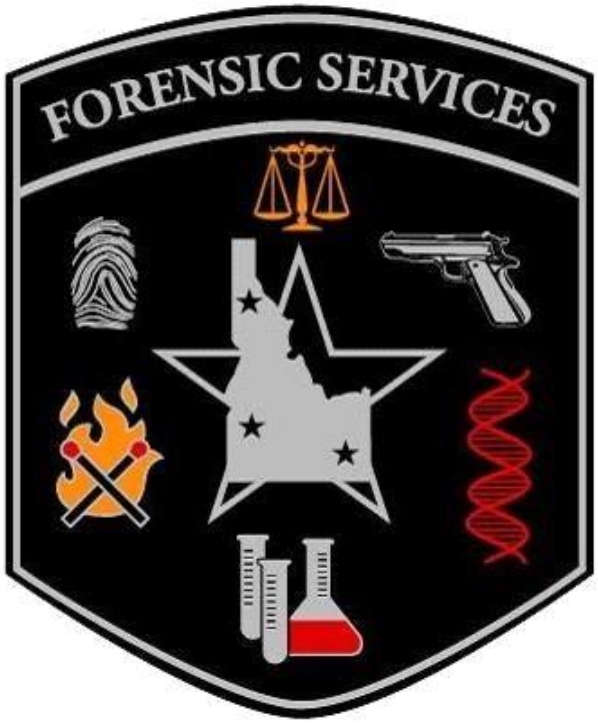
IDAHO STATE POLICE



Toxicology Program Trends

2016

2016 IDAHO STATE POLICE FORENSIC SERVICES:
TOXICOLOGY TRENDS

Overview and Background

This report discusses trends in the toxicology program, as well as the number of toxicology cases submitted to the following Idaho State Police Forensic Services (ISPFS) laboratories for the fiscal year 2016 (FY2016): District 1, Coeur d' Alene; District 5, Pocatello; and District 3, Meridian (blood alcohol only). A "toxicology case" is any case which has urine or blood submitted to the laboratory for qualitative drug analysis and/or volatiles analysis; volatiles analysis may also be performed on vitreous humor samples. Volatiles analysis quantitates ethyl alcohol (drinking alcohol) and detects a wide range of other alcohols or inhalants. Toxicology analysis falls under three major disciplines: alcohol (the level of alcohol in blood, urine, vitreous humor, or unknown liquids), blood toxicology (drugs in blood) and urine toxicology (drugs in urine).

A case may have multiple items submitted for analysis (e.g. blood and urine samples taken from both drivers in a two car auto accident account for one case with four items). If blood and/or urine is also taken from any passenger(s) in either vehicle, those samples will also be contained under the same case number. The case counts in the Toxicology Tracking Information table do not account for multiple items in one case; this total also applies to any items not analyzed (e.g. insufficient sample for analysis). The results discussions in the Alcohol and Toxicology sections of the report are based solely on actual items tested – so if there are multiple items in a case, each item is accounted for in the results discussion. The Alcohol and Toxicology sections do not account for any items not analyzed.

These statistics were compiled from the Idaho Laboratory Information Management System (ILIMS), which was used to log in and track all evidence submitted to the forensic laboratory system during FY2016. All case information is provided by the submitting agencies to the laboratory.

For the purposes of this and all subsequent years, "juvenile" refers to any subject under age 18 as of the incident date, except for alcohol analyses. Subjects under age 21 as of the incident date are considered juveniles for alcohol analysis statistics. This clarification to the "juvenile" definition for alcohol statistics is based on the per se level of 0.02 g% for persons under age 21.

Alcohol statistics for this year's report are expressed in g% units, as not all cases analyzed were blood. The g% unit includes blood (g/100cc blood), urine (g/67mL urine), and vitreous humor (g/100cc vitreous humor). Any liquid alcohol samples have been excluded from the statistical analysis presented here.

One analyst was in the process of being trained in blood toxicology in FY2016 and was signed off to do some methods on casework in September 2016. In addition, two additional analysts were hired in 2016 (one started in July, the other in September) to be trained in blood toxicology. So while the turnaround times and backlog are very large right now, we anticipate significant decreases in backlog and turnaround times in FY2017.

In addition to training new analysts, we have also been working on new blood toxicology methods (discussed later) to reduce the time it takes to process each sample while also providing testing for more compounds than we are currently able to confirm. It is anticipated that the new methods will be implemented in FY2017.

Terms and Drug Categories

Central Nervous System Stimulants (CNS-S), Central Nervous System Depressants (CNS- D), and carboxy-

THC (THC) account for most of the positive toxicology results obtained from analysis. The report appendix includes term definitions, drug category descriptions, and examples of drugs included in each category.

Carboxy-THC is an inactive metabolite of marijuana (MJ). After ingestion, MJ is broken down in the body to a form that the body can eliminate as waste. There are many MJ metabolites, and carboxy-THC is one of them. ISPFS current methods for extracting MJ from blood and urine will extract this metabolite. ISPFS has recently approved a method which will allow the lab to identify several cannabinoids, including the active component of MJ (delta9-THC) and its metabolites, in blood and urine. This method was approved in August 2015. In addition to approving the new marijuana method, a complete overhaul to the blood toxicology discipline methods began in July 2016 and will likely be implemented in FY2017. These new methods will allow us to not only identify more compounds that we were previously unable to confirm, but also report quantities associated with the confirmed compounds. It is expected that the toxicology discipline caseload will increase significantly once ISPFS has quantitative methods validated for use in casework. It has been expressed to ISPFS personnel that coroners especially require quantitative results for meaningful interpretation of toxicology results in death investigations. Also, prosecutors have expressed an increasing desire for quantitative results in prosecuting criminal cases.

Driving under the influence of impairing prescription drugs is an increasing problem in Idaho. Some of the most impairing drugs fall under the CNS-D category of drugs. Drugs that exhibit CNS-D effects are found in a wide range of therapeutic categories: anti-depressant, anti-anxiety, anti-histamine, barbiturate, narcotic analgesic (NA), and others.

Narcotic analgesics are prescribed to relieve pain and also to induce profound sleep. If these drugs are taken in excess of the prescribed dose, stupor, convulsions, and coma can result. Some of the most commonly confirmed narcotic analgesics in Idaho DUI cases are hydrocodone, oxycodone, and methadone.

The benzodiazepine class drugs are prescribed for anti-anxiety, and as tranquilizers. The most well-known benzodiazepines include Xanax (alprazolam), Valium (diazepam), and Ativan (lorazepam). There are many different drugs under this class; however, we typically only see a few different ones. The most commonly found benzodiazepines in casework were alprazolam, nordiazepam, and clonazepam/7-aminoclonazepam.

The laboratory tracks cases with positive inhalant results. Investigators suspect inhalation of paint or air duster in most of these cases. Fluorinated hydrocarbons (e.g. 1,1-difluoroethane (DFE)) are the compounds typically detected after air duster inhalation; acetone and toluene are volatiles detected after canned paint inhalation.

Highly impairing CNS-S drugs such as methamphetamine and cocaine are usually not distributed in prescription form. Amphetamine can be obtained as a prescription, but is most commonly seen as an active metabolite of methamphetamine. Methamphetamine is metabolized (or broken down into) amphetamine after ingestion, and is excreted partly as amphetamine. Once broken down into amphetamine, the amphetamine acts as its own drug (i.e. it is an active metabolite), and produces stimulant effects aside from those produced by methamphetamine. ISPFS laboratory analysis yields relatively few positive results for cocaine. This does not necessarily mean cocaine is not being abused in Idaho. Since cocaine is eliminated from the body very rapidly, if a significant amount of time passes between use and sample collection, cocaine may not be detected. However, the inactive cocaine metabolite, benzoylecgonine, has a longer detection window. This means that toxicology results can support allegations of cocaine use, even if cocaine itself is not detected in the sample.

ISPFS lists drug combinations in each of the drug toxicology categories because drug combinations can cause additive or synergistic effects. Hydrocodone (Vicodin) used in conjunction with carisoprodol (Soma) has greater impairing effects than either drug used alone. An anti-depressant taken alone in therapeutic amounts (prescribed quantities) may not have any impairing effects, but taken in conjunction with other CNS-Ds (e.g. alcohol or other anti-depressants) may display more marked effects. (i.e. 1 + 1 = 2). Some drugs produce synergistic effects. Synergistic means that the drug combination may cause effects much greater than either drug alone (i.e. 1 + 1 = 5). A common example of this would be the mixture of codeine and acetaminophen for the relief of moderate pain. Taken separately either of these substances will provide relief for a lesser amount of pain, but when taken together the synergistic reaction between the two drugs allows for a greater amount of pain relief than if either drug was taken on its own. A negative sample result in one discipline (i.e. alcohol, blood toxicology, or urine toxicology) only reflects the testing performed in that discipline; the sample may have a positive result from testing in another discipline. For example, a case may have a negative alcohol result, but a positive result for drugs. ISPFS laboratory policy is not to process a sample for toxicology if the blood alcohol result is above 0.10 g%. In special circumstances, such as sexual assault or death investigations, injury to a child, or possible overdose cases, the toxicology may still be analyzed even if the blood alcohol is above 0.10 g%. An ISPFS policy change in 2013 required toxicology analysis (if requested) on samples from deceased drivers in fatality accidents when the alcohol level is below 0.20 g% of blood.

General Toxicology Discipline Breakdown for FY2016

Statistics included in this report were obtained from the Idaho Laboratory Information Management System (ILIMS). This is the system that is used to log in and track all evidence submitted to the forensic laboratory system during FY2016. The ILIMS system allows for agencies to enter multiple charges instead of forcing the agencies to list only the highest charge; therefore, many cases with a drug charge were also DUI cases. It should be noted that any cases in which a date of birth (DOB) was not provided are classified as "adult" to prevent significant statistical changes to the juvenile category. A summary of the number and types of cases for specific categories are shown in **Table 1**.

	Blood Toxicology	Alcohol/Volatiles	Urine Toxicology	Total	FY2016 Percent
DUI					
Adult	511	990	314	1815	68.9%
Juvenile	21	66	13	100	
Probation Violations*					
Adult	0	0	13	13	0.5%
Juvenile	0	0	1	1	
Drug/Narcotic Violations**					
Adult	58	21	41	122	4.6%
Juvenile	5	4	1	5	
Other***	95	55	18	168	6.1%
Auto Accident Fatalities	75	84	0	159	5.7%
Accident Victim Kits	0	3	0	3	0.1%
Death (non-homicide)	21	24	1	46	1.7%
Murder	2	2	2	6	0.2%
Rape****	26	40	47	113	4.1%
Cases Closed Before Analysis*****	189	27	10	226	8.1%
Total:	**1001**	**1316**	**461**	**2778**	100%

Table 1- Statistical Representation of the Number and Distribution of Toxicology Cases for FY2016.

*Includes Juvenile, Misdemeanor, and Felony; **Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, Possession/Distribution/Use by a Minor; ***Includes Abuse/Exploitation of a Vulnerable Adult, Assault/Battery (Aggravated or not), Burglary, Domestic Violence, Evidence Destruction/Alteration/Concealment, Officer Involved Shooting/Accident, Possession of liquor not subject to regulation by division, Injury Accidents, Injury to Child, Under the Influence in Public, Unlawful exercise of functions of peace officers, Trespassing, Manslaughter, Vehicular Manslaughter, Lewd Conduct, and Competency/Proficiency Tests; ****Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor, and Penetration with a Foreign Object. *****Cases can be closed either because the testing is no longer necessary per the agency or if other evidence proves to be probative and testing of another type is no longer warranted (i.e. blood alcohol and blood toxicology are both requested but the alcohol result is greater than 0.10 g%, so the blood toxicology request is closed without analysis).

The ISPFS laboratory system received 2,612 toxicology cases for FY2016, an increase of 166 cases from FY2015. This number corresponds to an increase of nearly 6%. The stability of the caseload observed (as opposed to a large increase) may be due to ISPFS toxicology analysis limitations, particularly in the area of drug quantitation. Many prosecutors are determining that quantitation of the drugs in toxicology samples is necessary for prosecuting cases; ISPFS is currently only able to provide qualitative

identification of the drugs in samples, with the exception of ethyl alcohol. This means that ISPFS can identify which drugs are present, but not how much of the drug is present.

Topics covered in this report include:

Alcohol and Other Volatiles	Adult and Juvenile Trends Fatality Accidents Other Offenses
Toxicology	Adult and Juvenile Trends
	DUI Related Trends
	Other Offenses

Figure 1 (below) contains a line graph of the total yearly toxicology submissions for the last ten years. Multiple items for a single case are often submitted, but are not accounted for in the totals. Samples may be counted twice because an alcohol sample may also be processed for toxicology. The average number of cases submitted to ISPFS for the last 5 years is 3152 cases.

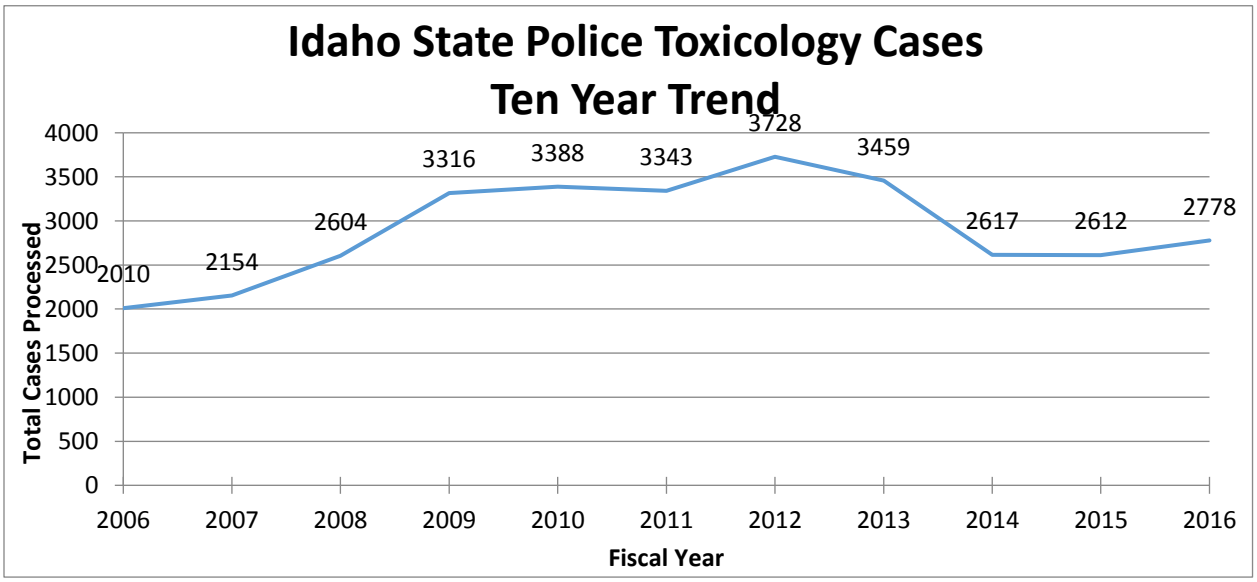


Figure 1- Ten Year Trend for Toxicology Case Submissions

Alcohol and Other Volatiles

The number of alcohol case submissions to ISPFS decreased by 16 cases from FY2015 to FY2016. This is not a significant decrease and it is typical for the numbers to fluctuate slightly from year to year. Another reason that a significant increase in number of cases is not expected is that ISPFS provides support for breath testing in Idaho; the scientists working in this discipline have reported a significant increase in breath testing workload. Idaho also implemented a new fuel cell/IR breath testing instrument recently that officers may be eager to use. It is likely that officers are opting to perform breath tests rather than obtain warrants, except in cases where drugs other than alcohol are also suspected.

Alcohol analysis requests span a wide range of case types: DUI, rape, accident, death investigation, and other offense cases. The alcohol result category levels are: none detected/ below reportable limit (<0.02 g%), ≥0.02 g% and <0.08 g%, and ≥0.08 g%. Many inhalants and other volatiles can be detected when alcohol analysis is performed.

Adult Alcohol Concentrations

This section's statistics are based not on a total number of cases, but on total alcohol results. This may result in different numbers than the previous table, as some cases have multiple items and others were not analyzed. ISPFS processed 1193 adult samples for alcohol and inhalants during FY2016. The analysis results are tabulated below. Each sample for which alcohol analysis is requested is simultaneously tested for the presence of inhalants. Of the 1193 adult alcohol samples, 34 were urines and none were vitreous humor. The total 1193 samples reported in the table below does not include beverage samples, or inhalant results.

Number of Adult Samples	Result Category
14 (not included in total)	Not analyzed
246	<0.02 g%
68	≥0.02 g% and <0.08 g%
865	≥0.08 g%
1193	Total (Reflects ethanol results only)

For the purposes of this report, any alcohol result that was reported as "none detected" or "below reportable limit" is categorized as <0.02 g%. The 246 samples with a result of <0.02 g% are 17 less than the same result category for FY2015. If alcohol and toxicology testing are both requested, then a negative alcohol sample is also processed for drugs. Samples may be positive for drugs other than alcohol.

Figure 2 is a depiction of the overall adult alcohol results for FY2016; this chart includes DUIs, death investigations, auto accident fatalities, and a wide variety of other case types.

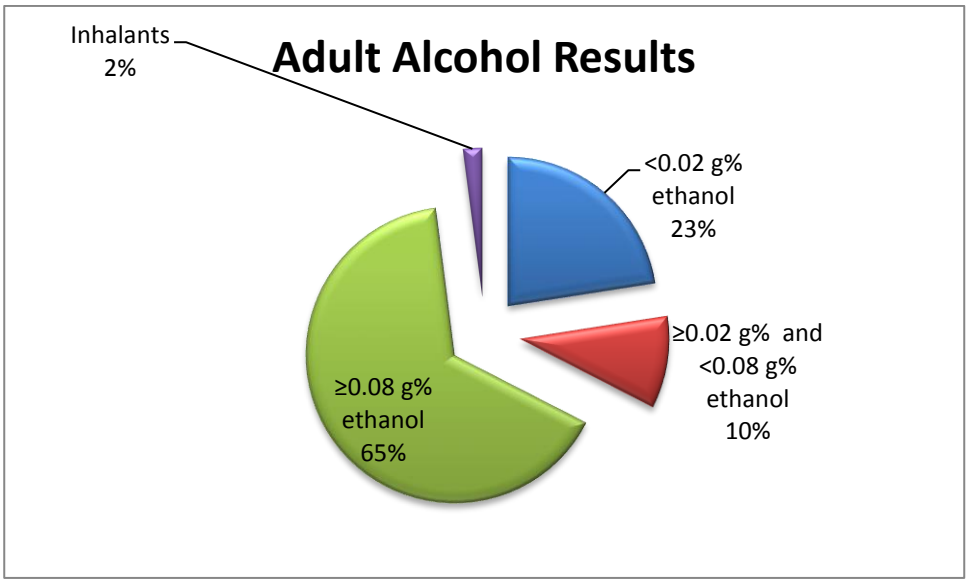


Figure 2- Adult Alcohol Levels for FY2016

Twenty-two adult samples tested positive for inhalants. When comparing this number to the five samples that tested positive for inhalants in juveniles, it would appear that juveniles are less likely to use inhalants than adults. However, when the total number of adult and juvenile cases is taken into consideration, the percentage of juveniles testing positive for inhalants is double that of the adults. So it seems that the juvenile population appears more likely to use inhalants. In terms of significance, considering the 1193 adult alcohol samples submitted, 22 inhalant samples is not a significant percentage. The inhalants confirmed in the 22 positive samples include:

- 12 samples positive for fluorinated hydrocarbons (air duster)
- 6 samples positive for acetone (nail polish remover, formed in the body during ketoacidosis)
- 1 sample positive for acetaldehyde (formed in the body from ethanol)
- 3 sample positive for toluene (common in paint thinners)
- 1 sample positive for isopropanol (rubbing alcohol)

Adult samples submitted for pending DUI charges constituted 979 of the total 1193 (82.1%). Of these 979 samples, 865 were over the per se limit of 0.08 g% (88.4%). As stated earlier, if alcohol and toxicology were both requested on submission, any sample with alcohol results below 0.10 g% was automatically forwarded for drug testing. ISPFS also provides toxicology analysis for those cases where the alcohol level is ≥0.10 g% if there are extenuating circumstances which may include sexual assault or death investigations, injury to a child, or aggravated offenses.

When urine samples are submitted for inhalant testing, they undergo simultaneous alcohol testing as it is the same test. Urine alcohol results are of questionable value, and are reported by ISPFS with a disclaimer statement. The questionable value of these results is due to several reasons. First, bacteria and yeast are common in urine and as these organisms grow, they produce alcohol. Second, urine collection procedures are critical for meaningful interpretation of results. The urine needs to be voided,

and then a 15 minute wait period should follow before a fresh urine sample is collected for alcohol analysis. ISPFS discourages the use of urine for alcohol analysis due to the questionable value of results (IDAPA 11.03.01), but urine samples are occasionally submitted for alcohol and/or inhalants analysis.

One category of particular interest is adult auto accident fatalities. A total of 67 adult auto accident fatality case samples were submitted to ISPFS in FY2016; this is two less for this case type than was submitted to the lab in FY2015. Of the 67 cases, 75% contained <0.02 g% alcohol, and 22% were at or above the legal limit of 0.08 g%. The samples at or above the legal per se level is approximately 11.3% lower than FY2015. **Figure 3** shows the BAC results for the adult auto accident fatalities.

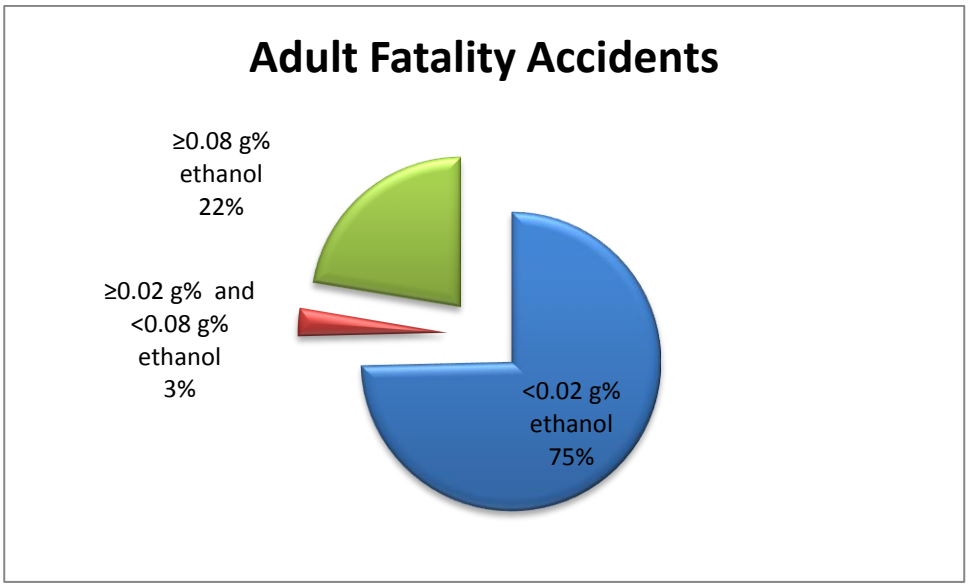


Figure 3- Results for Adult Fatality Accidents

Figure 4 depicts the ten year trend of adult auto accident fatality cases submitted to ISPFS. The ten year average of 70 submissions is relatively stable. Law enforcement efforts, including their increased presence on Idaho roads, have helped to keep these cases from rising significantly. One particularly good example of inter-department cooperation in this public safety effort is the Idaho Department of Transportation (IDT) contributing funds to increase trooper saturation on the highways during high-risk time periods (i.e. holiday weekends).

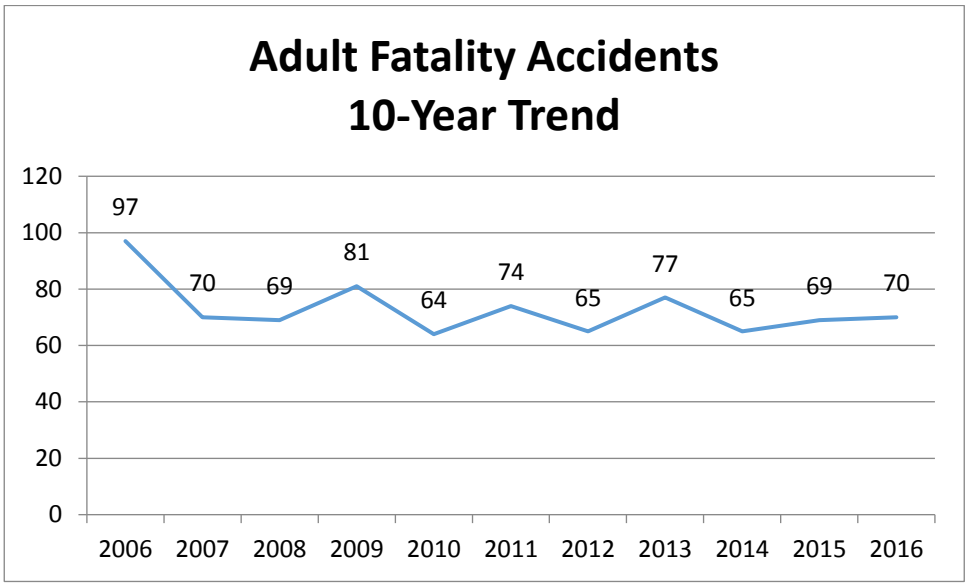


Figure 4- Ten Year Adult Fatality Accident Trend

Juvenile Alcohol Concentrations

ISPFS processed 126 juvenile BAC cases in FY2016. This is only 2 cases more than what was received in FY2015. Of these samples, 64 (or 51%) were over the legal limit for persons under age 21 (0.02 g%). Of the 126 juvenile alcohol samples submitted to ISPFS, 77 were juvenile DUI cases; 46 of these 77 cases (60%) were over the juvenile (under age 21) legal limit of 0.02 g%.

Figure 5 displays the overall juvenile case results; these results include DUIs, accident fatalities, and various other case types.

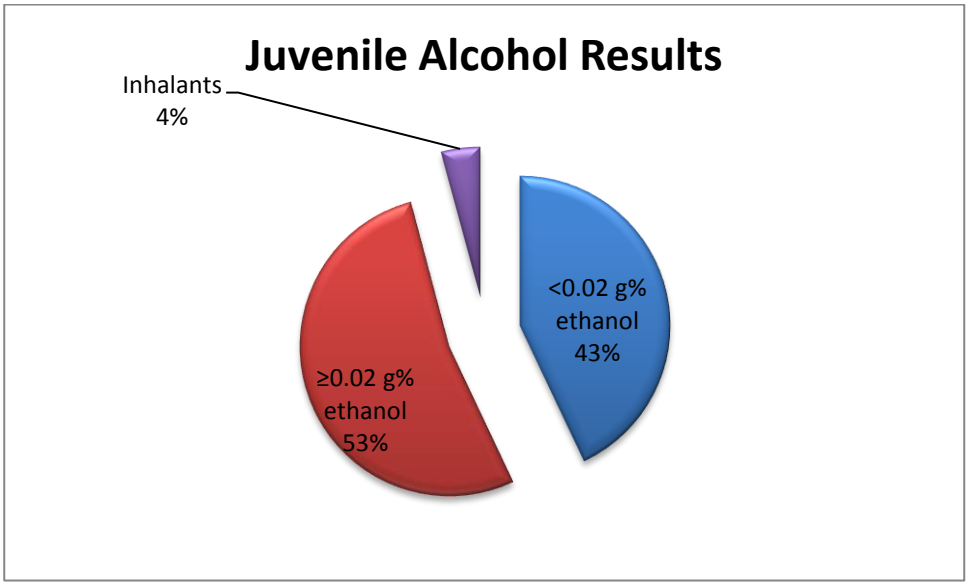


Figure 5- Juvenile Alcohol Levels for FY2016

As mentioned earlier, a larger percentage of the cases received for juveniles tested positive for inhalants than for adults. Of the 125 juvenile samples, five (approximately 4%) tested positive for inhalants. Two samples tested positive for acetone (found in nail polish remover) and three tested positive for fluorinated hydrocarbon(s). Since inhalants are volatiles and evaporate easily they do not stay in the blood or urine in detectable amounts for long periods of time, so the laboratory results may not be indicative of the prevalence of use.

A significant increase of Juvenile alcohol samples submitted in fatality cases was seen as it increased from 8 cases in FY2015 to 15 cases in FY2016. However, as one-quarter of the juvenile fatality cases in FY2015 had an alcohol result above the per se 0.02 g%, only about one-sixth of the cases in FY2016 were above 0.02 g%. So it appears that more juveniles are involved in fatal crashes, however, it seems that most of the crashes are not due to alcohol. Interestingly, in the three cases that were above 0.02 g%, one was around 0.5 g% and the other two were well over 0.2 g% (that's ten times the juvenile per se limit).

Figure 6 is trend chart to show the juvenile auto accident fatality cases submitted over the last 10 years.

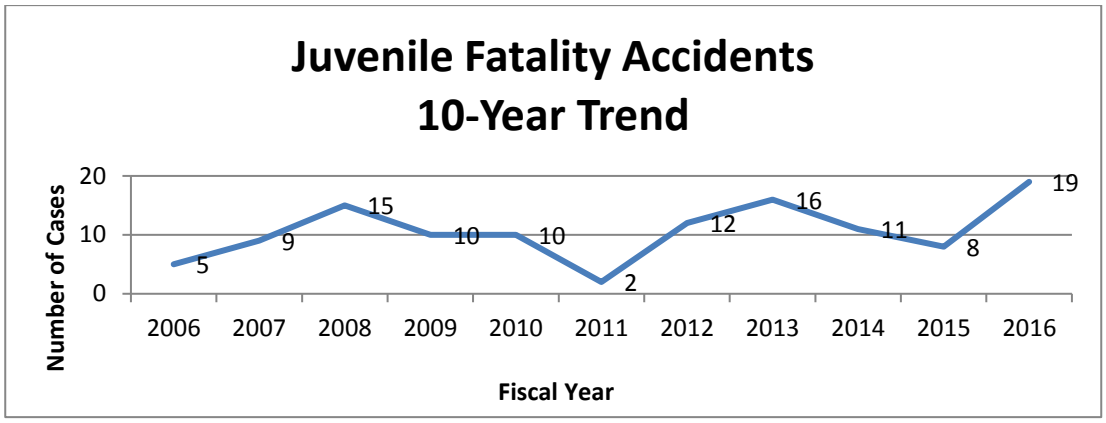


Figure 6- Ten Year Juvenile Fatality Accident Trend

Other Offense Alcohol Concentrations

Cases submitted for alcohol analysis in FY2016 also included several other offenses. **Figures 7** is a graphic depiction of offenses (other than DUI) for which samples were submitted for alcohol analysis. **Figures 8 and 9** are depictions the results breakdowns for these other offenses for adults and juveniles, respectively. Death investigations (non-homicide) can be suicides, unattended deaths, or any other death that is deemed non-criminal. Many of the cases listed with negative or low alcohol concentrations may have a positive result for other drugs in the toxicology section of this report.

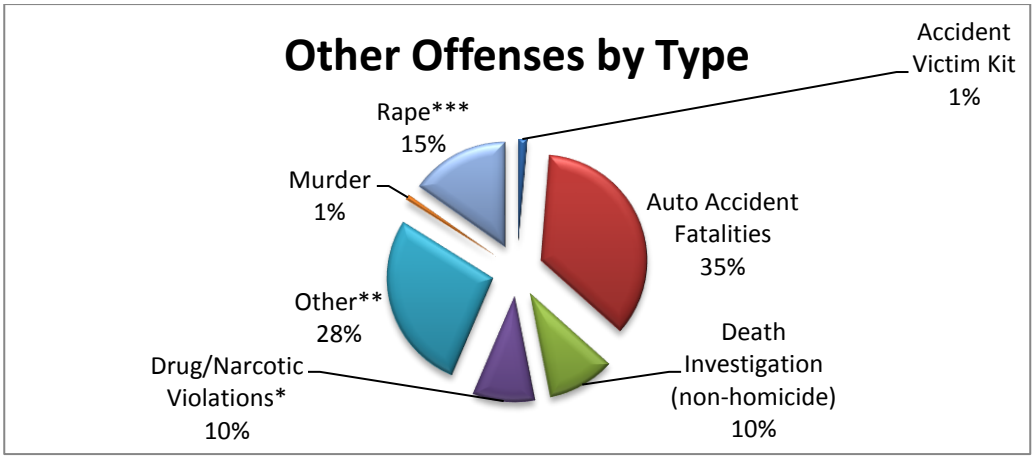


Figure 7 – Alcohol Analysis Requests by Other Offense Types

*Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, Possession/Distribution/Use by a Minor; **Includes Abuse/Exploitation of a Vulnerable Adult, Assault/Battery (Aggravated or not), Burglary, Domestic Violence, Evidence Destruction/Alteration/Concealment, Officer Involved Shooting/Accident, Possession of liquor not subject to regulation by division, Injury Accidents, Injury to Child, Under the Influence in Public, Unlawful exercise of functions of peace officers, Vehicular Manslaughter; ***Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor.

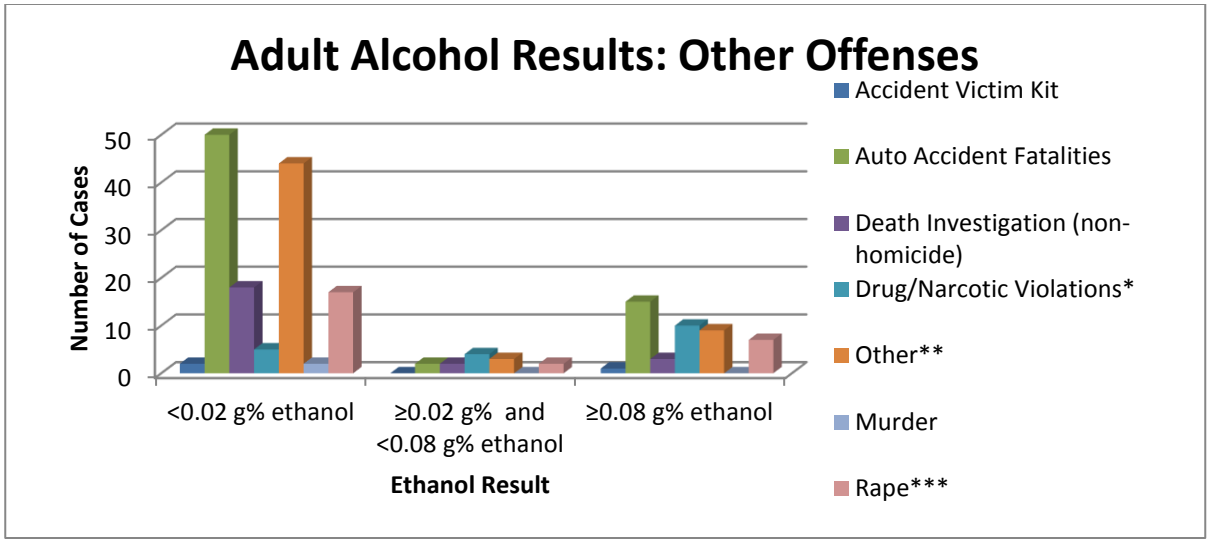


Figure 8- Adult Alcohol Results for Other Offenses

*Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, Possession/Distribution/Use by a Minor; **Includes Abuse/Exploitation of a Vulnerable Adult, Assault/Battery (Aggravated or not), Burglary, Domestic Violence, Evidence Destruction/Alteration/Concealment, Officer Involved Shooting/Accident, Possession of liquor not subject to regulation by division, Injury Accidents, Injury to Child, Under the Influence in Public, Unlawful exercise of functions of peace officers, Vehicular Manslaughter; ***Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor.

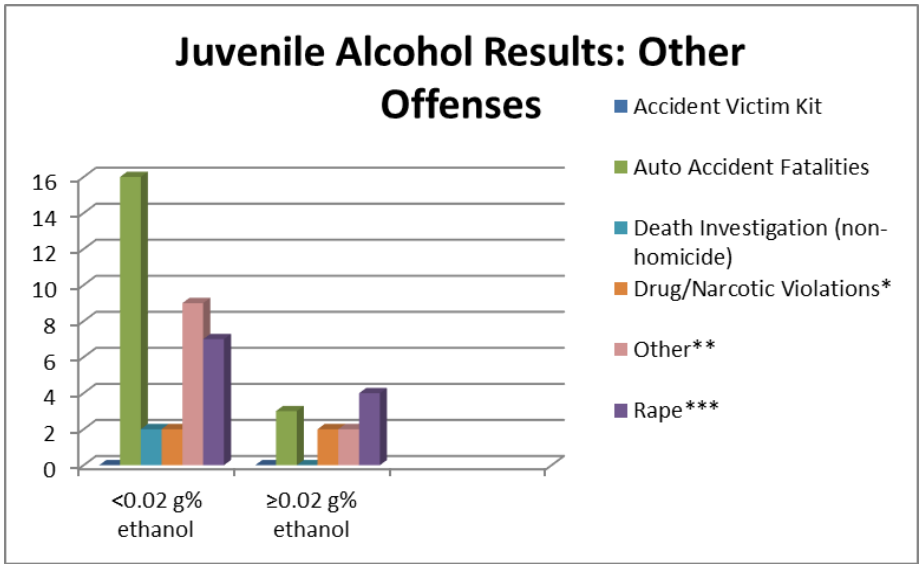


Figure 9- Juvenile Alcohol Results for Other Offenses

*Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, Possession/Distribution/Use by a Minor; **Includes Abuse/Exploitation of a Vulnerable Adult, Assault/Battery (Aggravated or not), Burglary, Domestic Violence, Evidence Destruction/Alteration/Concealment, Officer Involved Shooting/Accident, Possession of liquor not subject to regulation by division, Injury Accidents, Injury to Child, Under the Influence in Public, Unlawful exercise of functions of peace officers, Vehicular Manslaughter; ***Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor.

It should also be noted that ISPFS annually provides each analyst one proficiency test in each discipline in which s/he is certified. The successful completion of this annual test is required for analysts to be permitted to continue to perform analyses on casework. Furthermore, analysts are also provided a competency test prior to becoming certified to perform analysis. The proficiency and competency test statistics are not applicable to this report, and therefore not included.

Toxicology (Drugs in Blood and Urine)

The difference between the blood and urine matrices submitted for testing drugs (toxicology) depends on many things: pH, methods of analysis, drug metabolism, and many others. Based on this knowledge, some drugs may be found in one matrix and not the other. For instance, carboxy-THC may be found in urine many days after use, but not in blood. If carboxy-THC is found in the blood, it may be indicative of more recent use. The type of fluid sample sent for toxicology analysis may depend on legal considerations. Blood is a better sample for alcohol, and can easily be retained for toxicology testing. Blood is often the preferred sample for toxicology because it gives the best indicator for possible impairment, and blood is usually obtained for legal purposes. Urine is filtered by the kidneys and is a much cleaner matrix; thereby allowing faster extractions for drugs. Further, urine pools in the bladder and often provides a greater concentration of drug than in blood. Obtaining a urine sample is not an invasive procedure, whereas a blood sample collection is invasive; also, it is usually possible to obtain a much larger volume of urine than blood. Blood is the preferred sample for purposes where current impairment is in question, so urine is often not collected. The blood and urine results cannot be directly compared against each other, but using both blood and urine methods allows for more diverse and comprehensive analysis. It also allows for more accurate interpretation of results.

ISPFS accepted 1001 blood samples and 461 urine samples for toxicology testing in FY2016. This corresponds to an increase of 202 blood toxicology samples (or 25%) submitted to the laboratory system between FY2015 and FY2016. There was a decrease of 20 urine toxicology samples submitted between FY2015 and FY2016.

Please note that all toxicology graphs use red for blood, yellow for urine. ISPFS occasionally receives blood/urine combination kits; the numbers for that type of kit received in FY2016 was very small (6), and as such are not included in the graphs below. Graphical representation of the “Single Drug” category refer to samples that only had a single therapeutic drug category present – some of these samples had multiple drugs within that same category. For example, diphenhydramine (Benadryl) and zolpidem (Ambien) are both in the CNS-D category; a sample containing both drugs will show up in the “Single Drug” category despite the presence of multiple drugs in the sample.

Adult

Figure 10 shows the adult blood and urine toxicology results for FY2016 by therapeutic category. For example, hallucinogens (Hall) might be ecstasy (MDMA); narcotic analgesics (NA) might be drugs such as morphine or hydrocodone.

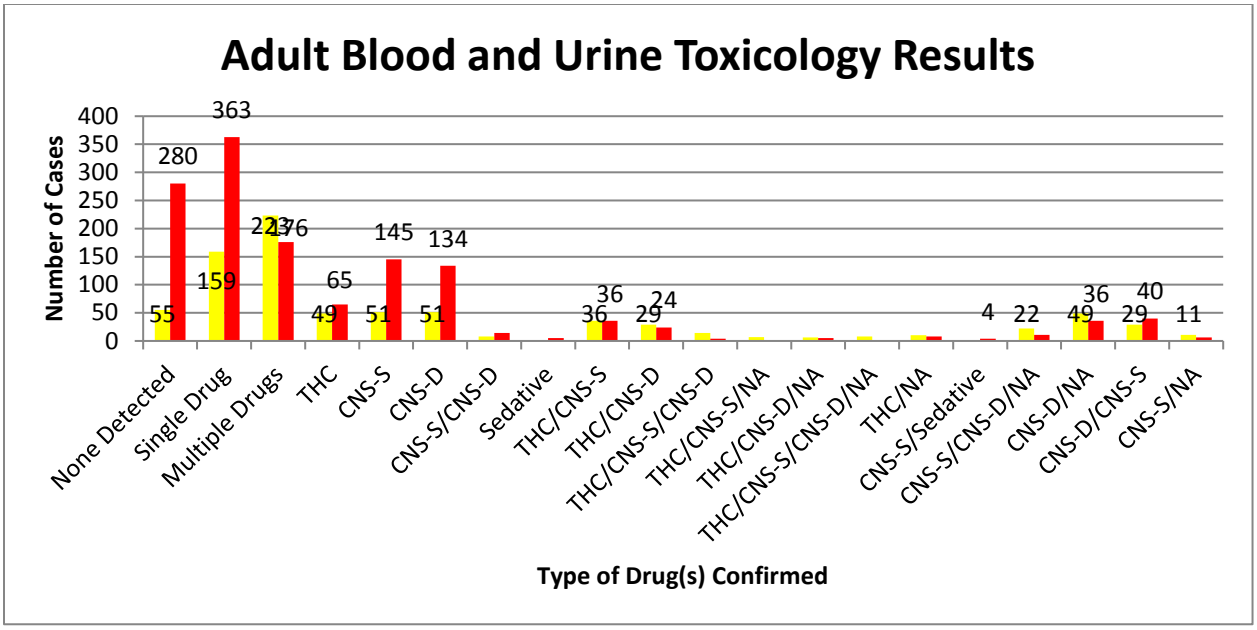


Figure 10 – Adult Blood and Urine Toxicology Results by Category

The data for adult blood and urine samples show some interesting differences. For instance, blood analysis data indicates single-category drug use is more prevalent than multiple drug category combinations. Urine analysis shows the opposite indication. This is not surprising when you think about the fact that drugs stay in the urine much longer than in the blood, and are therefore more likely to be detected in the urine than in the blood.

One thing to note is that some of the results included in the "None Detected" designation include drugs that do not fit into a specific therapeutic category (e.g. metoprolol). Many of the blood samples submitted had a request for both alcohol and toxicology testing, but if the alcohol result was 0.10 g% or higher, the blood sample and urine sample (if present for the same case) was returned without toxicology testing in most cases.

It is common in Idaho for the most common single drugs present in both adult urine and blood matrices to be a central nervous system stimulant (CNS-S), followed by a central nervous system depressant (CNS-D), and then by carboxy-THC. CNS-Ss include drugs like Ritalin, Adderall, and methamphetamine. CNS-Ds can be many different drugs; examples include Valium, Xanax, and Ambien. Carboxy-THC is commonly the metabolite of either MJ or the prescription drug Dronabinol.

Data from FY2016 indicates the most prevalent drug combination in urine is CNS-D and a narcotic analgesic (NA), followed by a combination of CNS-S and carboxy-THC. The drug combination of CNS-D/NA is often prescribed together (e.g. muscle relaxers and pain killers), which is perhaps one of the reasons it is seen most often. In blood, the most prevalent drug combination is CNS-S combined with CNS-D, followed by CNS-S combined with carboxy-THC, and CNS-D/NA (both combinations are tied for second). The reason NAs are not seen as often as in urine may be in part due to the current method limitations for confirming opiates in blood. Alprazolam (anti-anxiety /tranquilizer), and diphenhydramine (OTC cold medicine/ motion sickness medication) are the most prevalent CNS-D's found, followed by nordiazepam, 7-aminoclonazepam (an active metabolite of clonazepam), and Zolpidem (sleep aid). Other popular CNS-D's are citalopram, lorazepam, and diazepam. Hydrocodone is

by far the most commonly found narcotic analgesic. Narcotic analgesics and benzodiazepine-class compounds (e.g. alprazolam) are widely abused and addictive.

The most common CNS-Ss are methamphetamine and amphetamine. CNS-Ss also include cocaine and phentermine (commonly prescribed for weight loss). If methamphetamine is present in a urine or blood sample, amphetamine will likely be present as well. Amphetamine is an active metabolite of methamphetamine and it is impossible to determine whether any confirmed amphetamine in a sample is a result of prescription or illicit drug use. Amphetamine is available as prescription under the brand name Adderall. While amphetamine can be confirmed or at least noted in blood toxicology cases in which methamphetamine was confirmed, a urine sample will have amphetamine present in almost all cases where methamphetamine is present due to the increased time in the body for metabolism of the methamphetamine to amphetamine to occur.

Figure 11 illustrates adult drug results for both blood and urine associated with DUI. The pattern is the same as demonstrated with overall adult toxicology (see **Figure 10).** This trend is expected since the majority of cases submitted for toxicology are DUI's.

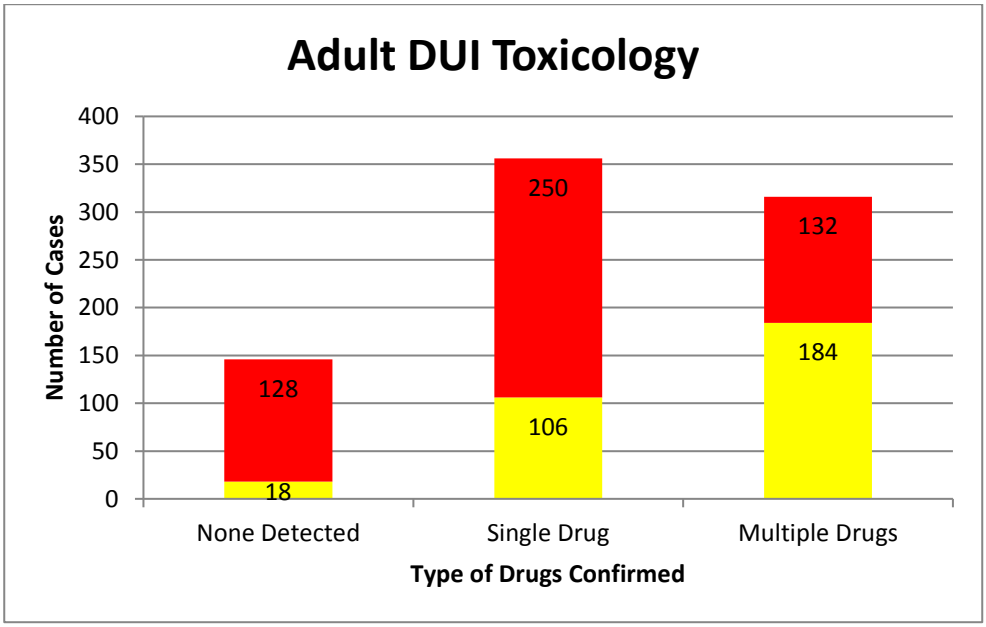


Figure 11 – Adult DUI Toxicology Results

Figure 12 shows the result categories for the 76 blood toxicology accident fatality samples submitted for toxicology in FY2016. This is a 57% increase in fatality accidents as compared to FY2015 (47 cases).

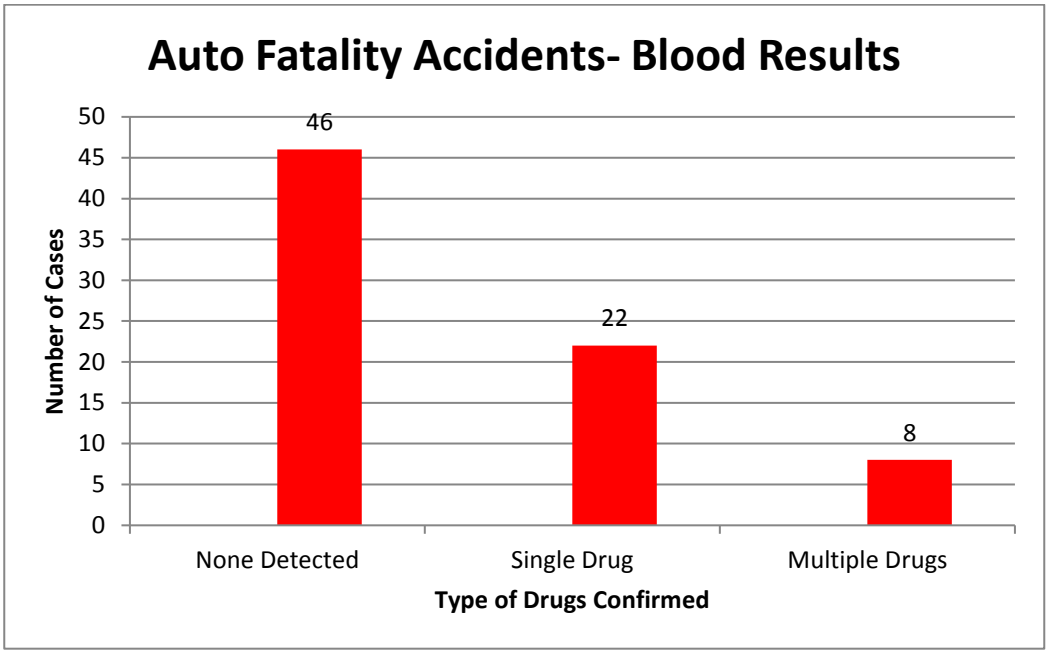


Figure 12 –Toxicology Summary for Fatality Accidents, by Category

In FY2016, 61% of the 76 cases submitted for fatality cases had no drugs confirmed (None Detected category). The most common drug category present in drug-positive cases was CNS-D, followed by Carboxy-THC.

Juvenile

Juvenile toxicology case submissions remained stable. Year after year, ISPFS reports carboxy–THC is the most commonly detected drug in those juvenile samples containing drugs. Carboxy-THC is an inactive metabolite of MJ.

ISPFS reported 49% of blood and 80% of urine samples contained at least one drug. Seventy-six percent of urine cases and 35% of blood cases were positive for a single drug category while only 4% of juvenile urine samples and 14% of juvenile blood samples contained drugs from multiple drug categories. There was only one urine sample that contained multiple drugs. The drug combinations seen with the urine sample was CNS-S and CNS-D. The most commonly reported drug combinations in blood were carboxy-THC with a CNS-S, and carboxy-THC with a CNS-D. Overall, 56% of juvenile urine and 37% of the juvenile blood samples that contained drugs contained carboxy-THC, either alone or in combination with other drugs. Twenty percent of the urine and 35% of the blood samples that were tested in juvenile toxicology cases were negative. The percentage of negative results may be partially due to limitations in ISPFS drug detection methods since ISPFS has limited capabilities to analyze toxicology samples for many designer drugs and/or their metabolites (i.e. spice and bath salts).

Figure 13 shows the distribution of results in the juvenile blood and urine toxicology categories.

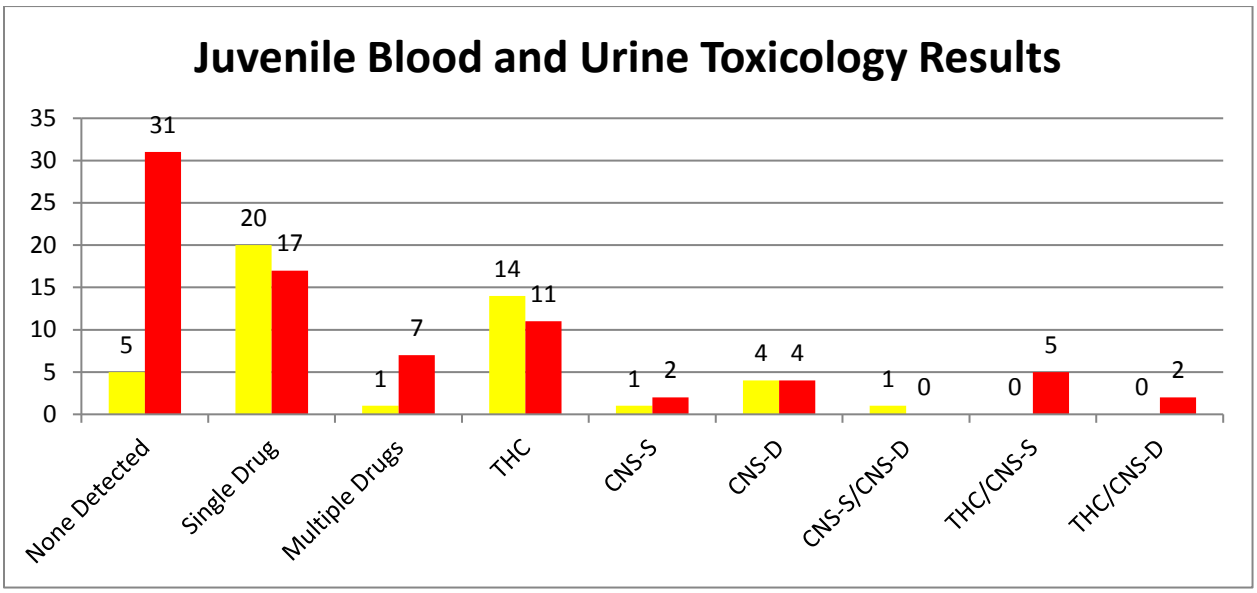


Figure 13 – Juvenile Blood and Urine Toxicology Results by Category

When looking at juvenile DUI cases, it appears that they are much more likely to test positive for one or more drugs than they are to have a negative result. Thirty-eight percent of the blood and 7% of the urine cases came back with no drugs detected. As was seen with juvenile toxicology results in general, Carboxy–THC was the drug most commonly confirmed in both blood and urine, either on its own or in combination with another drug. In fact, 28 out of 44 (or 63%) of the juvenile DUI cases (blood and urine combined) in which drugs were confirmed contained carboxy-THC. CNS-Ss such as methamphetamine and/or amphetamine are reported as a distant second in juvenile DUI cases. So while methamphetamine is not as prevalent as marijuana in the juvenile DUI cases, it does continue to be problematic.

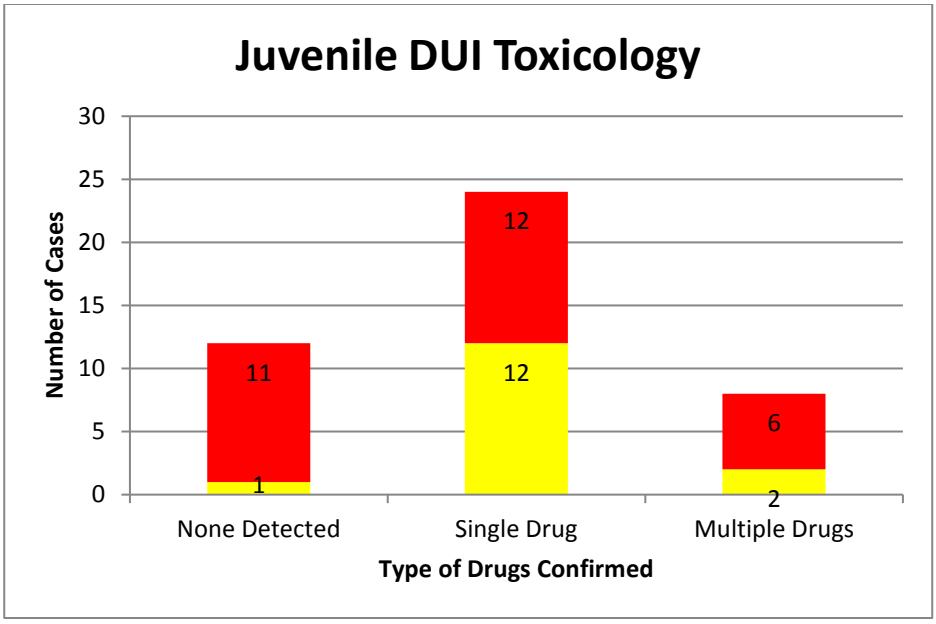


Figure 14- Juvenile DUI Toxicology Results

There were only 2 juvenile accident fatalities in which toxicology analysis was performed in FY2015; there were 4 in FY2016. That is an increase of 200%! Half of the samples tested positive for drugs of some sort, while the other two had no drugs confirmed.

Other Offense Toxicology Results

Cases submitted for toxicology analysis in FY2016 also included several other offenses (shown below).

Adults:

Count	Offense	Toxicology Results
4	Murder	• 3 negative • 1 Positive—CNS-D and THC
67	Rape****	• 41 negative • 26 Positive –CNS-S, CNS-D, and carboxy-THC were the most common results by far.
99	Drug Violations*	• 13 negative • 86 Positive – the most common categories detected were THC or CNS-S, either alone or in combination with other drugs.
13	Probation Violations**	• 1 negative • 12 Positive – Most contained a CNS-S or carboxy-THC
105	Other Offenses***	• 52 negative • 53 Positive—mostly CNS-Ds and CNS-Ss
20	Death Investigations*****	• 15 negative • 5 Positive-- CNS-D and CNS-S were the most common

Juveniles:

Count	Offense	Toxicology Results
6	Drug Violations*	• 3 negative • 3 Positive- CNS-S and c-THC and NA.
1	Probation Violations**	• 1 negative
8	Other Offenses***	• 2 negative • 6 Positive – carboxy-THC, CNS-D
13	Rape****	• 8 negative • 5 Positive--CNS-D, CNS-S, or carboxy-THC

* Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, Possession/Distribution/Use by a Minor; **Includes Juvenile, Misdemeanor, and Felony; ***Includes Abuse/Exploitation of a Vulnerable Adult, Assault/Battery (Aggravated or not), Burglary, Domestic Violence, Evidence Destruction/Alteration/Concealment, Officer Involved Shooting/Accident, Possession of liquor not subject to regulation by division, Injury Accidents, Injury to Child, Under the Influence in Public, Unlawful exercise of functions of peace officers, Vehicular Manslaughter; ****Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor; *****Death investigations can be suicides, unattended deaths or any other death that is deemed non-criminal.

Top ten ISPFS reported drugs:

- Methamphetamine (CNS-S)
- Carboxy- THC
- Amphetamine (CNS-S)*
- Alprazolam (CNS-D)
- Delta-9-THC
- Diphenhydramine (CNS-D)
- Hydrocodone (NA)
- Nordiazepam (CNS-D)**
- Zolpidem (CNS-D)
- 7-aminoclonazepam***

*Amphetamine may be a metabolite of methamphetamine.

**Nordiazepam may be a metabolite of diazepam.

***7-Aminoclonazepam is an active metabolite of clonazepam.

Summary

The laboratory system received 2,778 toxicology cases in FY2016, which is 166 more cases than in FY2015. The number of blood toxicology cases increased by 25% from FY2015. Urine toxicology case submission continued to decline in FY2016. This trend has been predicted over the last few years. We expect further decline in urine toxicology submission in FY2017, particularly as ISPFS expands its blood analytical capabilities to include some quantitative methods. ISPFS is moving toward testing only blood for DUI cases whenever possible.

Adult toxicology trends in every category (DUI'S, other offenses, etc.) remained fairly consistent with data from FY2015, aside from the auto fatality accidents which increased by 57%. One difference in results from FY2015 was the drugs most commonly seen changed slightly. Carboxy-THC went from being the number one drug reported in FY2015 to number two while methamphetamine moved into the number one spot for FY2016. This shows that methamphetamine continues to be a large problem in Idaho. With the increase in our scope of marijuana metabolites we could confirm, delta-9-THC (the active component of marijuana) was added to our top ten reported drugs for FY2016. It was the fifth most commonly reported drug. Year after year, marijuana becomes more prevalent in toxicology test results. This trend is expected to continue, particularly due to recreational and medical MJ legalization in the states surrounding Idaho.

In regard to juvenile cases, a significant increase of 138% was seen in juvenile alcohol samples submitted in fatality cases between FY2015 and FY2016. There was also a huge increase in the number of juvenile auto accident fatalities submitted in FY2016 compared to FY2015 (the number increased from 8 in FY2015 to 19 in FY2016). The number of samples submitted in this category was by far the largest number seen in the last ten years.

A loss in staffing left us unable to process cases as quickly as they came in, thereby leading to a large backlog. In addition to the loss in staffing, the number of blood toxicology cases received in FY2016 increased 25% from FY2015. To help alleviate the caseload burden, an additional scientist was trained in blood toxicology. However, it is a very long and intense process and it took approximately 14 months to get the analyst trained. Therefore, the impact of having an additional trained analyst will not be clear until the FY2017 turnaround times are examined. In addition to training a new analyst, two new scientists were hired to be trained in blood toxicology, and new and improved methods are in the works that will increase the number of drugs we can detect while also decreasing the amount of time that it takes to process them. Since the analysts did not start until FY2017, and the methods are not yet approved for use, the impact of these changes will also not be seen until FY2017.

For FY2016, it continues to be essential that ISPFS personnel get the funding, training, methods, and instruments needed to improve ISPFS detection of opiates, including heroin, from toxicology samples. These drugs have widely impacted our controlled substances section, and they will also impact the toxicology section when the testing can be accomplished. It is anticipated that many of our current "negative" samples would test positive for designer drugs and opiates that we are currently unable to detect. ISPFS frequently receives requests for analysis of designer drugs in toxicology samples. ISPFS scientists are working hard to reduce backlogs, but continued training, instruments, and space (bench space will be critical once the analysts are trained and working on cases) are needed to keep up with the demands of Idaho population growth and law enforcement activities.

APPENDIX

Non Random Juvenile Drug Testing (NJDT) Please see Idaho Statues *Title 33. Education, Chapter 2.*

Drug Evaluation and Classification (Information below was provided by the NHTSA *Drug Evaluation and Classification Training Manual,* January 2006 edition.) Changes have been made to help the understanding of the reader, such as Benzodiazepines have been added to antianxiety column in the chart and Methamphetamine has been added to list of stimulants.

Central Nervous System Depressants

Central Nervous System Depressants (CNS-D) slow down the operation of the brain. They first affect those areas of the brain that control a person's conscious, voluntary actions. As dosage increases, depressants begin to affect the parts of the brain controlling the body's automatic, unconscious processes, such as heartbeat and respiration.

Possible Effects of CNS Depressants:

- Reduced social inhibitions
- Divided attention impairment
- Slowed reflexes
- Impaired judgment and concentration
- Impaired vision and coordination
- Slurred, mumbled or incoherent speech
- A wide variety of emotional effects, such as euphoria, depression, suicidal tendencies, laughing or crying for no apparent reason, etc.

Alcohol is the model for the CNS Depressant category of drugs.

Some major subcategories of CNS Depressants other than alcohol include:

- Barbiturates
- Non-Barbiturates (synthetic compounds with a variety of chemical structures)
- Anti-Anxiety Tranquilizers
- Anti-Depressants (to combat psychological depression)
- Anti-Psychotic Tranquilizers
- Combinations of the above five subcategories

Examples of CNS Depressants

Barbiturates	Other	Anti-Anxiety Tranquilizers Benzodiazepines	Anti-Depressants	Anti-Psychotic Tranquilizers	Combinations
Amobarbital	Carisoprodol Meprobamate-M	Alprazolam	Amitriptyline Hydrochloride	Chlorpromazine	Chlordiazeproxide and Amitriptyline
Pentobarbital	Chloral Hydrate	Chlordiazepoxide	Bupropion	Droperidol	Chlordiazepoxide Hydrochloride and Clidinium Bromide
Phenobarbital	Diphenhydramine Hydrochloride	Clonazepam	Citalopram	Lithium Carbonate	Perphenazine And Amitriptyline
			Desipramine Hydrochloride	Lithium Citrate	
Secobarbital	Diphenylhydantoin Sodium	Diazepam	Doxepin Hydrochloride	Haloperidol	
			Escitalopram		
Barbital	Ethchlorvynol	Estazolam			
	Gamma-Hydroxybutyrate (GHB)	Flunitrazepam Flurazepam	Fluoxetine Impramine		
	Glutethimide Methaqualone	Lorazepam Oxazepam	Paroxetine Phenelzine Sulfate		
	Paraldehyde Zolpidem	Temazepam Triazolam	Sertaline Venlafaxine		

Central Nervous System Stimulants

Central Nervous System Stimulants (CNS-S) speed up the operation of the brain and spinal cord. It is important to emphasize that "speed up" does *not* mean "improve" or "enhance". Some CNS Stimulants can improve cognitive functions in very low doses; however, most definitely do not make the brain work better. Rather, they cause the brain and the rest of the nervous system to work *harder*, and often to make more mistakes.

The "speeding up" caused by CNS Stimulants results in significantly increased heartbeat, respiration and blood pressure, all of which can lead to physical harm to the abuser. In addition, the stimulant user experiences nervousness, irritability and an inability to concentrate or think clearly.

Possible Effects of CNS Stimulants

- Euphoria
- Anesthetic effect

- Hyperactive
- Impaired ability to perceive time and distance
- Confusion and loss of the ability to concentrate or to think clearly for any length of time

Some major subcategories of CNS Stimulants

- Cocaine
- Amphetamines
- Methamphetamines
- Others such as phentermine, methylphenidate, ephedrine/pseudoephedrine

Hallucinogens

Hallucinogens (Hall) are drugs or substances that affect a person's perception, sensation thinking, self awareness and emotions. They may also cause hallucinations. A hallucination is a sensory experience of something that does not exist outside the mind. It may involve hearing, seeing, smelling, tasting or feeling something that isn't really there. Or, it may involve distorted sensory perceptions so that things look, sound, smell, taste or feel differently from the way they actually are.

Possible Effects of Hallucinogens

- Hallucination
- Perception of reality severely distorted
- Delusions
- Illusions

Examples of Hallucinogens

Naturally occurring Hallucinogens

- Peyote
- Psilocybin

Synthetically manufactured Hallucinogens

- LSD
- MDA, MDMA, MMDA, TMA, STP, DET, DMT

Narcotic Analgesics

There are two subcategories of Narcotic Analgesics (NA). The first subcategory consists of the Opiates. The second subcategory is the Synthetic Opioids.

Possible Effects of Narcotic Analgesics

- "On the nod" (a semiconscious state of deep relaxation, eyelids will be droopy and the head will slump.)
- Slowed reflexes
- Slow and raspy speech
- Slow, deliberate movement
- Inability to concentrate
- Slow breathing
- Skin cool to touch
- Possible vomiting
- Itching of the face, arms, or body

Commonly-Abused Opiates and Their Derivation From Opium

- Morphine
- Codeine
- Heroin
- Dilaudid
- Hydrocodone
- Numorphan
- Oxycodone

Common Synthetic Opiates

- Demerol
- Methadone
- Fentanyl
- MPPP
- Darvon