Maximizing Impaired Driving Data Analysis

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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

- 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

Male 74 %
Female 26 %
Undetermined .18 %

Source: NHTSA DRE Data System
Evaluations by Race

- White: 62.63%
- Black/African American: 15.84%
- American Indian/Alaska Native: 0.86%
- Asian or Pacific Islander: 1.41%
- Hispanic: 14.36%
- Undetermined: 4.17%

Source: NHTSA DRE Data System
2021 Evaluations: 30,812 Total

- Medical, 377
- No impairment, 2636
- Poly category, 7125
- Alcohol only, 1107
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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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?
  o 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?

Died at the Crash

Medical Examiner

Died at the Crash

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

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?

Released

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

Arrested

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

Yes

No
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

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.
**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

<table>
<thead>
<tr>
<th>ANALYTE</th>
<th>RESULTS</th>
<th>REPORTING LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIAZEPAM</td>
<td>Negative</td>
<td>20 ng/mL</td>
</tr>
<tr>
<td>OXAZEPAM</td>
<td>Negative</td>
<td>20 ng/mL</td>
</tr>
<tr>
<td>CLONAZEPAM</td>
<td>Negative</td>
<td>20 ng/mL</td>
</tr>
<tr>
<td>LORAZEPAM</td>
<td>Positive 208 ± 14 ng/mL</td>
<td>20 ng/mL</td>
</tr>
<tr>
<td>ALPRAZOLAM</td>
<td>Negative</td>
<td>20 ng/mL</td>
</tr>
</tbody>
</table>
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
Understanding the Limitations of Drug Test Information, Reporting, and Testing Practices in Fatal Crashes

Amy Berning & Dennis D. Smither

Since 1996, the National Highway Traffic Safety Administration (NHTSA) has collected data from all 50 States, the District of Columbia, and has been the sole potenically useful cause of crashes on public roads through NHTSA’s National Center for Statistics and Analysis (NCSA). This dataset includes over 3 million crashes to 2020. This dataset provides a wealth of information on fatal crashes, the roadway, vehicle, and driver involved.

"Impaired driving" includes use of alcohol, drugs, or both. Blood alcohol concentration (BAC) results are not known for all drivers in all crashes. For crashes with missing alcohol data, NHTSA uses a statistical model called "multiple imputation" to estimate the likelihood of a driver using alcohol. This method is used to make judgments about the relationship between drinking and driving performance, and simulate various scenarios, making new assumptions.

Every State has enacted a law defining drivers who are under the influence of alcohol, drugs, or both. Drugs can impair driving performance, and drivers should be aware of the potential risks associated with such use.

Drug Possession Versus Drug Impairment

Drug possession refers to any individual who is in charge of, or in control of, a controlled substance that has been suspected of impaired driving, as opposed to the person being arrested for impaired driving. In the case of drug possession, the driver is under the influence of alcohol, drugs, or both. The presence of drugs or alcohol in the body can lead to impaired driving, which can result in crashes.

Differences in Drug Testing Procedures

There are several differences between the procedures used to test for drugs in crashes, including random testing, analysis of drugs that are not common in fatalities, and analysis of drugs that are not known to be a cause of crashes. This information is relevant to the public and professionals involved in traffic safety.

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


Drug Testing and Traffic Safety: What You Need to Know


Find Our Behavioral Safety Research

www.NHTSA.gov
then “More Info” then “Research” then Behavioral Research

https://rosap.ntl.bts.gov/ and search for NHTSA

Current Research
https://rip.trb.go and search for NHTSA

Find me at amy.berning@dot.gov
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
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.
US Transportation Fatalities in 2020 – by Mode

- **Highway**: 38,824 (95%)
  - **Railroad**: 931 (2%)
  - **Maine**: 851 (2%)
  - **Aviation**: 332 (1%)
  - **Pipeline**: 15 (0%)

**Highway Fatalities**

- **Passenger cars**: 13,472
- **Light trucks and vans**: 10,352
- **Pedestrians**: 6,516
- **Motorcycles**: 5,579
- **Medium and heavy trucks**: 938
- **Pedal cycles**: 831
- **Buses**: 16
- **Others**: 1,120

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
Most Wanted Highway Safety Improvement Items

1. Implement a Comprehensive Strategy to Eliminate Speeding-Related Crashes
2. Eliminate Distracted Driving
3. Prevent Alcohol- and Other Drug-Impaired Driving
4. Require Collision-Avoidance and Connected-Vehicle Technologies on All Vehicles
5. Protect Vulnerable Road Users through a Safe System Approach
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

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fatalities</td>
<td>36,355</td>
<td>38,824</td>
<td>+2,469</td>
<td>+6.8%</td>
</tr>
<tr>
<td>Alcohol-Impaired-Driving Fatalities</td>
<td>10,196</td>
<td>11,654</td>
<td>+1,458</td>
<td>+14%</td>
</tr>
<tr>
<td>AI-Driving Fatality Rate per 100 Million VMT</td>
<td>0.31</td>
<td>0.40</td>
<td>+0.09</td>
<td>+29%</td>
</tr>
</tbody>
</table>

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

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

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

- **Valid BAC**: ALC_RES $\leq 940$; 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

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

- Value Drug Test Result (DRUGRES) includes the following values:
  1. Tested, No Drugs Found/Negative; (100-996) Individual substances;
  2. Tested for Drugs, Drugs Found, Type Unknown/Positive
Percent Valid Alcohol and Drug Test Results by Road User Types, FARS 2020

- Drivers: 38% BAC, 33% Drugs
- Vulnerable Road Users: 48% BAC, 47% Drugs
- Other Road Users: 9% BAC, 9% Drugs
- All Users: 31% BAC, 27% Drugs
Valid Alcohol and Drug Test Results by Injury Severity, FARS 2020

![Graph showing valid alcohol and drug test results by injury severity for FARS 2020.](image)

- **Alcohol (31%)**
  - Fatal: 18,587 (52% Valid, 20,237 in total)
  - Nonfatal: 40,651 (14% Valid, 6,410 in total)

- **Drugs (27%)**
  - Fatal: 19,836 (49% Valid, 18,988 in total)
  - Nonfatal: 42,463 (10% Valid, 4,598 in total)
Alcohol Impairment Data

- 20,560 drivers with valid BAC values (38%)
- 7,383 drivers with BAC $\geq 0.08$ (36%) (map)
  - 7,227 fatal crashes with at least one driver with BAC $\geq 0.08$ (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]
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 driver with 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
Relationship Between %Valid BAC & Drug Test Value by State (FARS 2020)

% Valid Drug Value = 1.49 + 0.82 (% Valid BAC Value)
$R^2 = 0.6589$

% Valid Drug Value = -2.65 + 0.95 (% Valid BAC Value)
$R^2 = 0.8821$
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)

- Positive: 29,808 (29%)
- Negative: 11,829 (11%)
- Other: 62,299 (60%)
- Test Not Given: 45,151 (43%)
- Other Unknown: 17,148 (17%)
## Top 10 Individual Substances Found (FARS2020)

<table>
<thead>
<tr>
<th>Substance/Result</th>
<th>Records</th>
<th>Percent of 29,808 Positive Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Drug</td>
<td>6,229</td>
<td>20.9</td>
</tr>
<tr>
<td>Tetrahydrocannabinols (THC)</td>
<td>3,486</td>
<td>11.7</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>2,849</td>
<td>9.6</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>2,648</td>
<td>8.9</td>
</tr>
<tr>
<td>Delta 9</td>
<td>2,227</td>
<td>7.5</td>
</tr>
<tr>
<td>Cannabinoid, Type Unknown</td>
<td>2,118</td>
<td>7.1</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>1,122</td>
<td>3.8</td>
</tr>
<tr>
<td>Cocaine</td>
<td>1,061</td>
<td>3.6</td>
</tr>
<tr>
<td>Benzoylecgonine</td>
<td>1,052</td>
<td>3.5</td>
</tr>
<tr>
<td>Tested For Drugs, Drugs Found, Type Unknown/Positive</td>
<td>663</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Distribution of Drug Categories of 41,637 Results (FARS 2020)

- Negative: 11,829
- Cannabinoid: 8,451
- Stimulant: 7,930
- Other Drug: 6,229
- Narcotic: 3,410
- Depressant: 2,617
- Positive, Unspecified: 663
- Hallucinogen: 360
- Phencyclidine (PCP): 138
- Inhalant: 9
- Anabolic Steroid: 1

COUNT
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
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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