



REGIONAL FORENSIC SCIENCE CENTER SEDGWICK COUNTY, KANSAS

Timothy P. Rohrig, Ph.D. — Director
Jaime L. Oeberst, M.D. — District Coroner-Chief Medical
Examiner

FORENSIC SCIENCE LABORATORIES 2012 ANNUAL REPORT

HISTORY

The Regional Forensic Science Center officially opened on December 21st, 1995. The Center houses the Office of the District Coroner and the Forensic Science Laboratories [FSL]. The Forensic Science Laboratories are composed of three major sections: Criminalistics, Forensic Biology/DNA and Forensic Toxicology. The staff currently consists of 21 scientific and support personnel.

The FSL is staffed with highly-trained and experienced forensic scientists, many who have advanced scientific degrees [MS, MSFS, Ph.D.]. The technical staff has well over 215 years of combined professional experience.

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

The Forensic Science Laboratories are accredited by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board [ASCLD/LAB].

The FSL of the Center continues to grow, providing timely and comprehensive forensic science services to local and regional law enforcement.

LABORATORY LEADERSHIP

The laboratory management staff are all case-working scientists.

Director and Chief Toxicologist
Timothy P. Rohrig, Ph.D., DABFT

Chief of Criminalistics
Gary L. Miller

Toxicology Lab Manager
Lydia Harryman

Forensic Biology/DNA Manager
Shelly A. Steadman, Ph.D.

Quality Assurance Manager
Robert Hansen, M.S.F.S.

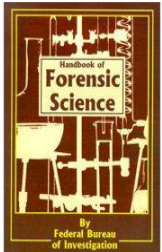


SIGNIFICANT ACHIEVEMENTS

- The laboratory presented 7 papers at various professional meetings:
 - L.E. Hume*, R.D. Fornshell, T.P. Rohrig, and J.G. Rankin, “New Gas Chromatography-Positive Chemical Ionization Tandem Mass Spectrometric Method for the Determination of Methylenedioxypropylamphetamine (MDPV), 4-Methylmethcathinone (Mephedrone), and 4-Methoxymethcathinone (Methedrone)”, Presented at the American Academy of Forensic Sciences Annual Meeting, February 2012, Atlanta, Georgia.
 - T.P. Rohrig, “DFSA Applications and Interpretations – OTC Antihistamines”, Invited presentations at the Society of Forensic Toxicologists Continuing Education Workshop – Drug Facilitated Sexual Assault, April 2012, Edmond, Oklahoma.
 - T.P. Rohrig, “Pain Management Medications Utilized in Drug Facilitated Sexual Assaults”, Invited presentations at the Society of Forensic Toxicologists Continuing Education Workshop – Drug Facilitated Sexual Assault, April 2012, Edmond, Oklahoma.
 - T.P. Rohrig, “Alcohol and Drug Facilitated Sexual Assaults”, Invited presentations at the Society of Forensic Toxicologists Continuing Education Workshop – Drug Facilitated Sexual Assault, April 2012, Edmond, Oklahoma.
 - T.P. Rohrig, “Toxicology for Kansas Prosecutors”, Invited presentation at the Trial Advocacy II for Kansas Prosecutors Workshop, August 2012, Wichita, Kansas.
 - A.J. Whitaker*, L. Harryman and T.P. Rohrig, “Single Dose Urinary Kinetics of Carisoprodol”, Presented at the Southwestern Association of Toxicologists Fall Meeting, October 2012, Norman, Oklahoma.
 - T.P. Rohrig, “Basic Pharmacology of the Synthetic Cannabinoids”, Presented at the Southwestern Association of Toxicologists Fall Meeting, October 2012, Norman, Oklahoma.



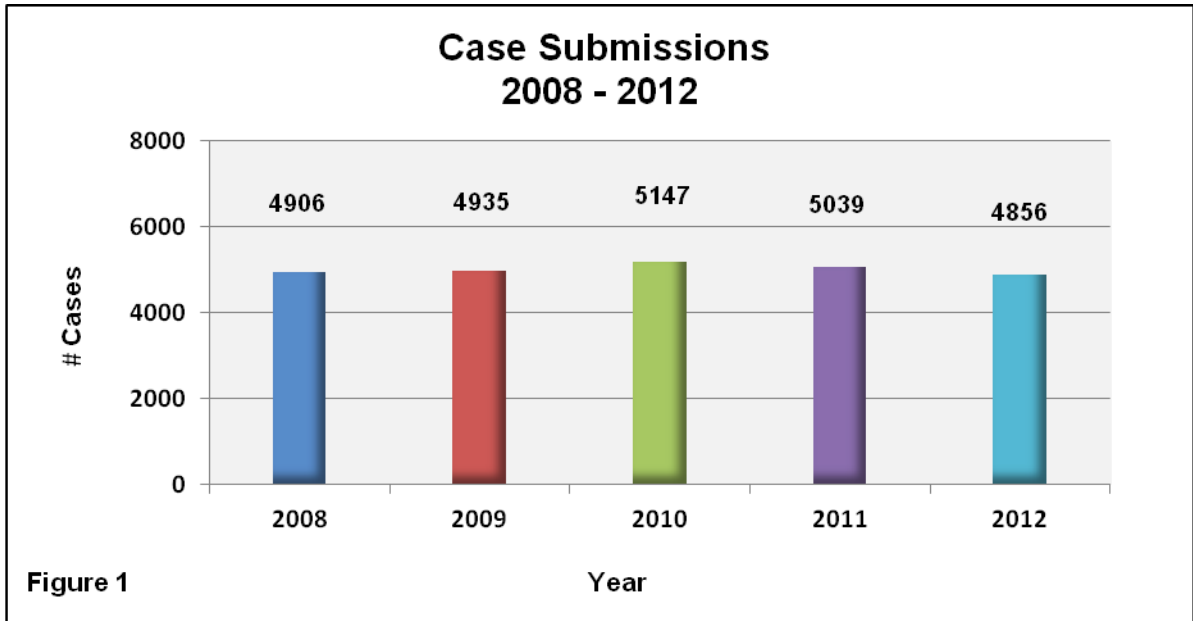
- Conferences/Symposiums:
 - T.P. Rohrig, “DWI-D Value of Urine and/or Blood Toxicology”, Invited Speaker at the DWI/Traffic Safety and DRE Recertification Conference, June 2012, Osage Beach, Missouri.
- 2012 Grant Funding:
 - Justice Assistance Grant
 - National Forensic Science Improvement Grant



FORENSIC SCIENCE LABORATORIES SERVICE OVERVIEW

Case Submissions

The Forensic Science Laboratory continues to experience a significant demand for its expert services. This year the Laboratory Division worked several high-profile cases, each case involving hundreds of exhibits requiring forensic analysis. While the total number of case submissions slightly decreased compared to last year, the number of items of evidence examined increased dramatically. Compared to 2008, case submissions decreased approximately 1%. The reduction is mainly attributed to triaging drug and alcohol cases; i.e., cases where forensic analysis were not required, they were not submitted. **Figure 1** illustrates the number of forensic laboratory cases submitted for examination for the past 5 years.



2012 Case Submissions

Figure 2 illustrates the breakdown of case submissions by Laboratory section. The Criminalistics section continues to receive the majority of evidence submitted.



Figure 2

Although Biology accounts for a small percentage of the overall caseload – a significant portion of the casework required analysis of hundreds of exhibits. Also, the increasing 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 percent breakdown of cases.

Requests for Expert Testimony

The professional staff is frequently called upon to present expert testimony in the courts [Figure 3]. In 2012, the FSL received 3372 subpoenas for court appearances, an approximate 16.7% decrease from the last year.

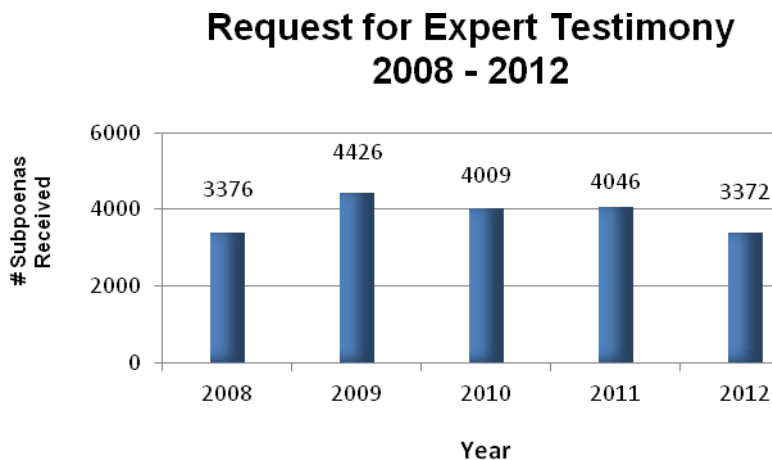


Figure 3

AGENCIES SERVED

The Forensic Science Laboratories provides expert testing services and consultation for a variety of law enforcement agencies within and outside of Sedgwick County. In 2012, the FSL provided expert testing services and consultations to 42 Law Enforcement Agencies, Fire Departments, and District Coroners. **Figure 4** indicates [yellow highlight] the counties within the state in which forensic laboratory services were provided.

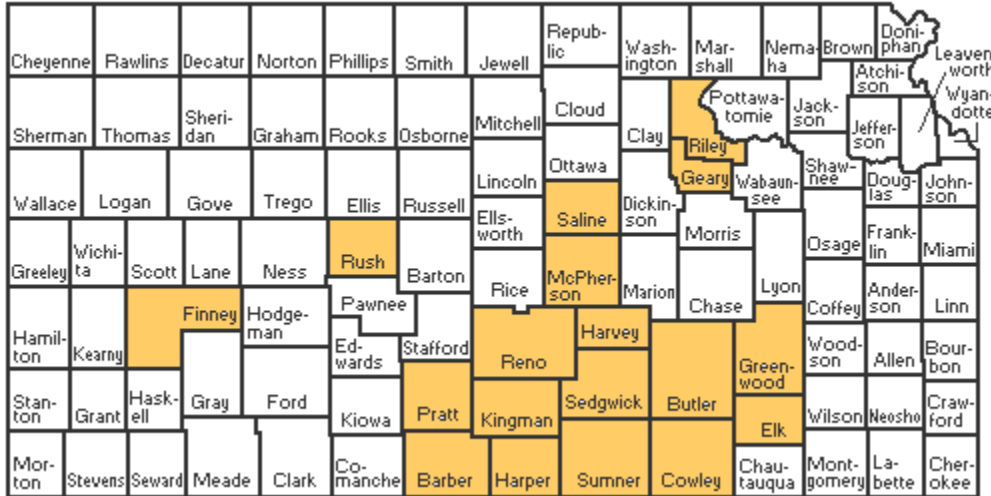


Figure 4

Sedgwick County vs. Out-of-County Cases

The Sedgwick County Regional Forensic Science Center serves as the principle Forensic [Crime] Laboratory for all of Sedgwick County Law Enforcement Agencies and provides forensic services to many other counties and municipalities within the state of Kansas. However, the vast majority of forensic laboratory services were provided for Sedgwick County Law Enforcement agencies. **Figure 5** illustrates the relative percentages of In-County [Sedgwick] and Out-of-County cases submitted to the Forensic Science Laboratories. A significant portion of the out-of-county cases was in support of the Sedgwick County Coroner’s out-of-county autopsies.

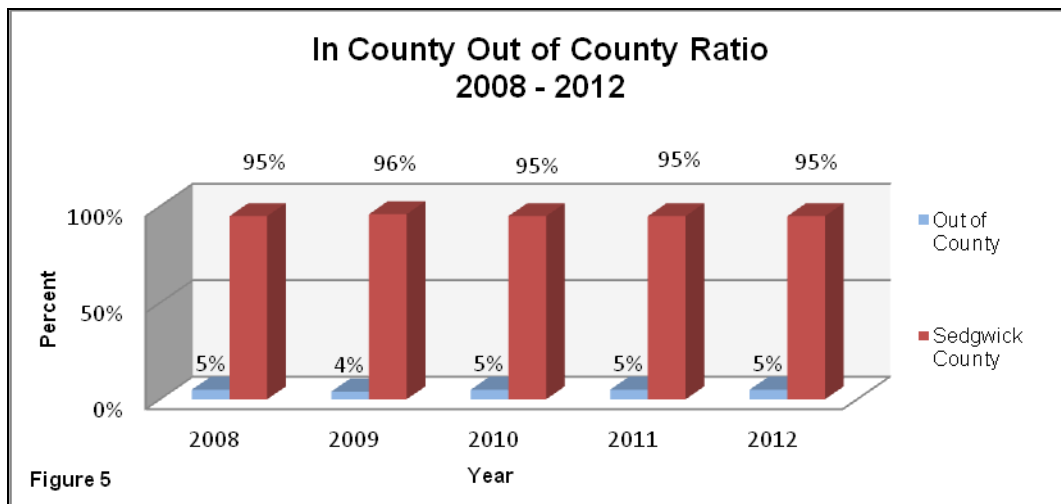


Figure 5

Table 1 is a list of Law Enforcement Agencies and Fire Departments that forensic laboratory services were provided for in 2012.

Table 1: Agencies Served 2012

Alcohol Beverage Control	Hutchinson Correctional Facility	Wellington PD
Andale PD	Junction City PD	Wichita FD
ATF Task Force	Kansas Dept. of Corrections	Wichita PD
Barber Co. Corner	Kansas Highway Patrol	Wichita State University PD
Butler Co. Coroner	Kingman Co. Coroner	
Bel Aire PD	Maize PD	
Clearwater PD	McPherson Co. Coroner	
Colwich PD	Mulvane PD	
Cowley Co. Coroner	Park City PD	
Derby PD	Pratt Co. Coroner	
Eastborough Police	Reno Co. Coroner	
Eldorado Correction Facility	Riley Co. Coroner	
Elk Co. Coroner	Rush Co. Coroner	
Finney Co. Coroner	Saline Co. Coroner	
Greenwood Co. Coroner	Sedgwick Co. Coroner	
Goddard PD	Sedgwick Co. FD	
Harper Co. Coroner	Sedgwick Co. Sheriff	
Harvey Co. Coroner	Sumner Co. Coroner	
Haysville PD	Valley Center PD	



CRIMINALISTICS SECTION

The Criminalistics Section accounts for the majority of the cases submitted to the Forensic Laboratories. The Criminalistics Section provides forensic examinations in the following disciplines; Drug Identification, Open Container [Beverage Alcohol] Analysis, Firearms & Toolmarks, Serial Number [Firearms] Restoration and Trace Evidence – including sub-disciplines of Ignitable Liquids [Arson], and Chemical/Material Analysis. **Figure 6** illustrates the trend in forensic case volume submitted to the Criminalistics Section.

Criminalistics Case Submissions 2008-2012

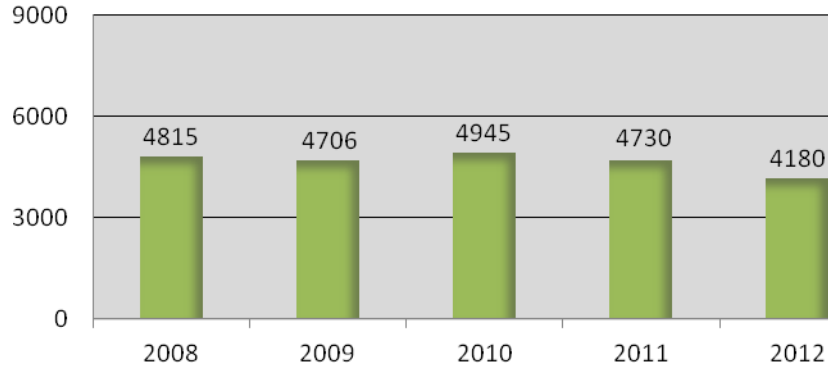


Figure 6

2012 Criminalistics Case Types

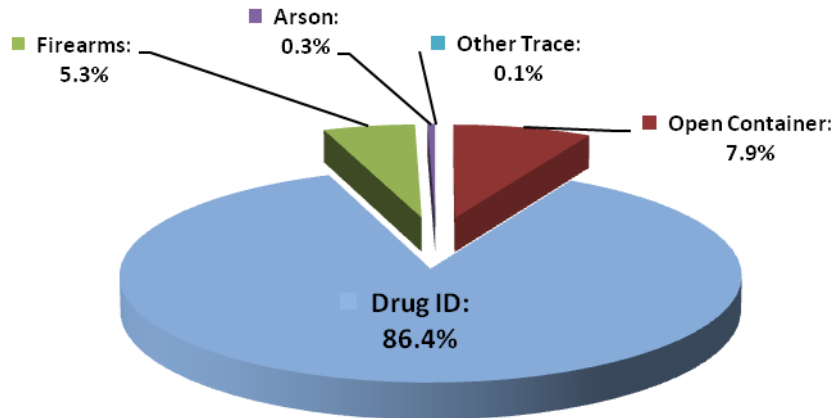


Figure 7

The majority of cases submitted to the Criminalistics Section [**Figure 7**] are for illicit drug identification. This accounts for a little more than three-fourths of the cases received. Open Container is the second most abundant case type, accounting for approximately 8% of the cases submitted for analysis to the section.

Drug ID Unit

The agency that submits the greatest volume of drug evidence is the Wichita Police Department [WPD]. This is apparent in **Figure 8** as nearly 90% of cases received are from the Wichita Police Department. Agencies other than the Wichita Police Department and the Sedgwick County Sheriff's Office comprise less than 5% of the total cases submitted.

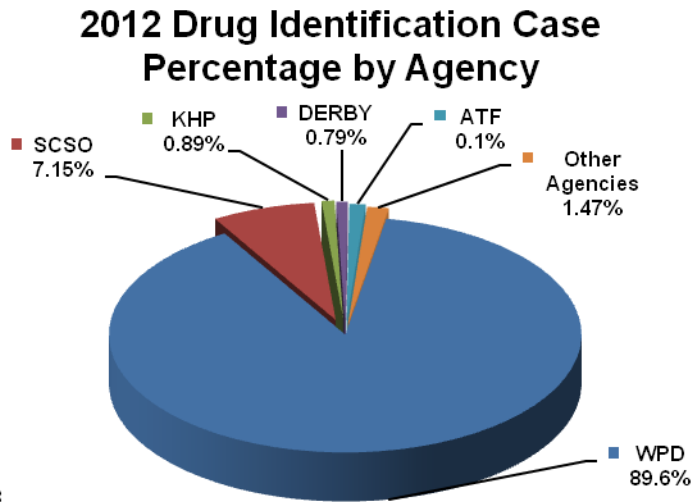


Figure 8

In 2012, the Drug Identification Unit examined over 8455 exhibits for the presence of controlled substances. The majority of drug exhibits were Marijuana (49.8%) Cocaine and Methamphetamine account for 35.1% of the total exhibits examined. There has been a significant increase in the number of Synthetic Cannabinoids (“Potpourri”) and designer stimulants (substituted Cathinone aka “Bath Salts”). The number of other controlled substances represents 8.3% of the exhibits examined. **Figure 9** illustrates the number of exhibits in which various types of drugs were positively identified.

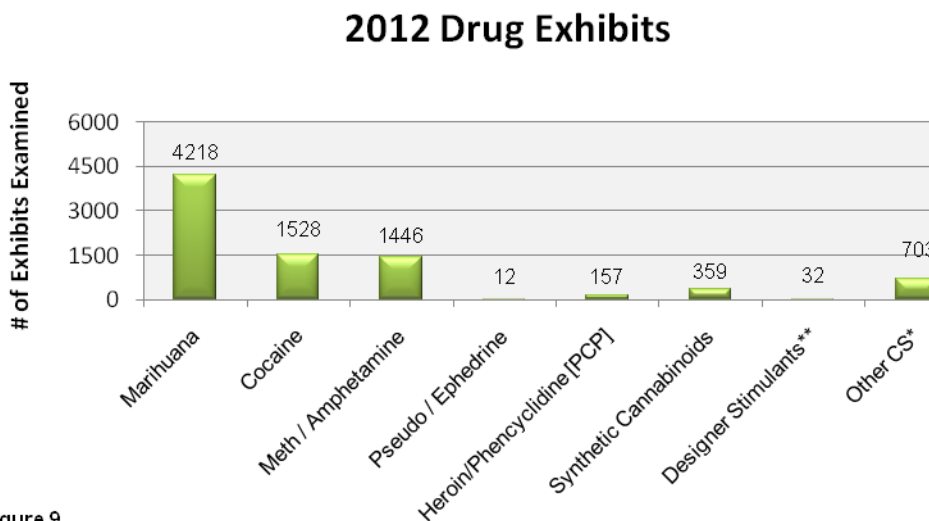


Figure 9

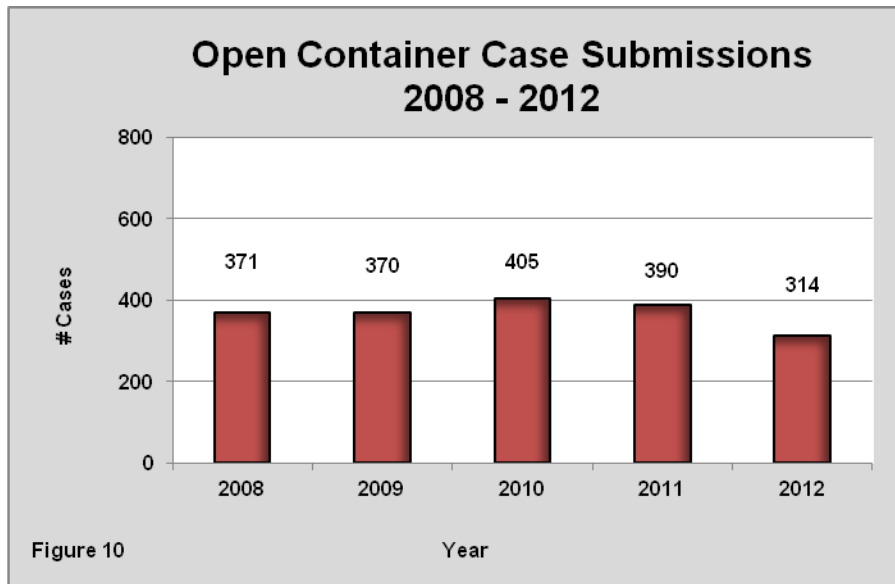
*CS: Controlled Substances

**Includes: 1-Benzylpiperazine [BZP], 1-(3-[trifluoromethylphenyl])piperazine [TFMPP], Methylendioxyamphetamine [MDMA], and Methylendioxyamphetamine [MDA].



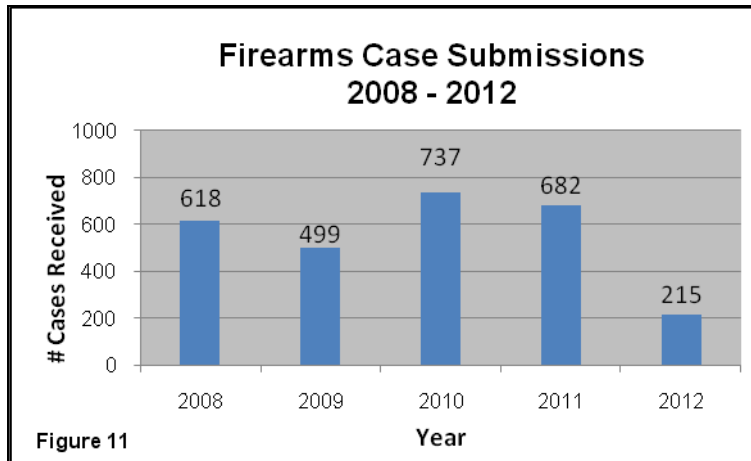
Open Container | Alcohol | Unit

Open Container/Beverage Alcohol Analysis is conducted in support of the state and local DUI laws, prohibition of minors to possess alcohol, and other liquor law violations. As shown in **Figure 10** the number of cases submitted remained somewhat constant.

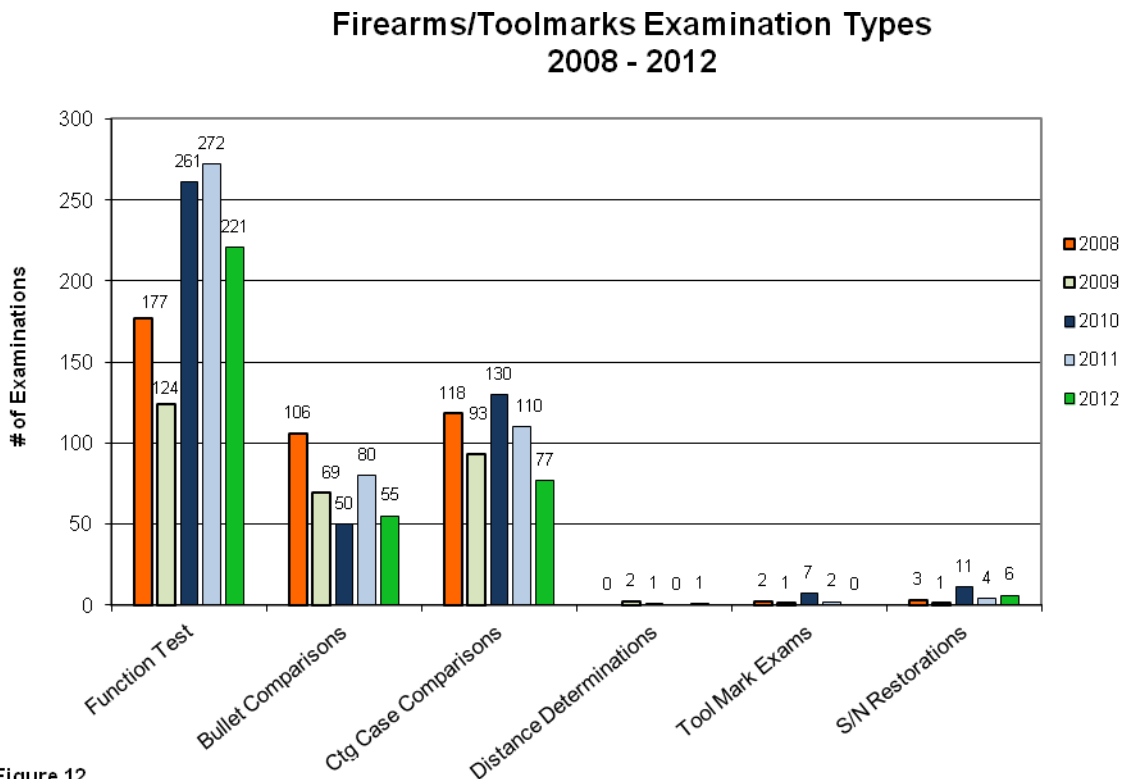


Firearms/Toolmarks Unit

The Firearms/Toolmarks Unit conducts many types of forensic examinations. The majority of examinations involve operability (function) tests on the submitted firearms. As shown in **Figure 11**, the unit experienced approximately a 19% decrease in function test requests from 2011 to 2012.

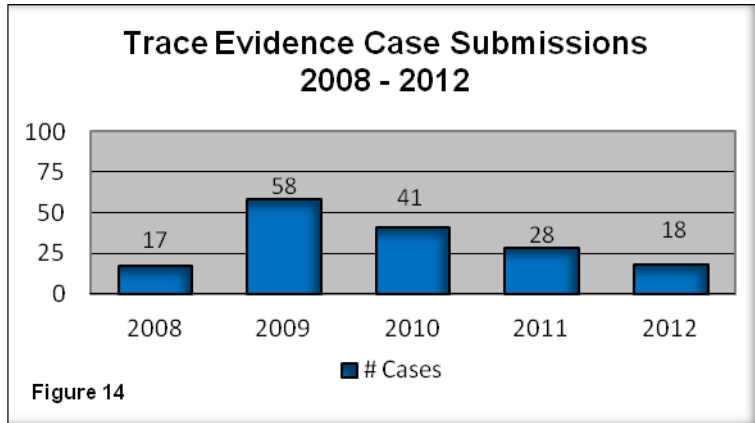


In 2012, bullet comparison examinations increased 31.25% while cartridge case comparisons decreased 30% from the previous year. **Figure 12** illustrates the case types submitted to the unit; classified as test fires, bullet comparisons, cartridge case comparisons, distance determinations, tool mark exams, and serial number restorations.



Trace Evidence Unit

Trace Analysis is the forensic identification and examination of unknown compounds, physical match, tape, and fire debris evidence in casework ranging from product tampering to assault and homicide. **Figure 14**, illustrates the number of cases worked by the Arson/Trace Evidence Unit each year from 2008 through 2012. The majority of casework in the Arson/Trace Evidence Unit is the investigation of suspicious fires. The unit will continue to see a high demand for this forensic service.



In addition to assisting arson investigations, the Arson/Trace Evidence Unit provides microscopic/physical/chemical analyses for a variety of evidence submissions associated with criminal investigations [Figure 15]. The trace analysis case-type category includes material analysis; such as, fracture analysis and identification of unknown liquid and/or solid material.

2012 Arson vs Other Trace

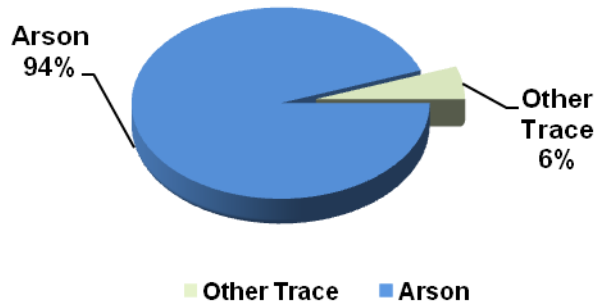
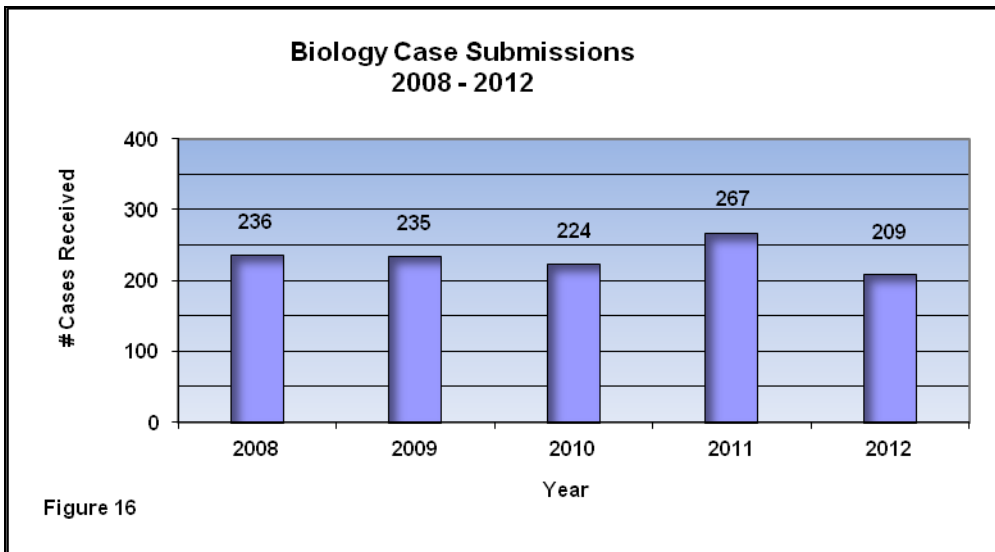
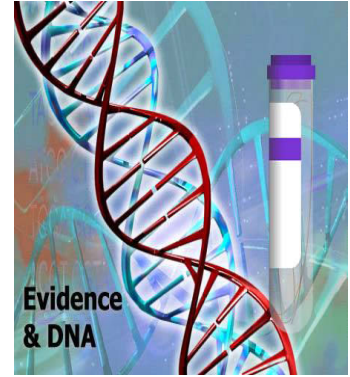


Figure 15

FORENSIC BIOLOGY/DNA SECTION

In 2012, the Biology/DNA section received 209 cases for forensic DNA examination [Figure 16]. While there has been a slight decline in the number of cases submitted, the number of exhibits for each case has increased. Furthermore, the number of DNA profiles generated increased per case upon implementation of Y-STR analysis in 2009.



The apparent increase in caseload observed in 2010 and 2011 was due to a change in Kansas legislature, database hit notification, and offender databasing. In addition to convicted offender collection, the new law allowed for arrestee sample collection to begin in 2007. With a vast amount of arrestee sample processing on the horizon, the State (KBI) databasing lab implemented robotic technology to increase throughput of offender/arrestee sample processing. This resulted in a drastic increase in the population of the offender database (approximately 40,000 profiles were added to the state's index) and resulted in hits between those newly collected offenders and DNA profiles previously uploaded from no-suspect cases typed by Sedgwick County. In late 2009, the Sedgwick County DNA Laboratory adopted new procedures for the release of investigative lead information, to include formal written and reviewed reports for database associations. Ultimately, the increased number of associations resulted in an increase in reports generated, as well as an increase in the number of known samples processed to confirm and prosecute these additional CODIS hits. All factors taken together caused a spike in workload that was realized in 2010 and continued throughout 2011. By 2012, the vast majority of the backlogged offender samples had been added to the database and the increase in workload due to CODIS investigative leads begins to level off.

The Forensic Biology Section provides forensic examinations in the identification of body fluids and STR DNA [profile] analysis. As depicted by **Figure 17**, over half the cases submitted for biological examination are Robbery/Burglary. The section continues to work a variety of case types, including other sex crimes (indecent liberties, incest, etc.), homicides, property crimes, assaults, and forensic identifications [unidentified bodies].

While property crimes constitute the majority of the cases worked, it should be noted that these generally are single exhibit cases that are processed only if the evidence submitted has a high likelihood of resulting in a profile suitable for CODIS entry. Given that these crimes have a high recidivism rate, they have an exceptional solvability factor when crime scene profiles are searched against the database.

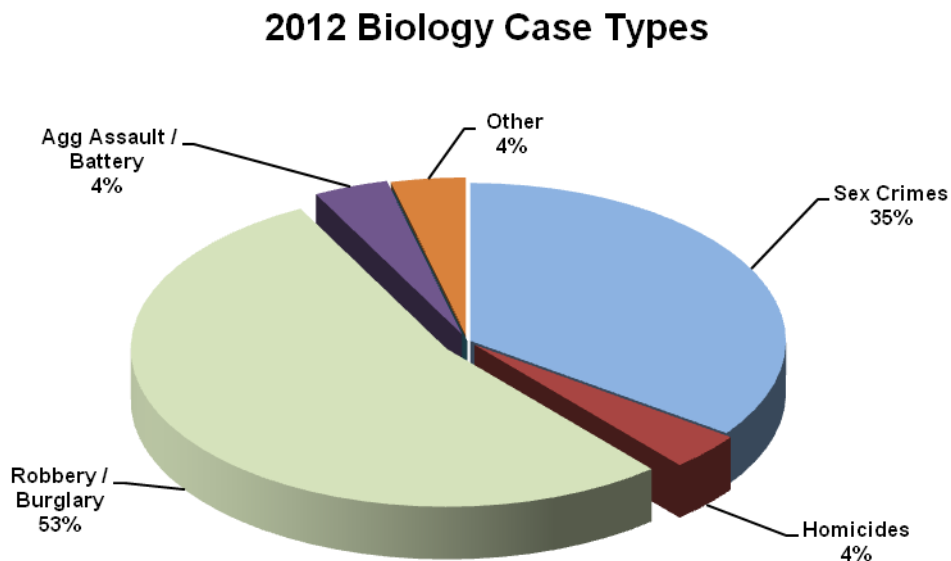


Figure 17 Four percent of the case types are categorized as other. This category may include cases involving felony possession of a firearm, arson, vandalism, auto theft, attempted murder, vehicular homicide, narcotics, stalking, etc. The section identified one human remain through Forensic DNA analysis.

The Biology / DNA section issued 371 reports in 2012. Of those, 87 were Offender Hit Notifications, which is when a forensic unknown sample hits to a convicted offender sample at the state or national level, and 13 were Local DNA Index System (LDIS) match reports, which is when a local forensically unknown sample hits to another sample previously entered into the local database.

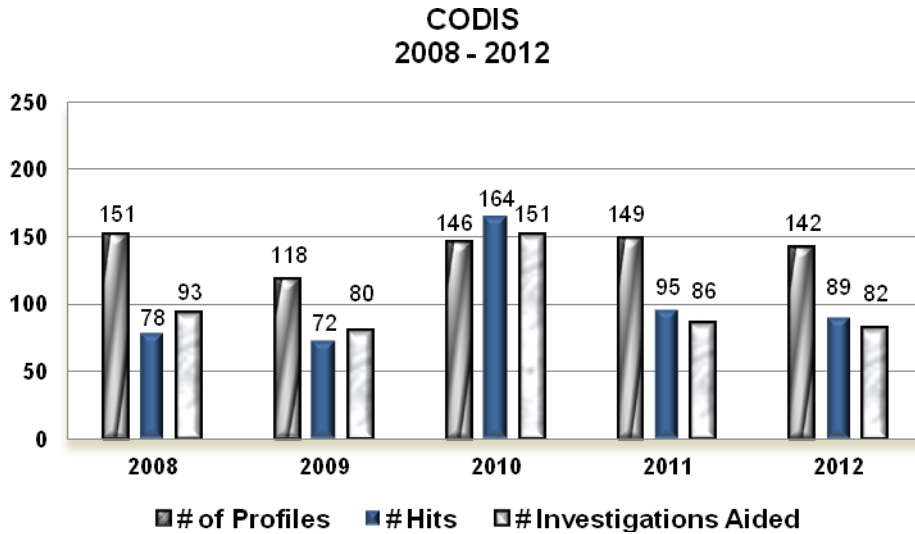


Figure 18 2010 indicates an increase in the number of reports issued by the Biology / DNA section due to new accreditation requirements. As the CODIS database increases in the number of profiles the number of reports is expected to increase.

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

Figure 19 Outlines the number of profiles entered, number of hits, and the number of investigations aided during the five year period beginning in 2008. The number of profiles entered into CODIS annually is steady, averaging 141 per year. The number of hits (average 100 per year) and investigations aided (average 99 per year) closely track one another.

FORENSIC TOXICOLOGY SECTION



The Forensic Toxicology Section has experienced a moderate increase in casework over the last few years. According to **Figure 20**, the number of cases submitted in 2012 has increased over years 2008 and 2009. The section continues to expand the number of drugs and poisons it can detect and quantitate. The Forensic Toxicology Section provides comprehensive examinations of post-mortem [autopsy] samples to assist in the determination of cause and manner of death. Specimens collected during the investigation of driving-under-the-influence-of-drugs/alcohol cases and drug-facilitated sexual assault cases are also examined by this section. The Toxicology Laboratory also provides drug testing on children removed from clandestine methamphetamine laboratories.

Toxicology Case Submissions 2008-2012

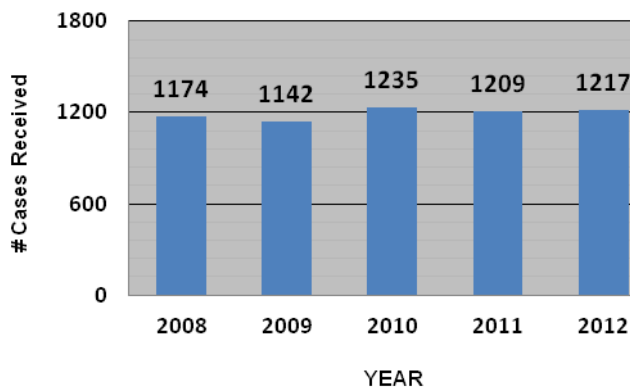


Figure 20

Figure 21 depicts the percentage of toxicology cases submitted by case type. Toxicological examinations in support of the District Coroner accounts for approximately two-thirds of the forensic case work performed by the section.

2012 Toxicology Case Types

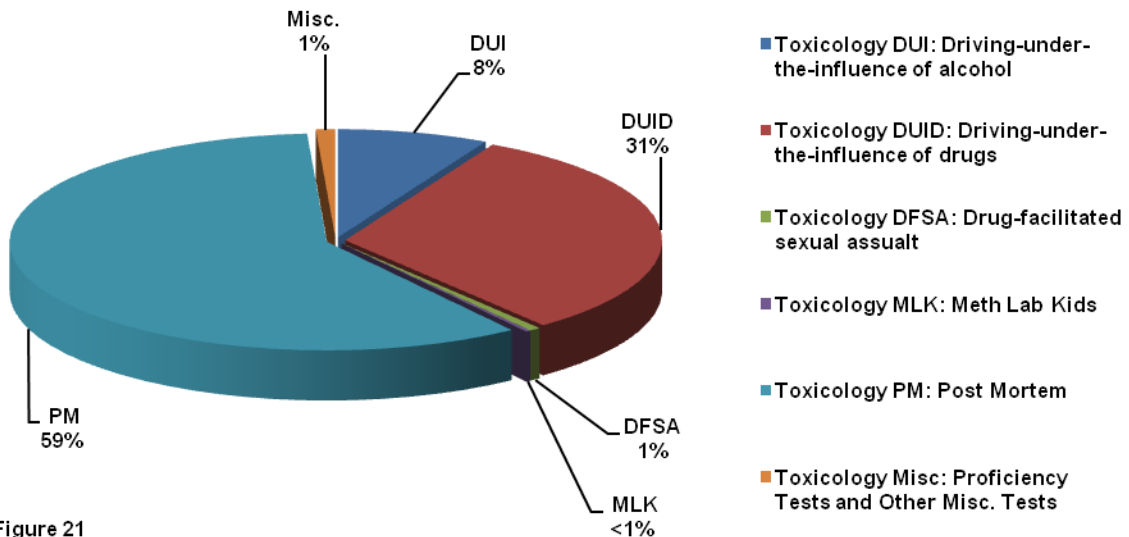


Figure 21

Children Removed from METH LABS

The RFSC is a partner in the Sedgwick County “Meth Kids Initiative Task Force” and the Kansas Alliance for Drug Endangered Children [DEC]. The DEC program is a multidisciplinary approach to protecting children found in clandestine methamphetamine laboratories. Children in these laboratories are at a great risk for physical, emotional, and developmental harm.



As shown in **Figure 22**, the Toxicology Laboratory evaluated 3 children [2 cases] removed from clandestine methamphetamine laboratories for exposure to methamphetamine in 2012.

Overall, 43.8% of all children tested had detectable amounts of methamphetamine in their systems from 2009 through 2012.

2009-2012 Clandestine Meth Lab Kids

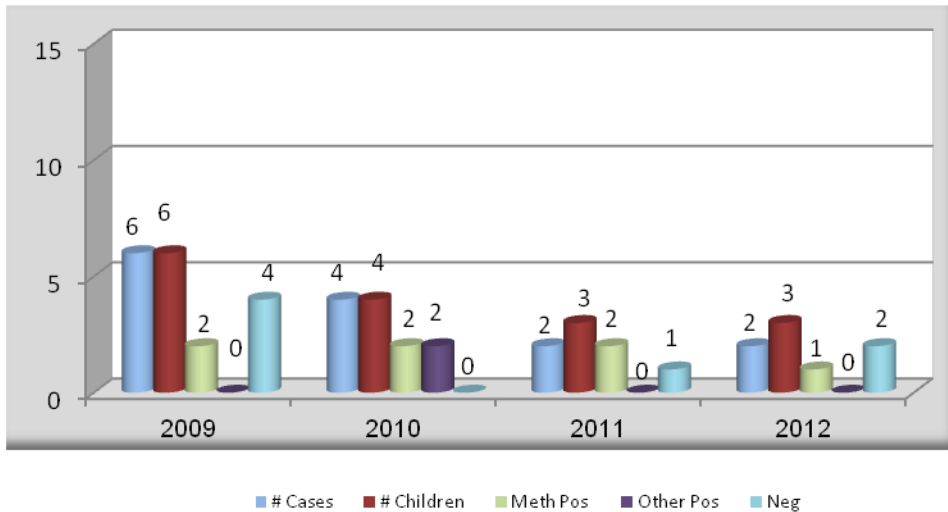
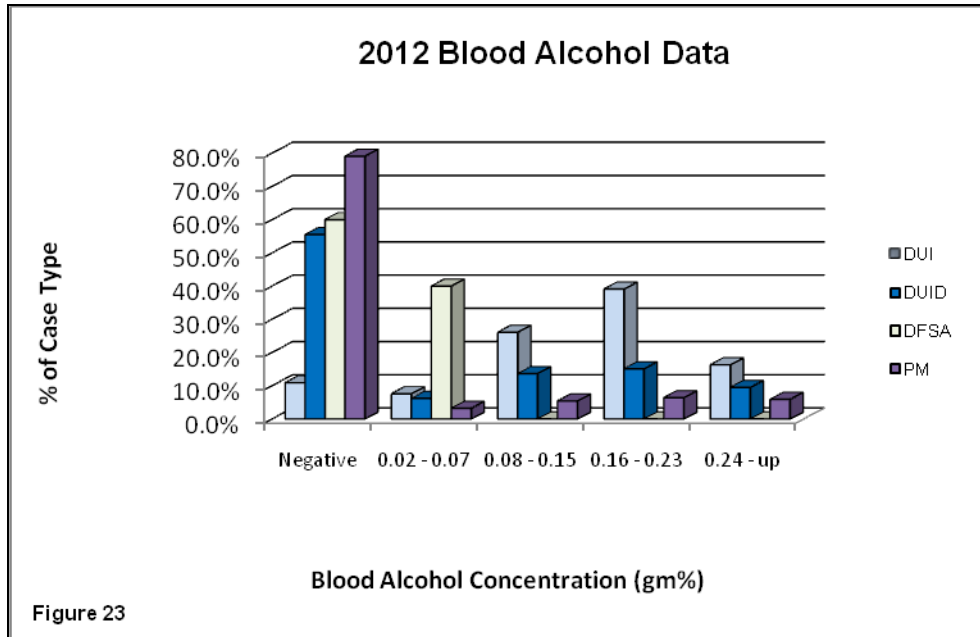


Figure 22

Alcohol and Drugs

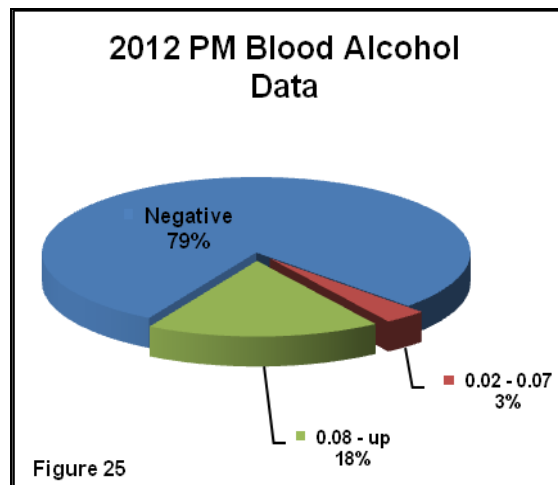
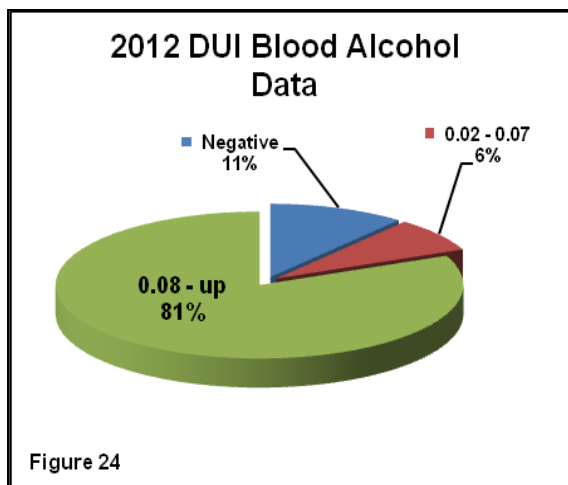
Alcohol continues to play a significant role in all of the FSL toxicology case types [Figure 23]. In more than 49% of the toxicology alcohol positive cases, the driver/decedent was greater than twice the legal limit (0.08 gm%).



DUI = Driving-under-the-influence (Alcohol exclusively tested)
 DUID = Driving-under-the-influence (Alcohol and/or drugs tested)
 DFSA = Drug-Facilitated Sexual Assault
 PM = Post-Mortem

The vast majority of samples submitted in Driving-Under-the-Influence [DUI] cases were found to have alcohol concentrations at or above the legal limit of 0.08 g% [Figure 24].

In approximately 21% of the postmortem (PM) case investigation there was a positive finding of alcohol [Figure 25].



Drug-Related Deaths



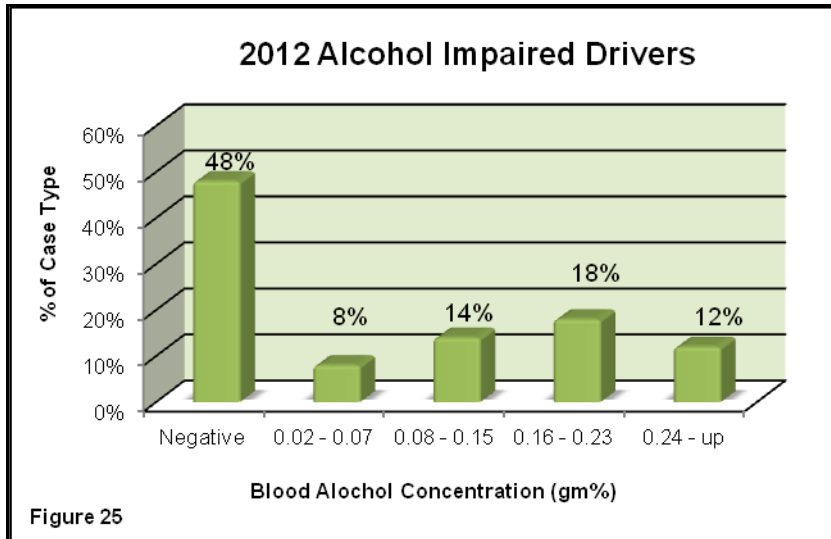
Aside from alcohol, cocaine is the most commonly found drug in post-mortem cases. Table 3 depicts the 44 most common drug findings in post-mortem Toxicology cases [excluding ethyl alcohol] for 2012.

Table 2: 2012 Most Commonly-Found Drugs (Post-Mortem)

6-Monoacetylmorphine/6-Acetylcodeine (Heroin)	Hydrocodone/Hydromorphone/Dihydrocodeine
Acetaminophen & Other NSAIDs	Hydroxyzine
Alprazolam/alpha-Hydroxyalprazolam	Lamotrigine
Amitriptyline / Nortriptyline	Lidocaine
Amphetamine / Methamphetamine	Lorazepam
Anhydroecgonine, ethyl ester	Methadone / Normethadone / EDDP / EMDP
Atropine	Mirtazapine
β -Phenylethylamine	Morphine / Codeine
Bupropion	Oxazepam
Butalbital	Oxycodone
Carisoprodol / Meprobamate	Oxymorphone
Citalopram / Desmethylcitalopram	Promethazine / Norpromethazine
Clonazepam / 7-Aminoclonazepam	Paroxetine
Cocaine / Benzoylecgonine / Cocaethylene	Phencyclidine
Cyclobenzaprine/Norcyclobenzaprine	Phenytoin
Dextromethorphan	Temazepam
Diazepam / Nordiazepam	Sertraline / Norsertraline / Desmethylsertraline
Difluoroethane	Tetrahydrocannabinol / Carboxytetrahydrocannabinol
Diltiazem	Tramadol / n-Desmethyltramadol / o-Desmethyltramadol
Diphenhydramine & Other Antihistamines	Trazodone
Fentanyl	Venlafaxine / o-Desmethylvenlafaxine
Fluoxetine / Norfluoxetine	Zolpidem

Alcohol Positive Drivers

Alcohol plays a significant role in driving under the influence cases. In 2012, more than half of the drivers [DUI and DUID] tested had some detectable alcohol in their blood, the largest group being over twice the legal limit [Figure 25]. Approximately eighty seven percent of alcohol positive drivers were at or above “per se” limit of 0.08 gm%.



Alcohol Positive Drivers – Under the Age of 21

The legal age for possession of alcohol is 21 years old. In 2012, a significant portion [13%] of all motor vehicle drivers testing positive for alcohol were under the age of 21 [Figure 26].

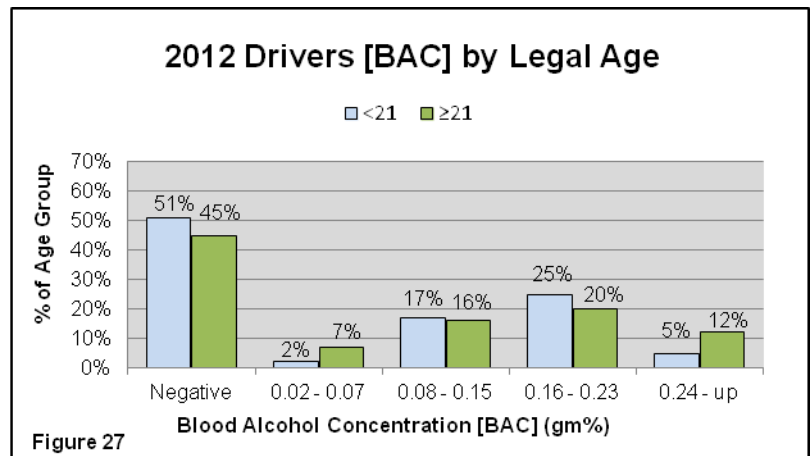
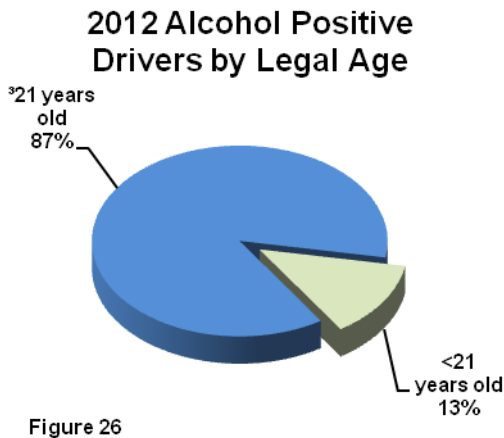


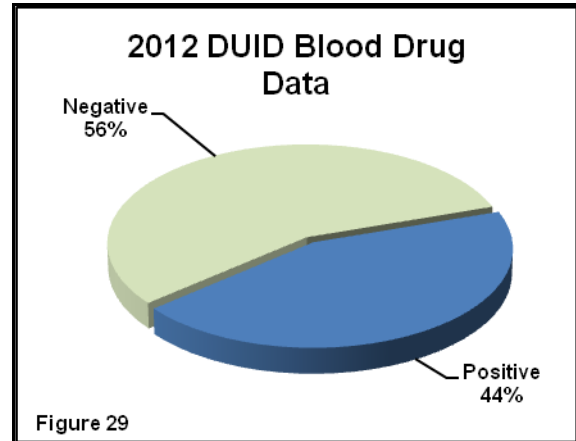
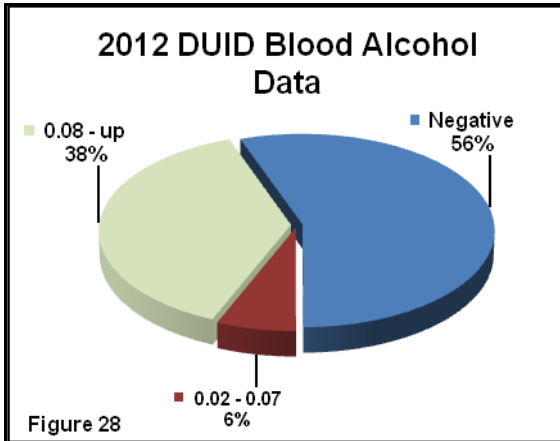
Figure 27 illustrates the percentages of suspected alcohol impaired drivers by age. For drivers tested that were under 21, 47% had alcohol concentrations $\geq 0.08\%$.

Drugs and Driving

Drugs play a significant role in driving under the influence cases. While 56% of cases were found to be negative for alcohol upon pre-screening, 6% were cases involving blood alcohol levels at or below the legal limit and 38% of the cases were severe impairment (over 0.08% and up) [Figure 28].



[Figure 29] illustrates that 44% of individuals suspected of driving under the influence of drugs tested positive.



Drivers Drug Usage: Controlled Substance, Prescription, and Over the Counter Drugs

In those cases where drugs were detected, 86% were Controlled Substances [Figure 30].

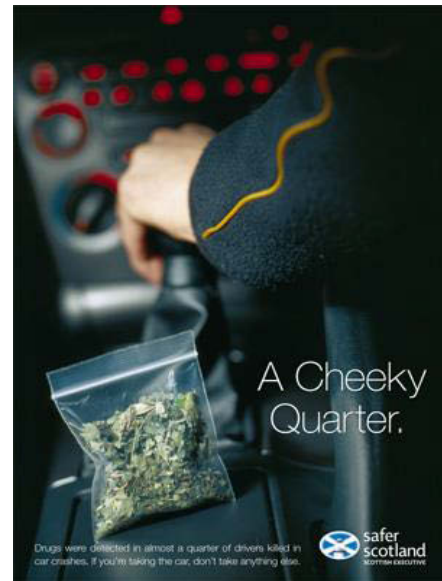
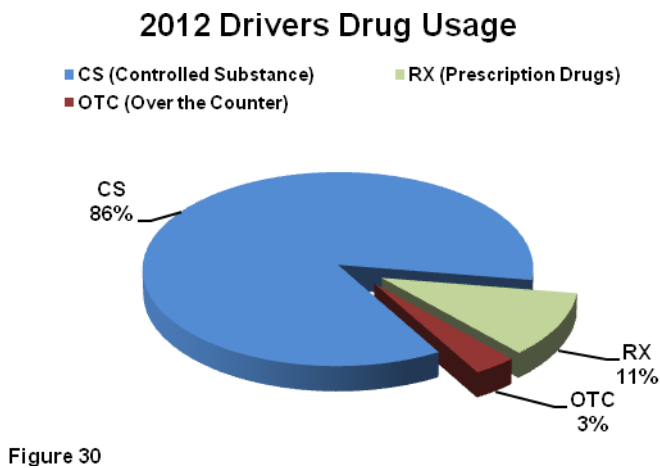


Table 4 depicts the 34 most common drug findings in Driving-Under-the-Influence-of-Drugs [DUID] toxicology cases [excluding ethyl alcohol] for 2012.

Table 3: 2012 Most Commonly-Found Drugs (DUID)

Tetrahydrocannabinol/Carboxytetrahydrocannabinol	Lorazepam
Alprazolam/a-Hydroxyalprazolam	Sertraline/Norsertaline/Desmethylsertraline
Amphetamine/Methamphetamine	Amitriptyline/Nortriptyline
Hydrocodone/Hydromorphone/Dihydrocodeine	Clonazepam/7-Aminoclonazepam
Methadone/Normethadone/EDDP/EMDP	Dextromethorphan
Diazepam/Nordiazepam	Fluconazole
Carisoprodol/Meprobamate	Tramadol / n-Desmethyltramadol / o-Desmethyltramadol
Cocaine/Benzoylcegonine/Cocaethylene	Difluoroethane
Zolpidem	Dihydrocodeine
Oxazepam	6-Monacetylmorphine
Temazepam	Carbamazepine / Carbamazepine Epoxide
Citalopram/Desmethylcitalopram	Chlorpromazine
Codeine/Morphine	Cyclobenzaprine/Norcyclobenzaprine
Oxycodone	Fentanyl
Bupropion	Fluoxetine/Norfluoxetine
Phencyclidine	Levorphanol
Butalbital	Oxymorphone
Mirtazapine	Paroxetine
Trazodone/m-Chlorophenylpiperazine	Phentermine
Diphenhydramine/Nordiphenhydramine	Quetiapine
Lamotrigine	Venlafaxine / o-Desmethylvenlafaxine



Drug-Facilitated Sexual Assaults

Sexual Assault
Nurse Examiner

SANE



Drug-Facilitated Sexual Assaults [DFSA] continue to be difficult forensic investigations. In 2012 alcohol was detected in 40% of the cases [Figure 31]. The cases often involve a perpetrator who will surreptitiously administer a drug to a victim to render them unconscious and sexually assault them. In 2012, the Toxicology Laboratory investigated 5 suspected DFSA cases. Diphenhydramine was a common drug finding in DFSA cases.

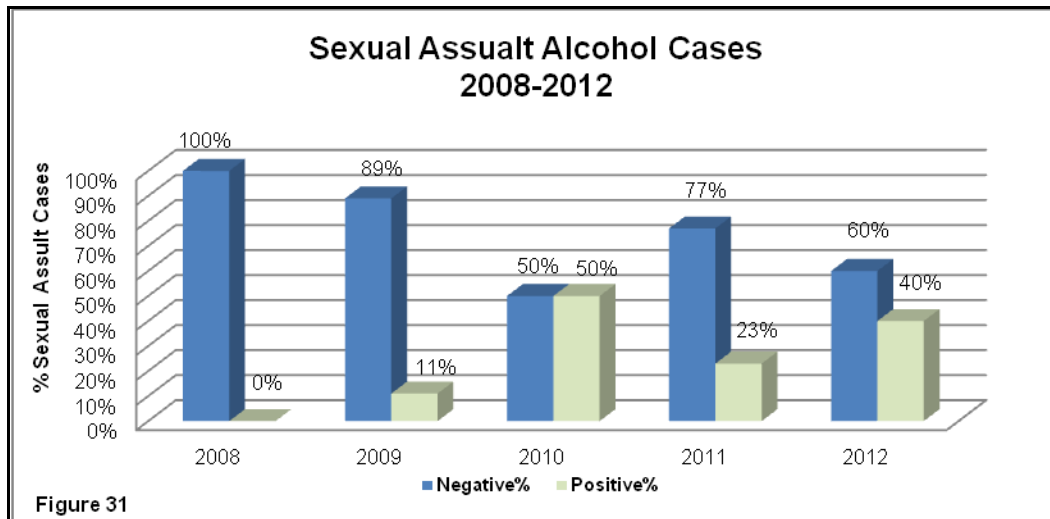


Table 5 depicts the most common drug findings in Drug-Facilitated Sexual Assault [DFSA] toxicology cases [excluding ethyl alcohol] for 2008 through 2012.

**Table 4: 2012 Most Commonly-Found Drugs DFSA
(2008 through 2012)**

Alprazolam/α-Hydroxyalprazolam	Levamisole
Amitriptyline/Nortriptyline	Lorazepam
Amphetamine/Methamphetamine	Methadone
Carisoprodol/Meprobamate	Methylecgonine
Citalopram/Desmethylcitalopram	Midazolam
Chlorcyclizine	Mirtazapine
Chlorpheniramine	Nordiazepam
Clonazepam/7-Aminoclonazepam	Oxazepam
Clozapine	Oxycodone
Cocaine/Benzoylecgonine/Cocaethylene	Phentermine
Cyclobenzaprine/Norcyclobenzaprine	Propoxyphene/Norpropoxyphene
Desmethylsertraline/ Sertraline/Norsertaline	Pseudoephedrine/Ephedrine
Diazepam	Quetiapine
Diphenhydramine/Nordiphenhydramine	Temazepam
Fentanyl	Tetrahydrocannabinol/Carboxytetrahydrocannabinol
Hydrocodone/Dihydrocodeine	Trimethoprim
Hydroxyzine	Zolpidem
Lamotrigine	