FOUNDATION FOR TRAFFIC SAFETY

RESEARCH BRIEF

Use of Potentially Impairing Medications in Relation to Driving, United States, 2021

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Many prescription and over-the-counter medications have potential effects that adversely impact driving, including dizziness, sleepiness, fainting, blurred vision, slowed movement, and problems with attention (Center for Drug Evaluation and Research, 2019). Drivers may take one or more potentially driver impairing medications but may not be aware of the possible impacts on driving (e.g., MacLennan et al., 2009). This study utilized data from a survey of driving behavior in the United States in 2021 to quantify the prevalence of recent use of potentially driver impairing medication and driving after use, and to assess the association of healthcare provider warnings regarding medication effects with drivers' likelihood of driving shortly after use.

Method

The current study investigated the prevalence of recent use of potentially driver impairing (PDI) medications in a representative sample of U.S. drivers. Data were from the *Traffic Safety Culture Index*, a national online survey of driver behavior carried out annually (AAA Foundation for Traffic Safety, 2021). In 2021, a set of questions was included on the use of six classes of prescription and over-the-counter medications, which were selected on the basis of their potential to impair driving and their having been detected in drivers in other recent studies (Kelley-Baker, Berning, et al., 2017; Kelley-Baker et al., 2016). Specifically, drivers were asked whether or not they had used any of the following medications in the past 30 days:

- Antihistamines and/or cough medicines (such as Claritin, Allegra, Benadryl)
- Antidepressants (such as Prozac, Zoloft, Wellbutrin)
- Prescription pain medicines (such as Tylenol with codeine, OxyContin, Percocet, Vicodin/ hydrocodone)
- Muscle relaxants (such as Soma, Flexeril)
- Sleep aids, Barbiturates, or Benzodiazapines (such as Ambien, Lunesta, phenobarbital, Xanax, Valium, Ativan)
- Amphetamines (such as Adderall, Dexedrine, phentermine)

For each PDI medication that a respondent reported using, they were asked whether they had driven within two hours of using it. Respondents were also asked whether the medication was prescribed to them, and if so, whether a health care provider (e.g., a doctor, nurse, or pharmacist) had spoken with them about the possible side effects of the medication and its likely impacts on driving. (Response options for all questions were *yes, no,* and *I don't remember.*)

The survey was administered in English and Spanish from July to August 2021, to an online research panel whose participants were recruited using standard probability-based random digit dial and address-based sampling methods. Email invitations were sent to 7,570 panelists and 3,382 completed the survey. Although the original survey also included non-drivers, data analyzed in the current study was based on the responses of 2,657 respondents ages 16 or older who reported that they possessed a valid driver's license and had driven in the 30 days before they completed the questionnaire. Data were weighted to project results from the survey sample to the population of all U.S. drivers. Table 1 shows the age and gender distribution of the sample.

Table 1. Survey respondents by age and gender

	n (unweighted)	% (weighted)
Total	**2,657**	**100**
16–18	471	3
19–24	93	6
25–39	437	25
40–64	1,018	45
≥65	638	21
Male	1,348	49
Female	1,309	51

Table 2. Percentage of drivers who reported using various potentially driver impairing medications within the past 30 days overall and in relation to age, United States, July–August 2021.

Age Group	Antihistamines and/or cough medicines (%)	Antidepressants (%)	Rx pain medications (%)	Muscle relaxants (%)	Sleep aids, barbiturates, or benzodiazepines (%)	Amphetamines (%)	≥1 of these medications (%)	≥2 of these medications (%)	≥3 of these medications (%)
All drivers	33.5	13.1	13.1	7.0	7.6	3.2	49.6	19.0	6.2
16–18	33.4	9.0	8.1	1.6	3.2	4.0	42.6	10.3	2.5
19–24	33.6	11.4	16.2	3.3	6.7	2.9	45.4	21.5	4.7
25–39	31.6	10.1	10.6	5.7	4.9	5.0	45.4	14.4	5.1
40–64	36.4	16.2	12.9	8.8	9.6	2.6	53.8	23.0	7.4
≥65	29.6	11.5	16.3	6.5	7.4	2.0	48.0	16.1	5.7

Base: U.S. residents ages 16+ with a driver's license who reported driving in past 30 days, weighted to reflect U.S. population.
Red numbers indicate significantly different across age groups based on unadjusted statistical analysis (corrected Pearson F test).

This study conducted descriptive analyses using cross-tabulations to examine the public's use of PDI medications and likelihood of driving shortly after using these medications. Statistical significance of bivariate associations was assessed using an F test corrected for the survey sample design (Rao & Scott, 1984). The association of driving after using PDI medications with warnings from healthcare providers about the medications' ability to impair driving was assessed using Poisson regression to adjust for age, gender, Census region, urban versus rural place of residence, and frequency of driving. This analysis excluded data from respondents who answered "I don't remember" or refused to answer one or more of the relevant questions. Statistical significance was assessed at a 95% confidence level. All analyses were conducted using weighted data.

Results

Approximately half of the drivers reported using one or more of the PDI medications examined in the past 30 days, while nearly one in five reported using two or more medications (Table 2). Antihistamines and/or cough medicines were the most commonly used type of medication, reportedly taken by one third of drivers, more than double the proportions for the next most frequently used medications—antidepressants and prescription pain medications. Few drivers reported using muscle relaxants; sleep aids, barbiturates, or benzodiazepines; and amphetamines. Reported medication use differed significantly across age groups for two of the included medication types: use of prescription pain medications was highest among drivers ages 19–24 and 65 and up, while use of muscle relaxants was highest among drivers ages 40–64.

Nearly half of drivers who reported using one or more PDI medications reported driving after using at least one medication, with higher proportions among those taking two or more medications (63.3%) or three or more medications (70.8%) (Table 3). Nearly three quarters of drivers who reported amphetamine use reported driving within two hours of using it in the past month. Antidepressants had the second highest proportion of users who reported driving within two hours of use, followed by antihistamines and/or cough medicines, and prescription pain medications. Driving within two hours of use did not vary significantly by age group for all medication types except antihistamines and/or cough medicines.

Drivers who reported taking a PDI medication and indicated that the medication was prescribed to them were asked whether a healthcare provider had spoken with them about possible side effects and potential impacts on driving. The proportion that received a warning was lowest for antihistamines and/or cough medicines and highest for sleep aids, barbiturates, or benzodiazepines (Table 4). Amphetamines were the only type of medication for which the prevalence of receiving a warning varied significantly by driver age.

Table 3. Percentage of drivers who reported driving within 2 hours of using various potentially driver impairing medications within the past 30 days, United States, July–August 2021.

Age Group	Antihistamines and/or cough medicines (%)	Antidepressants (%)	Rx pain medications (%)	Muscle relaxants (%)	Sleep aids, barbiturates, or benzodiazepines (%)	Amphetamines (%)	≥1 of these medications (%)	≥2 of these medications* (%)	≥3 of these medications* (%)
All drivers	38.9	60.8	32.6	21.6	9.2	73.1	45.0	63.3	70.8
16–18	32.8	55.7	29.3	27.6	4.7	56.4	40.9	56.6	46.1
19–24	31.8	52.8	20.1	0.0	0.0	1.0	39.3	54.1	83.6
25–39	36.5	74.7	28.4	20.3	13.8	80.7	44.8	69.6	70.0
40–64	43.1	60.9	40.5	22.7	8.4	61.9	48.6	64.2	72.7
≥65	34.4	49.3	26.6	22.8	10.9	74.3	38.9	58.2	64.6

Base: U.S. residents ages 16+ with a driver's license who reported driving and taking the corresponding medicine (or number of medicines) in past 30 days, weighted to reflect U.S. population.
Red numbers indicate significantly different across age groups based on unadjusted statistical analysis (corrected Pearson F test).
Blue shading indicates small sample size (<100).
*Not necessarily at the same time.

Table 4. Percentage of prescription medication users who were warned by a healthcare provider that the medication had the potential to impair their driving, United States, July–August 2021.

Age Group	Antihistamines and/or cough medicines (%)	Antidepressants (%)	Rx pain medications (%)	Muscle relaxants (%)	Sleep aids, barbiturates, or benzodiazepines (%)	Amphetamines (%)
All drivers	50.2	58.2	76.6	75.5	79.7	64.6
16–18	58.0	77.5	51.1	90.1	100.0	38.9
19–24	27.4	54.7	52.2	100.0	0.0	0.0
25–39	42.4	56.6	75.8	93.8	89.7	54.5
40–64	57.5	61.0	82.8	73.3	78.4	81.6
≥65	45.5	49.5	72.0	59.1	83.8	91.6

Base: U.S. residents ages 16+ with a driver's license who reported driving and taking the corresponding medication, which was prescribed to them, in past 30 days, weighted to reflect U.S. population.
Red numbers indicate significantly different across age groups based on unadjusted statistical analysis (corrected Pearson F test).
Blue shading indicates small sample size (<100).

Table 5. Incidence rate ratios indicating prevalence of driving within 2 hours of using various prescription medications among drivers who were warned by a healthcare provider about potential driving impairment versus among those who were not, adjusted for demographic characteristics.

	Incidence Rate Ratio*	95% Confidence Interval	n
Antihistamines and/or cough medications	0.72	(0.51–1.01)	248
Antidepressants	0.77	(0.64–0.93)	272
Rx pain medications	0.54	(0.36–0.80)	210
Muscle relaxants	0.50	(0.26–0.96)	136
Sleep aids, barbiturates, or benzodiazepines	1.44	(0.29–7.16)	128
Amphetamines	0.89	(0.65–1.21)	58
All medications aggregated	0.82	(0.70–0.95)	779

Base: U.S. residents ages 16+ with a driver's license who reported using the corresponding medication, which was prescribed to them in past 30 days, weighted to reflect U.S. population.
*Incidence rate ratios adjusted for age, gender, education, Census region, metro/non-metro, and frequency of driving.

Table 5 contains the ratios of the adjusted proportions of drivers who reported driving within two hours of taking a prescribed medication among those who reported receiving a healthcare provider's warning about potential medication impacts on driving relative to those who did not. Overall, drivers who received a warning about a medication were 18% less likely to report having driven within two hours of taking that medication (Incidence Rate Ratio or IRR = 0.82). Drivers who were provided with a warning about a prescribed medication were significantly less likely to have driven after use for all medications except sleep aids, barbiturates, or benzodiazepines, and amphetamines.

Discussion

Our results indicate that approximately half of licensed drivers reported taking one or more PDI medications in the past month, with antihistamines and/or cough medicines—many of which are available without a prescription—the most commonly used type. Nearly half of drivers who took at least one prescribed PDI medication reported driving within two hours of a dose, and the proportions were higher among those who took multiple PDI medications. The proportion of drivers that reported driving after use was highest for those who reported amphetamine use. Between 20% and 50% of drivers who took each of the types of PDI medications did not report having received a warning from a healthcare provider regarding its possible impacts on driving. Those who did receive a warning were 18% less likely to report having driven after use. This highlights the potential for healthcare providers' counseling to reduce medication-impaired driving but suggests current practices of providing this important information are not adequate. Providers can also reduce prescribing PDI medications, particularly those with alternatives that are less impairing or non-impairing, and especially for older drivers, among whom these medications may have even greater effects due to interactions with other medications or chronic health conditions or to reduced ability to metabolize the drugs (2019 American Geriatrics Society Beers Criteria® Update Expert Panel, 2019).

Other studies have also attempted to quantify the prevalence of PDI medication use among various populations of drivers using a variety of methods. In one study of drivers stopped on the road and asked to provide oral fluid and blood samples for research purposes, 13% of daytime drivers and 9% of nighttime drivers had one or more PDI medication detectable in their oral fluid or blood. Opioids and their metabolites were the most prevalent medication, detected in 5% of daytime drivers and 4% of nighttime drivers (Kelley-Baker, Berning, et al., 2017). Drivers were also asked about PDI medication use within the past two days, and nearly 20% reported using at least one, with sedatives most prevalent (Kelley-Baker, Waehrer, et al., 2017). Data from the Centers for Disease Control and Prevention indicate that from 2015 to 2018, 36% of people ages 18–44, 67% of people ages 45–64, and 89% of people ages 65 and older reported taking at least one prescription drug—including those that are not PDI—in the past 30 days. Similarly, 10% of those ages 18–44, 37% of those ages 45–64, and 66% of those ages 65 and older reported taking three or more prescription drugs (National Center for Health Statistics, 2019, p. 39).

We identified scant research on warnings about PDI medications from healthcare providers. In the roadside study of drivers cited above, the proportion that reported receiving a provider warning was highest among users of prescribed sedatives (79%) and prescription pain medications (77%) and lowest among users of prescribed stimulants (48%) and antidepressants (54%) (Pollini et al., 2017). While their findings are only directly comparable with some of our results, the proportions are similar to those from our survey as is the pattern across different types of medications. In a 2007 survey of drivers ages 55 and older in Alabama, only 18% of those taking one or more PDI medications reported having received a warning from a healthcare professional about possible medication impacts on driving; even among those taking five or more PDI medications, the prevalence was still only 19% (MacLennan et al., 2009). In a 2018 survey

of Japanese drivers ages 20–79 taking a prescribed medication, 50% reported having received a warning from a healthcare professional about potential impairing effects on driving (Fukuda et al., 2020). Direct expressions from health professionals, such as "Please do not drive," were associated with high risk perception among participants, while slightly indirect messages, such as "Please practice caution," were most common (Fukuda et al., 2020). The percentages of drivers who reported having received a warning from a healthcare provider about the ability of prescribed drug to impair driving ability were considerably higher in the current study than in most of these other studies. It is unclear, however, whether these apparent differences reflect changes in healthcare providers' counseling of patients or whether it is attributable to study-specific factors such as study populations or medications examined.

A recent review of countermeasures against prescription and over-the-counter drug-impaired driving identified strategies to increase and improve patient counseling regarding PDI medications, including strict state policy requiring pharmacists to counsel patients and prompts integrated into pharmacy software (Smith et al., 2018). The review also identified strategies to reduce the prescription and use of PDI medications, including rescheduling drugs with acceptable substitutes available and placing over-the-counter PDI medications behind the counter at pharmacies. Others have observed that patient education alone may not be sufficient to reduce medication-impaired driving, as is often the case for attempts to change behavior through education (Fischer et al., 2017).

This study is subject to several limitations. Survey data is subject to bias due to issues with sampling or non-response, and differences in respondents' recall of past events, misinterpretation of the survey questions and response options, and deliberate misreporting. For example, respondents may have inadvertently reported taking one type of PDI medication when they actually took another or intentionally declined to report driving after medication use. In addition, the survey did not cover other sources of information about medication impacts on driving beyond healthcare providers, which may also influence a drivers' likelihood of driving after PDI medication use.

Further, while it may be alarming that nearly half of drivers who reported any PDI medication use reported driving within two hours after taking a dose in the past month, these drivers were not necessarily impaired. As the term implies, PDI medications have the potential to impair driving but effects in individuals vary in relation to many factors, including the medical condition a given medication treats and any comorbidities. This study focused on commonly used PDI prescription and over-the-counter medications (Kelley-Baker, Berning, et al., 2017). There are many other PDI medications, and many medical conditions can impair driving, and some PDI medications may improve driver safety by reducing symptoms. Amphetamines, for example, may impair driving if abused (e.g., Blandino et al., 2022; Gjerde et al., 2015); however, they may actually improve driving when used as directed to treat certain conditions such as attention deficit/hyperactivity disorder or narcolepsy (e.g., Blandino et al., 2022; Kay et al., 2009; Strand et al., 2016). Similarly, some antihistamines are much more likely than others to impair driving (Verster & Volkerts, 2004), and medications such as nasal steroid sprays used to treat allergy symptoms (e.g., Flonase) might be misreported as antihistamines but are unlikely to impair driving at all (e.g., Sur & Scandale, 2010; Weiner et al., 1998). Furthermore, for many medications, there is a lack of definitive research establishing that the associated increase in crash risk is due to the effects of the medication and not the associated medical condition (e.g., Brubacher et al., 2021).

The results of this study indicate that many drivers have recently taken PDI medications and those who use PDI prescription drugs are less likely to drive after using them if a healthcare provider talks to them about the potential of the drugs to impair their ability to drive safely. However, between 20% and 50% of drivers using various types of prescription drugs report that no healthcare provider had spoken with them about the drug's possible impact on driving. It is important for healthcare providers to properly counsel their patients about the potential of drugs they prescribe to impact the ability to drive safely.

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