Maximizing Impaired Driving Data Analysis

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NHTSA

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

NHTSA DRE Data System

Drug Recognition Program

DRE Program

- Specially trained officers to detect and apprehend drug impaired drivers
- DRE Training consists of 72 hours of classroom training and 40 hours of field training
- Requirements for maintaining certification every two years
- These officers are trained to conduct a 12-step protocol leading to an opinion of impairment or no impairment and from what category or categories
- Currently there are 7,266 certified DRE’s in the United States

DRE Data System 2.0

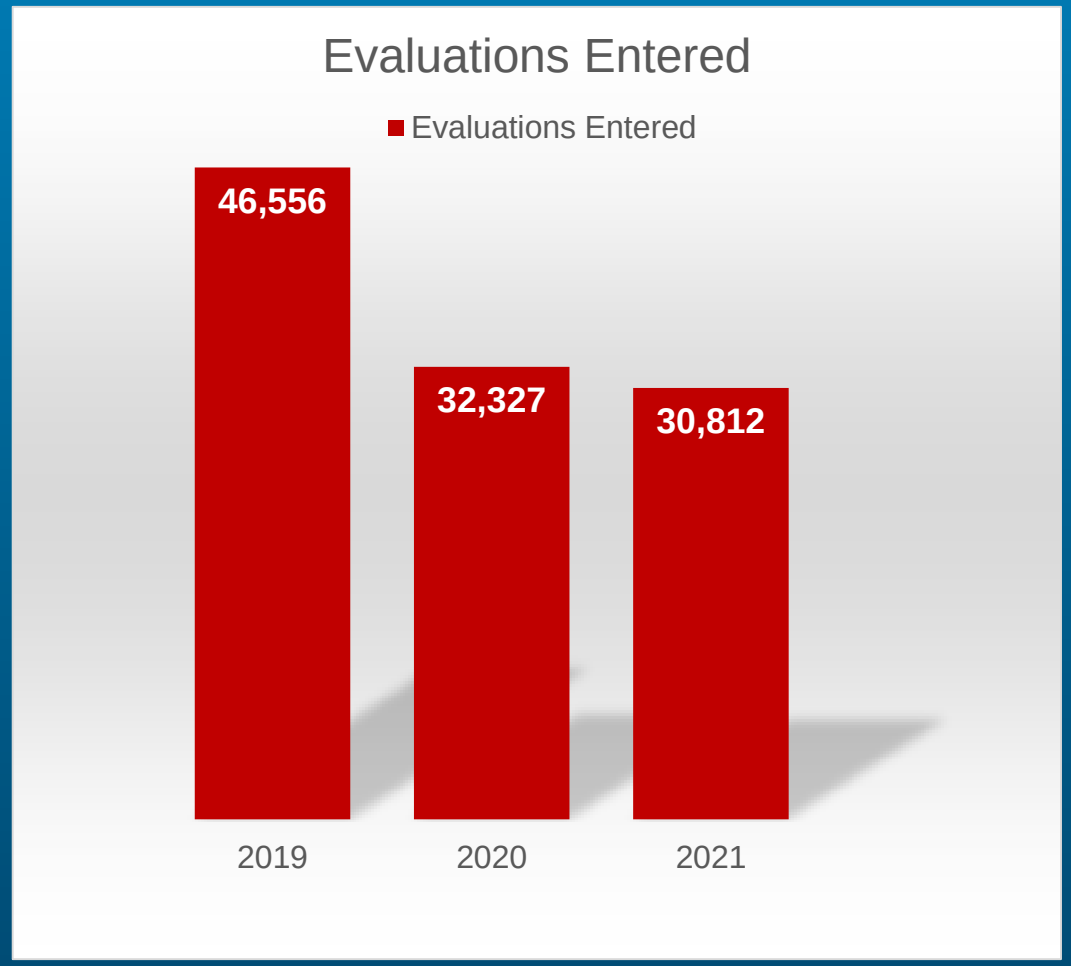
January 2020

DRE Data System 2.0

- Current active users: 9854
- Collects 496 Data Sets
- Data agnostic
- AWS/In line with DHS security requirements
- Ability to run expanded queries/administration
- What CAN the Data system show us?

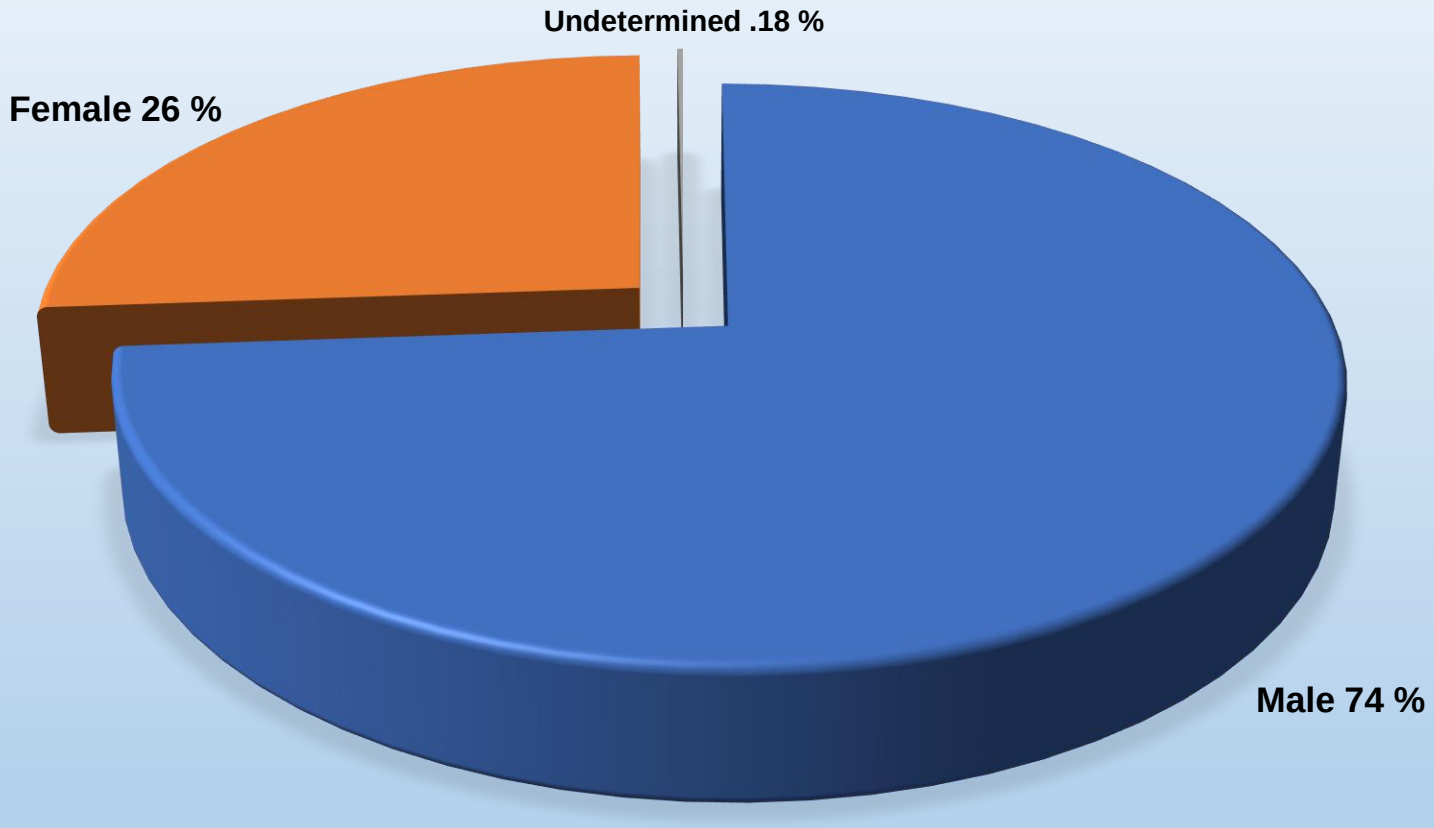
DRE Evaluations

- *TOTAL since inception of all systems 735,374*
- *2019 - 46,556 evaluations*
- *2020 -32,327 evaluations*
- *2021 – 30,812 evaluations*

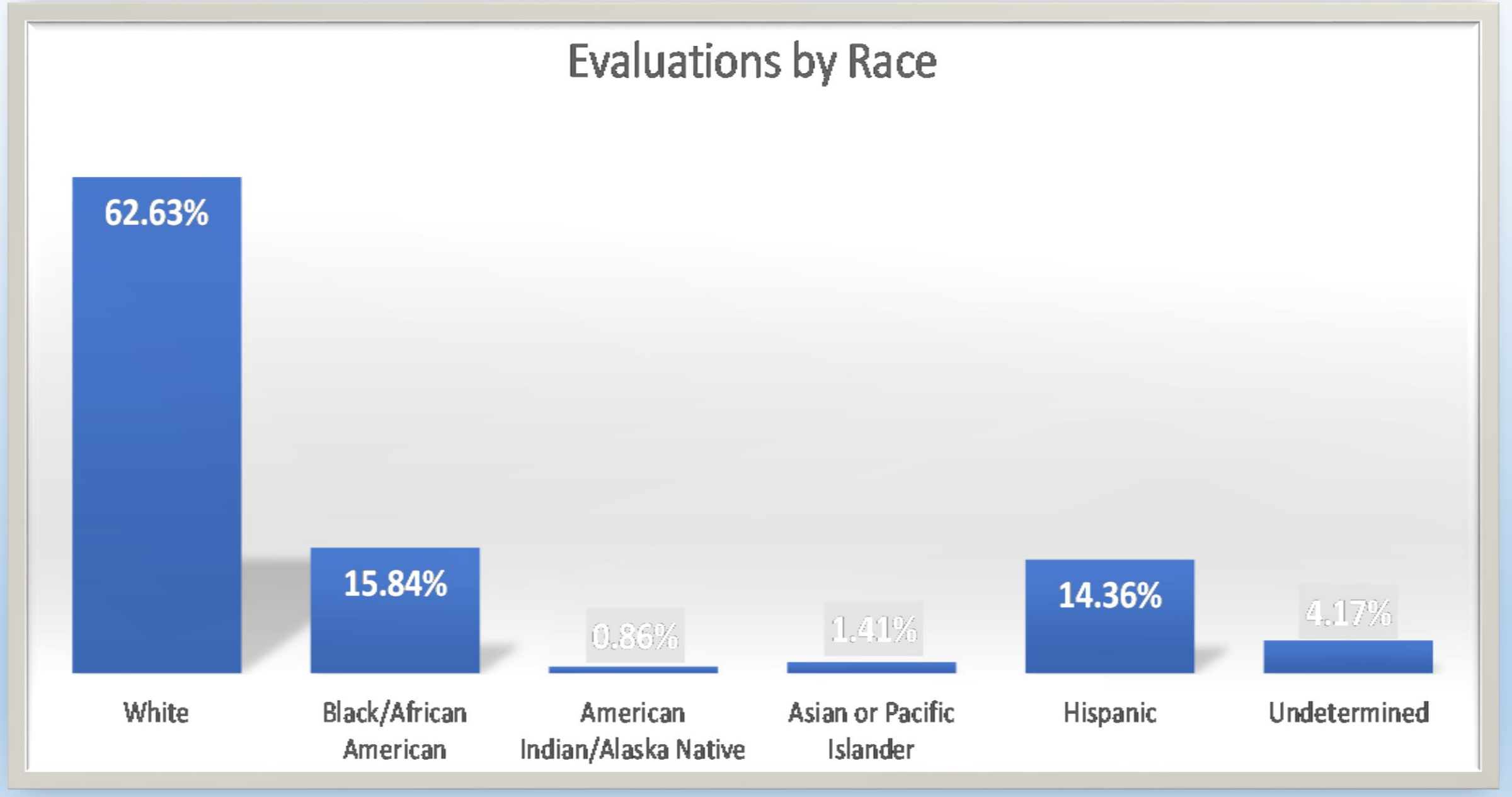


** Source - NHTSA DRE Data System*

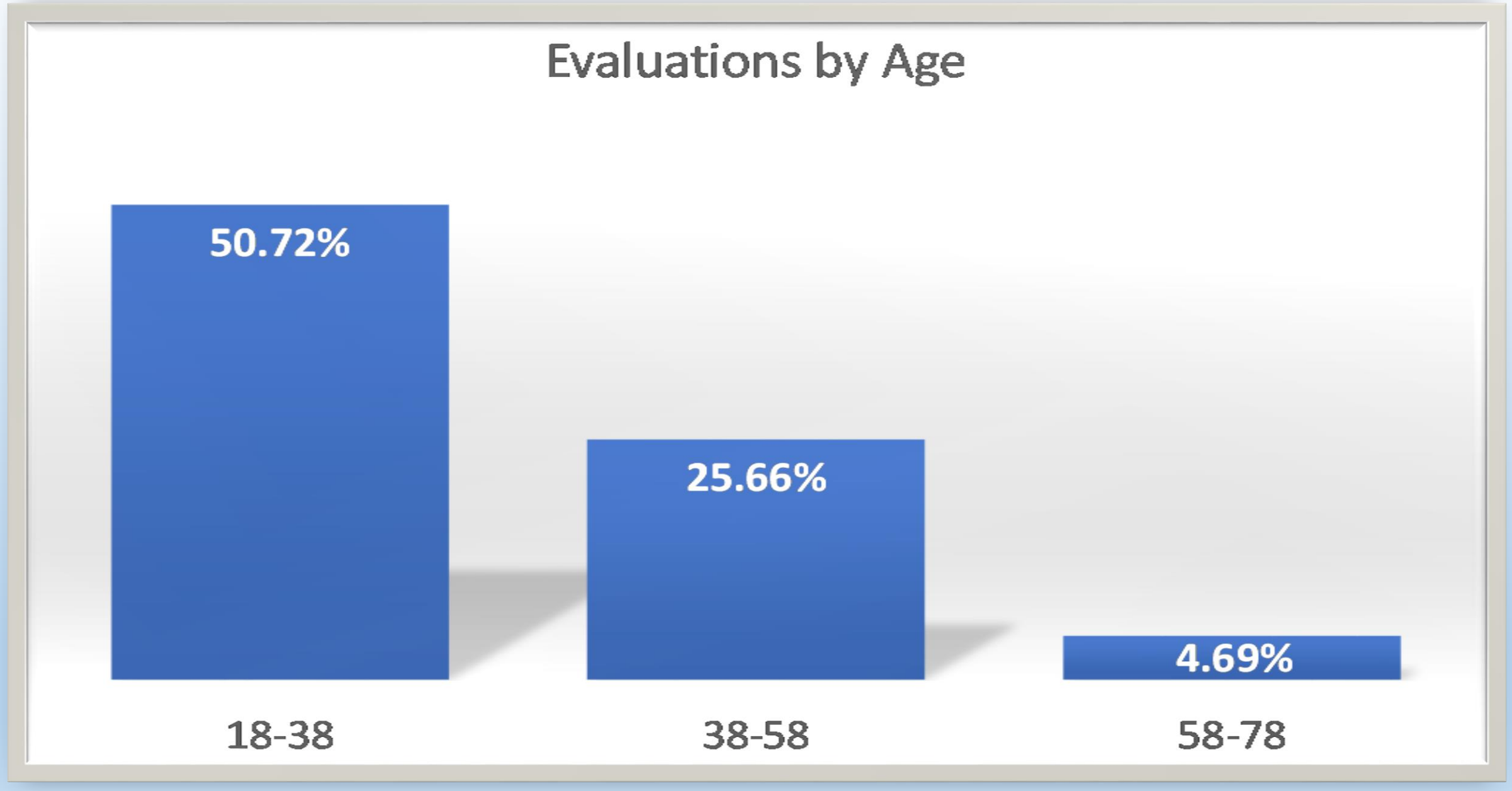
EVALUATIONS BY GENDER



Source: NHTSA DRE Data System

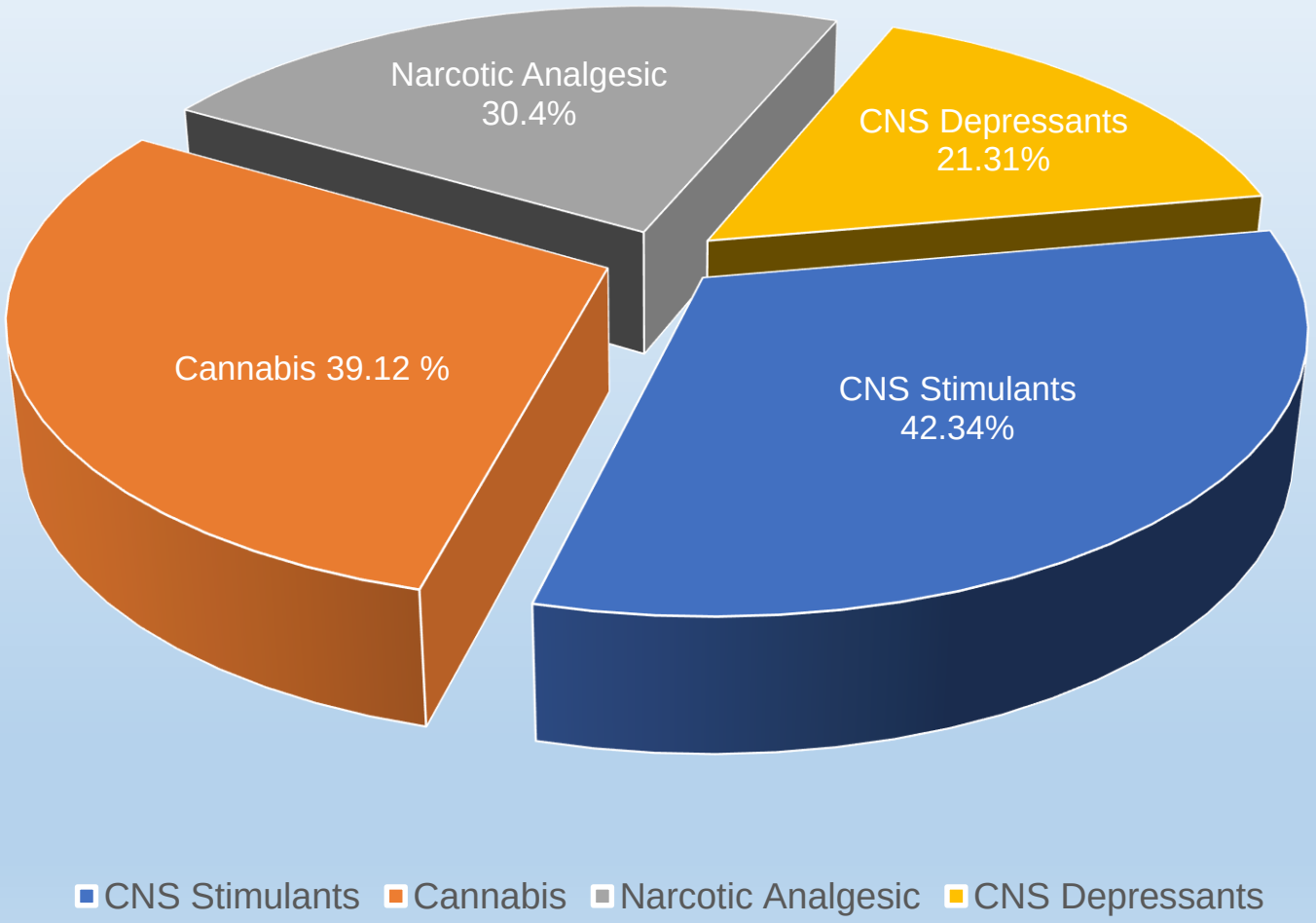


Source: NHTSA DRE Data System

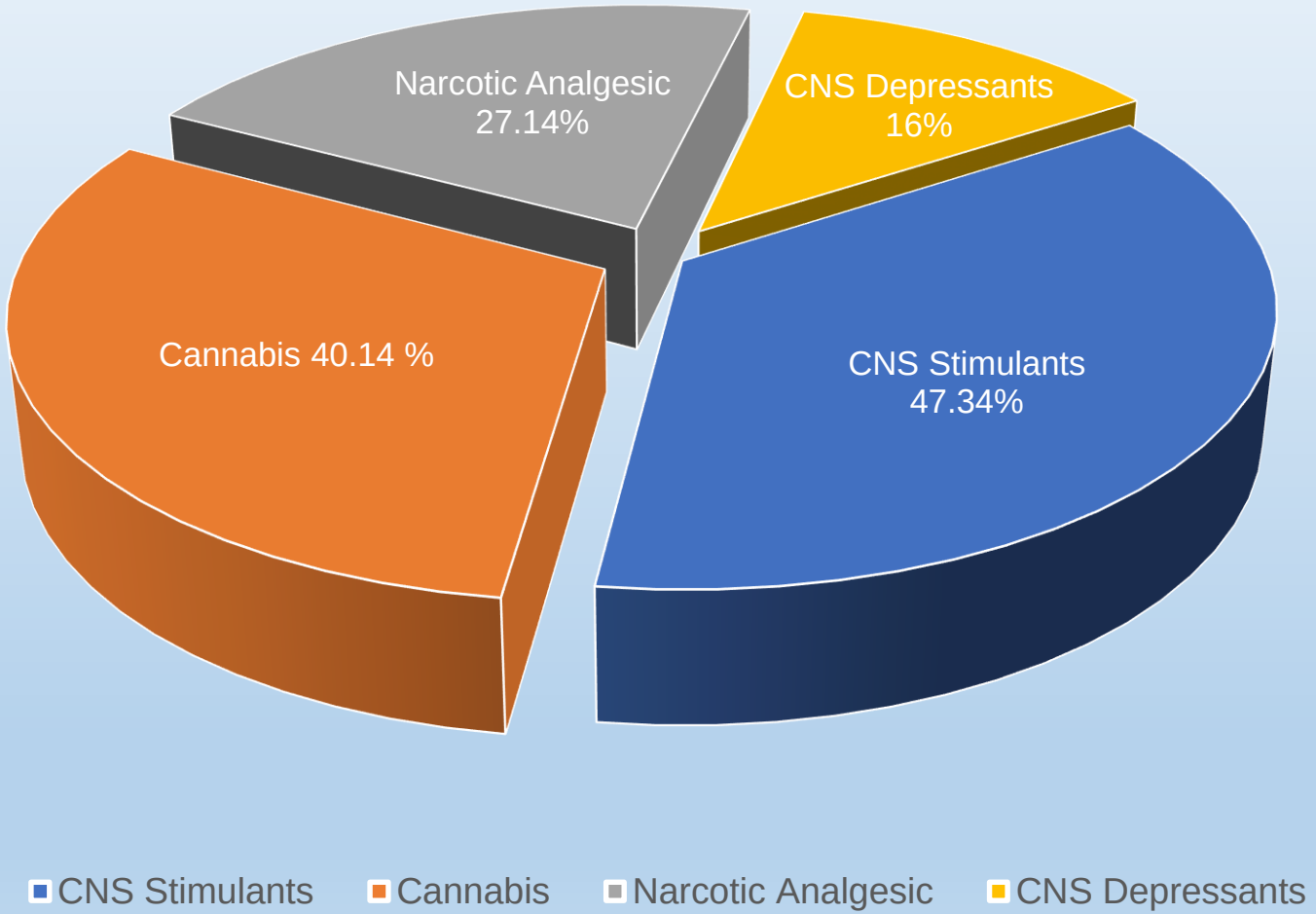


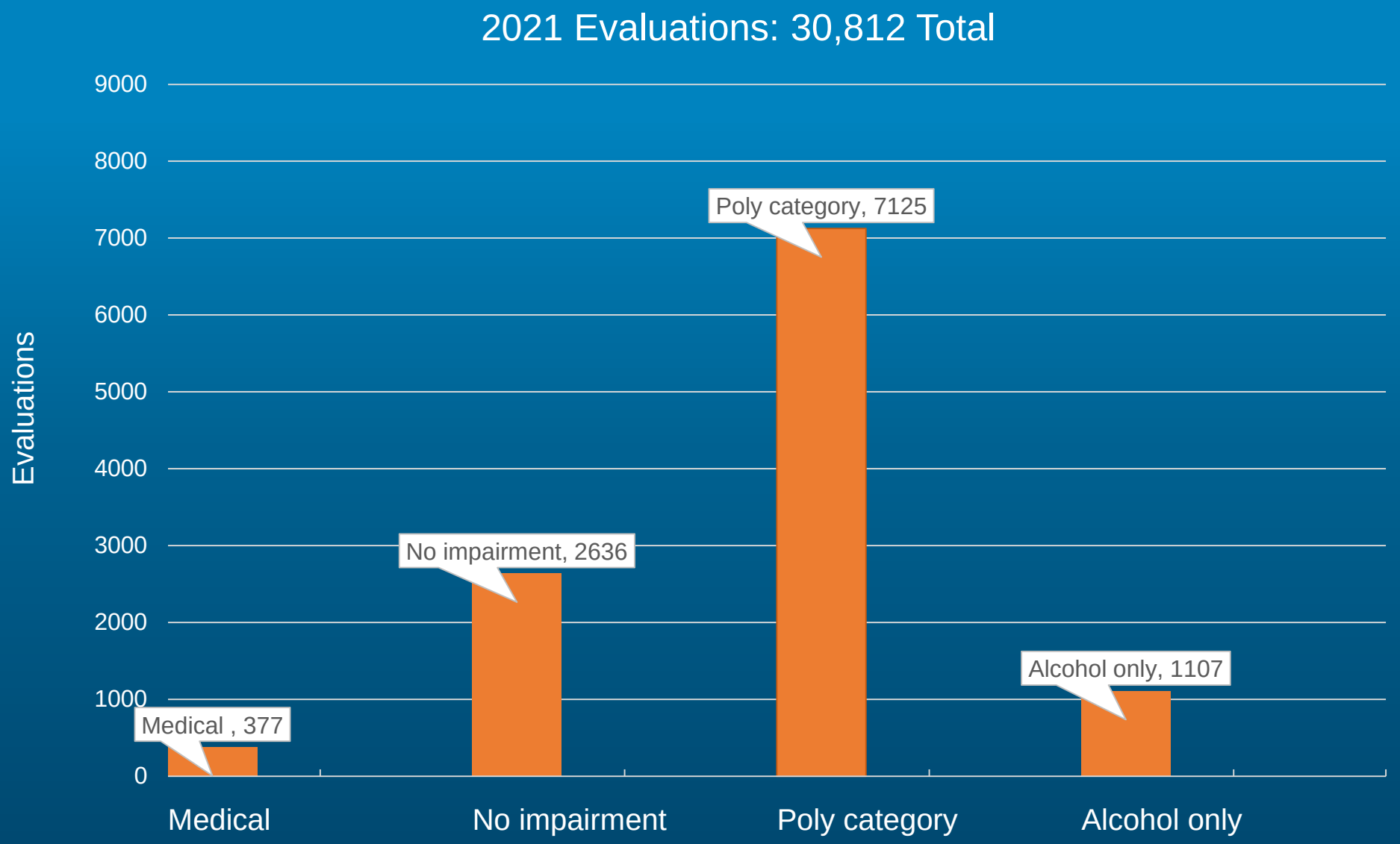
Source: NHTSA DRE Data System

2021 Drug Category Opined



2021 Tox Results By Category




2021 Evaluations: 30,812 Total
Evaluations
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Medical , 377
No impairment, 2636
Poly category, 7125
Alcohol only, 1107
Medical
No impairment
Poly category
Alcohol only

Limitations

- NHTSA does not require data entry: Participation is encouraged but voluntary by states
- Quality assurance over data entered falls under DRE SC
- QA over toxicology results falls under DRE SC
- Tox results are dependent upon what their State lab tests for and varying cutoff levels

Limitations

- Minimum required data points – some DREs are only required to enter the minimum limiting our data
- Third Party States (17) – reliant on those states to send quarterly
- Accuracy levels for each DRE based on Opinion vs. Tox result
- Data consists of only those in which a DRE conducted an eval (and entered)

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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Drug Testing and Traffic Safety: What You Need to Know

Amy Berning amy.berning@dot.gov

Office of Behavioral Safety Research

Lifesavers March 2022

What People Want to Know

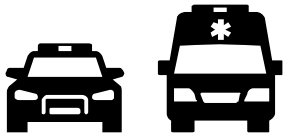
- Did drug use among drivers go up?
  - How much did it go up?
- Which drugs are used most often; and more than in the past?

How People Imagine Drug Information Gets Into FARS

Crash Occurs

Single-vehicle, multi-vehicle?

Driver, pedestrian, cyclist, etc. involved?



Response

Who responds to the crash (police, EMS, medical examiner)?

Who in crash will be tested for presence of drugs?

Is there evidence / probable cause for impaired driving?

Surviving with injuries; or died within 720 hours.

Did EMS administer drugs?

Transported to a Hospital

Are specimens collected for crash investigation?

Is testing done onsite or offsite?

Where does information go after hospital?

Wherever Testing is Conducted

Which biological samples were tested?

Which drugs are in test panel?

Is confirmation testing done as well as screening?

What are the detection thresholds?

Died at the Crash

Medical Examiner

No

Released

There is (typically) no test for alcohol or other drugs

Yes

Arrested

Testing for alcohol or other drugs could be at police station, or at a hospital

Local, State, and Federal Reporting Requirements (one of which is FARS)

Limitations and Consequences

Testing varies widely across States, jurisdictions, types of drivers, and years

Analysts often receive test results not from lab but from police / others

Typically, unknown if only screening tests, or also confirmatory testing

Typically, unknown which drugs tested for

Typically, drug detection thresholds not reported

Data transfer loss across State agencies

Local Transportation • Analysis

Drivers using prescription opioids twice as likely to trigger a fatal crash, study finds

The Columbia Universi

By Fredrick Kunkle
Staff writer

February 15, 2019

FATALLY INJURED DRIVERS INCREASINGLY TEST POSITIVE FOR DRUGS, NUMBERS NEARLY TRIPLE FOR MARIJUANA IN TEN-YEAR PERIOD

The prevalence of non-alcohol drugs detected in fatally injured drivers in the U.S. has been steadily rising and tripled from 1999 to 2010 for drivers who tested positive for marijuana -- the most commonly detected non-alcohol drug -- suggesting that drugged driving may be playing an increasing role in fatal motor vehicle crashes.

There is significant missing data - breadth and depth

Sometimes with missing data, there is a skew in one direction and estimates can be useful, especially trends over time. This is not the case with FARS drug data. Some of the issues lead to underestimates, and others lead to overestimates.

These limitations constrain interpretation of the drug data, including examining trends or comparing States.

Data ARE often used and receive much media attention, including by partners; conferences.

Specificity of Drug Results Varies

Police Accident Report for Springfield, USA
I am Officer Thorn. I responded to a call about a crash at 11:30 pm at the intersection of Vine and 2nd Street. There were 2 drivers involved. Driver 1 did not stop at the stop sign and hit Driver 2 in the Driver's side of the vehicle. Driver 2 was pronounced dead at the scene of the crash. The medical examiner obtained a blood sample at the scene, and I will update this report when those results are available.
[later updated] Driver 2 Blood Test Alcohol = .07; Amphetamine .09; Methamphetamine .38

ANALYTE	RESULTS	REPORTING LIMIT
DIAZEPAM	Negative	20 ng/mL
OXAZEPAM	Negative	20 ng/mL
CLONAZEPAM	Negative	20 ng/mL
LORAZEPAM	Positive 208 ± 14 ng/mL	20 ng/mL
ALPRAZOLAM	Negative	20 ng/mL

More Complications

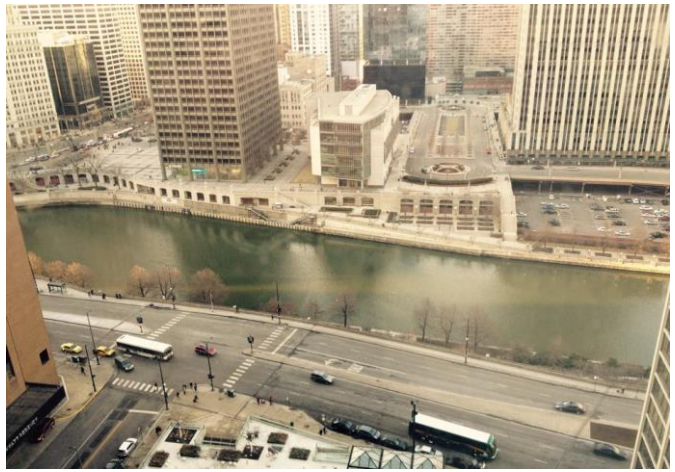
- In cases of a surviving driver, emergency medical technicians or hospital personnel may have administered a drug(s) as part of treatment following the crash.
  - Benzodiazepines and opioids are particularly likely for treatment
  - A toxicologist may be able to determine if medical administration was likely
- Depending on when sample obtained, body may have begun metabolizing any drug
- Some jurisdictions have “stop testing” procedures whereby if alcohol is detected at a certain level, such as .08 or .10 g/dL, there is no continued testing for other drugs.
- Conversely, a lab may test for other drugs only if testing for alcohol was negative.
- There can be data loss as information is transferred across agencies’ systems.

Available Fatality Drug Data is Inconsistent and Incomparable

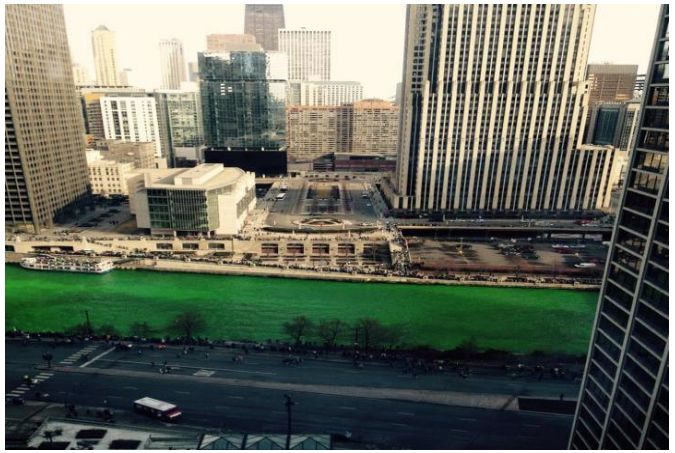
The Chicago River

2015

March 13



March 14



March 15

Improving FARS Drug Data

Recent Improvements

- Can enter each drug that has a positive test result (previously limited)
- Can enter matrix (sample type), allowing for more accuracy
- Can enter when a test result is negative, as well as positive

In Short-Term

- Updating list of drug names
- Allow recording of data source (e.g., lab)
- Test type: screening/confirmatory

Long-Term

- Record date / time tests conducted
- Amount of drug
- Drug Panel / detection level

Improving FARS Drug Data

- Researching Out to Stakeholders
  - FARS Analysts
  - National and International Research Committees
  - Lifesavers
  - Forensic Toxicology / Chemical Testing

- Working with Stakeholders
  - Regional Toxicology Liaisons (NHTSA Regions 5, 7, 9)
  - Toxicology Stakeholder Meetings in as many as 10 States

U.S. Department of Transportation
National Highway Traffic Safety Administration

TRAFFIC SAFETY FACTS
Research Note

NHTSA

DOT HS 812 072 | Behavioral Safety Research | November 2014

Understanding the Limitations of Drug Test Information, Reporting, and Testing Practices in Fatal Crashes

Amy Berning & Deveace D. Smither

Since 1975, the National Highway Traffic Safety Administration (NHTSA) has collected data from all 50 States, the District of Columbia, and Puerto Rico on all police-reported fatal crashes on public roadways. NHTSA's National Center for Statistics and Analysis (NCSA) includes data from these fatal crashes in the Fatality Analysis Reporting System (FARS). This dataset provides a wealth of information on fatal crashes, the roadways, vehicles, and drivers involved.

"Impaired driving" includes use of alcohol, or drugs, or both. Blood alcohol concentration (BAC) results are not known for all drivers in fatal crashes. For crashes with missing alcohol data, NHTSA uses a statistical model called "multiple imputation" to estimate the BAC of a driver at the time of the crash. In contrast, the variables regarding drug test information in crashes is evolving. It does not include estimates for missing data or impairment levels and therefore needs further interpretation. This paper summarizes some of the complexities related to drug-involved driving, notes limitations of drug data collected in FARS, and presents challenges in interpreting, reporting, and analyzing the data.

Drug Presence Versus Drug Impairment

An important distinction to make when evaluating impaired driving data is the mere presence of a drug in a person's system, as compared to the person being impaired by a drug in his/her system. FARS drug data provides information about drug presence, rather than whether the driver was impaired by a drug at the time of a crash. Data identifying a driver as "drug positive" indicates only that a drug was in his/her system at the time of the crash. It does not indicate that a person was impaired by the drug (Compton & Berning, 2009). The presence of some drugs in the body can be detected long after any impairment. For example, traces of cannabinoids (marijuana) can be detected in blood samples weeks after use. Thus, knowing that a driver tested positive for cannabinoids does not necessarily indicate that the person was impaired by the drug at the time of the crash.

In addition, while the impairing effects of alcohol are well-understood, there is limited research and data on the crash risk of specific drugs, impairment, and how drugs affect driving-related skills. Current knowledge about the effects of drugs other than alcohol on driving performance is insufficient to make judgments about connections between drug use, driving performance, and crash risk (Compton, Vegega, & Smither, 2009).

Every State has enacted a law defining drivers who are at or above .08 grams per deciliter BAC as "legally impaired," but there are no similar, commonly accepted impairment levels for other drugs. Some State laws have established levels for some drugs at which it is illegal to operate a motor vehicle (Lacey, Brainard, & Snyder, 2010; Walsh, 2009). The alcohol laws are based on evidence concerning the decreased ability of drivers across the population to function safely at those BACs. Such evidence is not currently available for concentrations of other drugs. Additionally, not all drugs reported in FARS are illegal. Over-the-counter and prescription medications are also reported. The legal status of a drug is not a factor in determining a drug's potential for decreasing driving performance or increasing crash risk.

Differences in Drug Testing Procedures

There is no consistent policy or set of procedures between, or sometimes even within, States for drug testing. Considerable variation exists regarding who is tested; which drug is tested for; type of test, cut-off levels, and equipment; and which biological specimen (blood, urine, or oral fluid) is used. Some jurisdictions test only fatally injured drivers; others test all drivers involved in fatal crashes. Some jurisdictions test no one at all. As such, a jurisdiction that tests more drivers is likely to have a higher percentage of drivers who are known to be drug-positive.

Similarly, there is no consistency regarding the types and number of drugs for which drivers are tested. Lab tests are costly. A driver is more likely to be tested for drugs if there is infor-

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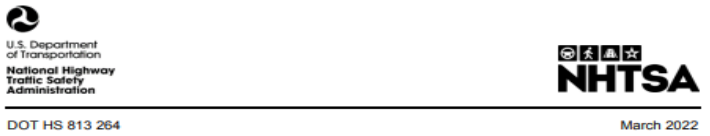
https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812072

Berning, A., & Smither, D. D. (2014). Understanding the limitations of drug test information, reporting, and testing practices in fatal crashes. (Traffic Safety Facts Research Note. DOT HS 812 072). Washington, DC: National Highway Traffic Safety Administration.



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DOT HS 813 264 | March 2022

Drug Testing and Traffic Safety: What You Need to Know

https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-03/15501_DrugTestingReport_031122_v5_tag.pdf

Berning, A., Smith, R. C., Drexler, M., & Wochinger, K. (2022, March). Drug testing and traffic safety: What you need to know (Report No. DOT HS 813 264). National Highway Traffic Safety Administration.

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Geography of Impaired Driving: What does the data tell or not tell us?

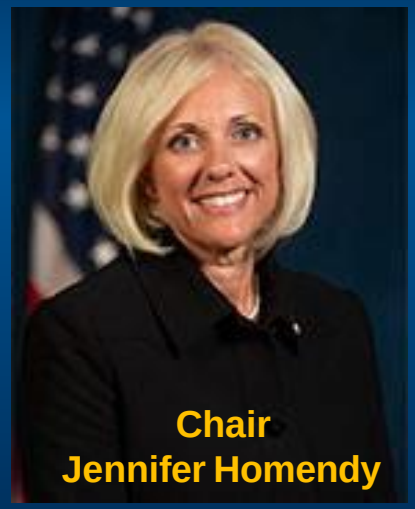
Workshop: Maximizing Impaired Driving Data Analysis

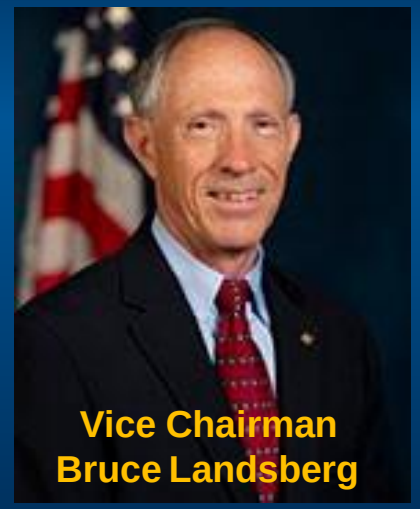
Ivan Cheung, PhD [Office of Member Chapman]

2022 Lifesavers National Conference on Highway Safety Priorities

March 13, 2022, Chicago, IL


AVIATION
HIGHWAY
MARINE
RAILROAD
PIPELINE
Our Mission
The NTSB is an independent Federal agency charged by Congress with **investigating** every civil aviation accident in the United States and significant accidents in the other modes of transportation – highway, marine, railroad and pipeline – and **issuing safety recommendations** aimed at preventing future accidents.
NTSB


Chair
Jennifer Homendy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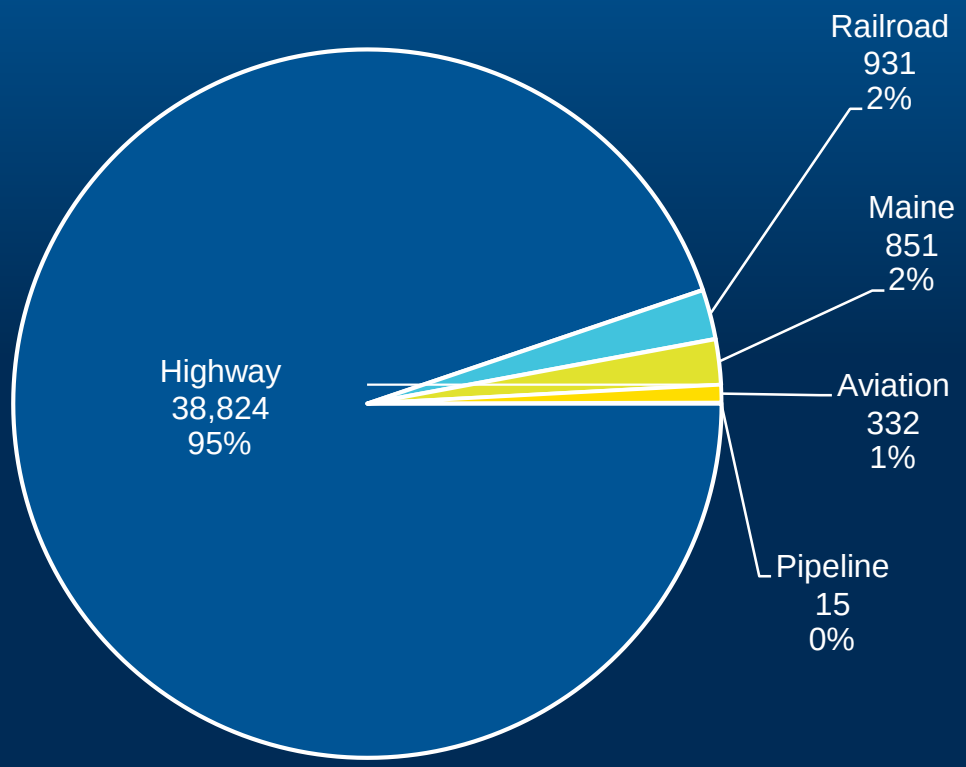
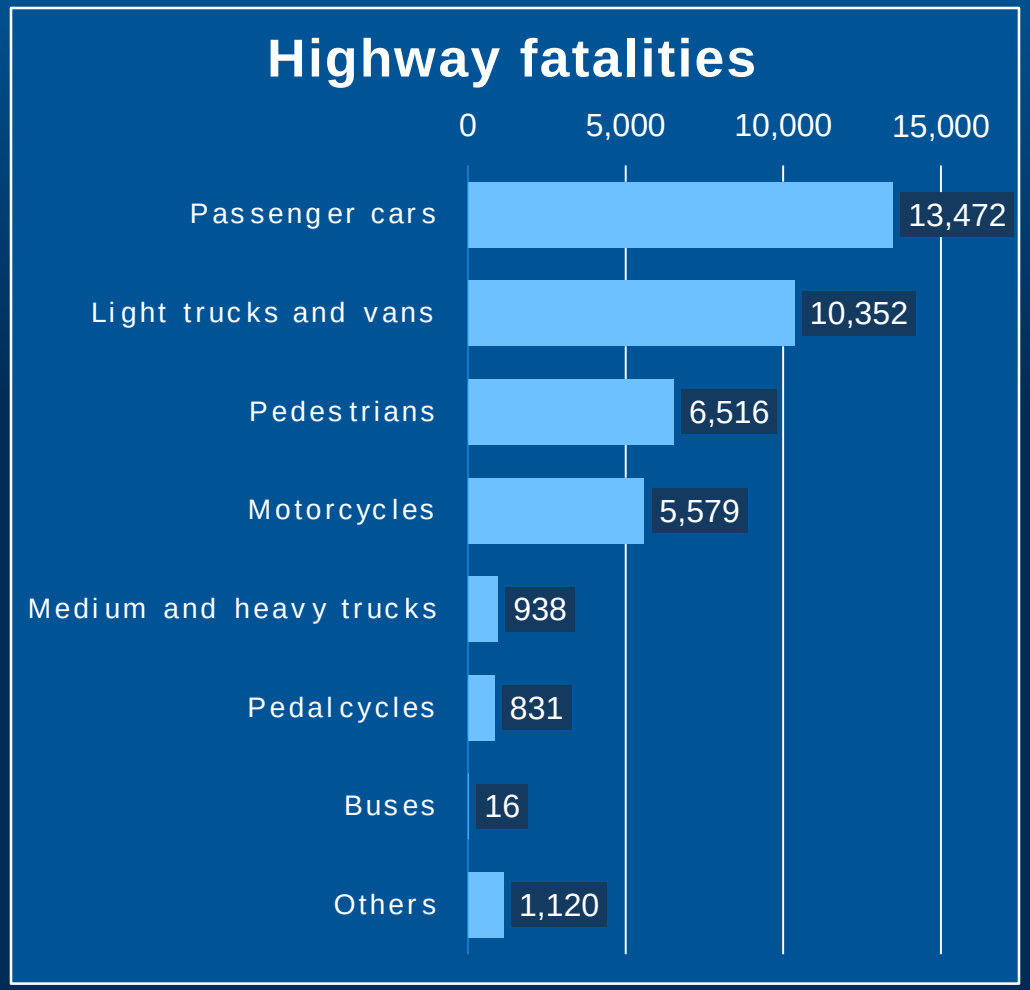
Michael Graham


Member
Tom Chapman

US Transportation Fatalities in 2020 – by Mode





Data prepared by NTSB Office of Research & Engineering's Safety Research Division

2021–2022 NTSB MOST WANTED LIST OF TRANSPORTATION SAFETY IMPROVEMENTS

AVIATION

Require and Verify the Effectiveness of Safety Management Systems in all Revenue Passenger-Carrying Aviation Operations

Install Crash-Resistant Recorders and Establish Flight Data Monitoring Programs

HIGHWAY

Implement a Comprehensive Strategy to Eliminate Speeding-Related Crashes

Protect Vulnerable Road Users through a Safe System Approach

Prevent Alcohol- and Other Drug-Impaired Driving

Require Collision-Avoidance and Connected-Vehicle Technologies on All Vehicles

Eliminate Distracted Driving

MARINE

Improve Passenger and Fishing Vessel Safety

RAILROAD, PIPELINE, AND HAZARDOUS MATERIALS

Improve Pipeline Leak Detection and Mitigation

Improve Rail Worker Safety

NTSB 2021–2022 MWL MOST WANTED LIST

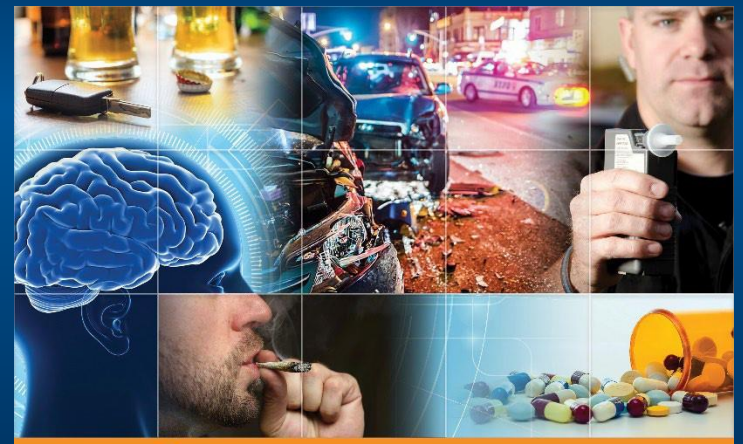
Most Wanted Highway Safety Improvement Items

NTSB 2021–2022 MWL MOST WANTED LIST

Implement a Comprehensive Strategy to Eliminate Speeding-Related Crashes

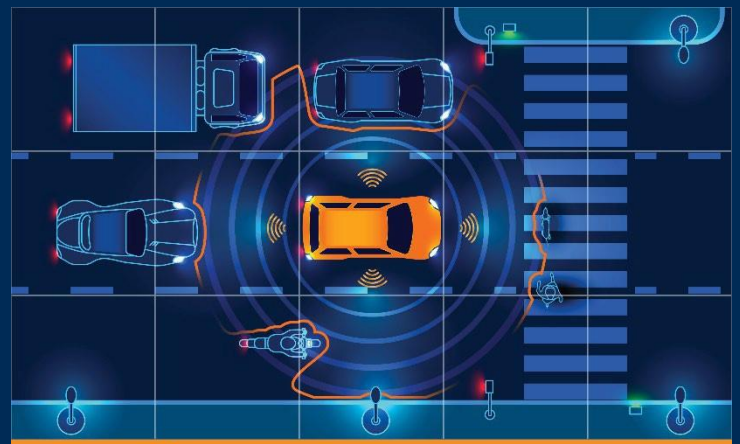
NTSB 2021–2022 MWL MOST WANTED LIST

Eliminate Distracted Driving



NTSB 2021–2022 MWL MOST WANTED LIST

Prevent Alcohol- and Other Drug-Impaired Driving



NTSB 2021–2022 MWL MOST WANTED LIST

Require Collision-Avoidance and Connected-Vehicle Technologies on All Vehicles

NTSB 2021–2022 MWL MOST WANTED LIST

Protect Vulnerable Road Users through a Safe System Approach

NHTSA's 2020 Preliminary FARS Data Summary

U.S. Department of Transportation
National Highway Traffic Safety Administration

NHTSA

DOT HS 813 266 March 2022

Overview of Motor Vehicle Crashes in 2020

38,824 people died on U.S. roads in 2020.

Fatalities compared to 2019:

- ↑6.8% overall
- ↑21% rate per 100 million VMT
- ↑14% in alcohol-impaired-driving crashes
- ↑17% in speeding-related crashes
- ↑11% motorcyclists
- ↑3.9% pedestrians
- ↑14% unrestrained passenger vehicle occupants
- ↑21% ejected passenger vehicle occupants
- ↑9.4% in single-vehicle crashes
- ↑8.5% in urban areas
- ↑12% during nighttime
- ↑9.5% during weekend

Sources: FARS 2019 Final File, 2020 ARF; VMT – FHWA's Annual Highway Statistics

Alcohol-Impaired Driving

Alcohol-impaired-driving fatalities increased by 14 percent from 2019 to 2020 (Table 5), accounting for 30 percent of 2020 overall fatalities. Alcohol-impaired-driving fatality rate per 100 million VMT increased by 29 percent from 0.31 in 2019 to 0.40 in 2020.

Table 5. Total and Alcohol-Impaired-Driving Fatalities, and Alcohol-Impaired-Driving (AI-Driving) Fatality Rates per 100 Million VMT, 2019 and 2020

	2019	2020	Change	% Change
Total Fatalities	**36,355**	**38,824**	**+2,469**	**+6.8%**
Alcohol-Impaired-Driving Fatalities	10,196	11,654	+1,458	+14%
AI-Driving Fatality Rate per 100 Million VMT	0.31	0.40	+0.09	+29%

Sources: FARS 2019 Final File, 2020 ARF; VMT – FHWA's Annual Highway Statistics

Stewart, T. (2022, March). Overview of motor vehicle crashes in 2020 (Report No. DOT HS 813 266). National Highway Traffic Safety Administration.

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Number & Percent of Valid BAC Results by Road User Types, FARS 2020

Road Users	Valid BAC Values	No BAC Values	Total	% Valid BAC Values
Drivers	20,560	33,330	53,890	38%
Vulnerable Road Users	3,922	4,181	8,103	48%
Other Road Users	2,165	21,727	23,892	9%
All Users	26,647	59,238	85,885	31%

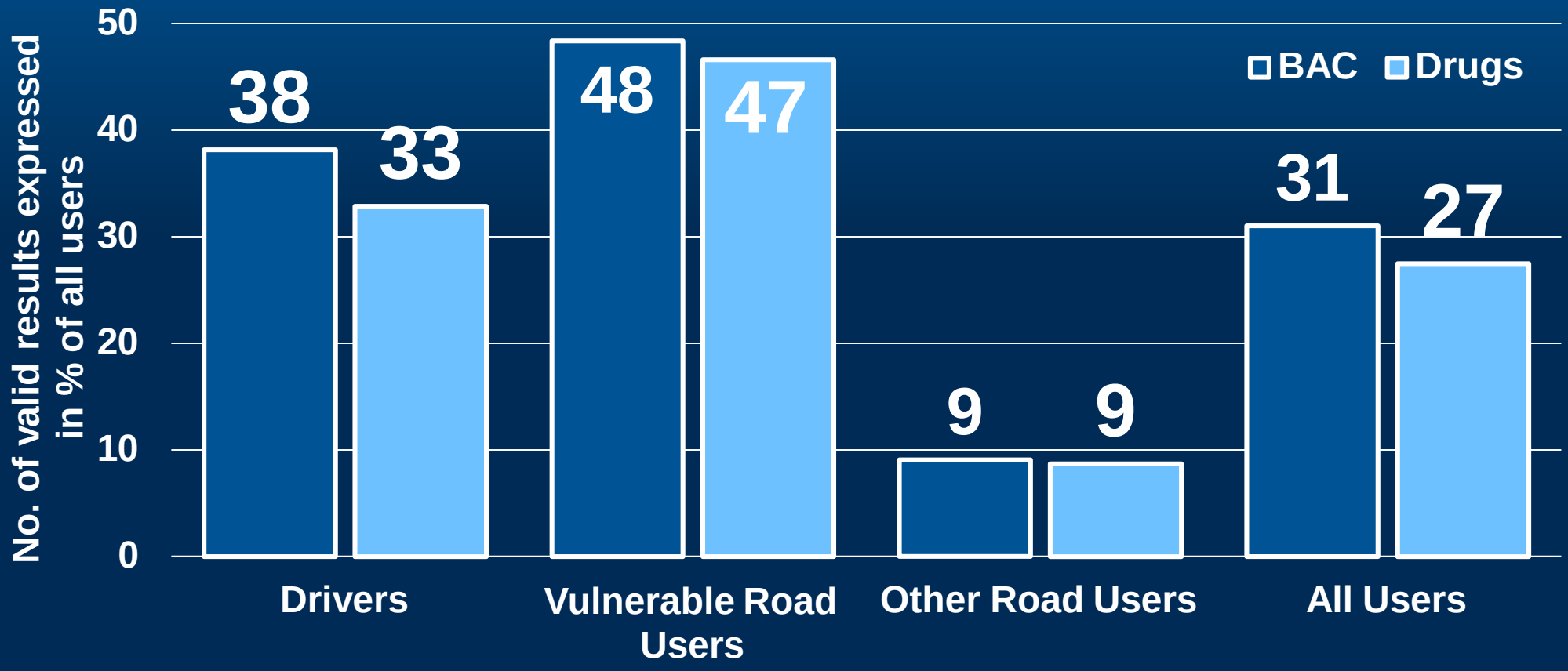
- *Valid* BAC: ALC_RES <= 940; ALC_RES = Alcohol Test Result
- Vulnerable Road Users include pedestrian, bicyclist, other cyclist, person on motorized personal conveyance or non-motorized personal conveyance

Number & Percent of Valid Drug Test Results by Road User Types, FARS 2020

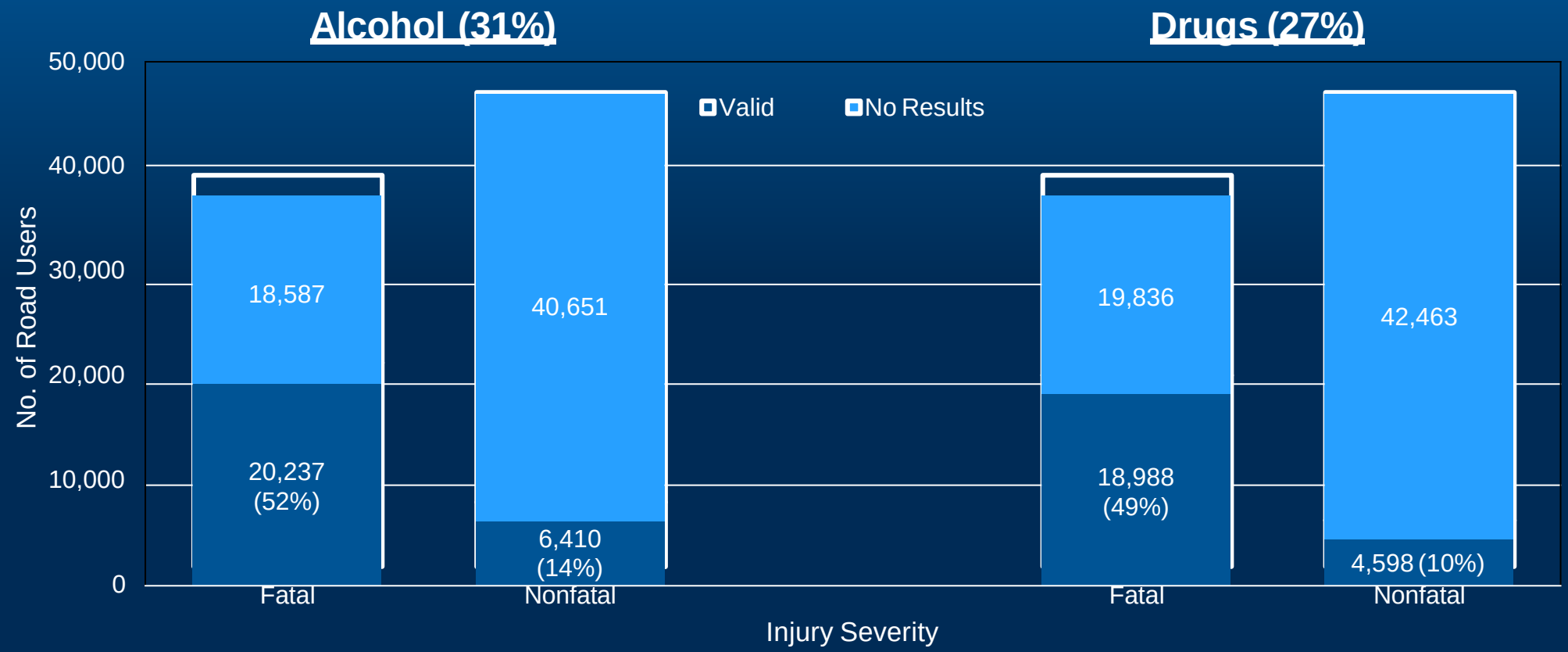
Road Users	Valid Drug Values	No Value Drug Values	Total	% Valid Drug Values
Drivers	17,727	36,163	53,890	33%
Vulnerable Road Users	3,778	4,325	8,103	47%
Other Road Users	2,081	21,811	23,892	9%
All Users	23,586	62,299	85,885	27%

- Value Drug Test Result (DRUGRES) includes the following values: (1) Tested, No Drugs Found/Negative; (100-996) Individual substances; (998) Tested for Drugs, Drugs Found, Type Unknown/Positive

Percent Valid Alcohol and Drug Test Results by Road User Types, FARS 2020

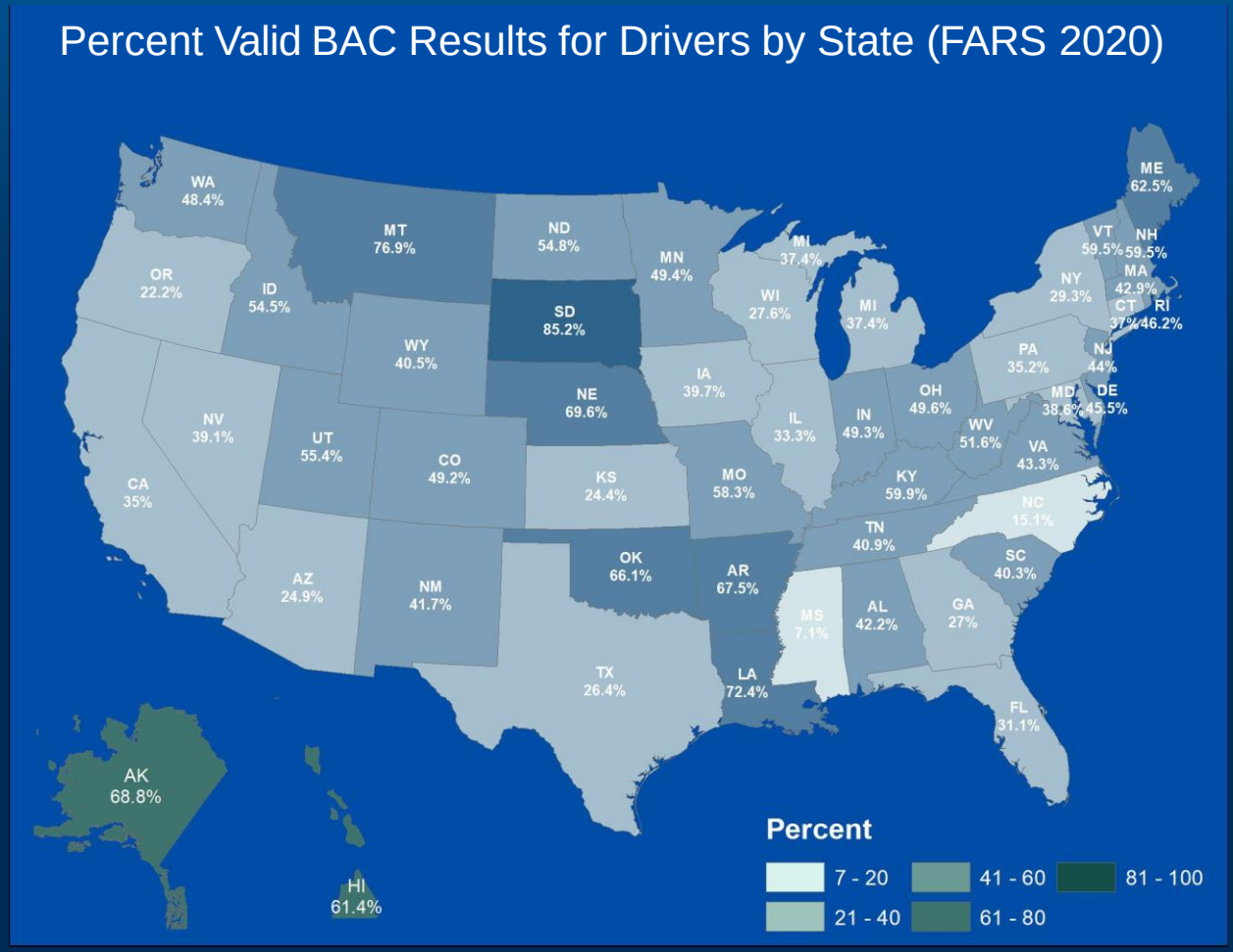


Valid Alcohol and Drug Test Results by Injury Severity, FARS 2020



Alcohol Impairment Data

- 20,560 drivers with valid BAC values (38%)
- 7,383 drivers with BAC >= 0.08 (36%) (map)
  - 7,227 fatal crashes with at least one drivers with BAC >= 0.08 (20% of all fatal crashes)
  - 8,040 deaths involved (20% of all deaths)
- *11,654 estimated deaths based on multiple imputation (30%) [Table 11, latest 2020 FARS]*



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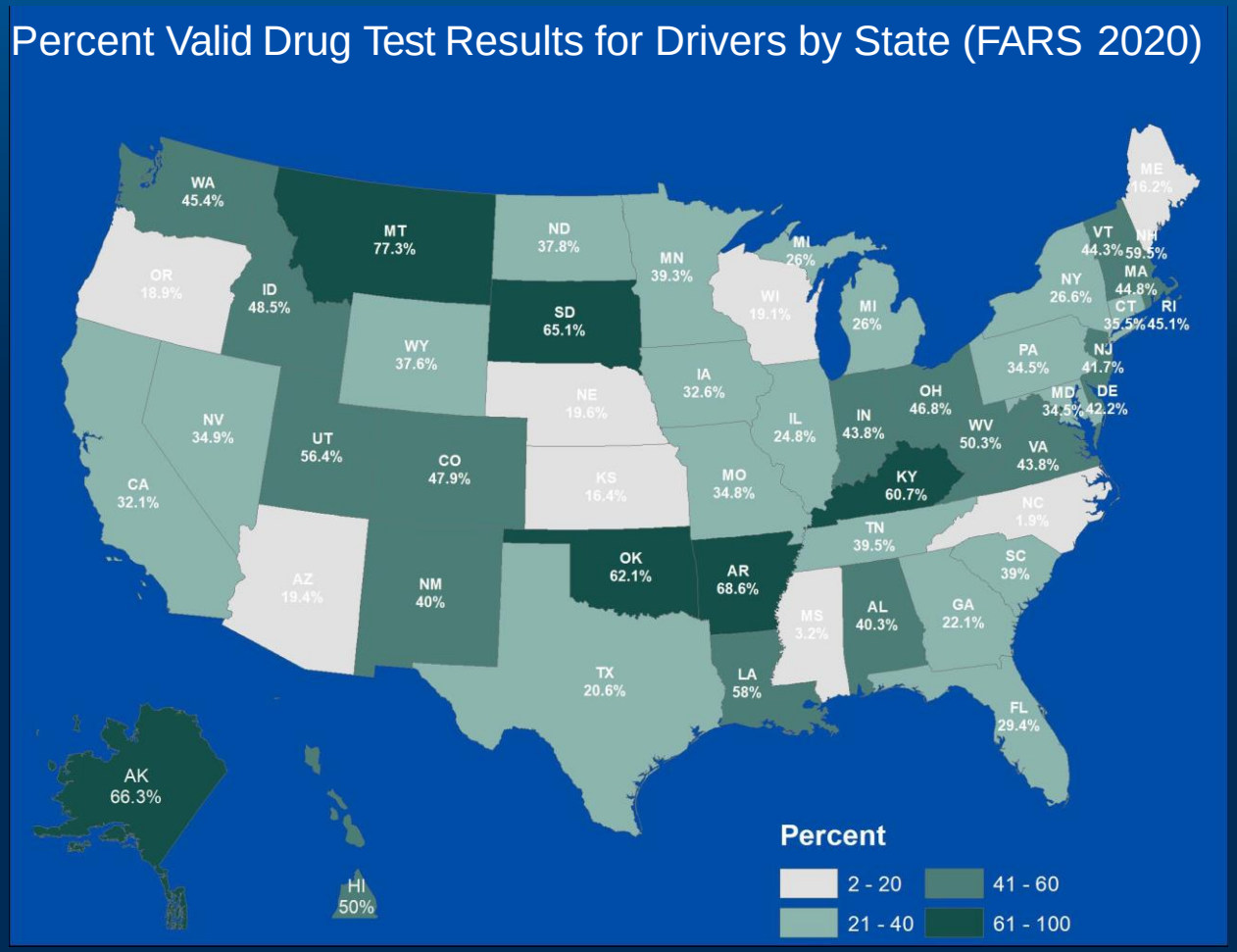
Drug Test Result Data

- Drug Found, any drug category (33%)
- 17,727 drivers with valid drug test results (map)
- 9,150 drivers with positive results (drugs found) (52%)
  - 8,744 fatal crashes with at least one driverwith positive results (drugs found) (24% of all fatal crashes)
  - 9,817 deaths involved (25% of all deaths)
- *There is no estimates based on multiple imputation*



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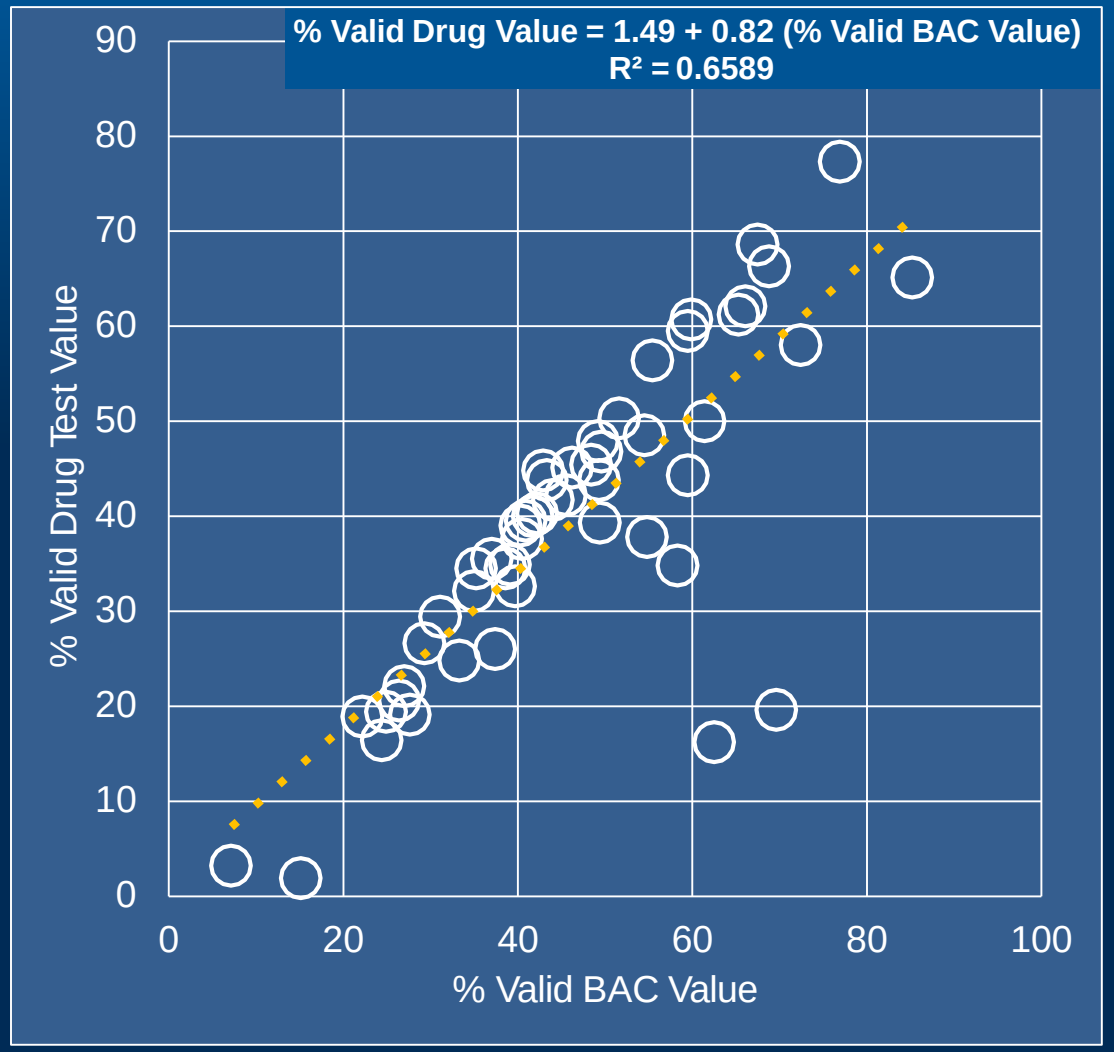
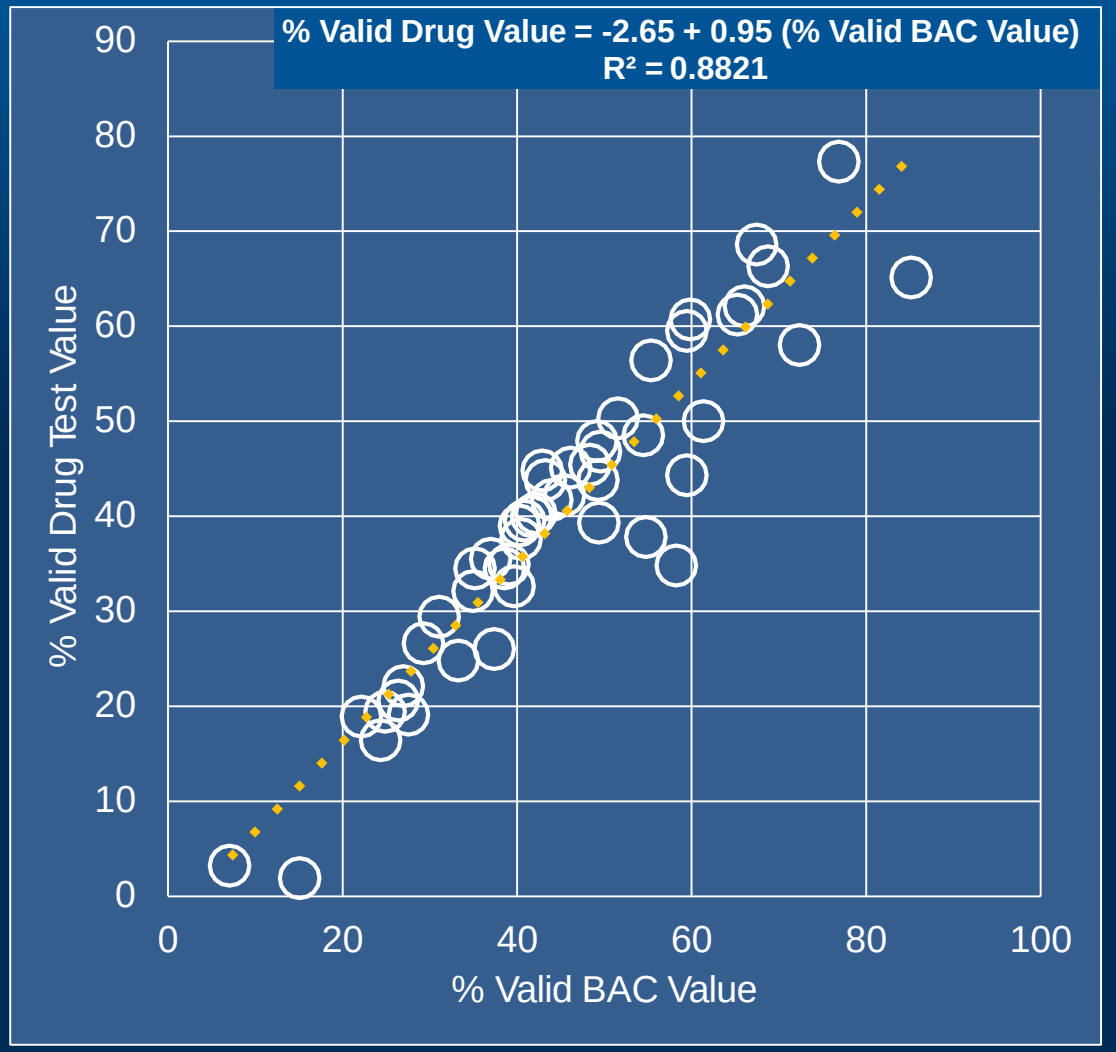
Relationship Between %Valid BAC & Drug Test Value by State (FARS 2020)





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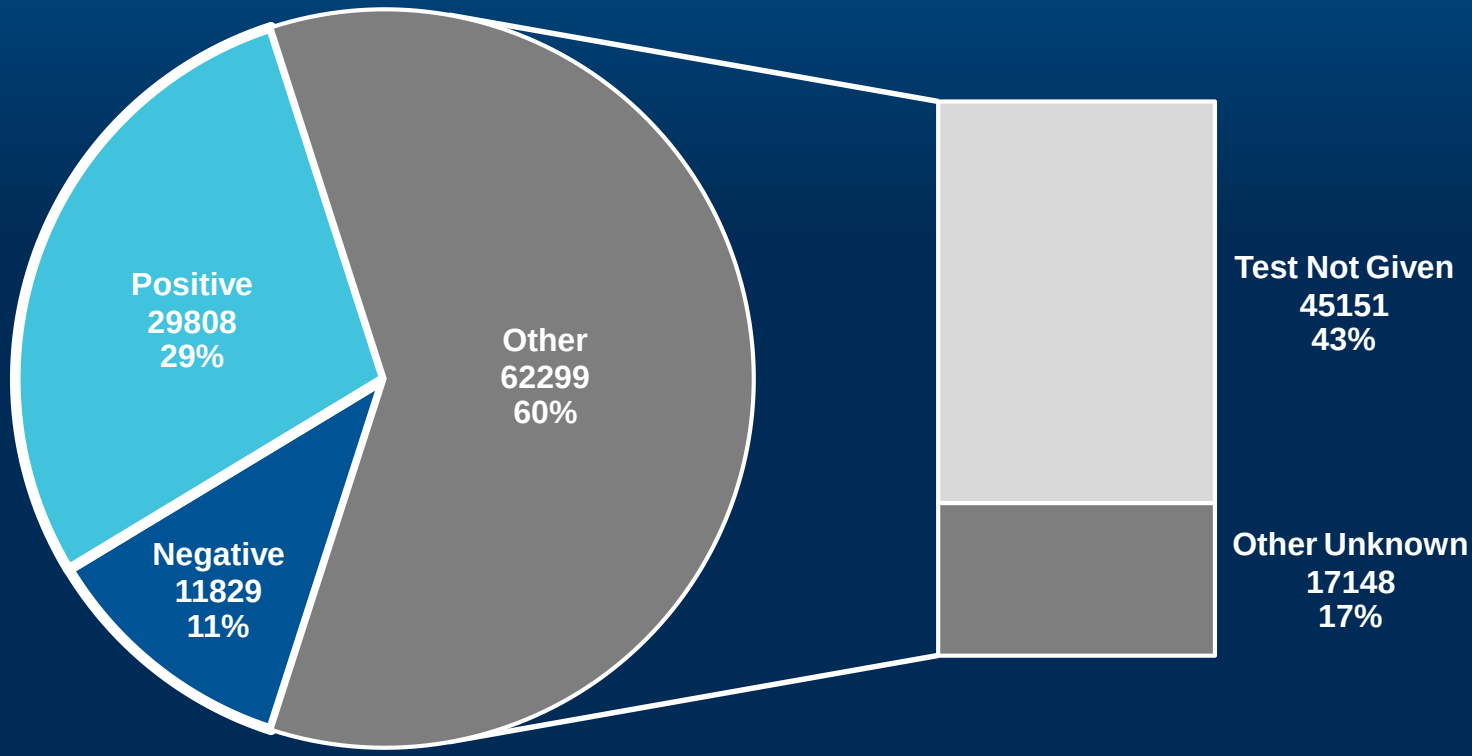
Further Examination of the 2020 FARS Drugs Data File

- Available 2018-present
- This data file contains the specimens tested and the drug results from toxicology reports of all people involved in the crash
- There is one record per specimen tested and its corresponding drug result
- 103,936 records
- 85,886 persons with records

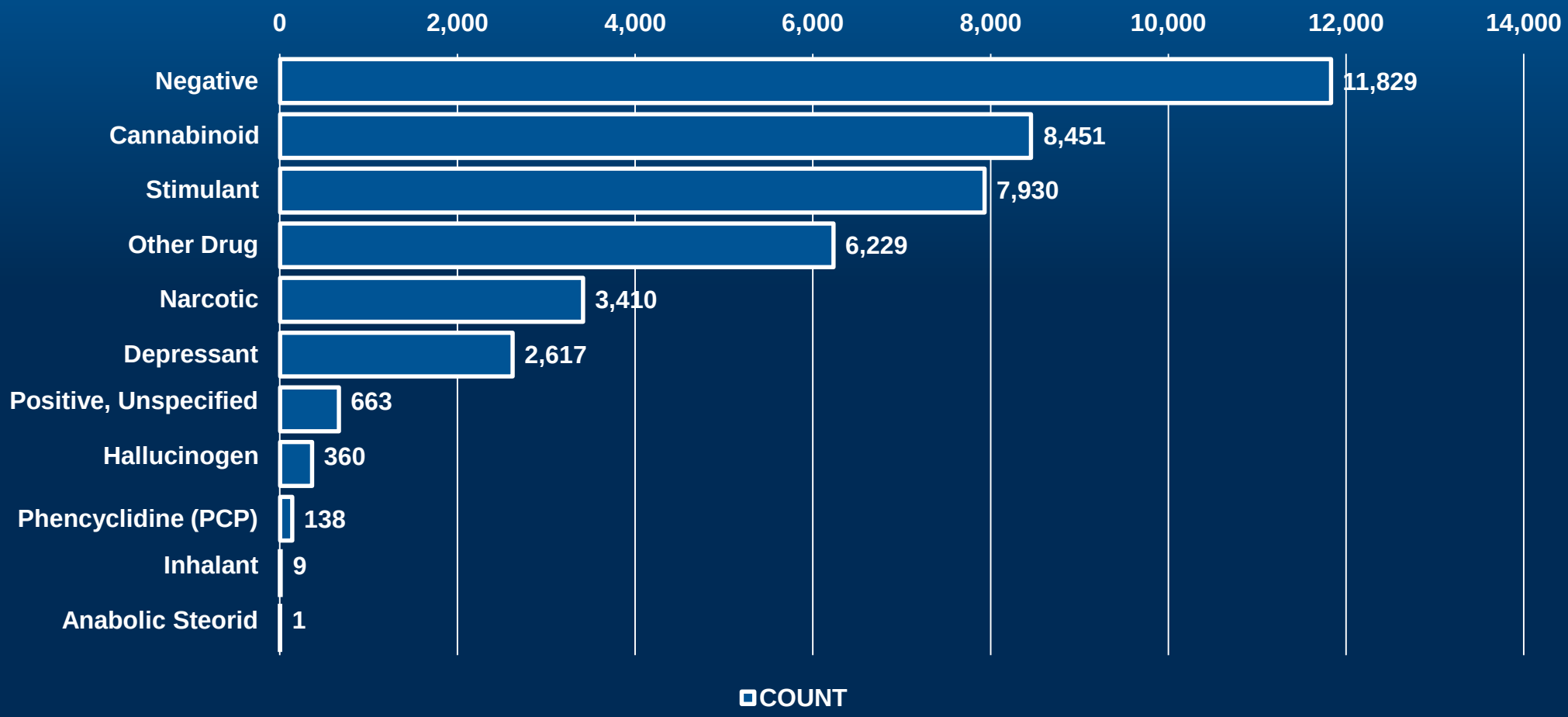
Distribution of 103,936 Specimen Records (FARS 2020)



Top 10 Individual Substances Found (FARS2020)

Substance/Result	Records	Percent of 29,808 Positive Results
Other Drug	6,229	20.9
Tetrahydrocannabinols (THC)	3,486	11.7
Methamphetamine	2,849	9.6
Amphetamine	2,648	8.9
Delta 9	2,227	7.5
Cannabinoid, Type Unknown	2,118	7.1
Fentanyl	1,122	3.8
Cocaine	1,061	3.6
Benzoylecgonine	1,052	3.5
Tested For Drugs, Drugs Found, Type Unknown/Positive	663	2.2

Distribution of Drug Categories of 41,637 Results (FARS 2020)

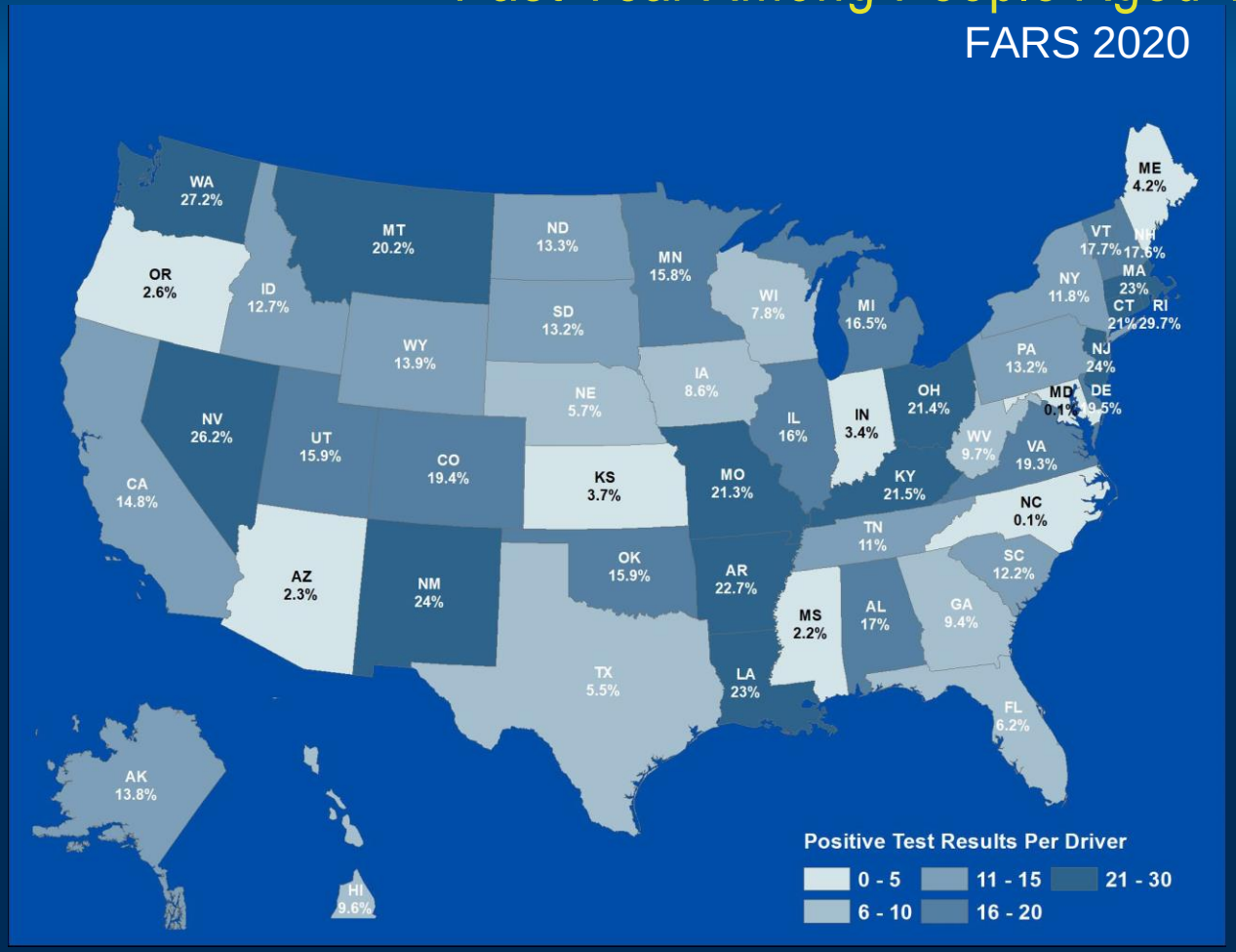


Exploring Other Data Sources (select examples)

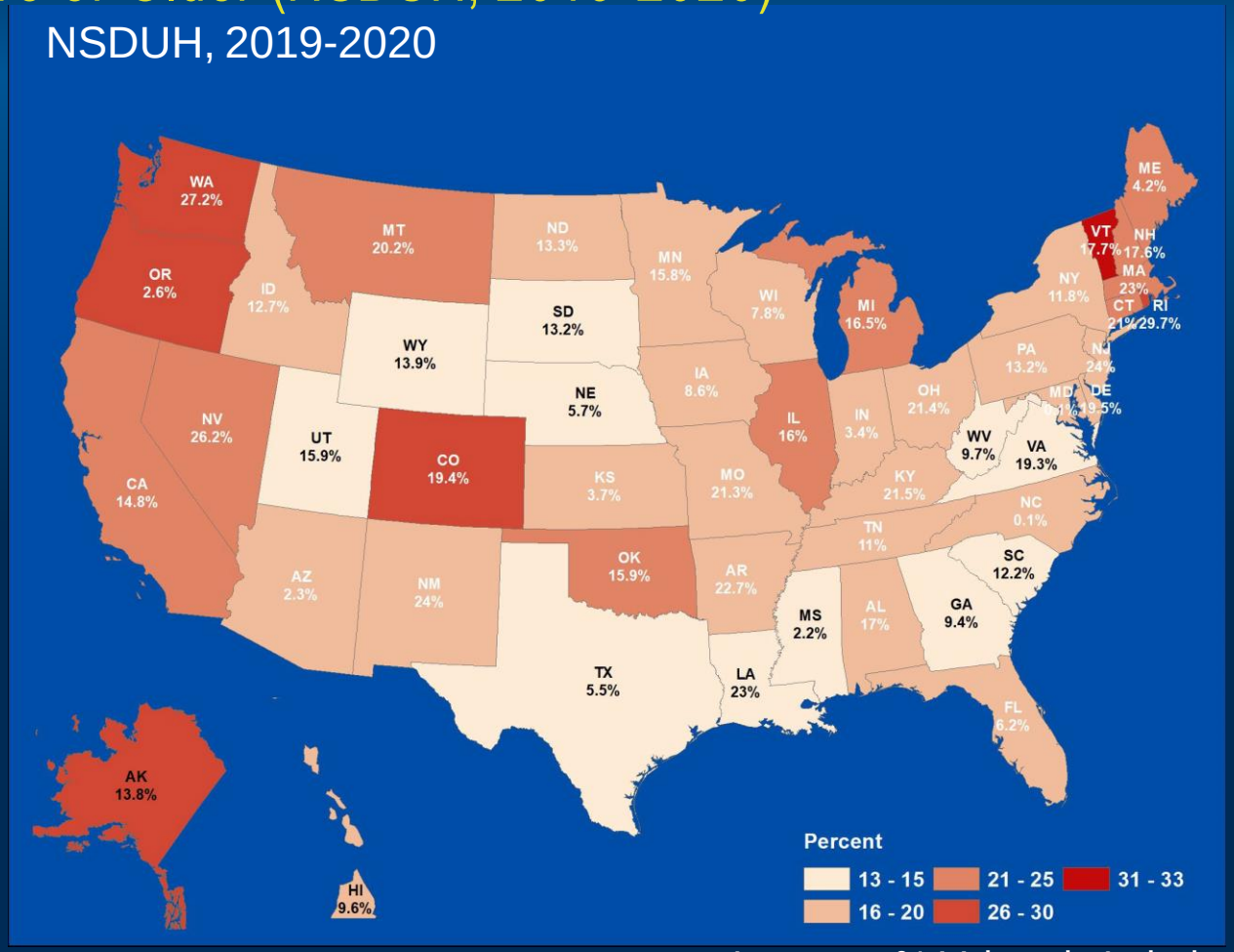
- Adopting a Safe System Approach
- National Survey on Drug Use and Health (NSDUH) (Substance Abuse and Mental Health Services Administration, SAMHSA)
- County Health Rankings & Roadmaps: Building a Culture of Health, County by Count (University of Wisconsin Population Health Institute)

Percent of Drivers with Cannabinoid Substance Found (FARS 2020) vs Marijuana Use in the Past Year Among People Aged 18 or Older (NSDUH, 2019-2020)

FARS 2020



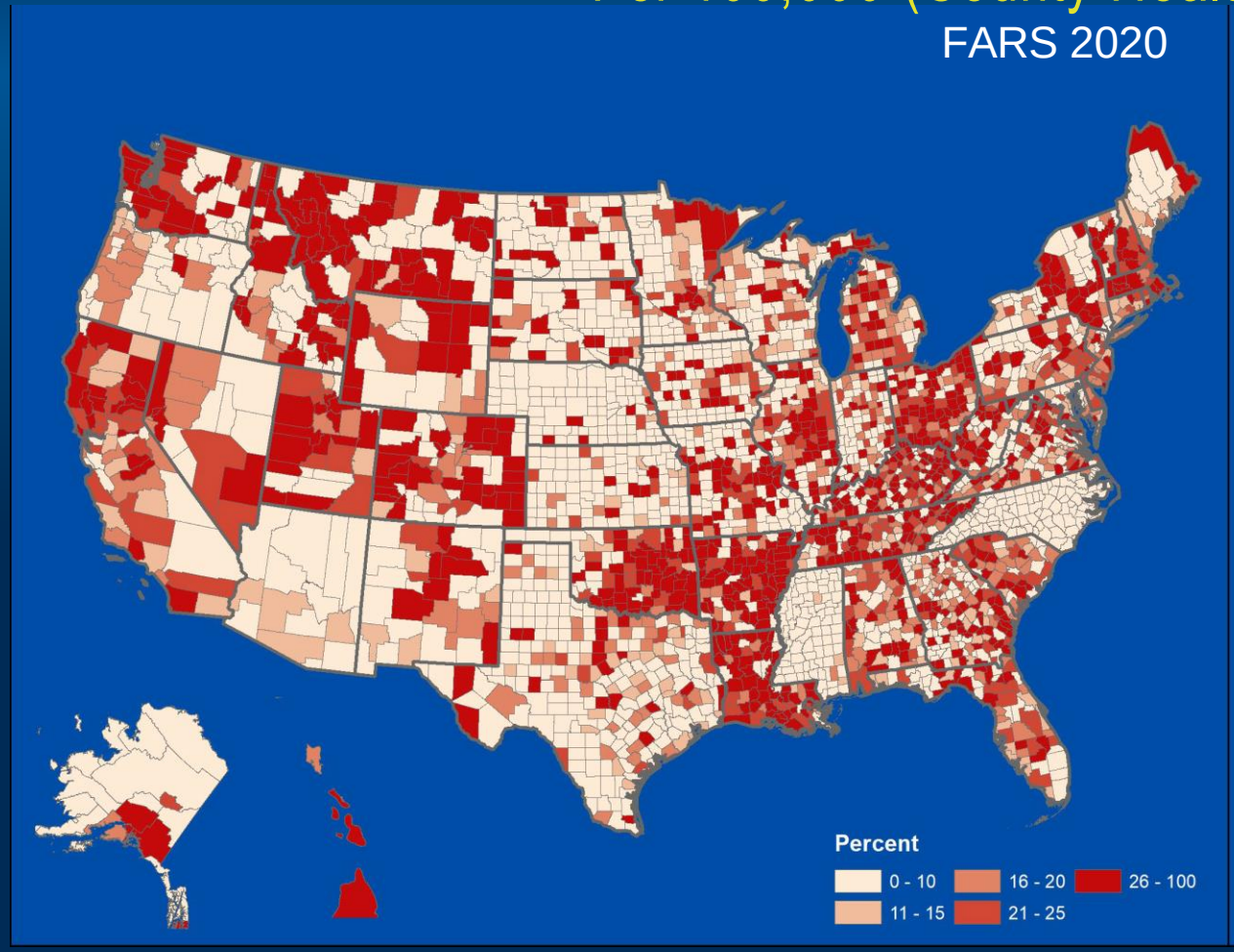
NSDUH, 2019-2020

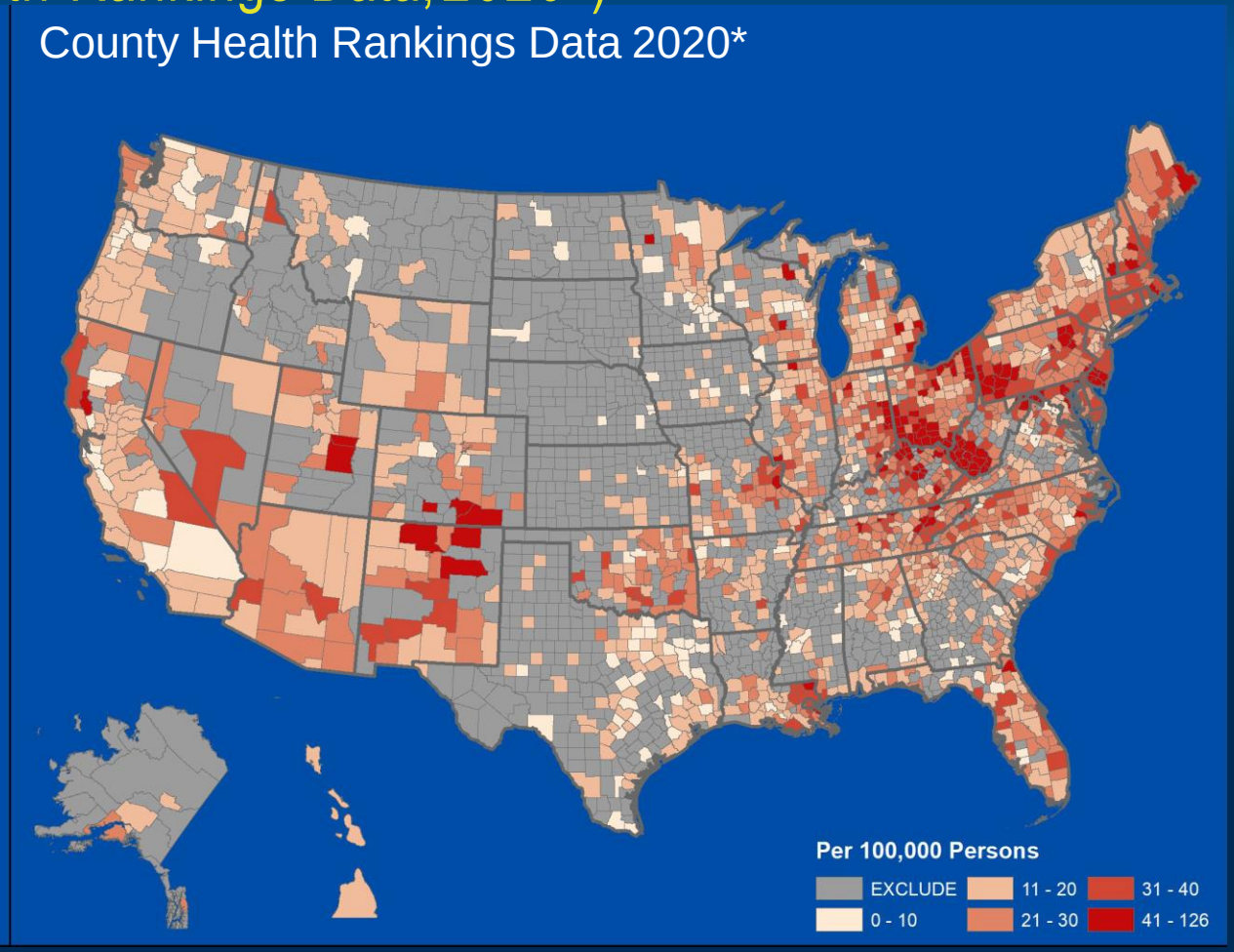


Incorrect % Values in Labels

NTSB

Percent of Drivers with Positive Drug Test Results (FARS 2020) vs Drug Overdose Deaths Per 100,000 (County Health Rankings Data, 2020*)





Number of drug poisoning deaths per 100,000 population.
Source: National Center for Health Statistics – Mortality Files (2016-2018)

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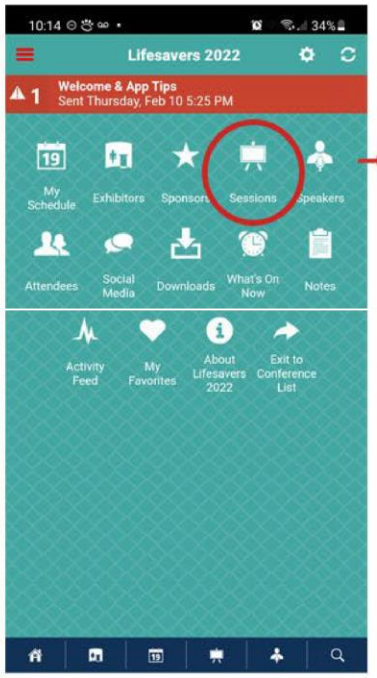

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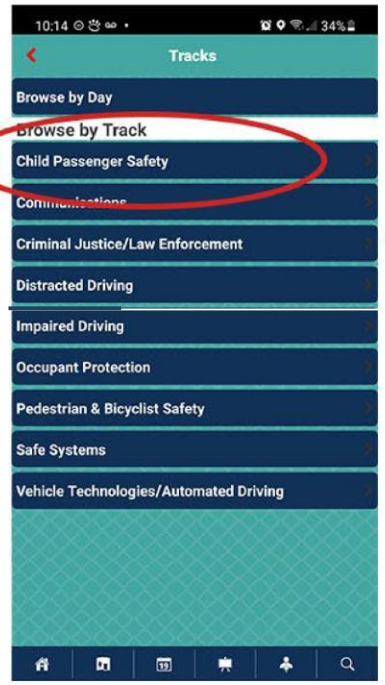

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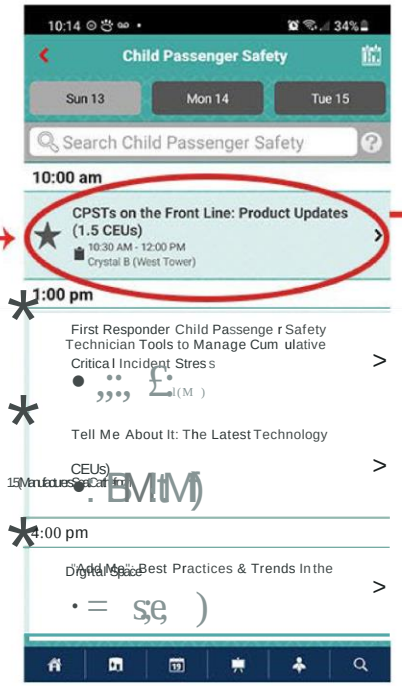

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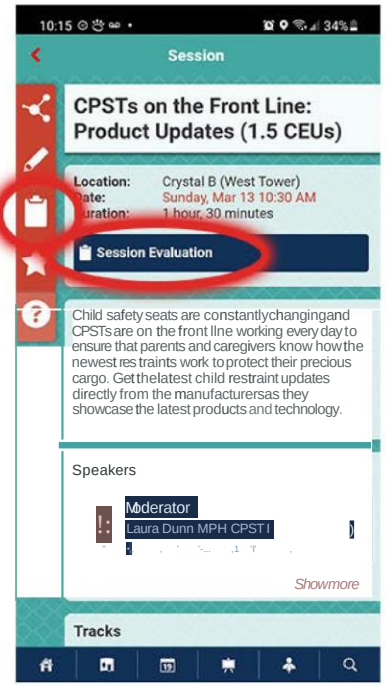

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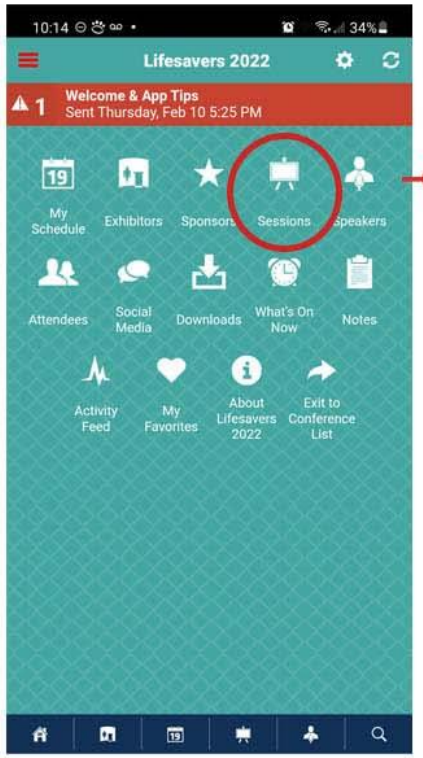

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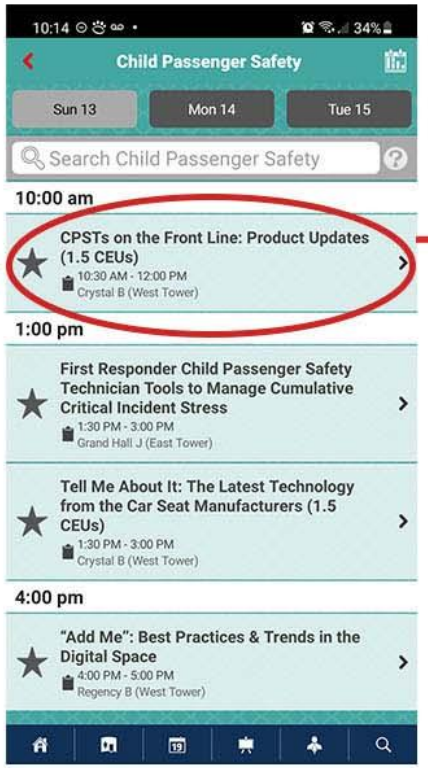

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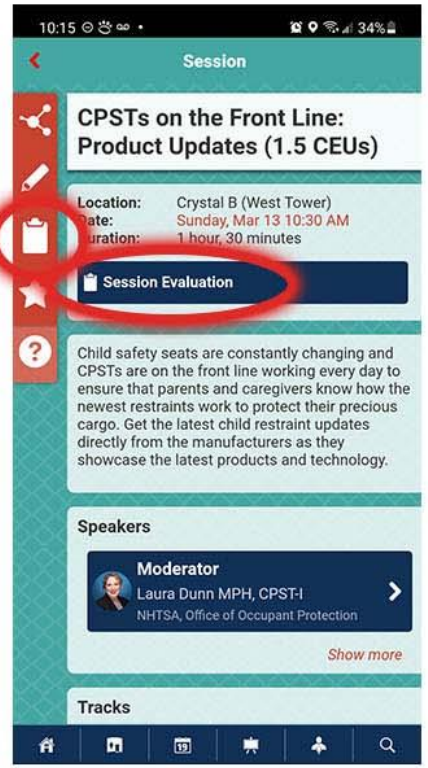

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