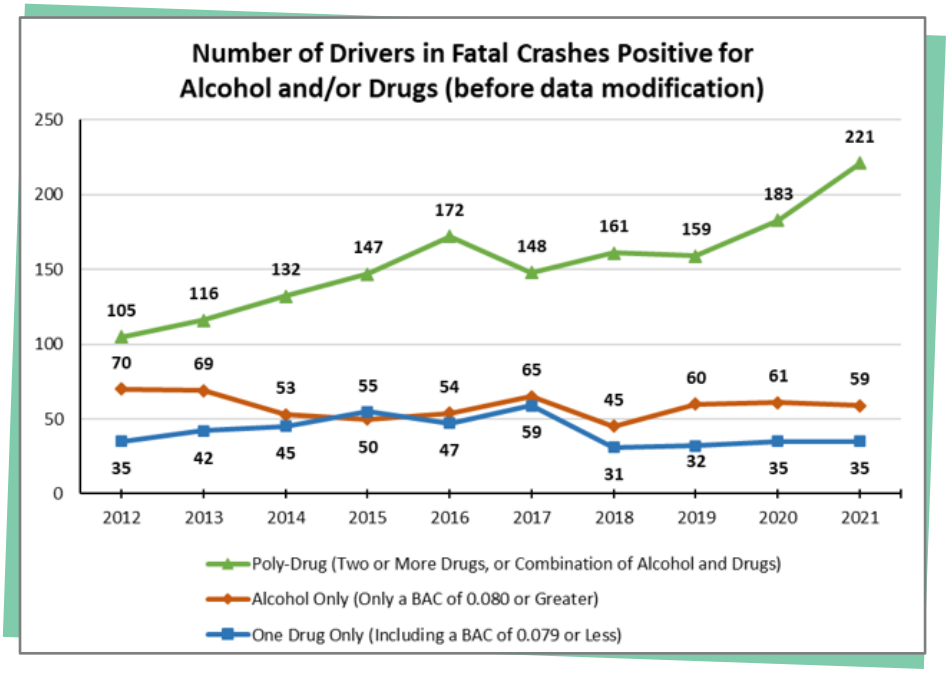
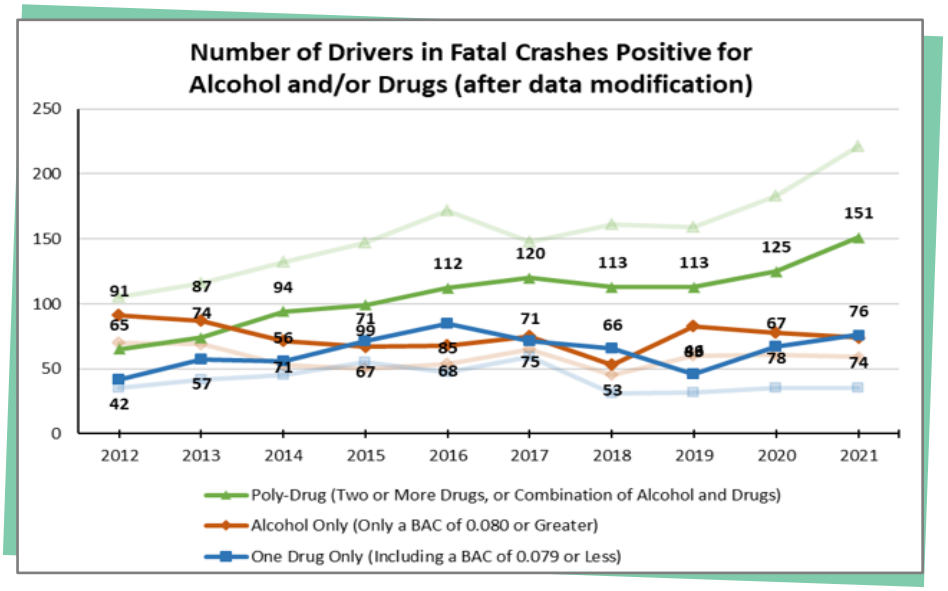
Drug-Positive Driver Data Update – Methods

In October 2023, the Washington Traffic Safety Commission (WTSC) implemented new updates to drug-positive driver data in our Coded Fatal Crash (CFC) files. These data updates provide more accurate information pertaining to drug impairment. The WTSC retroactively implemented these updates since 2012. As a result of the data updates, existing drug-positive driver data changed. The methods and reasoning for these updates are described in the following pages.

The change in the data over time is shown in the charts to the right among drivers involved in fatal crashes. The first chart above shows the number of drivers involved in fatal crashes that were positive for alcohol and/or drugs over time prior to the data updates. The second chart below shows how these numbers changed after implementing the data updates. Each chart shows three different impairment categories: one drug only (including a blood alcohol content of 0.079 or less), alcohol only (including a blood alcohol content of 0.08 or greater), and poly-drug (two or more drugs, or a combination of alcohol and one or more drugs). These categories are mutually exclusive.





In 2021, prior to the data updates, there were 221 poly-drug positive drivers involved in fatal crashes. After implementing the data updates, this number changed to 151, representing a 32% change in the number of poly-drug positive drivers. The number of drivers involved in fatal crashes that were positive for only alcohol changed slightly from 59 to 74 — a 25% change. Lastly, the number of drivers involved in fatal crashes that were positive for one drug only changed by 117% from 35 to 76. Although the proportion of poly-drug positive drivers involved in fatal crashes decreased in every year, it remained the most prevalent impairment category. Meanwhile, the prevalence of one-drug positive only drivers and alcohol only impaired drivers increased in every year after the data updates.

Methods

1. Matched parent drugs with their metabolites.
2. Removed toxicology screening results when confirmatory results were present.
3. Removed likely non-impairing drugs or unrelated substances.
4. Removed inactive metabolites when the parent drug was absent.
5. Removed likely non-impairing pharmaceutical drugs when alcohol was absent.

1. Matched parent drugs with their metabolites. In circumstances where both the parent drug and metabolite were present, we combined them together to form a parent/metabolite compound (see Appendix). The following tables show that, prior to the updates, a person that tested positive for delta-9 THC and carboxy-THC presented as positive for two drugs when in fact only one drug had been consumed. This results in an overcount of the number of drugs in a person's system and inflated poly-drug positive counts. After we matched the parent drug with its metabolite, the example below shows the person as positive for one parent/metabolite compound.

Before

	Result 1	Result 2
Person A	Delta-9 THC	Carboxy-THC

After

	Result 1	Result 2
Person A	Delta-9 THC/Carboxy-THC	

2. Removed toxicology screening results when confirmatory results were present. In toxicology testing, a screening test can be performed to determine whether a type of drug is present in the blood sample. Whereas a confirmatory test can be performed to determine the specific drug and its level or concentration in the blood. Examples of screening results include 'benzodiazepines', 'cannabinoids', and 'opiates'. We removed screening results in circumstances where confirmatory results were also present. For example, the tables below show a person that had a positive screening result for cannabinoids, but also, a positive confirmatory result for delta-9 THC. This person would present as positive for two drugs, when in fact they only had one drug in their system.

Before

	Result 1	Result 2	Result 3
Person B	Cannabinoids	Delta-9 THC	

After

	Result 1	Result 2	Result 3
Person B	Delta-9 THC		

3. Removed likely non-impairing drugs or unrelated substances. We removed drugs that were deemed to be likely non-impairing— meaning it is unlikely that they affect one's ability to operate a motor vehicle — or substances that were unrelated to the events of the crash (see Appendix). Examples of likely non-impairing drugs included acetaminophen (e.g., Tylenol), ibuprofen (e.g., Advil), caffeine, nicotine and cotinine. Examples of unrelated substances included carboxyhemoglobin, which is present in cases of vehicle fires and CO2 inhalation, or midazolam (e.g., Versed), which is a sedative administered by emergency personnel. The tables below show how removing non-impairing substances can change a person that was positive for three drugs to being positive for zero drugs.

Before

	Result 1	Result 2	Result 3
Person A	Caffeine	Ibuprofen	Nicotine

After

	Result 1	Result 2	Result 3
Person A			

4. Removed inactive metabolites when the parent drug was absent. When a drug is consumed the body quickly begins to metabolize it, producing either active or inactive metabolites. Inactive metabolites do not have impairing effects on the body. For example, delta-9 THC, the major psychoactive component of cannabis, is metabolized into carboxy-THC, which is an inactive metabolite. A person can test positive for the parent drug alone, a combination of the parent drug and metabolite, or the metabolite alone. We removed inactive metabolites when the parent drug was absent from the toxicology results (see Appendix). As shown in the tables below, if a person tested positive for carboxy-THC alone, it would be removed and that person would no longer present as positive for any drugs.

Before

	Result 1	Result 2	Result 3
Person A	Carboxy-THC		

After

	Result 1	Result 2	Result 3
Person A			

5. Removed likely non-impairing pharmaceutical drugs when alcohol was absent. We removed pharmaceutical drugs that were deemed to be likely non-impairing, but only if alcohol was absent (see Appendix). Pharmaceutical drugs can interact with alcohol to enhance the effects of the drugs or result in other impairing qualities that might otherwise be absent if the drug were taken without alcohol and as prescribed by a doctor. Pharmaceutical drugs may be needed for people maintain their health and carry out day-to-day functions, such as driving. The following tables show that two likely non-impairing pharmaceutical drugs were removed because alcohol was absent. If alcohol was present, both drugs would be retained.

Before

	Result 1	Result 2	Result 3
Person A	Gabapentin	Risperidone	

After

	Result 1	Result 2	Result 3
Person A			

These updates provide better quality data pertaining to impairment. The steps listed above prevent overcounting drugs and metabolites when only one drug was consumed, remove drugs and substances that do not impair one's ability to drive and eliminate double counting screening and confirmatory test results as multiple drugs. Impairment data is challenging and constantly evolving. With updated impairment data, we are be better informed as to the common drugs and drug combinations involved in fatal crashes which can inform and guide program decisions to combat impaired driving and save lives.

Appendix

List of Likely Non-Impairing Drugs or Unrelated Substances Removed

6-beta-naltrexol
acetaminophen
amantadine
amlodipine
benzene
buspirone
caffeine
carboxyhemoglobin
cotinine
desmethylloperamide
dicyclomine
diltiazem
ephedrine
etomidate
glucose
guaifenesin
ibuprofen
ketones
laudanosine
levamisole
lidocaine
loperamide
metformin
metoprolol
midazolam
monoethylglycinexylidide
n-desmethylsildenafil
naloxone
naltrexone
nicotine/cotinine
nifedipine
norverapamil
phenylpropanolamine
quinine
salicylate
sevoflurane
sildenafil
tadalafil
theobromine
trimethoprim
verapamil
warfarin
yohimbine

List of Screening Results Removed when Confirmatory Results were Present

amphetamines
benzodiazepines
opiates

List of Likely Non-Impairing Pharmaceutical Drugs Removed when Alcohol was Absent

10-hydroxycarbazepine
9-hydroxyrisperidone
Aripiprazole
carbamazepine
gabapentin
glipizide
lacosamide
lamotrigine
levetiracetam
norpseudoephedrine
olanzapine
oxcarbazepine
oxcarbazepine/10-hydroxycarbazepine
phenytoin
primidone
primidone/phenobarbital
primidone/plenylethylmalonamide
primidone/phenobarbital/plenylethylmalonamide
pseudoephedrine
pseudoephedrine/norpseudoephedrine
quetiapine
risperidone
risperidone/9-hydroxyrisperidone
topiramate
topiramate/topiramate metabolite
zonisamide

List of Parent-Metabolite Compounds Created

6-monoacetylmorphine/codeine
6-monoacetylmorphine/morphine
6-monoacetylmorphine/morphine/codeine
amitriptyline/nortriptyline
alprazolam/alprazolam metabolite
buprenorphine/norbuprenorphine
bupropion/bupropion metabolite
bupropion/hydroxybupropion
carisoprodol/meprobamate
chlordiazepoxide/nordiazepam
citalopram/desmethylcitalopram
citalopram/norcitalopram
clonazepam/7-aminoclonazepam
clozapine/norclozapine
cocaine/benzoylecgonine
cocaine/benzoylecgonine/cocaethylene
cocaine/benzoylecgonine/ecgonine methyl ester
cocaine/benzoylecgonine/ecgonine methyl ester/cocaethylene
cocaine/cocaethylene
codeine/morphine
delta-9 thc/11-hydroxy thc
delta-9 thc/carboxy-thc
delta-9 thc/carboxy-thc/11-hydroxy thc
diazepam/nordiazepam
doxepin/desmethyldoxepin
fentanyl/4-anpp
fentanyl/4-anpp/norfentanyl
fentanyl/4-anpp/para-fluorofentanyl
fentanyl/4-anpp/para-fluorofentanyl/norfentanyl
fentanyl/norfentanyl
fentanyl/para-fluorofentanyl
fluoxetine/norfluoxetine
hydrocodone/dihydrocodeine
hydrocodone/dihydrocodeine/hydromorphone
hydrocodone/hydromorphone
imipramine/desipramine
ketamine/norketamine
loratadine/descarboethoxyloratadine
methadone/eddp
methamphetamine/amphetamine
methylphenidate/ritalinic acid
oxcarbazepine/10-hydroxycarbazepine
oxycodone/oxymorphone
primidone/phenobarbital
primidone/phenobarbital/plenylethylmalonamide
primidone/plenylethylmalonamide
propoxyphene/norpropoxyphene
pseudoephedrine/norpseudoephedrine
risperidone/9-hydroxyrisperidone
sertraline/desmethylsertraline
sertraline/norsertraline
topiramate/topiramate metabolite
tramadol/o-desmethyltramadol
trazadone/mcpp
venlafaxine/ norvenlafaxine
venlafaxine/o-desmethylvenlafaxine

For more information, please contact the WTSC Research and Data Division at (360) 725-9860.