Toxicology Program Trends

FY2021

FY2021 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 2021 (FY2021): District 1, Coeur d' Alene; District 5, Pocatello; and District 3, Meridian (volatiles analysis only). A "toxicology case" was any case which has urine or blood submitted to the laboratory for drug analysis and/or volatiles analysis; volatiles analysis may also be performed on vitreous humor samples and beverages suspected of containing ethyl alcohol. 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 was 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 was 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 FY2021. All case information was 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 was based on the per se level of 0.02 g% for persons under age 21.

Alcohol statistics for this 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.

Both the Pocatello and Coeur d'Alene labs started using new toxicology methods in FY 2018, which greatly decreased the time it takes to process case samples and blood toxicology turnaround times have continued to decline from those seen in previous years.

In addition to decreasing the amount of time it takes to process blood toxicology cases, the new methods implemented also included the ability to report out quantitative values for numerous compounds. The toxicology section was currently able to report 103 compounds (40 of those can be reported quantitatively). The labs will continue to collect data for additional compounds and start reporting out quantitative values for those additional compounds as appropriate uncertainties are established.

Best practice in toxicology testing was to use two different technologies to screen and confirm compounds. Sometimes this was not possible so workarounds such as using the same instrument but different mobile phases, columns, and methods for the screening and confirmatory testing can be employed. This was how the toxicology section was and has been functioning for some time.

Toward the end of FY2019, the toxicology section received two new instruments (LCMS-QTOF). One instrument went to the Pocatello laboratory and the other went to the Coeur d'Alene laboratory. The validation process for those instruments was completed and the instruments were put into service for casework in June 2020. However, instrument issues have delayed the actual use of the instruments for casework. Troubleshooting was being done on the instruments and as soon as the issues are resolved, the instruments will be used for casework. These instruments will be used for preliminary screening procedures for both blood and urine. The use of these instruments will allow us to follow the best practices guidelines and have two different technologies for screening and confirmatory testing. In addition, unlike the LCMS-QQQ instruments that are currently being used for preliminary testing (screening), the new LCMS-QTOF instruments will allow us to go back and search data that has been run on the instrument for additional compounds that are not covered on our targeted screen. Therefore, if a particular drug starts becoming prevalent in Idaho but it was not something that was covered under our screening method, we can go back and search the data to determine if this compound was present in previous samples we had run.

Terms and Drug Categories

After a drug enters the body, it starts getting broken down into compounds that are easier for the body to eliminate. This was referred to as metabolism. Compounds that the drugs are broken down into are termed metabolites. Some metabolites do not produce any pharmacological effects (inactive metabolites), while others do have pharmacological properties and cause effects of their own. During the metabolic process, there will be a combination of both the original drug (or parent drug) and the metabolite(s). In the case of active metabolites, both the parent drug and metabolite(s) can simultaneously cause pharmacological effects on the body.

The central nervous system (CNS) was comprised of the brain and spinal cord. Drugs that act to speed up the processes of the central nervous system are called central nervous system stimulants (CNS-S). Drugs that slow the processes of the central nervous system are termed central nervous system depressants (CNS-D). Central nervous system stimulants, central nervous system depressants, and cannabinoids (marijuana) account for the vast majority 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.

Highly impairing CNS-S drugs, such as methamphetamine and cocaine, are typically not distributed in prescription form. Amphetamine can be obtained as a prescription but was most commonly seen alongside methamphetamine (which was not surprising since it was an active metabolite of methamphetamine). Since amphetamine was an active metabolite, it will act as its own drug and produce stimulant effects aside from those produced by methamphetamine. While cocaine was a well-known stimulant and was seen in many other states, ISPFS laboratory analysis yields relatively few

positive results for cocaine. However, this does not necessarily mean cocaine was not being abused in Idaho. Since cocaine was eliminated from the body very rapidly, if a significant amount of time passes between use and sample collection, cocaine may not be detected in the sample. An inactive cocaine metabolite, benzoylecgonine, has a longer detection window, and can sometimes be detected in samples if the individual has recently used cocaine. This means that toxicology results can support allegations of cocaine use, even if cocaine itself was not detected in the sample.

Driving under the influence of impairing prescription drugs was 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-depressants, anti-anxiety drugs, antihistamines, benzodiazepines, narcotic analgesics (NA), and others.

The psychoactive component of marijuana was tetrahydrocannabinol (THC). There are numerous THC metabolites, including hydroxy-THC and carboxy-THC. Before the implementation of the new methods, ISPFS was only able to detect the inactive metabolite (produces no pharmacological effects), carboxy-THC in blood samples. The current method for blood and urine not only allows for the detection of THC, hydroxy-THC and carboxy-THC, but also allows THC and hydroxy-THC quantities to be reported (in blood only). For simplification, THC will be listed on graphs and referred to in discussion of graphs, even though the results are referring to cannabinoids and could be THC, hydroxy-THC or carboxy-THC.

Narcotic analgesics are prescribed to relieve pain and 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 morphine and fentanyl. Since fentanyl has become so popular nationwide, it and one of its metabolites (norfentanyl) were added to the new methods to allow for the reporting of those compounds in blood. Acetyl fentanyl (a designer drug that was similar to fentanyl) and its metabolite, acetyl norfentanyl, were also added.

Benzodiazepine class drugs are typically prescribed for anti-anxiety, and as tranquilizers. There are many different drugs under this class, but the most well-known benzodiazepines include Xanax (alprazolam), Valium (diazepam), Klonopin (clonazepam), and Ativan (lorazepam). The most commonly found benzodiazepines in casework were alprazolam, clonazepam/7-aminoclonazepam, and lorazepam. Due to an increase in the number of designer benzodiazepines or novel psychoactive substances (NPS), the toxicology section has been monitoring what the controlled substance section has been seeing as well as what agencies are requesting or suspecting. During FY2019, an increase in the number of etizolam submissions was noted and this drug was added to our testing panel. During FY2020, an increase in the number of flualprazolam and clonazolam submissions was noted and this drug was added to our testing panel. In addition to the benzodiazepines, cocaethylene, levetiracetam, norketamine, and alpha-PHP were also added to the testing panel.

Drug combinations are discussed in this report because these 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). These combinations are both examples of additive effects. 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.

One important factor to keep in mind was that 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 was not to process a sample for toxicology if the blood alcohol result was above 0.10 g%. In special circumstances, such as sexual assault, death investigations, injury to a child, or possible overdose cases, the toxicology may still be analyzed even if the blood alcohol was 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 was below 0.20 g% of blood.

A negative toxicology result does not necessarily mean that there was no drug in the sample. It could be that there was a drug or drugs in the sample but that we are not able to detect it/them with our methods, or it could also mean that the drug(s) present is/are below our limits of detection. There are, of course, cases in which there was no drug detected because there was no drug present, but it was important to keep in mind that there are testing limitations and these limitations should be considered when a negative result arises.

General Toxicology Discipline Breakdown for FY2021

Statistics included in this report were obtained from the Idaho Laboratory Information Management System (ILIMS). This was the system that was used to log in and track all evidence submitted to the forensic laboratory system during FY2021. 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**.

	Alcohol/Volatiles	Blood Toxicology	Urine Toxicology	Total	FY2021 Percent
DUI					
Adult	1049	917	119	2085	66.34%
Juvenile	47	21	5	73	
Drug/Narcotic Violations**					
Adult	46	150	37	233	7.44%
Juvenile	4	3	2	9	
Other***	65	66	33	164	5.04%
Auto Accident Fatalities	98	92	0	190	5.84%
Accident Victim Kits	10	10	0	20	0.62%
Death (non-homicide)	10	11	1	22	0.68%
Murder	0	1	2	3	0.09%
Rape****	41	4	65	110	3.38%
Cases Closed Before Analysis*****	33	308	3	344	10.57%
Total:	1403	1583	267	**3253**	100%

Table 1- Statistical Representation of the Number and Distribution of Toxicology Cases for FY2021.

*Includes Juvenile, Misdemeanor, and Felony; **Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, Possession/Distribution/Use by a Minor; ***Includes Assault/Battery (Aggravated or not), Domestic Violence, Probation Violations, Officer Involved Shooting/Accident, Injury Accidents, Injury to Child, Grand Theft, Under the Influence in Public, Unlawful possession of a firearm, Leaving the scene of an accident, Manslaughter, Vehicular Manslaughter, and Lewd Conduct; ****Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor, and Penetration with a Foreign Object. *****Cases can be closed either because the testing was no longer necessary per the agency or if other evidence proves to be probative and testing of another type was no longer warranted (i.e. blood alcohol and blood toxicology are both requested but the alcohol result was greater than 0.10 g%, so the blood toxicology request was closed without analysis).

The ISPFS laboratory system received 3,253 toxicology cases for FY2021, which was an increase of 300 cases from FY2020, and an increase of 134 cases from FY2019. The number of cases corresponds to an increase of approximately 10.16% from FY2020 and a 4.39% increase from FY2019.

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

Figures 1a and 1b (below) show the ten-year trend for toxicology cases as well as the breakdown of the individual matrices/testing requested. 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 was 2979 cases.

There appears to be a trend in which there were a much higher number of cases submitted in FY2012 and FY2013 than there were between FY2014 and FY2021, although the number of cases submitted for FY2021 appears to be trending upward. The 2-year average for FY2012-FY2013 was significantly higher than the average for FY2014-FY2021 (there was an average of 731 more cases submitted per year in FY2012-FY2013 than there was in FY2014-FY2021). One possible explanation for the large change in cases submitted could be due to the Supreme Court ruling on Missouri vs. McNeely in which it was decided that if an evidentiary blood draw was desired, a warrant must be obtained prior to collecting the blood. **Figure 1** further supports this hypothesis as the rapid decline in the number of alcohol/volatiles was seen. There were over 2000 cases submitted for alcohol/volatiles analysis in FY2012 and FY2013, then in 2014, this number plummeted to just over 1300 and has remained fairly stable from then on. The Supreme Court ruling on Missouri vs. McNeely was issued just before FY2014. If this hypothesis was correct, one would expect to see an increase in the number of breath alcohol cases, starting in FY2014.

Interestingly, the number of cases submitted for FY2019 increased substantially from the previous five years, then went back down, slightly in FY2020, and back up in FY2021. It was suspected that the slight decrease for FY2020 was likely due to COVID-19, since fewer people were out in public and driving. The number of cases for blood alcohol/volatiles analysis has been fairly consistent since FY2014 but there are very different trends seen with the blood and urine toxicology case submissions. The number of blood toxicology cases submitted was on an upward trend, while the number of urine toxicology cases submitted was on a downward trend. Starting in FY2014, the number of blood toxicology cases has continued to increase, nearly every year. The number of cases submitted for blood toxicology for FY2021 was more than double what it was in FY2014. As mentioned previously, the opposite trend was seen with urine toxicology cases drastically decreasing. The number of urine toxicology cases submitted in FY2021 was less than half of what was submitted in FY2012. One explanation for the increase in blood toxicology and decrease in urine toxicology cases was that more officers have switched from collecting urine for DUI cases to blood, as blood was the preferred specimen for DUI cases due to it indicating

more recent drug use. Another explanation for the increase in blood toxicology cases could be that since the number of people being prescribed medications goes up every year, the number of people driving while on these medications also goes up. Since some medications can impact driving performance, more people driving while on prescription medications could cause the number of DUI cases submitted to increase. Another possible reason for the increase could be due to an increase in the Idaho population. This trend will likely continue in future years as it was anticipated that the population in Idaho will continue to increase.

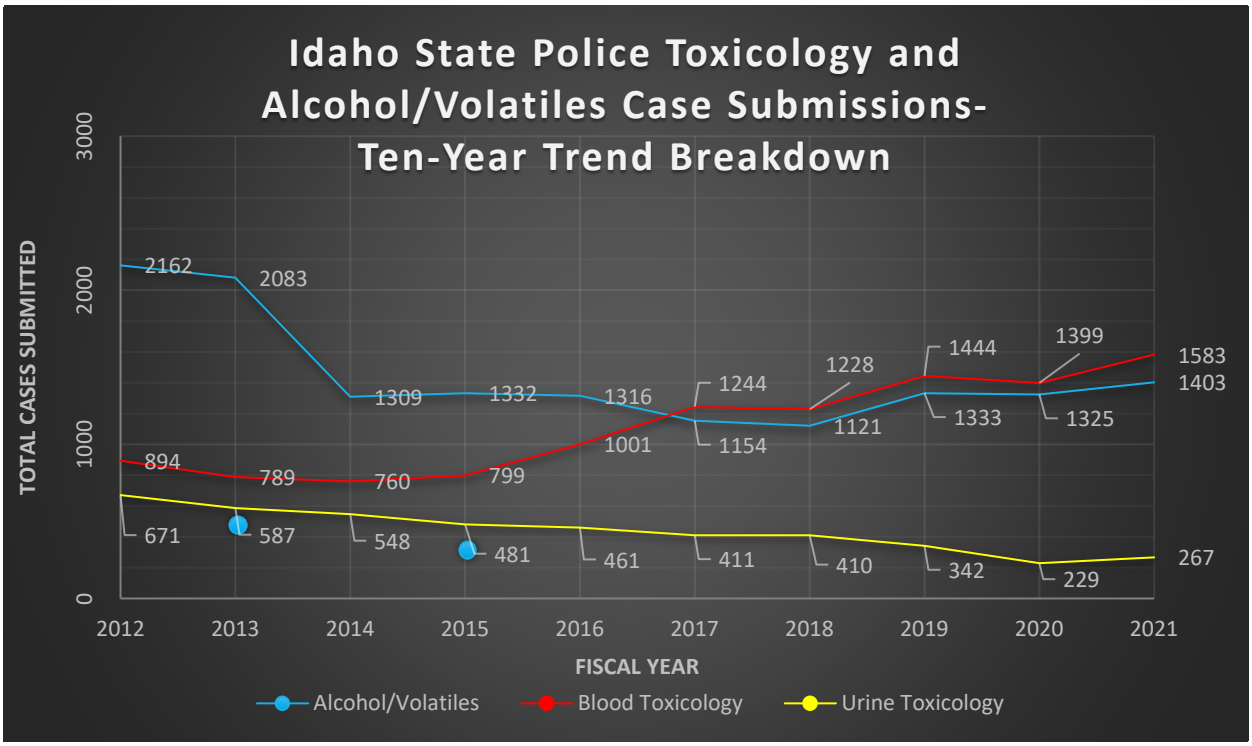

FIGURE 1- Breakdown of the Ten-Year Trend for Toxicology Case Submissions

Alcohol and Other Volatiles

The number of alcohol/volatiles case submissions to ISPFS increased by 78 cases from 1,325 in FY2020 to 1,403 in FY2021. This change corresponds to about a 5.9% increase. There were significantly more alcohol/volatiles cases submitted prior to the McNeely decision in 2013. Then in FY2014, there was a dramatic decline in the number of alcohol/volatiles cases submitted and since then, the number has stayed fairly consistent. A large increase (beyond that expected due to population growth) in the number of cases was not expected since ISPFS provides support for breath testing in Idaho and the scientists working in this discipline have reported a significant increase in breath testing workload. Since breath testing instruments are becoming more widely available and easier to use, it was likely that

officers are opting to perform breath tests rather than obtain warrants for blood draws, except in cases where drugs other than alcohol (i.e. inhalants) are also suspected. If any issues arise with the breath testing instruments or laws, it was likely that there will be a large increase in the number of alcohol/volatiles cases submitted.

Ethanol was not the only compound that was detectable during blood/urine alcohol testing. The laboratory also reports 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.

Alcohol analysis requests span a wide range of case types: DUI, rape, accident, death investigation, and other offense cases. The alcohol result categories include: none detected/ below reportable limit (<0.02 g%), ≥0.02 g% and <0.08 g%, ≥0.08 g%, and other volatiles (acetone, DFE, toluene, etc.).

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, in addition, these are adult cases, not total cases. ISPFS processed 1,289 adult samples for alcohol and inhalants during FY2021. The analysis results are tabulated below. Each sample for which alcohol analysis was requested was simultaneously tested for the presence of inhalants, however, the total 1,272 samples reported in the table below does not include beverage samples, or inhalant results.

Number of Adult Samples	Result Category
(not included in total)	Not analyzed
308	<0.02 g%
67	≥0.02 g% and <0.08 g%
897	≥0.08 g%
1,272	Total (Reflects ethanol results only)

For the purposes of this report, any alcohol result that was reported as "none detected" or "below reportable limit" was categorized as <0.02 g%. If alcohol and toxicology testing are both requested, then a negative alcohol sample was also processed for drugs. Therefore, samples listed as none detected (or <0.1 g%) may be positive for drugs other than alcohol.

Figure 2 was a depiction of the overall adult alcohol results for FY2021; this chart includes DUIs, death investigations, auto accident fatalities, and a wide variety of other case types.

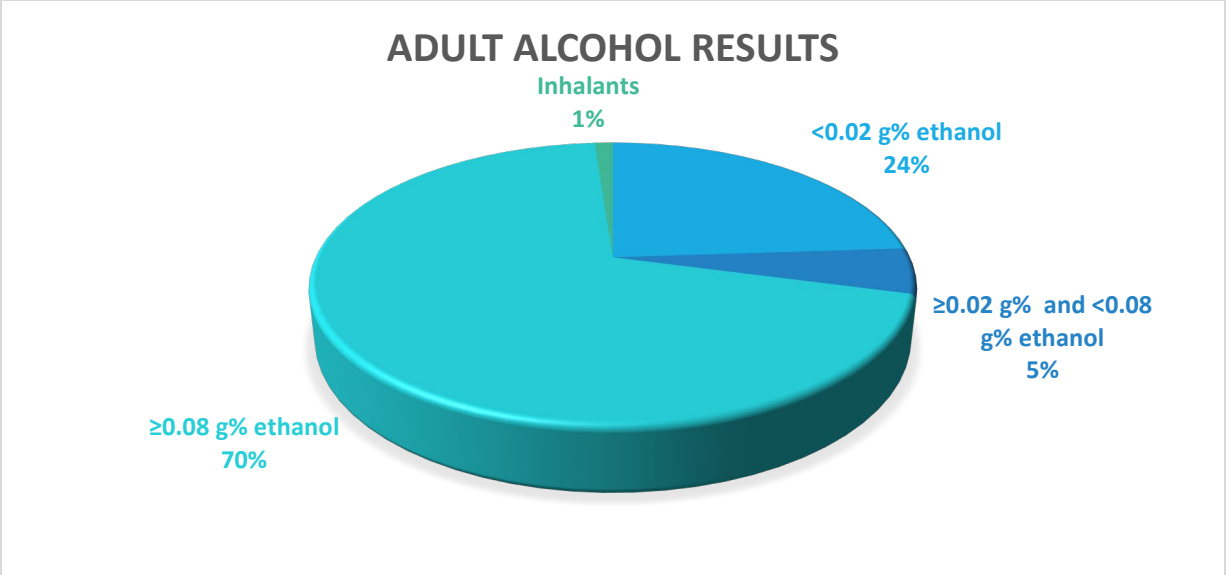

FIGURE 2- Adult Alcohol/Volatiles Levels for FY2021

Fifteen adult samples tested positive for inhalants. In terms of significance, considering the 1258 adult alcohol samples submitted, fifteen inhalant samples was not a significant percentage. However, it was interesting to note that this was the same number as FY2020. For FY2019, the number of inhalants reported was thirty-five. This difference corresponds to a 133% decrease for FY2020 and FY2021. The inhalants confirmed in the 15 positive samples included: 12 samples that were positive for fluorinated hydrocarbons (air duster), and three samples that were positive for acetone (nail polish remover, it was also formed in the body during ketoacidosis).

Adult samples submitted for pending DUI charges constituted 1,028 of the total 1,272 alcohol/volatiles cases (80%). Of these 1,028 samples, 842 were over the per se limit of 0.08 g% (81.9%). 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 was ≥0.10 g% if there are extenuating circumstances which may include sexual assault, death investigations, injury to a child, or aggravated offenses.

When urine samples are submitted for inhalant testing, they also undergo simultaneous alcohol testing as it was the same test. Urine alcohol results are of questionable value, and thus are reported by ISPFS with a disclaimer statement. The questionable value of these results was 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 was 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 was adult auto accident fatalities. **Figure 3** shows the BAC results for the adult auto accident fatalities. A total of 84 adult auto accident fatality case samples were submitted to ISPFS in FY2021; this was 9 more cases than in FY2020. Of the 84 cases, 63 (75%) contained <0.02 g%

alcohol, four (~5%) were between 0.02 and 0.08 g%, and 17 (20%) were at or above the legal limit of 0.08 g%. This distribution was very similar to previous years.

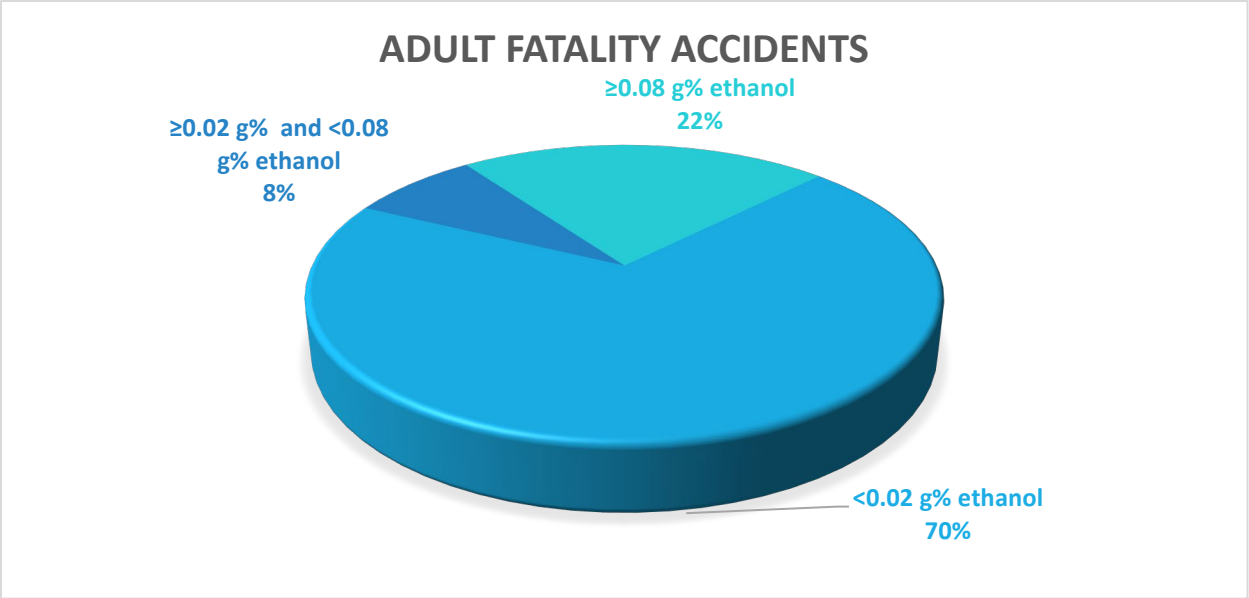

Figure 3- Results for Adult Alcohol Fatality Accidents

The ten-year trend of adult auto accident fatality cases submitted to ISPFS was depicted in **Figure 4**. Interestingly, there does not seem to be any obvious trend. The average number of adult fatality cases submitted for the last 10 years (including FY2021) was 75 cases.

Figure 4- Ten Year Adult Fatality Accident Trend

Juvenile Alcohol Concentrations

ISPFS processed 121 juvenile alcohol cases in FY2021. This was 12 more juvenile alcohol/volatile cases than was processed in FY2020. Of these samples, 62% were over the legal limit for persons under age 21 (0.02 g%). Of the 121 juvenile alcohol samples submitted to ISPFS, 69 were juvenile DUI cases; 50 of these 69 cases (72%) were over the juvenile (under age 21) legal limit of 0.02 g%. This was a similar percentage to what was seen in FY2020.

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

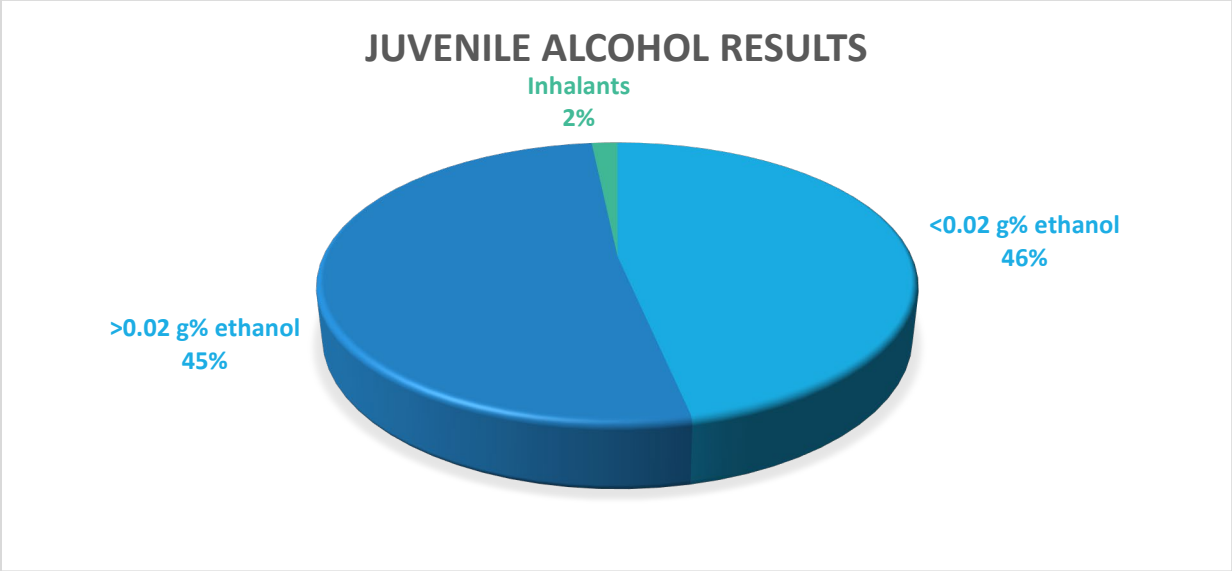

Figure 5- Juvenile Alcohol Levels for FY2020

A significant increase in the number of juvenile alcohol samples submitted in fatality cases was seen in FY2020 as it increased from 2 cases in FY2019 to 13 cases in FY2020. That corresponded to a 550% increase. This number increased even more in FY2021 to 17 cases. The average number of juvenile auto accident fatality cases submitted in the last ten years was 13. Over the last ten years, the lowest number of cases were in FY2015 (8 cases) and FY2019 (2 cases). There was no obvious explanation for why those years were significantly lower.

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

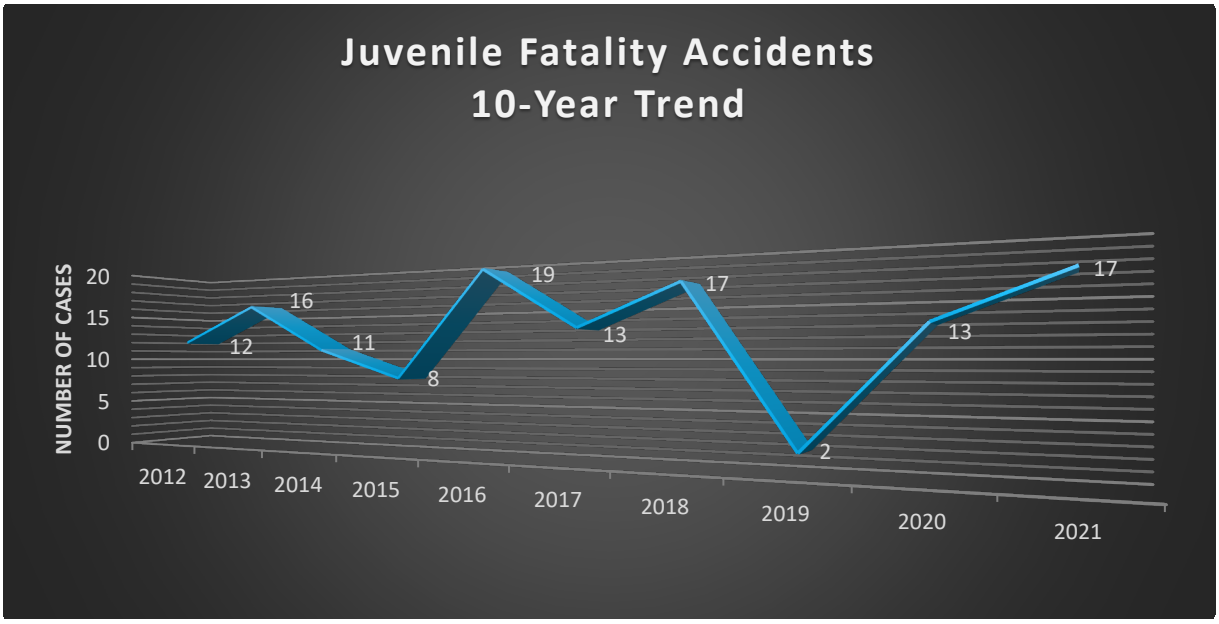

Figure 6- Ten Year Juvenile Fatality Accident Trend

Other Offense Alcohol Concentrations

Cases submitted for alcohol analysis in FY2021 also included several other offenses. **Figures 7** was a graphic depiction of offenses (other than DUI) for which samples were submitted for alcohol analysis. **Figures 8 and 9** depict the results breakdowns for these other offenses for adults and juveniles, respectively. Death investigations (non-homicide) includes suicides, unattended deaths, or any other death that was deemed non-criminal but needs investigating. 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.

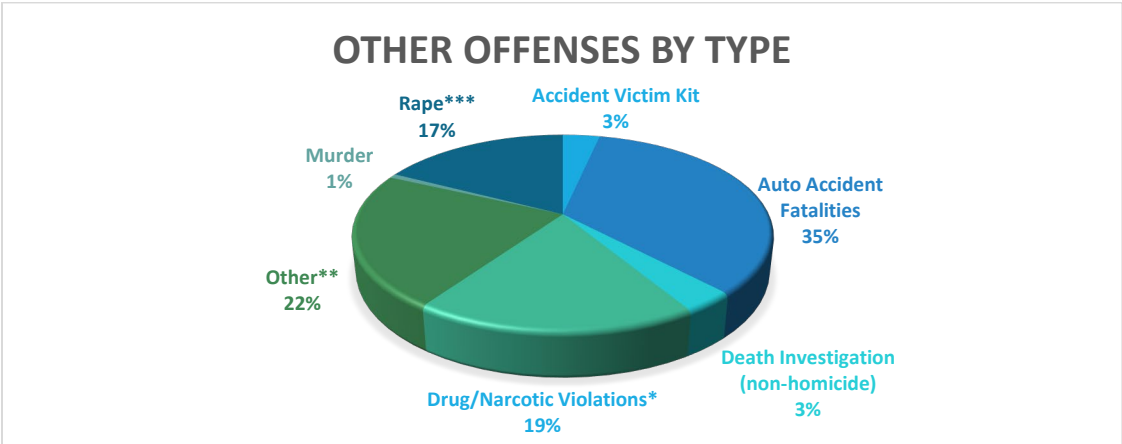

Figure 7 – Alcohol Analysis Requests by Other Offense Types

*Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, Possession/Distribution; **Includes Assault/Battery (Aggravated or not), Domestic Violence, Officer Involved Shooting/Accident, Injury Accidents, Injury to Child, Under the Influence in Public, Unlawful possession of a firearm, Leaving the scene of an accident, Manslaughter, Vehicular Manslaughter, and Lewd Conduct; ***Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor, and Penetration with a Foreign Object.

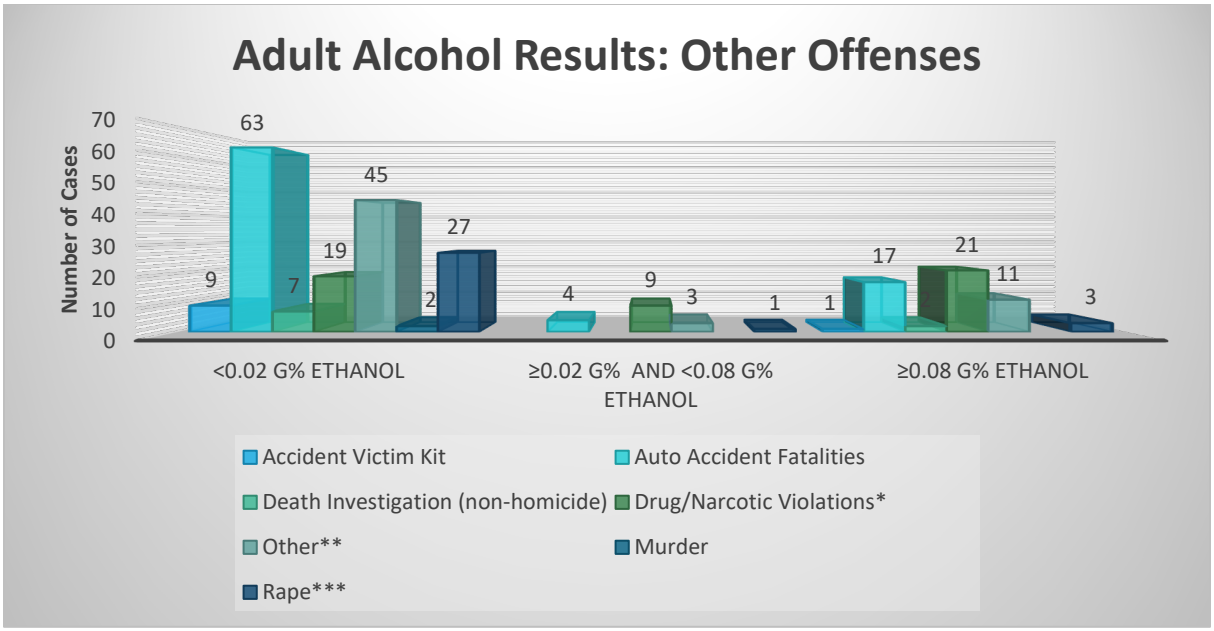

Figure 8- Adult Alcohol Results for Other Offenses

*Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, Possession/Distribution; **Includes Assault/Battery (Aggravated or not), Domestic Violence, Officer Involved Shooting/Accident, Injury Accidents, Injury to Child, Under the Influence in Public, Unlawful possession of a firearm, Leaving the scene of an accident, Manslaughter, Vehicular Manslaughter, and Lewd Conduct; ***Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor, and Penetration with a Foreign Object.

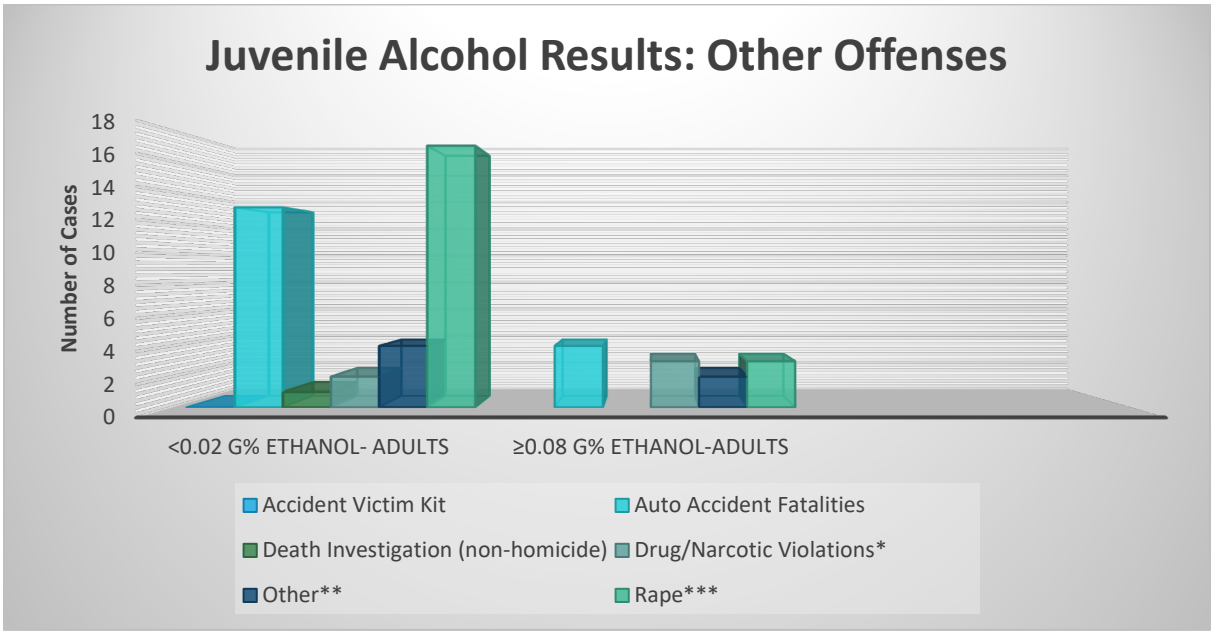

Figure 9- Juvenile Alcohol Results for Other Offenses

*Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, Possession/Distribution; **Includes Assault/Battery (Aggravated or not), Domestic Violence, Officer Involved Shooting/Accident, Injury Accidents, Injury to Child, Under the Influence in Public, Unlawful possession of a firearm, Leaving the scene of an accident, Manslaughter, Vehicular Manslaughter, and Lewd Conduct; ***Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor, and Penetration with a Foreign Object.

It should also be noted that ISPFS annually provides each analyst one proficiency test in each discipline in which s/he was certified. The successful completion of this annual test was required for analysts to be permitted to continue performing analyses on casework. Furthermore, analysts are also provided a competency test prior to becoming approved 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 or weeks after use, but not in blood. If carboxy-THC was found in the blood, it was typically indicative of more recent use. THC and hydroxy-THC can be found in the blood, but due to rapid metabolism, are typically not found in urine.

The type of fluid sample sent for toxicology analysis may depend on legal considerations. Blood was a better sample for alcohol and can easily be retained for toxicology testing after the alcohol/volatiles analysis was complete. In addition, as stated earlier, urine alcohol results can be of questionable value.

If there was a question of impairment, such as in a DUI case, blood was often the preferred sample for toxicology because it gives the best indicator for recent use and drugs that were possibly pharmacologically active at the time of collection. With sexual assault cases, samples are not usually taken for several hours (or even days) after an assault, and by that time any drugs that may have been given will typically be filtered out of the blood or at very low concentrations in the blood. The problem of low drug concentration was much less likely with urine. Since urine pools in the bladder, the drug collects there and provides a much greater drug concentration than in blood. Also, obtaining a urine sample was not an invasive procedure, whereas blood sample collection was invasive. For these reasons, urine was typically the preferred matrix for sexual assault cases.

ISPFS accepted 1583 blood samples and 267 urine samples for toxicology testing in FY2021. This correlates to an increase of about 13% in the number of blood cases and a 16.5% increase in urine cases from FY2020. When considering the number of blood and urine toxicology submissions for the last 10 years, it appears that there was an upward trend associated with the blood toxicology samples and an overall downward trend with the urine toxicology samples. This trend can easily be seen when looking at the blood and urine toxicology submission numbers in **Figure 1b**.

Please note that in all toxicology graphs below, red was used for blood, yellow for urine. Graphical representation of the “Single Drug” category refers to samples that only had a single 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 would be placed into the “Single Drug” category despite the presence of multiple drugs in the sample.

Adult

Figure 10a shows the adult blood and urine toxicology results for FY2021 by drug category. **Figure 10b** shows the specific breakdown for the cases that had multiple drugs present in a sample. For example, CNS-S includes drugs such as methamphetamine, cocaine, and others; narcotic analgesics (NA) includes drugs such as morphine or hydrocodone. For the breakdown of the multiple drugs, only those combinations that had 20 or more cases associated with it are displayed in the graphs.

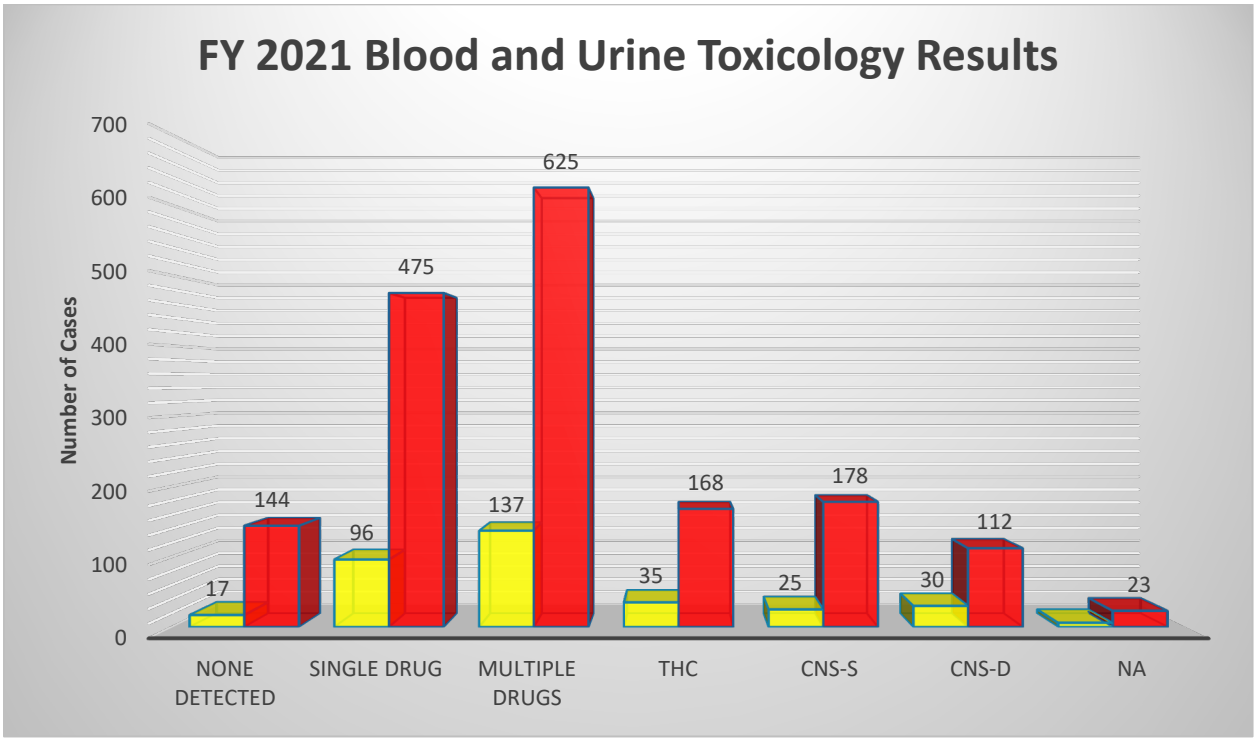

FIGURE 10a – Adult Blood and Urine Toxicology Results by Category

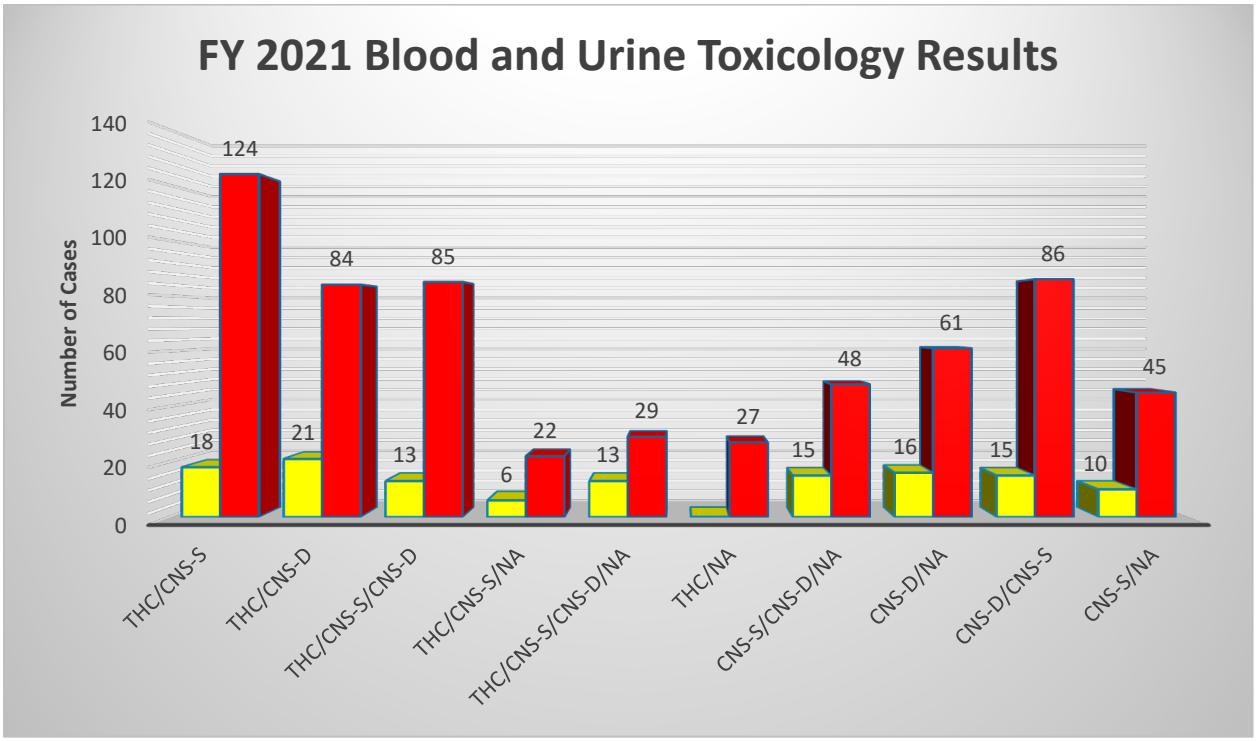

FIGURE 10b – Adult Blood and Urine Toxicology Results by Category

When reviewing blood and urine toxicology results, one thing to consider was that 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. Therefore, there may have been many more cases that could have been positive for drugs and been included in these categories had those samples been tested.

The data for adult blood and urine samples (**Figure 10a**) shows an interesting difference from previous years. Data from the previous five years has shown that single-category drug use was more prevalent than multiple drug category combinations for blood toxicology. For FY2021, this changed as there was a much higher number of blood cases in which there were drugs present from multiple drug categories. This prevalence was what has been seen in the urine toxicology cases for previous years and was 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. There was no obvious explanation for why there was now a higher number of blood samples that belong to the multiple drugs category instead of the single drug category. However, the drug most often seen in the cases where there are multiple drug categories present was THC (**see Figure 10b**). So, perhaps an increase in the use of THC in combination with other drug categories was responsible for the increase in multiple drug categories in FY2021. For instance, if someone who has been taking a CNS-D drug for depression now also starts smoking marijuana, the drugs in their blood would now show as multiple drug categories. Of the single category cases, it appears that cases with CNS stimulants are most prevalent, followed by cannabinoids (can be either THC, hydroxy-THC or carboxy-THC). CNS-Ss include drugs like Ritalin (methylphenidate), Adderall (amphetamine), and methamphetamine. Of the single drug urine cases, cannabinoids are detected most often, then CNS-D and CNS-S. CNS-Ds can be many different drugs; examples include Valium (diazepam), Xanax (alprazolam), and Ambien (Zolpidem).

There was a large number of possible combinations that can arise with the different drug classes. However, there were only ten different combinations that encompassed the majority of the samples. As such, only those combinations are displayed in **Figure 10b**. Of those ten combinations, CNS-S drugs are present in seven out of the ten combinations. Cannabinoids and CNS-D drugs are present in six out of the ten. In urine, CNS-D combined with carboxy-THC and CNS-S combined with carboxy-THC are the most common combinations. In blood, the most prevalent drug combination, by far, was CNS-S and cannabinoids. In previous years, NAs were not very prevalent in blood. This could be due to limitations of the blood toxicology methods and not the fact that there were not NAs present in the samples. It was possible that NAs are more prevalent in blood for FY2021 because of the updated methods, however, when looking at what drugs were confirmed most frequently, it appears that the increase was due to a rise in fentanyl cases.

Around 66 percent of blood and urine toxicology cases were associated with a DUI. As such, the results of just DUI cases shall be highlighted and discussed. This percentage was about the same as it was in FY2019 and FY2020. One thing to remember when reading this report and looking at the figures was that often times cases will come into the laboratory and only one charge will be listed but several other charges are associated with the crime (for instance DUI and possession or driving without a license or insurance). For the purposes of this report, the highest charge was the one the results are associated with for the case.

Figure 11 illustrates adult drug results for both blood and urine associated with DUI. Of the adult DUI toxicology cases tested in FY2021, 92% of them were positive for one or more drugs. This number was much higher than what was reported in FY2020 (70%) and higher than that for FY2019 (84%).

The percentage of blood toxicology DUI samples that were reported as none detected was about 31% for FY2020 and for FY2021, it was down to about 8.6%. The percentage for urine was around 28% in FY2020 and less than 2% for FY2021. This was a huge decrease in both blood and urine DUI samples that were negative for drugs (at least the drugs we test for). One possible explanation for this large decrease in the number of DUI cases in which there were no drugs present was the hands-free cell phone law that went into effect on July 1, 2020. If people were using their cell phones and getting distracted while driving, this could cause them to get pulled over for a possible DUI, even if they were not under the influence of anything. If there was a decrease in the number of people driving distracted due to their cell phones, then this would make sense as to why there was such a small percentage of DUI cases that have samples that are negative for drugs. Another possible explanation was that the officers pulling people over are getting better at differentiating between someone driving distracted and someone under the influence. This could be due to more/better training, or just more experience.

The trend of multiple drug categories being most prevalent for urine toxicology cases remains true when looking at DUI cases. For the urine cases, 28% of the samples contained drugs from a single category while over 70% of them contained drugs from multiple categories. For the blood toxicology DUI cases, the change that was seen this year, where the number of cases with drugs belonging to multiple drug categories was higher than that with the single drug categories was also seen with the blood DUI cases. For FY2020, about 38% of the cases contained drugs from a single drug category while only 22% contained drugs from multiple categories. For FY2021, the percentage of cases with drugs from a single drug category remained the same (38%) as FY2020 but the percentage of cases with drugs belonging to multiple drug categories increased from 22% to 53%.

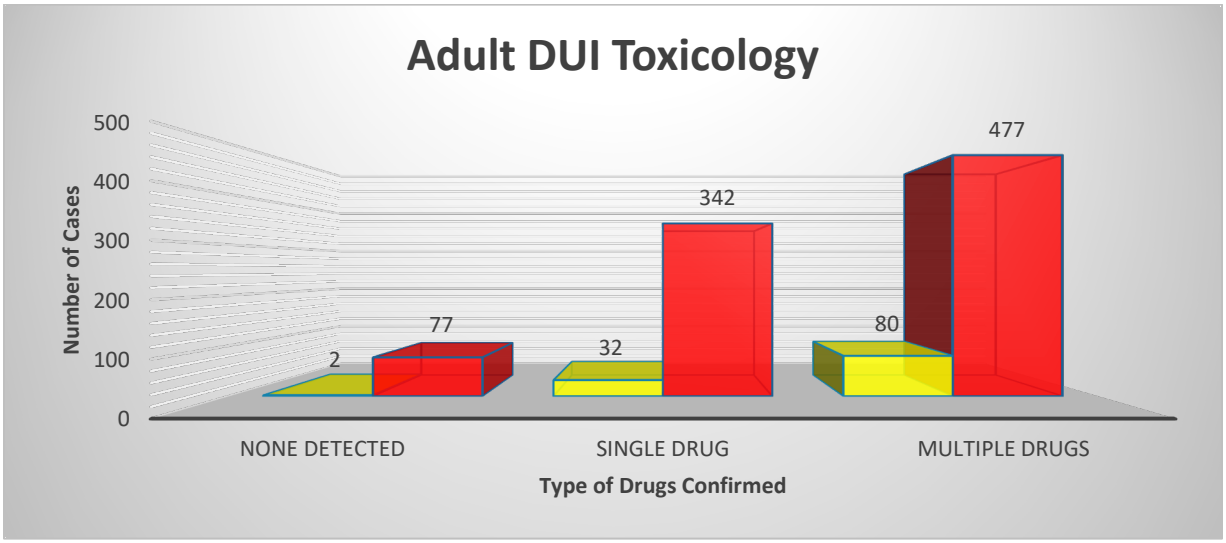

Figure 11 – Adult DUI Toxicology Results

In FY2021, there were 92 cases that were classified as auto accident fatalities. **Figure 12** shows the result categories for these cases. This corresponds to an increase of 15% from FY2020, but a decrease of about 9.8% from FY2019.

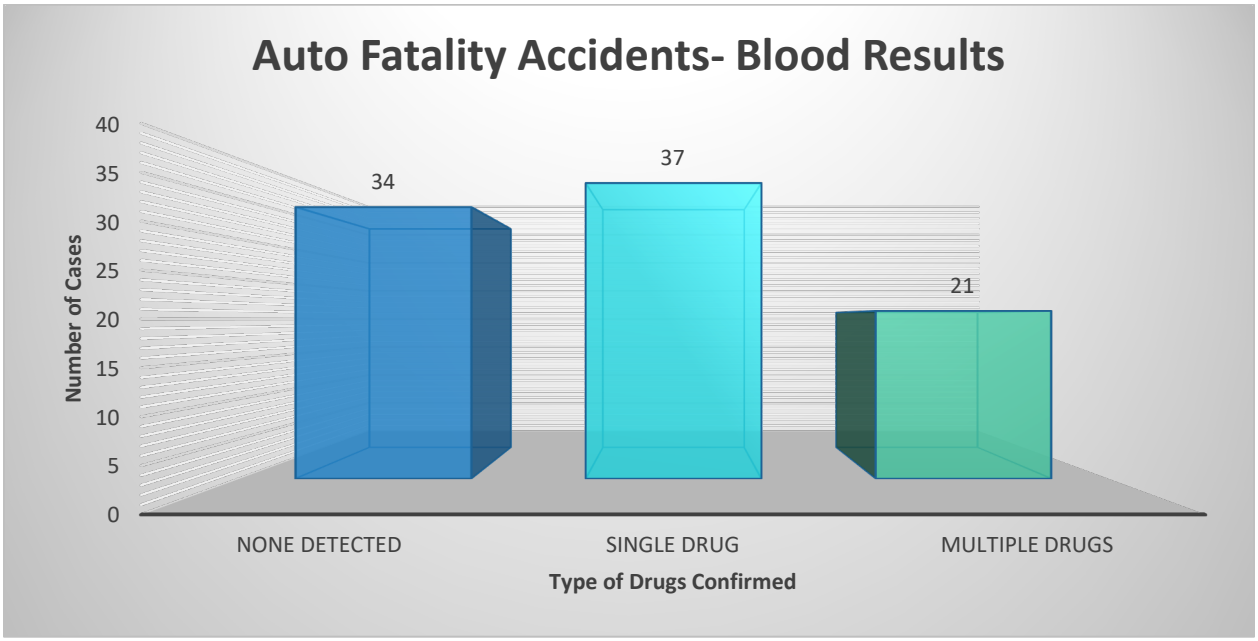

Figure 12–Toxicology Summary for Fatality Accidents, by Category

Although the overall trend for FY2021 was that there were more cases that contained drugs from multiple drug categories rather than a single category, the results for auto fatality accidents did not follow this. For the blood auto accident fatality cases, there was a higher percentage of cases that had drugs that belong to a single category than drug belonging to multiple categories. This was consistent with what was noted in previous years. For the blood auto accident fatality cases, roughly 40% of the cases contained drugs from a single category while only 23% of the cases had drugs from multiple categories. Unlike the adult DUI cases, a significant portion (37%) of the adult auto accident fatality cases were found to have no drugs detected. With the single drug fatality cases, approximately 46% had CNS-D drugs, 24% had CNS-S drugs, 22% had cannabinoids (marijuana), and 5% had narcotic analgesics. This was very different from FY2020 where 40% had cannabinoids (marijuana), 35% had CNS-D drugs, 15% had narcotic analgesics and only 10% had CNS-S drugs. This last percentage was very surprising as CNS-S drugs are usually the most common or second most common type of drug seen in toxicology cases.

Juvenile

Sixty juvenile toxicology cases were submitted for FY2019. There was a significant increase in the number of cases submitted for FY2020 (83 cases, which corresponded to a 38% increase). For FY2021, this number went up, but only slightly. It increased from 83 cases (FY2020) to 85 cases. Year after year, ISPFS reports cannabinoids are the most commonly detected drug in those juvenile samples containing drugs, and FY2021 was no exception as 54% of the total juvenile cases were positive for either cannabinoids alone or in combination with drugs from another drug category. Of just the cases that contained drugs from one or more drug categories (not taking into account the none detected cases), 64% contained cannabinoids either alone or in combination with another type of drug.

For FY2020, 64% of blood and 50% of urine samples contained at least one drug. For FY2021, this number increased drastically as just under 80% of blood and over 93% of urine cases contained at least one drug. Fifty-four percent of blood cases and 74% of urine cases were positive for a single drug category. In FY2021, there were four different drug combinations seen for both the blood and urine samples. Sixty-two percent of the juvenile urine toxicology cases that contained one or more drugs were positive for a CNS-D, 48% were positive for cannabinoids, and only 10% were positive for CNS-S drugs. Of the juvenile blood toxicology cases, 72% contained cannabinoids, 33% of the cases that contained one or more drugs included a CNS-D, and 30% included a CNS-S drug. It was interesting to look at the difference between what was being confirmed most often in blood versus urine. None of the juvenile cases tested positive for narcotic analgesics or hallucinogens either alone or in combination with another drug.

Figures 13a and 13b show the distribution of results in the juvenile blood and urine toxicology categories.

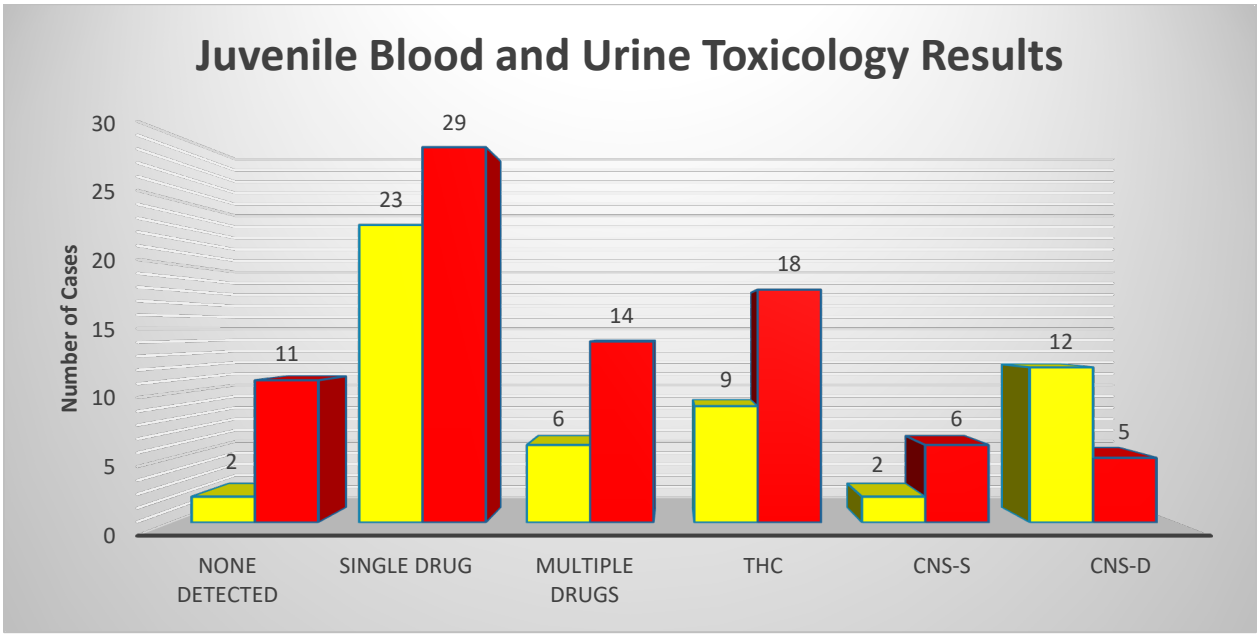

Figure 13a – Juvenile Blood and Urine Toxicology Results by Category

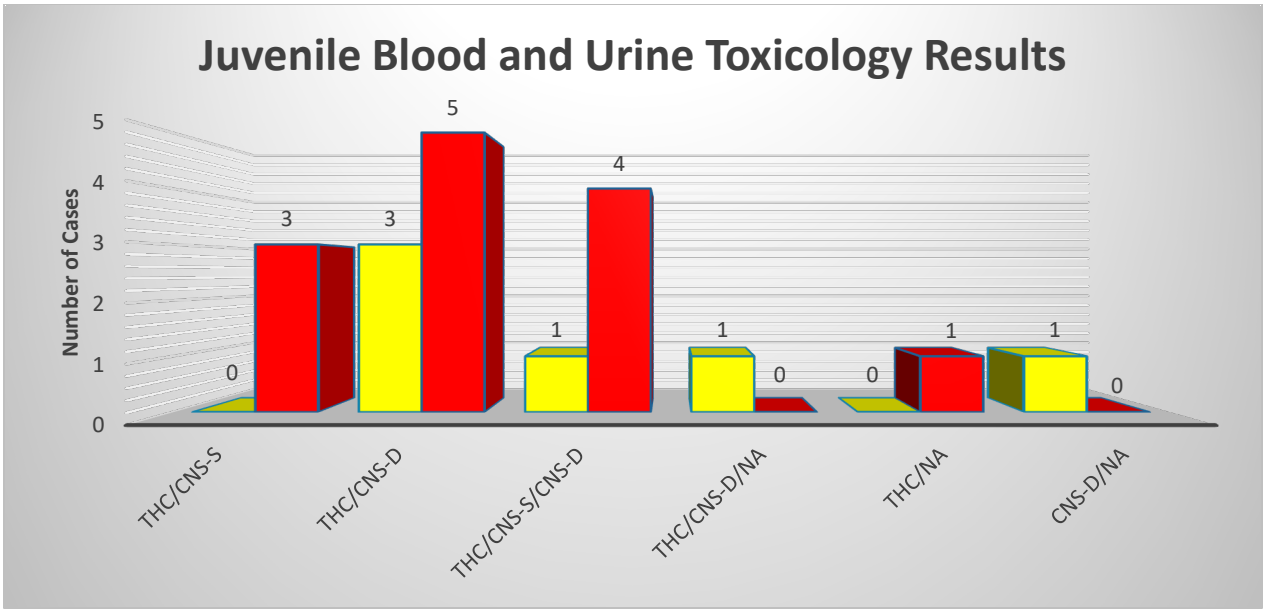

Figure 13b – Juvenile Blood and Urine Toxicology Results by Category

There was a large discrepancy in the number of juvenile fatality cases when you consider the last 10 years. The highest number of juvenile fatality cases was in FY2012, with 18 cases and there have been two years where there have only been 2 cases. After FY2012, there seemed to be downward trend until FY2016, then there seemed to be another downward trend until FY2021. There does not seen to be any trend to the large discrepancies over the last ten years. The overall trend was displayed in **Figure 14.**

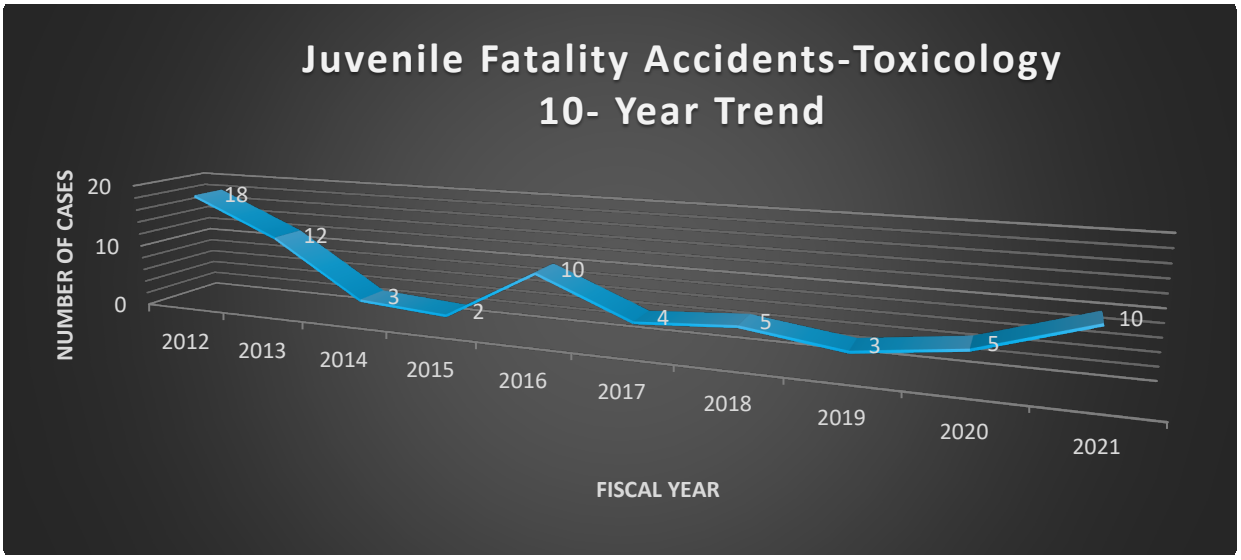

Figure 14 – Juvenile Fatality Accidents Submitted for Toxicology

For FY2017, 65% of the juvenile cases submitted for toxicology were DUI cases. In FY2018, this number dropped to only 38%. By FY2019, that number was up to 68%. For FY2020 and FY2021, the number had decreased to 52% and 50%, respectively. For the juvenile blood toxicology DUI cases, 63% of the cases contained drugs belonging to a single drug category while 33% had drugs belonging to multiple drug categories. This was a large increase from FY2020 where 46% of the cases contained drugs belonging to

a single drug category while 26% had drugs belonging to multiple categories. Of the 43 juvenile DUI toxicology samples tested for FY2021, none of the urine samples and only 2 of the blood samples tested negative for drugs. This means that only 4.6% of the juvenile DUI toxicology samples tested were negative for drugs.

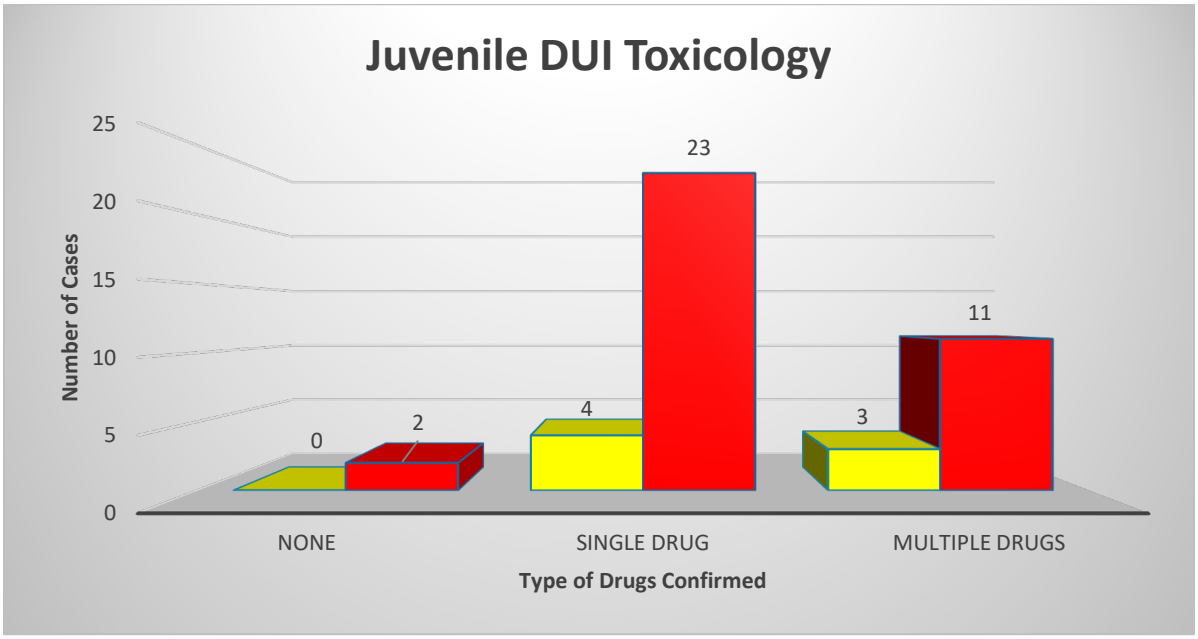

Figure 15- Juvenile DUI Toxicology Results

Other Offenses- Toxicology Results

While DUI cases accounted for roughly 66% of the total cases submitted for toxicology, the other 34% was broken down into several other offenses (including those shown below). Of those cases with a drug violation associated with them, roughly 97% tested positive for one or more drugs. For those cases classified as "other offenses" 74% of the cases in this category were positive for one or more drugs. The category of "other offenses" includes charges such as assault and battery, burglary, injury accidents, and under the influence in public.

In FY2018, there were 126 rape cases submitted for toxicology analysis. That was almost double what it was in FY2017 (71 cases). For FY2019, this number was back in line with previous years, at 78 cases, but it increased again for FY2020 to 115 cases and then dropped back down to 71 cases in FY2021. When considering the toxicology results associated with rape charges (rape, sexual abuse of a minor, etc.), there was typically a slightly lower percentage of positive cases. In FY2020, only forty-eight percent of the cases with a rape charge associated with it were positive for one or more drugs. The percentage of positive cases in FY2019 was 59%. However, for FY2021, the percentage of rape cases that tested positive for one or more drugs was over 84%. There was not a clear explanation as to why there was such a drastic increase for FY2021.

Adults:

Count	Offense	Toxicology Results
51	Rape*	• 8 Negative • 43 Positive – of the 43 positive cases, 31 of them contained CNS-D drugs (either alone or in combination with a drug from another category)
188	Drug Violations**	• 5 Negative • 183 Positive – of the 183 positive cases, 140 of them contained CNS-S drugs (either alone or in combination with a drug from another category)
86	Other Offenses***	• 21 Negative • 65 Positive — of the 65 positive cases, 24 of them contained CNS-S drugs (either alone or in combination with a drug from another category), 19 of them contained cannabinoids (either alone or in combination with a drug from another category)
11	Death Investigations	• 4 Negative • 7 Positive —of the 7 positive cases, 5 of them contained CNS-D drugs (either alone or in combination with a drug from another category)

Juveniles:

Count	Offense	Toxicology Results
20	Rape*	• 3 Negative • 17 Positive —of the 17 positive cases, 14 of them contained CNS-D drugs (either alone or in combination with a drug from another category)
6	Drug Violations**	• 0 Negative • 6 Positive —all contained marijuana (either alone or in combination with a drug from another category)
5	Other Offenses***	• 3 Negative • 2 Positive- one cannabinoids and one CNS-D

*Includes Rape, Male Rape, Sexual Abuse/Battery of Child/Minor, and Penetration with a Foreign Object.

**Includes Possession of Controlled Substances or Paraphernalia, Trafficking, Manufacturing, Delivering, and Possession/Distribution

***Includes Assault/Battery (Aggravated or not), Domestic Violence, Probation Violations, Officer Involved Shooting/Accident, Injury Accidents, Injury to Child, Grand Theft, Under the Influence in Public, Unlawful possession of a firearm, Leaving the scene of an accident, Manslaughter, Vehicular Manslaughter, and Lewd Conduct

Top ten ISPFS reported drugs for FY2021:

1. Delta-9-THC and Metabolites
2. Amphetamine (CNS-S)*
3. Methamphetamine (CNS-S)
4. Diphenhydramine (CNS-D)
5. Alprazolam/Alpha-hydroxyalprazolam (CNS-D)
6. Morphine (NA)
7. Clonazepam/7-aminoclonazepam (CNS-D)
8. Fentanyl (NA)
9. Trazodone (CNS-D)
10. Cocaine/Benzoylecgonine (CNS-S)**

*Amphetamine may be present as a metabolite of methamphetamine.

**Cocaine was only confirmed in ~15% of the cases.

In evaluating the top ten drugs for FY2021 and the previous four fiscal years, the majority of the drugs have not changed. In fact, the top three drugs have not changed. The ranking has changed between the years, but methamphetamine, amphetamine, and carboxy-THC have been in the top three spots each year. Alprazolam has been in the top five spots for four out of the five years. Diphenhydramine has been in the top six drugs in four out of the five years. For the last 4 years, 7-aminoclonazepam has been ranked in the top ten. Hydrocodone was present in FY2017, and FY2018, but was not in the top ten for the remaining years. Perhaps the biggest change of all was the inclusion of fentanyl in the top ten drugs for FY2021. It has not appeared in the top ten (or typically anywhere near the top ten or twenty drugs) for any of the previous years but was ranked at number ten for FY2021. This was not surprising as there has been a huge increase in the popularity of fentanyl. It was suspected that fentanyl will stay on the top ten list for future years and likely even increase in its rank. The top 10 drugs for FY2017 – FY2021 are displayed in **Figure 16**.

Rank	FY2017	FY2018	FY2019	FY2020	FY2021
1	Methamphetamine	Methamphetamine	Methamphetamine	Amphetamine	Carboxy-THC
2	Carboxy-THC	Amphetamine	Amphetamine	Methamphetamine	Amphetamine
3	Amphetamine	Carboxy-THC	Carboxy-THC	Carboxy-THC	Methamphetamine
4	Alprazolam	Alprazolam	THC	THC	THC
5	Diphenhydramine	THC	Alprazolam	Alprazolam	Diphenhydramine
6	Hydrocodone	Diphenhydramine	7-aminoclonazepam	Diphenhydramine	Alprazolam
7	Citalopram	Morphine	Diphenhydramine	Morphine	Morphine
8	Morphine	7-aminoclonazepam	Hydroxy-THC	7-aminoclonazepam	7-aminoclonazepam
9	THC	Hydrocodone	Morphine	Lorazepam	Hydroxy-THC
10	7-aminoclonazepam	Lorazepam	Clonazepam	Citalopram	Fentanyl

Figure 16- Ranking of Top 10 Drugs for FY2017 - FY2021

In FY2017, there were a total of 2590 times that a drug was reported. This was not the number of cases, but the number of times a drug was listed as being confirmed. Keep in mind that many cases had more than one drug listed on the report. This number increased to 3578 for FY2018, then dropped slightly to 3383 in FY2019, then it went back up to 3675 for FY2020. This number was at an all-time high of 4378 for FY2021. As ISPFS continues to add more drugs to the scope of our methods, it was suspected that this number will continue to increase. For the top ten drugs confirmed in FY2021, carboxy-THC was confirmed 630 times, amphetamine was confirmed 610 times, methamphetamine was confirmed 573 times, THC was confirmed 342 times, diphenhydramine was confirmed 106 times, alprazolam was confirmed 102 times, morphine was confirmed 93 times, 7-aminoclonazepam was confirmed 92 times, hydroxy-THC was confirmed 89 times, and fentanyl was confirmed 74 times. When looking at the number of times a compound was confirmed, it was easy to see why the top compounds stay in the top three or four compounds remain in the top and why the ones below that will move up and down but not reach the top three or four spots.

The highest, lowest and average concentrations reported for some of the compounds was also considered. For THC (the main active compound in marijuana), the lowest concentration was 1 ng/mL (we do not confirm below this concentration) and the highest was greater than 50 ng/mL (we do not

report above this concentration). The average concentrations for THC and methamphetamine were 7.76 ng/mL and 317.82 ng/mL, respectively.

Summary

The ISPFS laboratory system received 3,253 volatiles and toxicology cases for FY2021, which was an increase of 300 cases from FY2020, and an increase of 134 cases from FY2019. The number of cases corresponds to an increase of approximately 10.16% from FY2020 and a 4.39% increase from FY2019. The number of alcohol/volatiles case submissions to ISPFS increased by 78 cases from 1,325 in FY2020 to 1,403 in FY2021. This change corresponds to about a 5.9% increase. ISPFS accepted 1583 blood samples and 267 urine samples for toxicology testing in FY2021. This correlates to an increase of about 13% in the number of blood cases and a 16.5% increase in urine cases from FY2020.

As the population of Idaho continues to increase, it was likely that the number of cases submitted to the laboratory for volatiles and/or toxicological analysis will also continue to increase. In addition, as the turnaround times decrease, the number of cases submitted was also expected to increase. When evaluating the last ten years, there appears to be a downward trend in the number of urine toxicology cases that have been submitted. It was unknown why this happened, but one possible explanation was that it was due to a decrease in the turnaround time and an increase in the scope of testing (including quantitation) for blood toxicology analysis. So, more officers are choosing to collect blood where at all possible versus collecting urine. This decrease would also make sense if the process for obtaining blood draw warrants has become easier.

Adult samples submitted for pending DUI charges constituted 1,028 of the total 1,272 alcohol/volatiles cases (80%). Of these 1,028 samples, 842 were over the per se limit of 0.08 g% (81.9%). Around 66% of blood and urine toxicology cases submitted for toxicology were associated with a DUI. The percentage of blood toxicology DUI samples that were reported as none detected was about 31% for FY2020 and for FY2021, it was down to about 8.6%. The percentage for urine was around 28% in FY2020 and less than 2% for FY2021. This was a huge decrease in both blood and urine DUI samples that were negative for drugs (at least the drugs we test for). One possible explanation for this large decrease in the number of DUI cases in which there were no drugs present was the hands-free cell phone law that went into effect on July 1, 2020. If people were using their cell phones and getting distracted while driving, this could cause them to get pulled over for a possible DUI, even if they were not under the influence of anything. If there was a decrease in the number of people driving distracted due to their cell phones, then this would make sense as to why there was such a small percentage of DUI cases that have samples that are negative for drugs. Another possible explanation was that the officers pulling people over are getting better at differentiating between someone driving distracted and someone under the influence. This could be due to more/better training, or just more experience.

A significant increase in the number of juvenile alcohol samples submitted in fatality cases was seen in FY2020 as it increased from 2 cases in FY2019 to 13 cases in FY2020. That corresponded to a 550% increase. This number increased more in FY2021 to 17 cases.

The data for adult blood and urine toxicology samples shows an interesting difference from previous years. Data from the previous five years has shown that single-category drug use was more prevalent than multiple drug category combinations for blood toxicology. For FY2021, this changed as there was a much higher number of blood cases in which there were drugs present from multiple drug categories. This prevalence was what has been seen in the urine toxicology cases for previous years and was not

surprising considering 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.

There was no obvious explanation for why there was now a higher number of blood samples that belong to the multiple drugs category instead of the single drug category. However, the drug most often seen in the cases where there are multiple drug categories present was THC. So, perhaps an increase in the use of THC in combination with other drug categories was responsible for the increase in multiple drug categories in FY2021. For instance, if someone who has been taking a CNS-D drug for depression now also starts smoking marijuana, the drugs in their blood would now show as multiple drug categories. Of the single category cases, it appears that cases with CNS stimulants are most prevalent, followed by cannabinoids (can be either THC, hydroxy-THC or carboxy-THC).

For the FY2021 blood toxicology cases, the trend of having a larger percentage of cases with drugs belonging to multiple drug categories than to a single drug category was also seen with the blood DUI cases. For FY2020, about 38% of the cases contained drugs from a single drug category while only 22% contained drugs from multiple categories. For FY2021, the percentage of cases with drugs from a single drug category remained the same (38%) but the percentage of cases with drugs belonging to multiple drug categories increased from 22% to 53%.

In urine, CNS-D combined with carboxy-THC and CNS-S combined with carboxy-THC are the most common combinations. In blood, the most prevalent drug combination, by far, was CNS-S and cannabinoids. In previous years, NAs were not very prevalent in blood. This could be due to limitations of the blood toxicology methods and not the fact that there were not NAs present in the samples. It was possible that narcotic analgesics are more prevalent in blood for FY2021 because of the updated methods, however, when looking at what drugs were confirmed most frequently, it appears that the increase was due to a rise in fentanyl cases.

Sixty juvenile toxicology cases were submitted for FY2019. There was a significant increase in the number of cases submitted for FY2020 (83 cases, which corresponded to a 38% increase). For FY2021, this number increased slightly. It increased from 83 cases (FY2020) to 85 cases. Year after year, ISPFS reports cannabinoids are the most commonly detected drug in those juvenile samples containing drugs, and FY2021 was no exception as 54% of the total juvenile cases were positive for either cannabinoids alone or in combination with drugs from another drug category. Of just the cases that contained drugs from one or more drug categories (not taking into account the none detected cases), 64% contained cannabinoids either alone or in combination with another type of drug.

For FY2020, 64% of blood and 50% of urine juvenile samples contained at least one drug. For FY2021, this number increased as just under 80% of blood and over 93% of urine cases contained at least one drug. In FY2021, there were four different drug combinations seen for both the blood and urine samples. Sixty-two percent of the juvenile urine toxicology cases that contained one or more drugs were positive for a CNS-D, 48% were positive for cannabinoids, and 10% were positive for a CNS-S drugs. Of the juvenile blood toxicology cases, 72% contained cannabinoids, 33% of the cases that contained one or more drugs included a CNS-D, and 30% included a CNS-S drug.

There was a large discrepancy in the number of juvenile fatality cases when you consider the last 10 years. The highest number of juvenile fatality cases was in FY2012, with 18 cases and there have been two years where there have only been 2 cases. After FY2012, there seemed to be downward trend until FY2016, then there seemed to be another downward trend until FY2021. There does not seen to be any correlation to the large discrepancies over the last ten years.

Of the 43 juvenile DUI toxicology samples tested for FY2021, none of the urine samples and only 2 of the blood samples tested negative for any drugs. This means that only 4.6% of the juvenile DUI toxicology samples tested were negative for drugs.

While DUI cases accounted for roughly 66% of the total cases submitted for toxicology, the other 34% was broken down into several other offenses (including those shown below). Of those cases with a drug violation associated with them, roughly 97% tested positive for one or more drugs.

In FY2018, there were 126 rape cases submitted for toxicology analysis. That was almost double what it was in FY2017 (71 cases). For FY2019, this number was back in line with previous years, at 78 cases, but it increased again for FY2020 to 115 cases and then dropped back down to 71 cases in FY2021. When considering the toxicology results associated with rape charges (rape, sexual abuse of a minor, etc.), there was typically a slightly lower percentage of positive cases. In FY2020, only 48% of the cases with a rape charge associated with it were positive for one or more drugs. The percentage of positive cases in FY2019 was 59%. However, for FY2021, the percentage of rape cases that tested positive for one or more drugs was over 84%. There was not a clear explanation as to why there was such a drastic increase for FY2021.

In evaluating the top ten drugs for FY2021 and the previous four fiscal years, the majority of the drugs have not changed. In fact, the top three drugs have not changed. The ranking has changed between the years, but methamphetamine, amphetamine, and carboxy-THC have been in the top three spots each year. Alprazolam has been in the top five spots for four out of the five years. Diphenhydramine has been in the top six drugs in four out of the five years. For the last 4 years, 7-aminoclonazepam has been ranked in the top ten. Hydrocodone was present in FY2017, and FY2018, then it disappeared from the top ten for the remaining years. Perhaps the biggest change of all was the inclusion of fentanyl in the top ten drugs for FY2021. It has not appeared in the top ten (or typically anywhere near the top ten or twenty drugs) for any of the previous years but was ranked at number ten for FY2021. This was not surprising as there has been a huge increase in the popularity of fentanyl. It was suspected that fentanyl will stay on the top ten list for future years and likely even increase in its rank.

In FY2017, there were a total of 2590 times that a drug was reported. This was not the number of cases, but the number of times a drug was listed as being confirmed. Keep in mind that many cases had more than one drug listed on the report. This number increased to 3578 for FY2018, then dropped slightly to 3383 in FY2019, then it went back up to 3675 for FY2020. This number was at an all-time high of 4378 for FY2021. As ISPFS continues to add more drugs to the scope of our methods, it was suspected that this number will continue to increase.

The highest, lowest and average concentrations reported for some of the compounds was also considered. For THC (the main active compound in marijuana), the lowest concentration was 1 ng/mL (we do not confirm below this concentration) and the highest was greater than 50 ng/mL (we do not

report above this concentration). The average concentration was 7.76 ng/mL. The lowest concentration reported for methamphetamine was 5.14 (we do not report below 5 ng/mL), and the highest was greater than 1000 ng/mL (we do not report above this concentration). The average concentration was 317.82 ng/mL.

Toward the end of FY2019, the toxicology section received two new instruments (LCMS-QTOF). One instrument went to the Pocatello laboratory and the other went to the Coeur d'Alene laboratory. The validation process for those instruments was completed and the instruments were put into service for casework in June 2020. However, instrument issues have delayed the actual use of the instruments for casework. Troubleshooting was being done on the instruments and as soon as the issues are resolved, the instruments will be used for casework. These instruments will be used for preliminary screening procedures for both blood and urine. The use of these instruments will allow us to follow the best practices guidelines and have two different technologies for screening and confirmatory testing. In addition, unlike the LCMS-QQQ instruments that are currently being used for preliminary testing (screening), the new LCMS-QTOF instruments will allow us to go back and search data that has been run on the instrument for additional compounds that are not covered on our targeted screen. Therefore, if a particular drug starts becoming prevalent in Idaho but it was not something that was covered under our screening method, we can go back and search the data to determine if this compound was present in previous samples we had run.

For FY2021, it continues to be essential that ISPFS get the funding, training, and personnel needed to improve ISPFS scope of drugs and ability to report quantitative values. It was anticipated that many of our current "negative" samples would test positive for designer and/or synthetic drugs that we are currently unable to detect. ISPFS frequently receives requests for analysis of designer drugs in toxicology samples (including many fentanyl analogs). However, with ISPFS scientists working hard to reduce backlogs, continued training and method development for new designer drug methods and/or the addition of designer drugs to current methods was near impossible. Having additional personnel that can take over casework and allow the more senior scientists to focus on method development was essential for adding those types of compounds to our testing panel. In addition to allowing for method development, those scientists will also be needed to keep up with the increasing number of cases submitted as Idaho's population continues to grow. The increasing number of cases will also require additional instruments as the current ones will reach their maximum running capacity and a queue will develop for their use. Additional instruments would allow for multiple scientists to process their cases simultaneously.

APPENDIX

Non Random Juvenile Drug Testing (NJDT) Please see Idaho Statutes *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 was 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
Amobarbital	Carisoprodol Meprobamate-M	Alprazolam	Amitriptyline	Chlorpromazine
Butalbital	Zolpidem	Chlordiazepoxide	Bupropion	Droperidol
Phenobarbital	Diphenhydramine Hydrochloride	Clonazepam	Citalopram	Lithium Carbonate
			Desipramine	Lithium Citrate
Secobarbital	Zolpiclone	Diazepam	Doxepin Hydrochloride	Haloperidol
			Escitalopram	
Barbital	Metoprolol	Estazolam		
	Gamma-Hydroxybutyrate (GHB)	Flunitrazepam	Fluoxetine	
		Flurazepam	Impramine	
		Lorazepam	Paroxetine	
		Oxazepam	Trazodone	
		Temazepam	Sertaline	
		Triazolam	Venlafaxine	

Central nervous system stimulants

Central nervous system stimulants (CNS-S) speed up the operation of the brain and spinal cord. It was 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 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 was 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 was 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 Opiate Derivatives

- Morphine
- Codeine
- Heroin
- Hydromorphone
- Hydrocodone
- Oxycodone

Common Synthetic Opiates

- Meperidine
- Methadone
- Fentanyl
- Buprenorphine