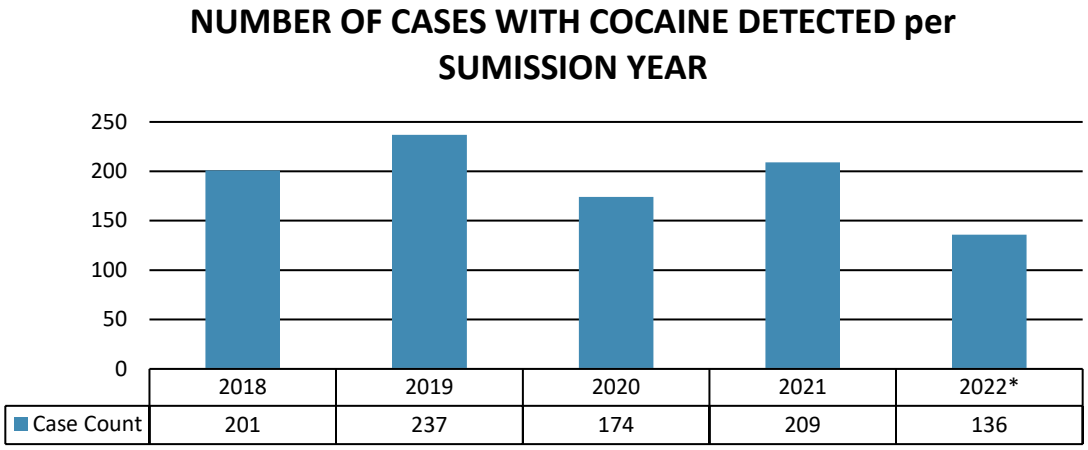


Figure 21: Graph depicting the number of cases that were submitted that had at least one cocaine positive exhibit associated with it over the past 5 years. *Not all cases submitted in 2022 were completed as of the date of this report.

Tetrahydrocannabinol

Tetrahydrocannabinol (THC) is a psychoactive substance found in the cannabis sativa plant, of which marijuana and hemp are two varieties. Tetrahydrocannabinol can be detected when analyzing a marijuana plant, 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 23** the number of cases completed that had THC detected has decreased from 785 in 2018 to 357 in 2022, which equates to an approximate 54.5% decrease. Additionally, of the 791 cases completed in 2022 approximately 49.6% of them at least 1 tetrahydrocannabinol positive exhibit.

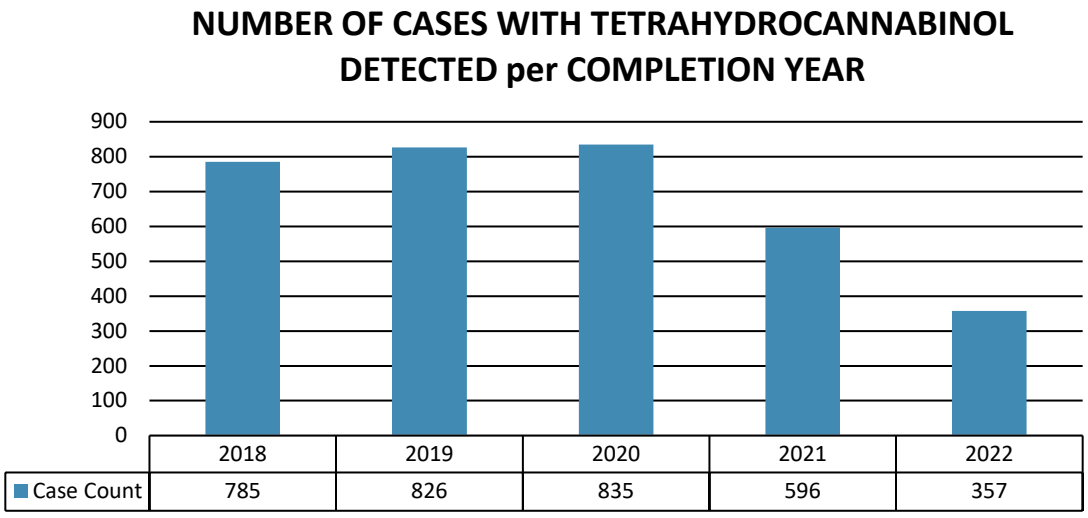


Figure 22: Graph depicting the number of cases that were completed that had at least one tetrahydrocannabinol positive exhibit associated with it over the past 5 years.

As illustrated in **Figure 24** the number of cases submitted that had THC detected has decreased from 819 in 2018 to 510 in 2022, which equates to an approximate 37.7% decrease since 2018. Additionally, of the 1370 (**Figure 14**) cases submitted approximately 37.2% of them at least 1 tetrahydrocannabinol positive exhibit.

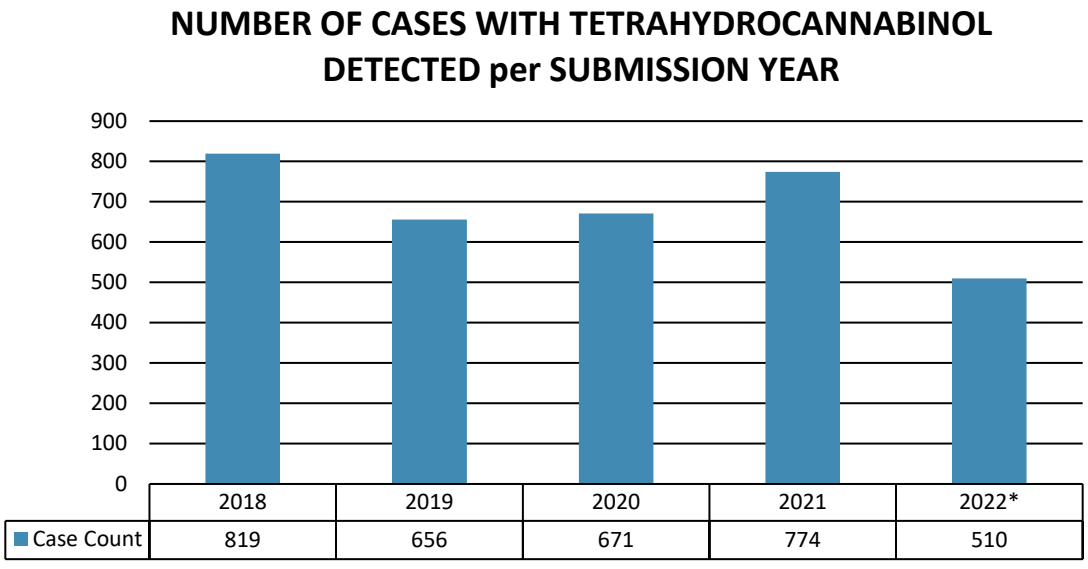


Figure 23: Graph depicting the number of cases that were submitted that had at least one tetrahydrocannabinol positive exhibit associated with it over the past 5 years. *Not all cases submitted in 2022 were completed as of the date of this report.

Clonazolam

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

As illustrated in **Figure 25** the number of cases completed that had clonazolam detected has increased from 1 in 2018 to 27 in 2022. Additionally, for the 791 cases completed in 2022 approximately 3.4% of them had at least 1 clonazolam positive exhibit.

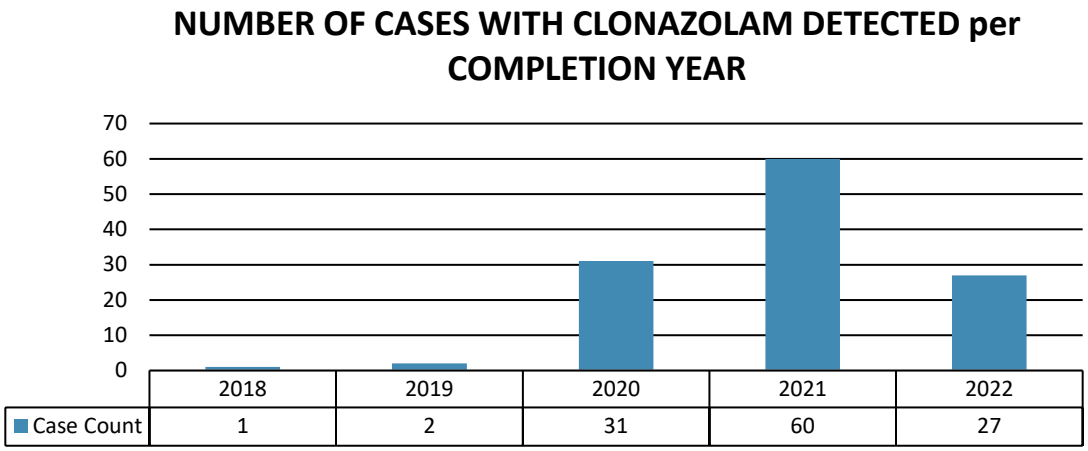


Figure 24: Graph depicting the number of cases that were completed that had at least one clonazolam positive exhibit associated with it over the past 5 years.

As illustrated in **Figure 26** the number of cases completed that had clonazolam detected has increased from 2 in 2018 to 31 in 2022, which equates to an approximate 1450.0% increase. Additionally, for the 1370 (**Figure 14**) cases submitted in 2022 approximately 8.3% of them had at least 1 clonazolam positive exhibit.

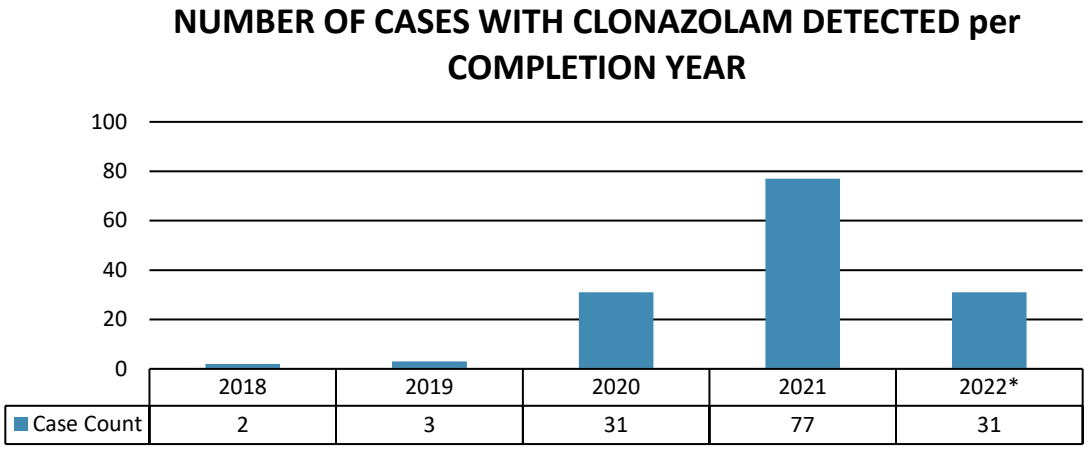


Figure 25: Graph depicting the number of cases that were submitted that had at least one clonazolam positive exhibit associated with it over the past 5 years. *Not all cases submitted in 2022 were completed as of the date of this report.

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. The effects are similar to other stimulant and empathogenic drugs such as MDMA, cocaine and amphetamines.

As illustrated in **Figure 27** the number of cases completed that had eutylone detected has decreased from 9 in 2020 to 3 in 2022, which equates to a 66.7% decrease. Additionally, for the 791 cases completed in 2022 approximately 0.3% of them had at least 1 eutylone positive exhibit.

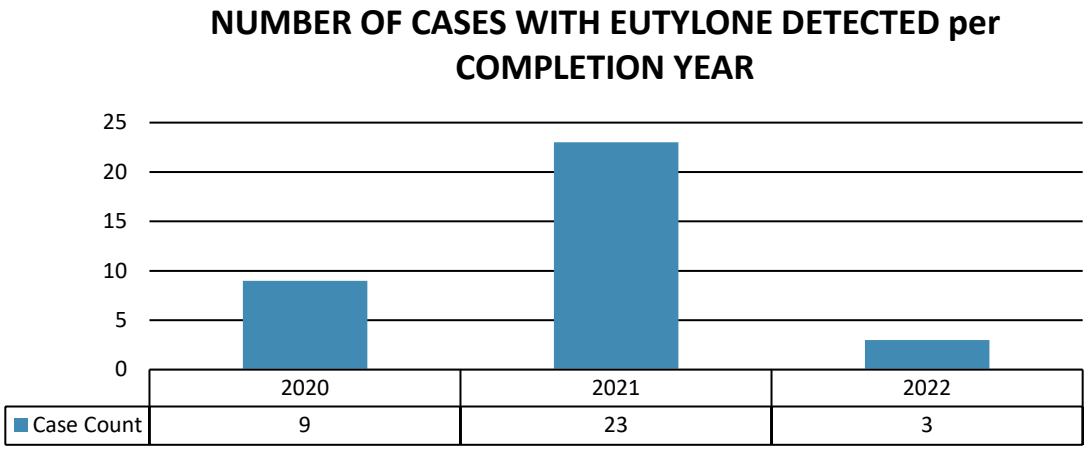


Figure 26: Graph depicting the number of cases that were completed that had at least one eutylone positive exhibit associated with it over the past 3 years.

As illustrated in **Figure 28** the number of cases completed that had eutylone detected has decreased from 11 in 2020 to 6 in 2022, which equates to a 45.4% decrease. Additionally, for the 1370 (**Figure 14**) cases submitted in 2022 approximately 0.4% of them had at least 1 eutylone positive exhibit.

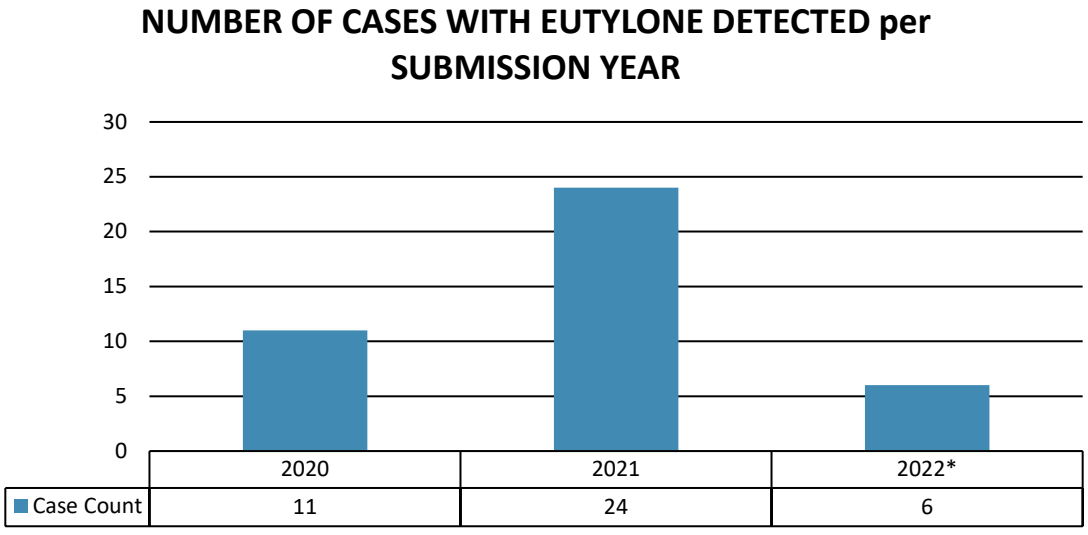
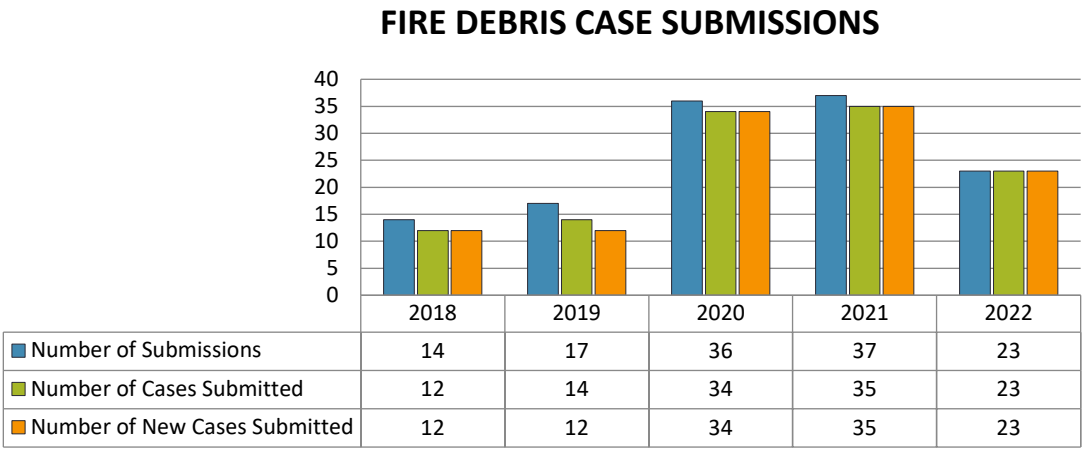


Figure 27: Graph depicting the number of cases that were submitted that had at least one eutylone positive exhibit associated with it over the past 3 years. *Not all cases submitted in 2022 were completed as of the date of this report.

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 2022, the Fire Debris Laboratory received evidence from 23 cases with a total of 23 submissions. The trend of case submissions over the last five years is illustrated in **Figure 29**.

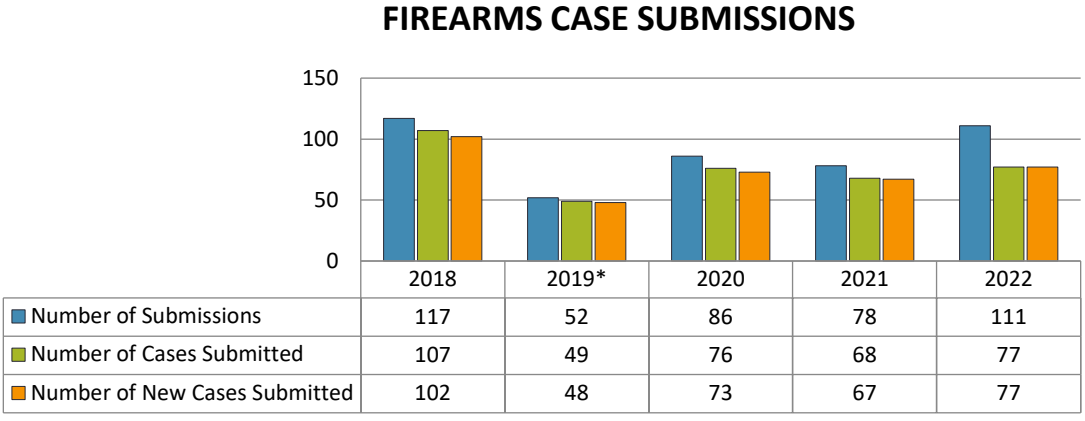


	2018	2019	2020	2021	2022
Number of Submissions	14	17	36	37	23
Number of Cases Submitted	12	14	34	35	23
Number of New Cases Submitted	12	12	34	35	23

Figure 28: Number of fire debris cases submitted over a five year period.

FIREARMS

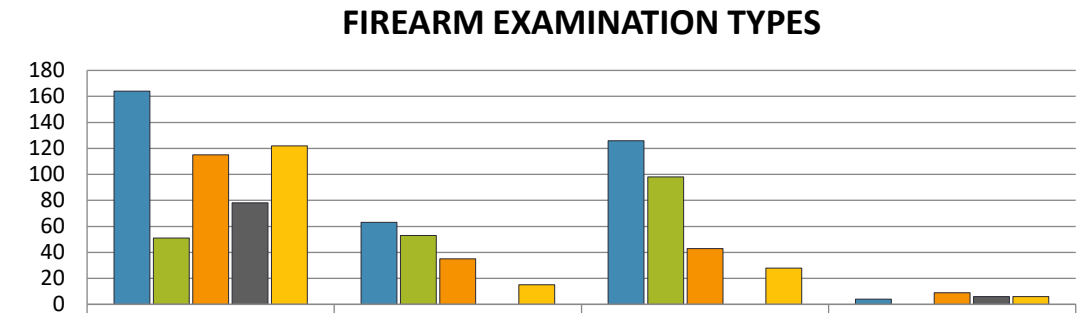
Firearm examination is conducted in support of state and federal law enforcement. The Firearms Laboratory conducts many types of forensic examinations. The majority of examinations involve operability (function) tests on the submitted firearms. Other exams performed by the Firearms Laboratory include bullet comparisons, cartridge case comparisons, and serial number restorations. In 2022, the Firearms Laboratory received evidence from 77 cases with a total of 111 submissions. The trend of case submissions over the last five years is illustrated in **Figure 30**. During 2019, the Center lost both qualified examiners, resulting in a decrease in submissions. Since then the Center was able to hire two examiners, both of whom were qualified to perform function test and serial number restoration casework, and one of whom was qualified to perform bullet and cartridge casing comparison casework in 2022.



	2018	2019*	2020	2021	2022
Number of Submissions	117	52	86	78	111
Number of Cases Submitted	107	49	76	68	77
Number of New Cases Submitted	102	48	73	67	77

Figure 29: Firearm case submissions from 2018 through 2022. *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 31**.



	Test Fire (Function Test)	Bullet Comparison	Cartridge Case Comparison	Serial Number Restorations
2018	164	63	126	4
2019	51	53	98	0
2020	115	35	43	9
2021	78	0	0	6
2022	122	15	28	6

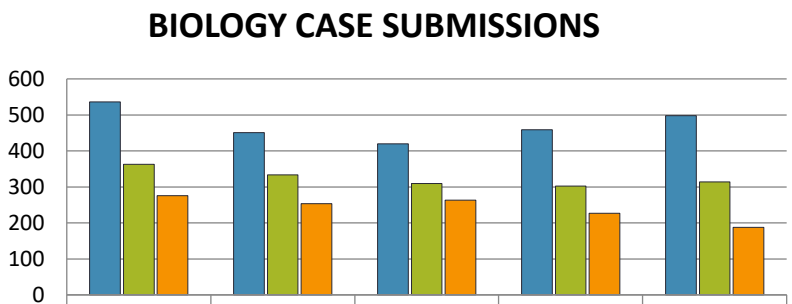
Figure 30: Case examination requests in the Firearms Laboratory; classified as test fires, bullet comparisons, cartridge case comparisons, and serial number restorations. In 2022, the scientist(s) in the Firearms Laboratory were qualified to perform function tests, serial number restorations, bullet and cartridge casing comparison casework.

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, and saliva). 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 2022, the Biology/DNA Laboratory received evidence from 314 cases with a total of 498 submissions. The trends of case submissions over the past five years are illustrated in **Figure 32**.



	2018	2019	2020	2021	2022
Number of Submissions	536	451	420	459	498
Number of Cases Submitted	363	333	309	302	314
Number of New Cases Submitted	276	253	263	227	188

Figure 31: Number of cases submitted to the Biology/DNA Laboratory over a five year period.

Figure 33 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 4.8% 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 16 non-homicide cases submitted by the District Coroner through forensic DNA analysis.

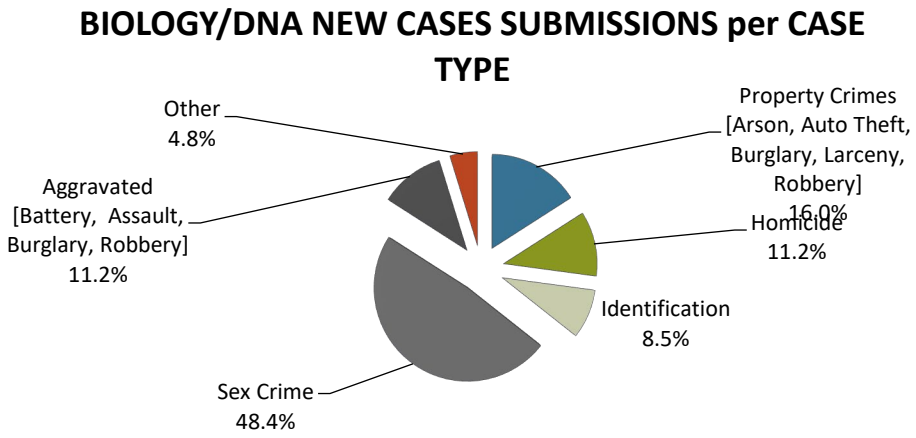
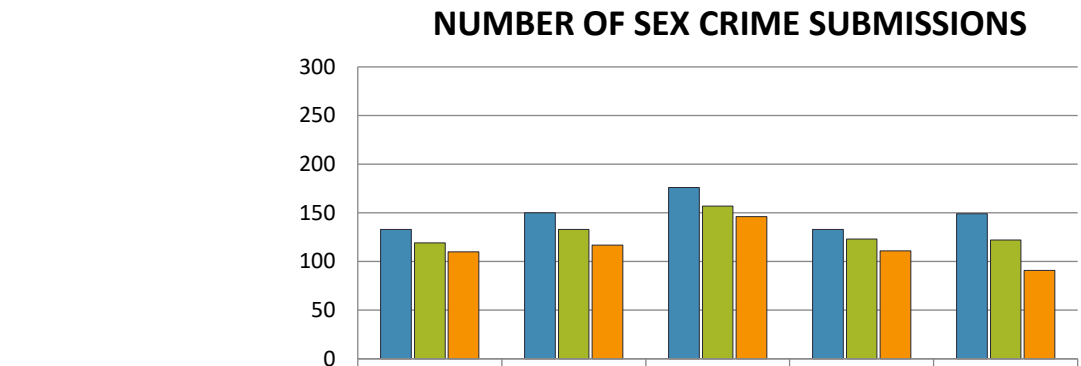


Figure 32: Classification of cases submitted for Biology/DNA analysis.

The number of sex crime cases submitted to the Biology/DNA Laboratory over the last five years is illustrated in **Figure 34**. In 2022, the Biology/DNA Laboratory received evidence from 122 sex crime cases with a total of 149 submissions.



	2018	2019	2020	2021	2022
Number of Submissions	133	150	176	133	149
Number of Cases Submitted	119	133	157	123	122
Number of New Cases Submitted	110	117	146	111	91

Figure 33: 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 35 and Figure 36**. In the last 5 years, the average number of case profiles entered into CODIS is 120, the average number of hits per year is approximately 82, and the average number of investigations aided per year is approximately 69.

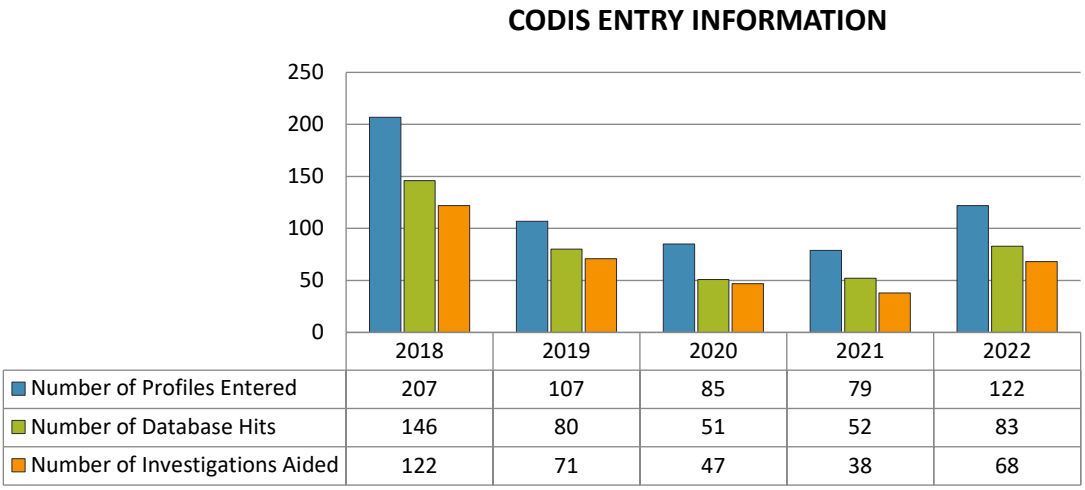


Figure 34: Five (5) year depiction of the number of DNA profiles entered into CODIS as well as the number of database hits and number of investigations aided.

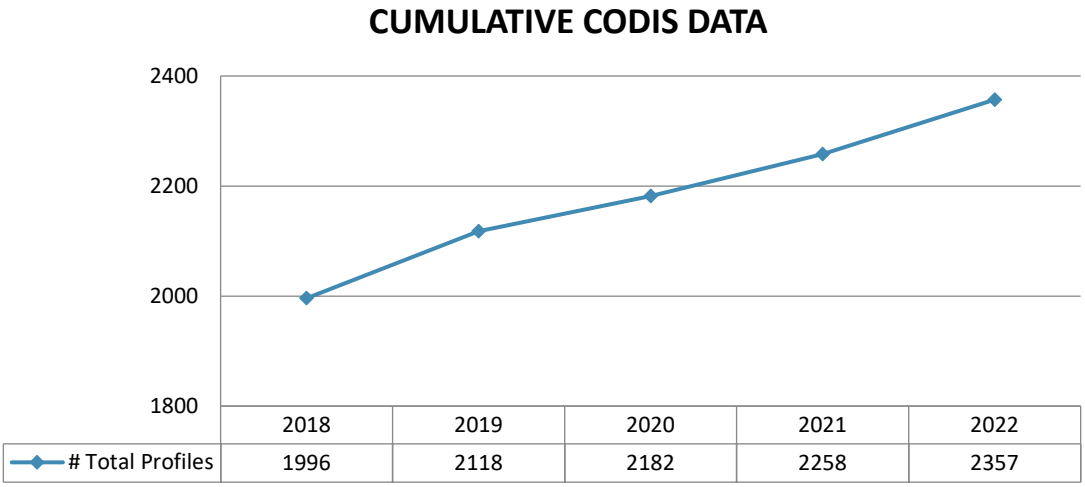
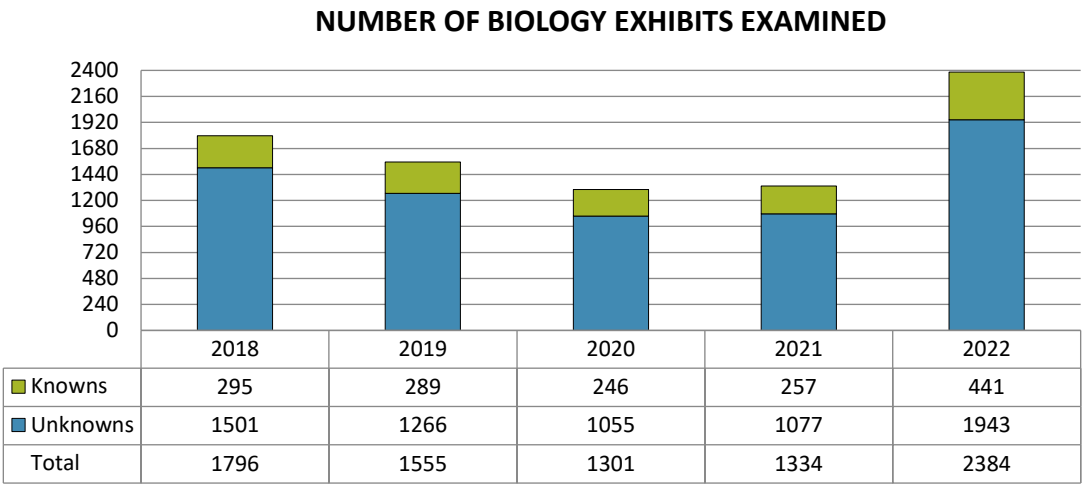


Figure 35: The graph and chart depicts total number of profiles residing in the database (LDIS) at the end of each year.

Unknown and Known Exhibits Examined

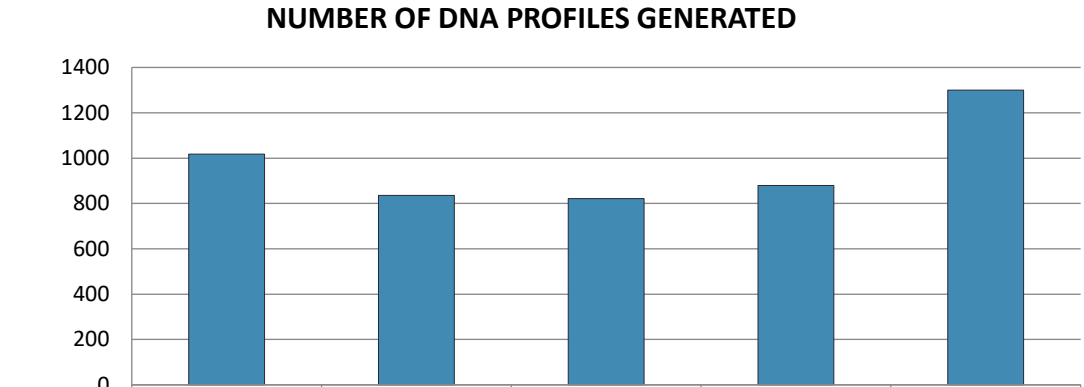
The Biology/DNA Laboratory examines unknown samples (Qs) from crime scene exhibits and known samples (Ks) collected from known individuals. The number of exhibits submitted in any given case can vary greatly. Some investigations may involve multiple scenes and individuals, while others require the testing 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 37 below illustrates the number of unknown and known exhibits examined by the laboratory over the past five years. **Figure 38** below illustrates the number of DNA profiles generated by Polymerase Chain Reaction (PCR) from the unknown and known exhibits over the same period.



	2018	2019	2020	2021	2022
Knowns	295	289	246	257	441
Unknowns	1501	1266	1055	1077	1943
Total	1796	1555	1301	1334	2384

Figure 36: The number of unknown and known exhibits examined by the Biology/DNA Laboratory in each of the past five years.



	2018	2019	2020	2021	2022
Amplified	1017	836	822	879	1300

Figure 37: The number of profile generated from PCR amplification by the Biology/DNA Laboratory in each of the past five years.

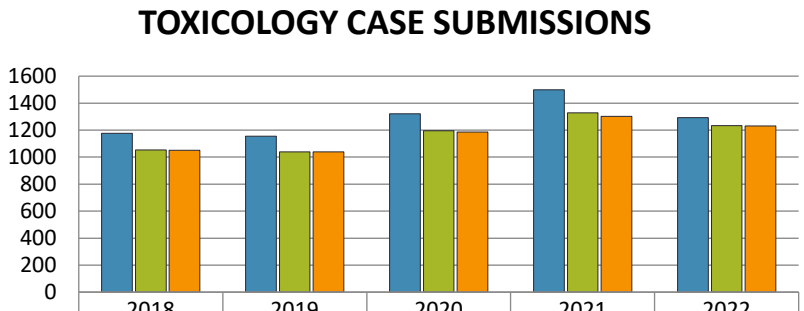
TOXICOLOGY

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.

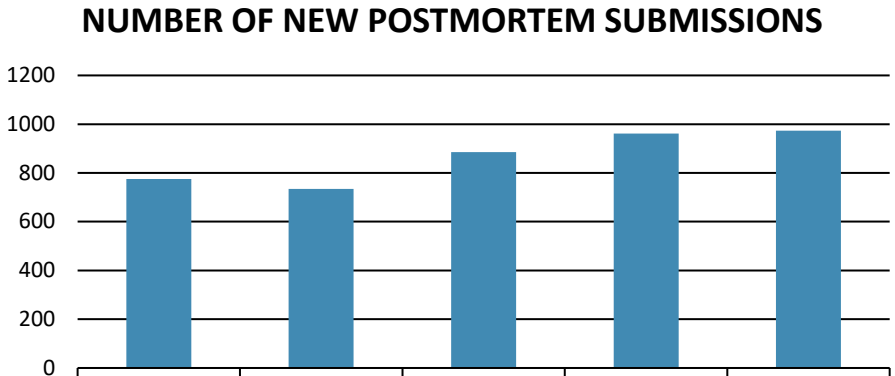
Illustrated in **Figure 39** is the total number of case submissions, the number of cases submitted, and the number of new cases submitted to the Toxicology Laboratory over a 5 year period. The average of new cases being submitted to the laboratory over the past 5 years is 1161.



	2018	2019	2020	2021	2022
Number of Submissions	1176	1156	1320	1498	1292
Number of Cases Submitted	1053	1039	1196	1328	1234
Number of New Cases Submitted	1051	1038	1185	1303	1230

Figure 38: 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 40** the number of new postmortem case submissions has increased from 775 in 2018 to 974 in 2022, which equates to an increase of 25.6% of new postmortem case submissions since 2018.



	2018	2019	2020	2021	2022
Number of Submissions	775	734	886	961	974

Figure 39: The graph depicts the number of new postmortem case submissions to the Toxicology Laboratory.

As illustrated in **Figure 41** the number of new antemortem case submissions as decreased from 281 in 2018 to 256 in 2022, which equates to an increase of 8.9% of new antemortem case submissions since 2018.

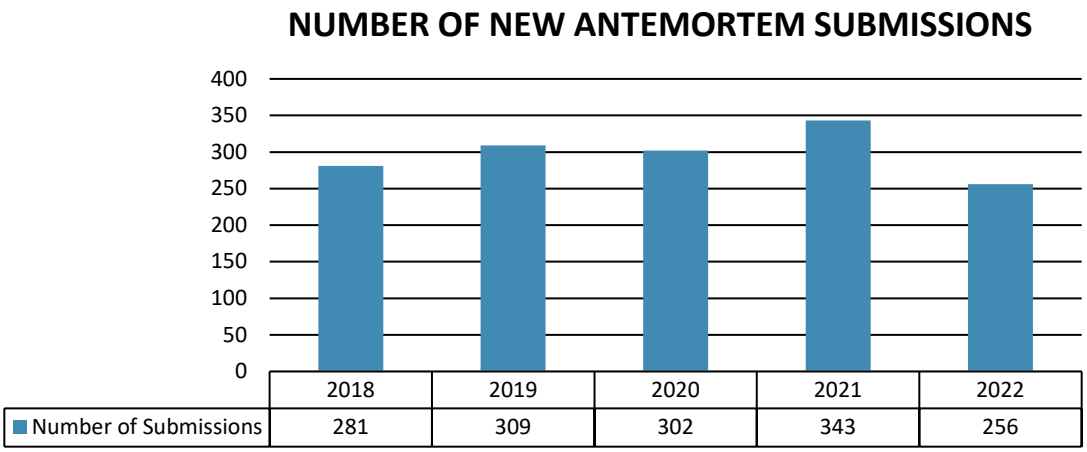


Figure 40: The graph depicts the number of new antemortem case submission to the Toxicology Laboratory.

As illustrated in **Figure 42** the number of total new case submissions to the Toxicology Laboratory has increased from 1056 in 2018 to 1230 in 2022, which equates to an increase of 16.45% of new case submissions since 2018.

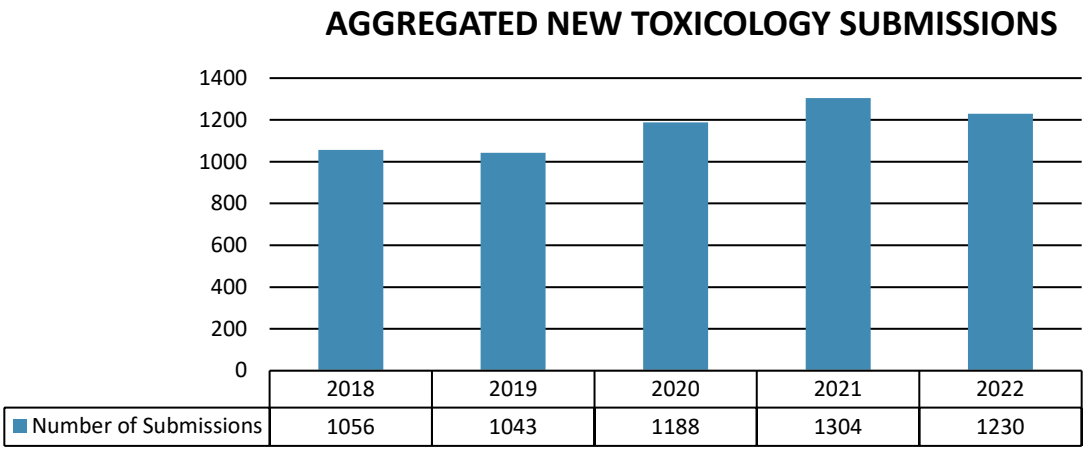


Figure 41: The graph depicts the number of total new case submissions to the Toxicology Laboratory.

The percentage of toxicology cases submitted by case type is illustrated in **Figure 43**. Postmortem (PM) toxicological examinations in support of the District Coroner account for approximately 79.2% of the forensic case work performed by the laboratory.

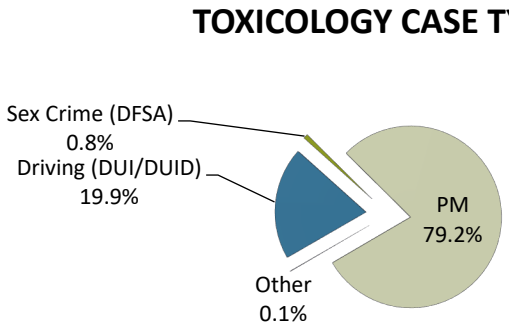
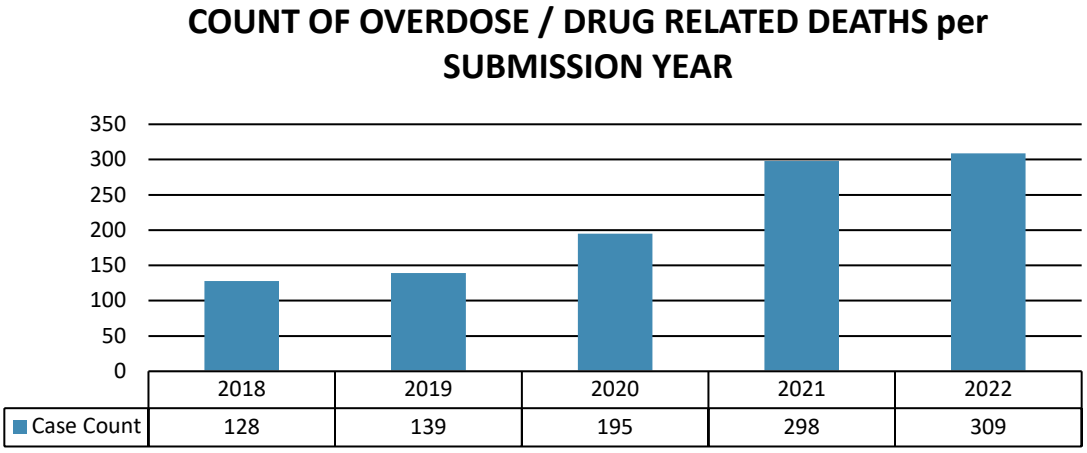


Figure 42: Submission of toxicology cases, sorted by case type. DUI (driving under the influence of alcohol), DUID (driving under the influence of drugs), PM (postmortem), DFSA (drug facilitated sexual assault), and Other (Aggravated Battery, Aggravated Assault, Drug, Homicide, and Undetermined).

Overdoses/Drug Related

Overdose/Drug Related 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 2022, there were a total of 309 overdose fatalities, which equates to an approximate 141.4% increase from 2018 [**Figure 44**].

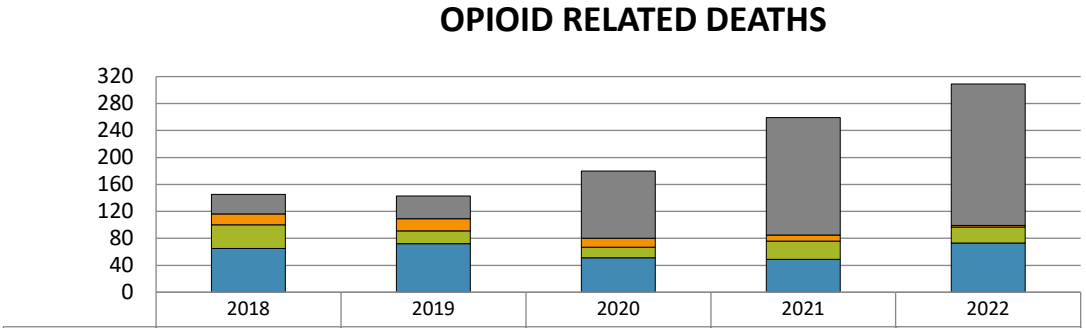


	2018	2019	2020	2021	2022
Case Count	128	139	195	298	309

Figure 43: Number of overdose / drug related deaths per year.

Opioid Related Deaths

Opioid deaths were at another record high in 2022 with a total of 309 (previous high was 259 in 2021). The range of opioid related deaths over the past five years is 143 to 309 with an average of 165 deaths. **Figure 45** provides the count of opioid related deaths broken down into four categories (Fentanyl, Heroin, Oxycodone, and Other Opioids).



	2018	2019	2020	2021	2022
Fentanyl	29	34	100	174	210
Heroin	16	18	13	9	2
Oxycodone	35	19	16	27	24
Other Opioids	65	72	51	49	73
Total	145	143	180	259	309

Figure 44: Opioid related deaths detected in Postmortem Toxicology cases.

Figure 46 illustrates the number of fentanyl related deaths per submission year since 2018.

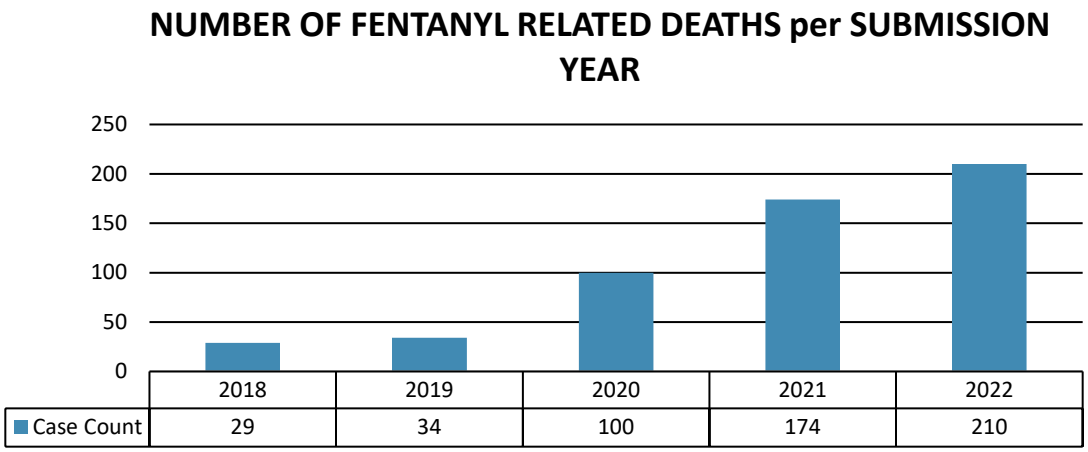


Figure 45: illustrates the number of fentanyl related deaths per submission year.

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	**2018**	**2019**	**2020**	**2021**	**2022**
4-Fluoro-isobutyryl fentanyl	1	0	0	0	0
6-Acetylmorphine (Heroin)	16	17	22	21	11
4-OH Mitragynine	1	0	0	0	0
Acetyl fentanyl	0	0	0	0	1
Buprenorphine	0	1	0	0	1
Codeine	10	7	6	11	10
Dihydrocodeine	0	0	0	5	3
EDDP	4	2	0	0	9
Fentanyl	28	32	100	174	269
Hydrocodone	35	27	25	25	44
Hydromorphone	5	4	8	12	10
Loperamide	0	0	0	0	1
Methadone	18	21	11	15	23
Mitragynine	2	1	4	1	5
*Morphine**	35	40	38	42	30
n-Demethyltramadol	0	0	0	2	0
Norbuprenorphine	0	0	1	8	2
Norfentanyl	1	3	78	140	213
o-Desmethyltramadol	0	0	0	7	7
Oxycodone	39	19	24	38	39
Oxymorphone	8	3	2	7	13
Propofol	1	2	0	1	0
Propoxyphene	1	0	0	0	0
Tramadol	11	10	9	10	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 2022 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 31 to 40 year old age group.

	Age Group	Number of Deaths (All Counties)	Number of Deaths (Sedgwick County)
2022	0-20	24	23
	21-30	38	35
	31-40	59	50
	41-50	44	41
	51-60	26	24
	61-70	18	15
	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 37 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
2022	Accidental	OD Substance Toxicity	225
	Accidental	Blunt Force Injuries	12
	Accidental	Ethanol Toxicity	6
	Accidental	Other	4
	Accidental	Drowning	2
	Accidental	Hypothermia	2
	Accidental	Suffocation Asphyxia	1
	Homicide	Firearms Injuries	1
	Suicide	Firearms Injuries	7
	Suicide	OD Substance Toxicity	4
	Suicide	Suffocation Asphyxia	1
	Undetermined	Other	3
	Undetermined	OD Substance Toxicity	2

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 (199) ever recorded at the Center in 2022. The range of methamphetamine related deaths over the past five years is 113 to 199 with an average of approximately 150 deaths. **Figure 47** illustrates the number of methamphetamine related deaths since 2018 per submission year.

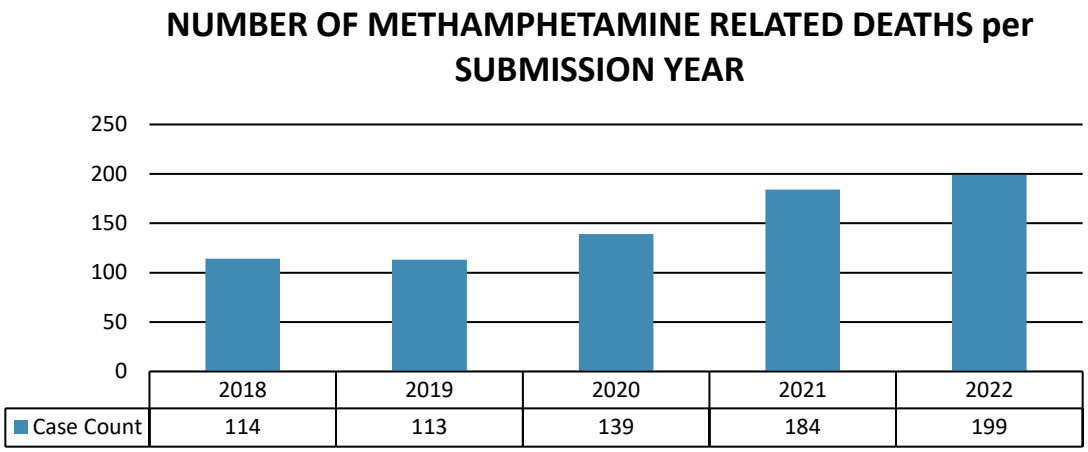


Figure 46: Illustrates the number of methamphetamine related deaths per submission year.

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

	Manner of Death	Cause of Death	Number of Deaths
2022	Accidental	OD Substance Toxicity	141
	Accidental	Blunt Force Injuries	18
	Accidental	Other	4
	Accidental	Ethanol Toxicity	2
	Accidental	Hypothermia	2
	Accidental	Thermal Injuries	1
	Homicide	Firearms Injuries	7
	Homicide	Sharp Force Injuries	2
	Homicide	Blunt Force Injuries	1
	Suicide	Hanging Asphyxia	8
	Suicide	Firearms Injuries	5
	Suicide	OD Substance Toxicity	1
	Suicide	Blunt Force Injuries	1
	Undetermined	Other	2
	Undetermined	OD Substance Toxicity	1
	Undetermined	Blunt Force Injuries	1

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 2022 Postmortem Toxicology cases where the most frequently detected drugs and/or metabolites were detected. Excluding Acetone, there were a total of 141 different drugs and/or metabolites detected in 713 cases.

Drugs Detected in Postmortem Cases	**Case Count**	**Percent of Case Detected**
Ethanol	211	29.5
Fentanyl	211	29.5
Methamphetamine	200	28.0
Amphetamine	180	25.2
Norfentanyl	168	23.5
Tetrahydrocannabinol	130	18.2
Benzoylecgonine	78	10.9
Caffeine	63	8.8
Cotinine	60	8.4
Hydrocodone	41	5.7
Alprazolam	40	5.6
Naloxone	36	5.0
Cocaine	34	4.7
Oxycodone	32	4.4
Gabapentin	26	3.6
*Morphine**	26	3.6
Carboxytetrahydrocannabinol	23	3.2
7-Aminoclonazepam	21	2.9
Diphenhydramine	20	2.8
Methadone	20	2.8
4-ANPP	15	2.1
Cocaethylene	15	2.1

Table 7: The most commonly detected drugs and/or metabolites detected in 2022 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 227 Blood Draw Kits submitted for analysis in 2022. Driving case violations may include, but not limited to, DUI/DUID (Driving Under the Influence of Drugs), various drug violations, vehicular homicide, vehicular fatality, evading police, and hit and run. In total there were 30 different individual drugs, drug metabolites, and/or alcohol positively identified for a total of 392 drugs/alcohol from the 205 cases that had a positive result.

Drugs Detected in Antemortem Driving Cases	**2018**	**2019**	**2020**	**2021**	**2022**
11-Hydroxy-Delta-9-THC	0	0	0	0	1
7-Aminoclonazepam	6	8	9	6	5
a-Hydroxyalprazolam	0	0	0	0	0
Alprazolam	35	18	18	20	11
Amphetamine	28	40	43	40	41
Benzoylecgonine	9	9	9	21	13
Bromazolam	0	0	0	1	1
Butalbital	1	0	1	1	2
Carboxytetrahydrocannabinol	5	2	1	0	0
Carisoprodol	2	2	0	3	2
Clonazolam	0	0	3	0	0
Clonazepam	4	9	10	5	3
Cocaethylene	1	1	0	0	1
Cocaine	2	4	0	3	5
Codeine	1	0	0	2	1
*Delta-8-Caboxy-THC^*	0	0	0	0	5
*Delta-8-THC^*	0	0	0	0	3
*Delta-9-Carboxy-THC^*	0	0	0	0	16
*Delta-9-THC^*	0	0	0	0	13
Desmethyl(es-)citalopram	1	0	0	0	0
Diazepam	5	1	0	6	0
Difluoroethane	0	2	3	1	2
Diphenhydramine	4	0	0	0	0
Doxylamine	0	0	1	0	0
Es/Citalopram	1	0	1	0	0
Ethanol	107	115	106	125	69
Etizolam	2	1	3	0	0
Fentanyl	3	7	17	57	33
Flualprazolam	0	7	13	0	0
Flubromazepam	1	2	1	0	0
Flubromazolam	8	2	3	0	0
Fluoxetine	0	0	0	1	0
Gabapentin	1	1	1	2	0
Hydroxyzine	1	0	0	0	0
Hydrocodone	6	3	3	5	10
Hydromorphone	0	0	0	1	0
Lamotrigine	0	0	0	1	0
Levetiracetam	0	1	0	0	0
Lorazepam	3	2	0	2	4
m-Chlorophenylpiperazine (m-CPP)	1	0	0	0	0

Meprobamate	3	2	2	5	2
Methadone	7	8	8	13	9
Methamphetamine	28	34	52	60	52
Methylenedioxyamphetamine	0	0	2	1	0
Methylenedioxymethamphetamine	1	0	1	2	0
Mitragynine	0	1	0	0	0
Morphine	0	4	8	6	1
Norbuprenorphine	0	0	1	0	0
Nordiazepam	6	3	3	7	0
Nordiphenhydramine	2	0	0	0	0
Norfentanyl	0	1	14	49	30
Norfluoxetine	0	0	0	1	0
o-Desmethyltramadol	1	0	2	0	0
Oxazepam	0	1	1	0	0
Oxycodone	5	6	7	9	2
Oxymorphone	0	1	1	0	0
Phenazepam	0	1	0	0	0
Phencyclidine	7	3	5	5	1
Phenobarbital	0	1	0	0	1
Quetiapine	0	1	0	0	0
Sertraline	1	0	1	0	0
Temazepam	0	0	2	1	0
Tetrahydrocannabinol (THC)	57	74	81	84	49
Tramadol	2	0	1	0	0
Trazodone	1	0	0	1	0
Venlafaxine	0	0	1	0	0
Zolpidem	6	5	3	3	5

Table 8: 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. ^ Prior to 2022, the laboratory did not have a method to differentiate between delta-8 and delta-9 tetrahydrocannabinol.

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 9**, in 2022 there were 10 DFSA cases submitted for analysis.

Year	**Cases Submitted**
2018	24
2019	26
2020	15
2021	18
2022	10

Table 9: DFSA cases submitted and completed each year since 2018.

DFSA case specimens often have several different drugs present. **Table 10** 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. In total there were 34 individual drugs, drug metabolites, and/or alcohol detected for a total of 51 drugs, drug metabolites, and/or alcohol for cases submitted in 2022.

Drugs Detected in Drug Facilitated Sexual Assault Cases per Submission Year	2018	2019	2020	2021	2022
7-Aminoclonazepam	3	1	2	1	2
α-Hydroxyalprazolam	5	1	0	1	0
Acetone	-	-	-	-	2
Alprazolam	5	1	0	0	0
Amitriptyline	0	1	0	0	0
Amphetamine	5	5	1	8	4
Anhydroecgonine methyl ester	1	0	0	0	0
Benzoylecgonine	5	3	3	4	1
Bupropion	1	0	0	0	1
Bupropion threo amino alcohol	1	0	0	1	0
Carboxytetrahydrocannabinol	11	13	5	9	5
Chlorcyclizine	1	1	1	2	0
Clonazepam	1	0	1	0	1
Cocaethylene	1	0	0	1	0
Cocaine	2	0	0	2	0
Codeine	0	1	0	0	0
Cyclobenzaprine	1	0	0	0	0
Desmethyl(es-)citalopram	0	1	1	2	0
Desmethylsertaline	1	0	0	0	0
Dextromethorphan	1	0	0	0	0
Diphenhydramine	3	4	4	1	1
Doxylamine	0	0	0	0	1
Duloxetine	1	0	0	0	0
Ecgonine ethyl ester	1	0	0	2	0
Ecgonine methyl ester	1	0	0	2	0
EDDP	1	0	0	0	0
Es/citalopram	0	1	1	2	0
Ethanol	8	8	5	4	2
Fentanyl	0	0	0	0	1
Flubromazolam	0	1	0	0	0
Fluconazole	1	0	0	0	0
Fluoxetine	0	1	0	2	2
Gabapentin	0	2	0	0	1
Hydrocodone	2	0	0	1	0
Hydromorphone	1	0	0	1	0
Hydroxybupropion	1	0	0	0	1
Hydroxyzine	0	1	0	0	0
Lamotrigine	0	0	0	0	2
Lidocaine	0	0	1	1	0
Lorazepam	1	2	2	0	2
m-Chlorophenylpiperazine	0	0	0	0	1
Meprobamate	1	0	0	0	0
Methadone	1	0	0	0	0
Methamphetamine	6	7	1	7	4
Methylenedioxyamphetamine	0	0	0	0	0
Morphine	0	1	0	0	1
n-Desmethyltramadol	0	1	0	0	0
Norcocaine	1	0	0	0	0

Nordiazepam	1	0	0	0	0
Nordiphenhydramine	1	3	4	1	1
Norfentanyl	1	0	0	1	1
Norfluoxetine	0	1	0	2	2
Norquetiapine	0	0	0	1	0
o-Desmethyltramadol	0	2	0	0	1
o-Desmethylvenlafaxine	0	0	0	1	1
Oxazepam	2	1	0	0	1
Oxycodone	1	1	0	0	1
Oxymorphone	1	1	0	0	1
Phencyclidine	1	0	1	0	0
Pheniramixy	1	0	0	0	0
Phentermine	2	0	0	0	0
Promethazine	0	2	2	0	1
Quetiapine	0	0	0	0	1
Salicylic Acid	1	1	0	0	0
Sertraline	0	1	0	0	1
Temazepam	1	1	0	0	0
Tetrahydrocannabinol	0	1	0	0	0
Toluene	0	0	1	0	0
Tramadol	0	2	2	0	1
Trazodone	0	0	0	0	1
Tyramine	0	0	0	0	1
Venlafaxine	0	1	0	1	1

Table 10: 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.