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# Alcohol-impaired driving among adults—USA, 2014–2018

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Received 3 August 2021  
Accepted 16 October 2021  
Published Online First  
5 November 2021

## ABSTRACT

**Introduction** Alcohol-impaired driving (AID) crashes accounted for 10 511 deaths in the USA in 2018, or 29% of all motor vehicle-related crash deaths. This study describes self-reported AID in the USA during 2014, 2016 and 2018 and determines AID-related demographic and behavioural characteristics.

**Methods** Data were from the nationally representative Behavioral Risk Factor Surveillance System. Adults were asked 'During the past 30 days, how many times have you driven when you have had perhaps too much to drink?' AID prevalence, episode counts and rates per 1000 population were estimated using annualised individual AID episodes and weighted survey population estimates. Results were stratified by characteristics including gender, binge drinking, seatbelt use and healthcare engagement.

**Results** Nationally, 1.7% of adults engaged in AID during the preceding 30 days in 2014, 2.1% in 2016 and 1.7% in 2018. Estimated annual number of AID episodes varied across year (2014: 111 million, 2016: 186 million, 2018: 147 million) and represented 3.7 million, 4.9 million and 4.0 million adults, respectively. Corresponding yearly episode rates (95% CIs) were 452 (412–492) in 2014, 741 (676–806) in 2016 and 574 (491–657) in 2018 per 1000 population. Among those reporting AID in 2018, 80% were men, 86% reported binge drinking, 47% did not always use seatbelts and 60% saw physicians for routine check-ups within the past year.

**Conclusions** Although AID episodes declined from 2016 to 2018, AID was still prevalent and more common among men and those who binge drink. Most reporting AID received routine healthcare. Proven AID-reducing strategies exist.

that a renewed effort to confront and reduce AID is needed.<sup>7–9</sup>

Efforts to reduce AID in the past have been successful. Between 1982 and 1997, there was a 43% decrease in the proportion of alcohol-impaired drivers involved in fatal crashes.<sup>10</sup> This corresponded with a time when many US states implemented laws making it illegal to drive with a blood alcohol concentration of 0.08 g/dL or higher and grassroots organisations like Mothers Against Drunk Driving (MADD) were formed to promote policies to reduce AID.<sup>11</sup> Strategies addressing AID have the potential to substantially reduce motor vehicle crashes and deaths.<sup>12</sup> Effective strategies to prevent AID exist, including drunk driving laws, sobriety checkpoints, ignition interlocks, mass media campaigns and increasing alcohol taxes.<sup>9 13</sup> However, implementation of these strategies varies across states and communities.<sup>14–16</sup>

The total number of self-reported AID episodes among adults in the USA per year has been estimated to range from 110 to 160 million during 1993 through 2012 with no clear decrease over time.<sup>17 18</sup> In 2012, an estimated 1.8% of adults in the USA reported at least one AID episode during the previous 30 days, which translated to 4.2 million adults engaging in 121 million annual AID episodes (a rate of 505 per 1000 population).<sup>18</sup> An update to these estimates is needed to illustrate the continued call for universal implementation of prevention efforts using both established and promising strategies.

This study estimated the annual prevalence, number of episodes and rates of AID among adults in the USA during 2014, 2016 and 2018. We also examined how these outcomes varied by certain demographic and behavioural characteristics.

## INTRODUCTION

Motor vehicle crashes in the USA are a significant public health issue that causes death and injury, burden health systems and have negative economic impacts. In 2018, traffic crashes on public roadways in the USA caused 36 560 motor vehicle-related deaths<sup>1</sup> and an additional 2.7 million non-fatal emergency department visits.<sup>2</sup> These statistics include drivers, passengers and non-occupants such as pedestrians and bicyclists. Alcohol-impaired driving (AID) is a major risk factor for traffic crashes. Of the 36 560 motor vehicle crash deaths that occurred in 2018, 29% (n=10 511) involved an alcohol-impaired driver.<sup>1</sup> Both the yearly number of deaths and the number that involved an alcohol-impaired driver have either held steady or increased annually from 2014 through 2018,<sup>1 3–6</sup> suggesting

## METHODS

### Data set

Data were from the 2014, 2016 and 2018 Behavioral Risk Factor Surveillance System (BRFSS) surveys. BRFSS is a nationally representative, cross-sectional, ongoing, random-digit-dialled telephone survey. State health departments in collaboration with the US Centers for Disease Control and Prevention use trained interviewers to collect reported health-related behaviours from a representative sample of civilian, non-institutionalised adults aged  $\geq 18$  years residing in any US state or territory. BRFSS participants are recruited via landline and cellular telephone numbers. All BRFSS questionnaires and data are available online.<sup>19</sup> Because the BRFSS is a surveillance system, the Centers for



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**To cite:** Barry V, Schumacher A, Sauber-Schatz E. *Inj Prev* 2022;**28**:211–217.

Disease Control and Prevention's Institutional Review Board has determined that the BRFSS is exempt from its review.

Nearly half a million adults completed the interview in each year (456 664 in 2014; 486 303 in 2016 and 437 436 in 2018). We limited the analysis to adults residing in the 50 US states or the District of Columbia that had information recorded for the AID survey question. The median response rates for the<sup>19</sup>BRFSS 2014, 2016 and 2018 surveys were 47% (49% landline, 41% cell phone), 47% (48% landline, 46% cell phone) and 50% (53% landline, 43% cell phone), respectively.

### Survey questions

In even-numbered years, BRFSS respondents who reported having had at least one alcoholic beverage in the past 30 days were asked 'During the past 30 days, how many times have you driven when you have had perhaps too much to drink?' Responses were recorded as whole numbers  $\geq 0$  and were considered to be the number of AID episodes. Those who reported no alcohol in the past 30 days were coded as having zero AID episodes. We created a binary variable for AID (yes/no) categorising people reporting zero episodes as 'no' and those with  $\geq 1$  episodes as 'yes'.

Respondent demographic characteristics collected included age in years at the time of the survey, race and ethnicity, highest level of education obtained, current marital status and household income. Reported behavioural characteristics collected included binge drinking and seatbelt use. Binge drinking was defined as having on at least one occasion five or more drinks for men and four or more drinks for women during the past 30 days. Seatbelt use was ascertained by asking 'How often do you use seatbelts when you drive or ride in a car? Would you say—always, nearly always, sometimes, seldom or never?' Responses were categorised into a binary variable: always versus less than always. AID prevalence, episodes and rates were described across demographic and behavioural characteristic categories. Healthcare utilisation was assessed to estimate the percentage of adults who engaged in AID who also had recently accessed healthcare for a routine check-up. This was measured by the question 'About how long has it been since you last visited a doctor for a routine check-up? (A routine check-up is a general physical examination, not an examination for a specific injury, illness or condition.)' Answers were recorded as being within the past 12 months, 2 years, 5 years or  $\geq 5$  years ago.

### Statistical analyses

Analyses were carried out separately for each year. Results were weighted using the BRFSS-provided weights, cluster and stratification variables to make results nationally representative. National AID 30-day prevalence was estimated using the percentage of respondents who reported any AID in the previous 30 days. Annual estimates of AID episodes per respondent were calculated by multiplying the respondent's reported episodes in the preceding 30 days by 12. For the 28 respondents (8 in 2014, 6 in 2016 and 14 in 2018) who reported more than one AID episode daily, annualised AID episodes were truncated at 360 (which is equivalent to 30 AID episodes per month). Annual rates of AID episodes and corresponding 95% CIs were then calculated by dividing the annual number of AID episodes by the respective weighted population estimate from BRFSS for the respective year (2014, 2016 or 2018). Each rate's SE was used to calculate CIs and was approximated using Taylor series linearisation (also called the 'delta method').<sup>20</sup> Annual AID episode rates were reported per 1000 population. National AID

prevalence, number of episodes and rates per 1000 population were stratified by demographic and behavioural characteristics. Data analysis was completed using the complex sampling survey procedures in SAS V.9.4.

## RESULTS

### Participants

The analysis included over 1 million respondents from the 50 US states and District of Columbia who had non-missing AID information (426 910 in 2014, 448 062 in 2016 and 405 074 in 2018).

### AID prevalence, number of episodes and rates

Nationally, 1.7%, 2.1% and 1.7% of adults in the years 2014, 2016 and 2018 reported having engaged in AID during the previous 30 days (tables 1–3).

On average, 57% of those who reported AID indicated one episode in the past 30 days, 24% indicated two episodes, 12% indicated 3–5 episodes and 7% reported that they had driven impaired  $\geq 6$  times over the past 30 days (data not shown). The estimated national annual number of AID episodes varied across years (2014: 111 million, 2016: 186 million, 2018: 147 million) and represented 3.7 million, 4.9 million and 4.0 million adults, respectively. The rate of AID episodes per 1000 population was highest in the year 2016 (rate=741, 95% CI 676 to 806) compared with 2014 (rate=452, 95% CI 412 to 492) and 2018 (rate=574, 95% CI 491 to 657).

### AID by demographic and behavioural characteristics

In each year, AID was most common among men, people who binge drink and people who did not always use a seatbelt (tables 1–3). Men accounted for an overwhelming percentage of AID episodes (80% in 2014, 70% in 2016 and 80% in 2018; data not shown). Similarly, people who engaged in recent binge drinking accounted for 85%, 80% and 86% of all AID episodes in 2014, 2016 and 2018, respectively (data not shown). Those who reported more binge drinking reported more AID episodes. For example, in 2014, the 4% of adults who reported binge drinking at least four times per month accounted for 58% of AID episodes. This was true in 2016 and 2018 where 4% and 5% of those who reported binge drinking at least four times a month accounted for 55% and 65% of AID episodes in each respective year. People who reported not always wearing a seatbelt had an annual AID rate four times higher in 2014 and 2016 and six times higher in 2018 than those who always wore a seatbelt.

Reported AID varied by other characteristics as well. Regardless of gender and year, AID rates were highest among people aged 21–34 years and then decreased with age. Married adults, particularly married male adults, tended to have lower AID rates compared with those who were coupled, previously married or never married. There were no significant differences in AID rates by race/ethnicity, education level or household income no matter the year or gender. Among those engaging in AID, 60% reported seeing a doctor for a routine check-up within the past year (data not shown). Another 16% had a check-up between 1 and 2 years prior (data not shown). Among respondents who reported recent binge drinking, 62% reported a routine check-up within the past year (data not shown). Finally, among those reporting recent AID and recent binge drinking, 57% had a check-up within the past year (data not shown).

**Table 1** Percentage of adults reporting recent alcohol-impaired driving, annual episodes and episode rates per 1000 population\*: 2014

	Overall				Men				Women			
	%	Number of episodes	Rate	95% CI	%	Number of episodes	Rate	95% CI	%	Number of episodes	Rate	95% CI
<b>Total</b>	1.7	110944086	452	412 to 492	2.6	88420455	740	666 to 814	0.8	22523631	179	144 to 213
<b>Age group (years)</b>												
18–20	1.1	3870671	267	151 to 383	1.6	2926456	392	182 to 602	0.5	944215	134	45 to 224
21–24	3.9	15863928	921	670 to 1172	5.5	12024610	1356	902 to 1810	2.1	3839318	459	268 to 651
25–34	2.6	32297921	760	622 to 898	3.9	25987040	1210	949 to 1471	1.3	6310881	301	215 to 386
35–54	1.7	34657343	413	362 to 464	2.7	28680700	690	590 to 790	0.7	5976643	141	118 to 164
≥55	0.9	24254224	277	223 to 332	1.5	18801649	468	385 to 552	0.3	5452574	115	43 to 187
<b>Race/ethnicity</b>												
White, non-Hispanic	1.7	72045438	461	417 to 505	2.8	58771144	775	688 to 862	0.8	13274294	165	142 to 188
Black, non-Hispanic	1.6	14127919	496	372 to 619	2.5	10606062	814	564 to 1063	0.9	3521857	228	138 to 317
Hispanic	1.6	16224292	434	305 to 562	2.6	13438206	716	473 to 959	0.7	2786086	150	69 to 230
Other, non-Hispanic	1.1	4885354	307	93 to 521	1.8	2760638	349	224 to 475	0.4	2124715	265	1 to 672
Multiracial, non-Hispanic	1.5	1918853	610	236 to 983	2.2	1608848	1061	293 to 1829	0.9	310004	190	84 to 296
<b>Education</b>												
<High school	1.0	17042593	480	324 to 637	1.9	15219215	855	551 to 1160	0.2	1823378	103	32 to 174
High school	1.5	29612698	429	359 to 498	2.4	25090855	716	585 to 847	0.6	4521843	133	89 to 177
Some college	1.8	33684906	448	388 to 508	3.0	26794425	776	654 to 897	0.8	6890482	170	129 to 210
College	2.1	30583379	486	411 to 561	3.0	21295451	694	589 to 798	1.2	9287929	288	180 to 395
<b>Marital status</b>												
Married	1.1	35452489	284	241 to 326	1.8	28181688	448	384 to 511	0.5	7270801	117	61 to 174
Coupled	2.4	7665211	755	460 to 1049	3.8	6839151	1325	748 to 1903	0.9	826060	165	91 to 239
Previously married	1.5	24394672	494	404 to 584	2.9	18978371	1032	805 to 1258	0.6	5416300	175	123 to 227
Never	2.8	42212452	718	612 to 824	3.9	33324492	1047	860 to 1234	1.6	8887961	330	257 to 402
<b>Household income</b>												
<US\$20k	1.2	17813460	411	302 to 521	2.1	13653919	740	500 to 980	0.6	4159541	167	98 to 237
US\$20k–<US\$35k	1.6	20276949	477	371 to 584	2.5	16523236	819	601 to 1036	0.8	3753713	168	116 to 221
US\$35k–<US\$50k	1.8	15079802	530	372 to 688	2.7	11231515	779	568 to 990	0.8	3848287	274	38 to 510
US\$50k–<US\$75k	2.0	15917264	517	412 to 622	3.0	13640932	842	645 to 1038	0.8	2276332	156	121 to 192
≥US\$75k	2.2	33969359	541	474 to 608	3.2	27453632	806	690 to 922	1.0	6515727	227	176 to 278
<b>Binge drink</b>												
No	0.8	18001485	225	169 to 281	1.2	13270054	333	227 to 439	0.4	4731431	118	83 to 152
1 x month	4.7	10983180	830	694 to 966	5.8	8349801	1071	857 to 1286	3.2	2633378	484	360 to 608
2–3 x month	7.6	16584332	1550	1340 to 1760	9.3	12981570	1901	1611 to 2191	4.8	3602762	931	654 to 1208
≥4 x month	13.9	62999896	5304	4597 to 6011	15.4	51898356	6090	5215 to 6965	10.1	11101539	3308	2142 to 4474
<b>Seatbelt use</b>												
<Always	3.6	40301630	1368	1117 to 1620	4.9	34265292	1874	1517 to 2230	1.6	6036339	541	223 to 859
Always	1.4	70078219	360	327 to 393	2.2	53670382	595	529 to 661	0.7	16407837	157	134 to 181

\*Data are self-reported from US-based 2014 Behavioral Risk Factor Surveillance System. Results weighted by survey population estimates.

## DISCUSSION AND PUBLIC HEALTH IMPLICATION

AID continues to be prevalent in the USA, and the majority of AID episodes during 2014–2018 occurred among men and those who engaged in recent binge drinking. AID prevalence and episode rates were also higher among those aged 21–34 years compared with older ages and among those who did not always wear seatbelts compared with those who always wear seatbelts.

These 2014, 2016 and 2018 BRFSS results are similar to previously published 2012 BRFSS results. In 2012, 2014, 2016 and 2018, 1.8%, 1.7%, 2.1% and 1.7% of adults engaged in AID. This translated to 4.2 million adults, 3.7 million adults, 4.9 million adults and 4.0 million adults engaging in 121 million annual AID episodes, 111 million episodes, 186 million episodes and 147 million episodes during each of the 4 years.<sup>18</sup> Rates across the 4 years were 505, 452, 741 and 574 per 1000 population.<sup>18</sup> Similar to 2014–2018, in 2012, men accounted for 80%

of AID episodes and respondents who reported binge drinking accounted for 85% of episodes.<sup>18</sup> Taken all together, there were slight differences in AID across these years with a peak in AID prevalence and number of episodes in 2016, but no clear trend across the years 2012, 2014, 2016 and 2018. This roughly correlates with national annual motor vehicle crash death data that suggest crash deaths and the percentage of them related to AID have remained relatively constant over the years 2012–2018.<sup>13–6</sup> It is unclear what might be behind the peak in AID in 2016. Changes in AID can be influenced by changing economic and societal factors (like economic recessions). Preliminary data show an increase in AID-related crash deaths in 2020 (during the COVID-19 pandemic), which might signify an associated increase in 2020 BRFSS AID rates.<sup>21</sup>

AID-related deaths are preventable via proven strategies. To reduce AID, states and communities can consider implementing

**Table 2** Percentage of adults reporting recent alcohol-impaired driving, annual episodes and episode rates per 1000 population\*: 2016

	Overall				Men				Women			
	%	Number of episodes	Rate	95% CI	%	Number of episodes	Rate	95% CI	%	Number of episodes	Rate	95% CI
<b>Total</b>	2.1	186204686	741	676 to 806	3.0	130116241	1064	948 to 1181	1.2	55873419	434	371 to 496
<b>Age group (years)</b>												
18–20	1.5	9732889	695	358 to 1032	2.1	7645790	1012	416 to 1607	0.8	2087099	324	104 to 544
21–24	3.6	17391530	979	797 to 1160	4.6	10424369	1186	938 to 1435	2.6	6967162	775	512 to 1039
25–34	3.2	47678014	1092	866 to 1318	4.2	32982904	1492	1087 to 1897	2.1	14480084	672	480 to 864
35–54	2.4	74940459	897	771 to 1022	3.4	52640447	1272	1058 to 1485	1.4	22300012	529	395 to 662
≥55	1.1	36461793	396	338 to 454	1.8	26422731	623	516 to 730	0.5	10039062	202	145 to 259
<b>Race/ethnicity</b>												
White, non-Hispanic	2.2	106414023	677	606 to 747	3.2	76409861	999	868 to 1131	1.2	30004161	371	314 to 429
Black, non-Hispanic	2.0	23723046	807	572 to 1043	2.9	15630286	1171	717 to 1625	1.4	7877734	491	285 to 698
Hispanic	2.0	34729369	883	684 to 1081	2.9	25022876	1276	934 to 1618	1.2	9706493	492	288 to 696
Other, non-Hispanic	1.6	14276080	853	556 to 1149	2.0	8207226	978	548 to 1408	1.2	6068854	727	318 to 1135
Multiracial, non-Hispanic	1.8	1994266	551	322 to 780	1.9	1230834	668	292 to 1043	1.7	763432	431	172 to 690
<b>Education</b>												
<High school	1.7	36496600	1057	735 to 1378	2.8	30607658	1749	1150 to 2348	0.5	5673917	333	116 to 550
High school	1.8	49724881	706	593 to 818	2.7	38182472	1064	864 to 1265	0.9	11542409	334	237 to 430
Some college	2.1	50724269	652	565 to 738	3.0	31345970	873	734 to 1012	1.4	19378299	462	355 to 569
College	2.6	48980090	729	639 to 819	3.4	29727643	918	790 to 1047	1.8	19252446	553	427 to 680
<b>Marital status</b>												
Married	1.6	66830645	529	459 to 598	2.3	47397890	749	635 to 864	0.8	19432755	308	229 to 386
Coupled	2.8	9931284	829	614 to 1045	3.7	6201015	1027	738 to 1317	1.9	3730270	628	308 to 948
Previously married	1.9	39176010	775	635 to 915	3.3	25715149	1346	1047 to 1644	1.1	13460861	428	294 to 561
Never	3.3	67647378	1120	933 to 1307	4.1	49480688	1504	1180 to 1829	2.2	18166690	661	523 to 798
<b>Household income</b>												
<US\$20k	1.6	30520443	791	558 to 1024	2.4	20237502	1238	747 to 1730	0.9	10282941	462	280 to 645
US\$20k–<US\$35k	1.8	30842308	748	558 to 938	2.7	22791749	1175	800 to 1551	1.1	8050559	368	235 to 502
US\$35k–<US\$50k	2.0	18326261	643	515 to 772	2.8	13119633	905	685 to 1126	1.2	5206628	372	243 to 502
US\$50k–<US\$75k	2.5	22830730	725	595 to 854	3.5	17164445	1050	846 to 1254	1.4	5666285	374	218 to 530
≥US\$75k	2.9	64821319	938	817 to 1060	3.7	44076553	1170	990 to 1350	1.8	20744766	661	502 to 819
<b>Binge drink</b>												
No	1.1	34434557	408	336 to 480	1.4	21202088	506	389 to 624	0.8	13232469	311	229 to 394
1 x month	5.2	16405817	1156	851 to 1461	5.9	11434318	1393	904 to 1882	4.2	4971500	831	556 to 1105
2–3 x month	9.4	26721680	2271	1795 to 2748	11.1	20158394	2704	1985 to 3423	6.4	6563287	1523	1136 to 1909
≥4 x month	15.0	90232145	6754	5872 to 7636	16.1	69375465	7518	6365 to 8670	12.5	20641654	5002	3774 to 6231
<b>Seatbelt use</b>												
<Always	4.1	52356006	1756	1451 to 2061	5.2	42519305	2295	1843 to 2746	2.4	9621676	853	537 to 1168
Always	1.6	95464266	471	420 to 523	2.4	68994424	731	629 to 833	1.0	26469842	245	208 to 282

\*Data are self-reported from US-based 2016 Behavioral Risk Factor Surveillance System. Results weighted by survey population estimates.

or scaling up effective interventions such as expanding the use of publicised sobriety check points; enforcing blood alcohol concentration (BAC) laws and minimum legal drinking age laws; requiring ignition interlocks for all persons convicted of AID and increasing alcohol taxes.<sup>22</sup> Because a significant proportion of adults engaging in AID also does not always wear a seatbelt, primary seatbelt laws that cover all passengers might decrease AID-related crash mortality. Increasing seatbelt use among those engaging in AID is particularly important because alcohol not only increases the risk of a crash but also increases the risk of injury or death in a crash.<sup>23–25</sup>

Promising strategies that have shown effectiveness in other countries, when implemented, could decrease AID and subsequent crash deaths. The National Transportation Safety Board recommended lowering the BAC limit in the USA for drivers from 0.08 to 0.05 to reduce crashes, injuries and deaths caused by AID.<sup>26</sup> A meta-analysis estimated that 1790 lives would be saved each year if all US states adopted a 0.05 BAC limit.<sup>27</sup> Most

high-income nations have already enacted a 0.05 illegal BAC limit, and these nations have lower motor vehicle crash fatality rates than the USA.<sup>28</sup> Because our results showed that AID rates were highest among people aged 21–24 years (followed closely by people aged 25–34 years), future strategies that work among young adults are warranted. Although consuming alcohol is generally illegal in the USA for anyone under the age of 21 years, 1.1%, 1.5% and 1.5% of people aged 18–20 years reported engaging in AID during 2014, 2016 and 2018, suggesting the need to support strategies that prevent alcohol use and AID among young adults. It is unclear what effects ride share companies (eg, Uber and Lyft) might have on AID, and this topic deserves evaluation. Studies have shown mixed results with one showing that rideshare operations decreased alcohol-involved crashes only in certain cities<sup>29</sup> while another showed no impact of rideshare services on alcohol-specific crash deaths.<sup>30</sup>

We found that three-quarters of people who engaged in AID attended a routine check-up with a doctor within the previous 2

**Table 3** Percentage of adults reporting recent alcohol-impaired driving, annual episodes and episode rates per 1000 population\*: 2018

	Overall					Men					Women					
	%	Number of episodes	Rate	95%CI	%	Number of episodes	Rate	95%CI	%	Number of episodes	Rate	95%CI	%	Number of episodes	Rate	95%CI
<b>Total</b>	1.7	146591009	574	491 to 657	2.5	113686940	917	753 to 1081	0.9	28691037	220	181 to 258				
<b>Age group (years)</b>																
18–20	1.5	14477319	1022	297 to 1748	2.0	9751100	1282	35 to 2528	0.9	3930733	602	19 to 1186				
21–24	3.3	16749363	965	713 to 1217	3.3	11184271	1304	824 to 1783	3.3	5467008	626	456 to 796				
25–34	2.6	37225113	838	614 to 1062	3.8	27377820	1220	807 to 1632	1.4	7857798	360	246 to 473				
35–54	1.8	50909688	611	440 to 783	2.7	42655181	1037	693 to 1381	0.9	7052808	168	137 to 200				
≥55	1.0	27229526	284	236 to 331	1.6	22718568	514	414 to 615	0.4	4382689	85	68 to 102				
<b>Race/ethnicity</b>																
White, non-Hispanic	1.8	85932814	542	459 to 626	2.6	69274351	901	737 to 1066	0.9	16598106	204	156 to 252				
Black, non-Hispanic	1.7	18627941	622	393 to 851	2.2	13422500	982	502 to 1461	1.4	4942793	305	181 to 428				
Hispanic	1.9	29834512	731	374 to 1087	2.8	25163500	1231	526 to 1936	0.8	3478034	171	107 to 236				
Other, non-Hispanic	1.0	8020174	457	267 to 647	1.4	3762475	430	298 to 562	0.6	1921479	220	50 to 389				
Multiracial, non-Hispanic	1.7	1670493	515	310 to 719	2.2	1016772	652	319 to 985	1.3	592400	352	117 to 587				
<b>Education</b>																
<High school	1.2	30740447	925	456 to 1395	1.9	26316359	1550	646 to 2453	0.4	2405344	149	35 to 264				
High school	1.6	43951782	620	446 to 794	2.2	35839378	983	662 to 1305	0.8	7937196	231	121 to 342				
Some college	1.8	33864638	429	370 to 488	2.7	24105615	663	551 to 775	1.0	9210562	217	169 to 265				
College	2.0	37293548	524	446 to 601	2.9	26737839	795	654 to 936	1.2	9137935	244	195 to 293				
<b>Marital status</b>																
Married	1.3	50168793	391	302 to 481	2.0	42694561	667	491 to 843	0.5	6533846	102	76 to 129				
Coupled	2.7	11029664	928	592 to 1263	3.6	7582307	1259	694 to 1825	1.8	2784531	476	190 to 763				
Previously married	1.5	36284321	718	422 to 1013	2.8	29350707	1533	765 to 2300	0.7	5585434	179	128 to 229				
Never	2.6	47960975	765	626 to 904	3.1	33436402	987	763 to 1210	2.0	13619282	475	331 to 620				
<b>Household income</b>																
<US\$20k	1.3	24190551	680	404 to 957	1.9	15115429	1023	435 to 1610	0.8	7213592	349	151 to 546				
US\$20k–<US\$35k	1.5	26160247	658	334 to 982	2.1	21566204	1165	472 to 1857	1.0	4403642	208	147 to 270				
US\$35k – <US\$50k	1.7	15919560	593	411 to 775	2.3	13094994	972	615 to 1329	1.2	2732970	205	145 to 266				
US\$50k–<US\$75k	2.1	18136714	569	450 to 688	3.1	14868615	893	671 to 1115	1.0	3268099	215	161 to 270				
≥US\$75k	2.3	53093373	707	549 to 865	3.3	43888900	1074	792 to 1356	1.1	7672543	225	177 to 273				
<b>Binge drink</b>																
No	0.9	15808234	185	151 to 219	1.1	11396254	271	204 to 337	0.6	4405494	102	83 to 121				
1 x month	4.5	10841462	780	632 to 929	4.9	6483091	805	661 to 949	3.8	4358372	749	456 to 1043				
2–3 x month	7.6	18187536	1560	1303 to 1816	8.6	12851703	1762	1422 to 2103	5.8	5299387	1217	832 to 1601				
≥4 x month	13.6	98736945	7410	5850 to 8969	14.7	81059671	8606	6475 to 10738	10.5	13507174	3493	2374 to 4611				
<b>Seatbelt use</b>																
<Always	4.0	69568587	2315	1677 to 2953	5.1	55796732	3056	2047 to 4066	2.3	10464936	895	516 to 1273				
Always	1.4	76941398	370	327 to 413	2.1	57886887	595	507 to 683	0.8	18149230	164	143 to 186				

\* Data are self-reported from US-based 2018 Behavioral Risk Factor Surveillance System. Results weighted by survey population estimates.

years. This was also true for those who engaged in recent binge drinking and those who engaged in binge drinking and AID. Although not all people will accurately report their alcohol use, routine check-ups offer opportunities for healthcare providers to inquire about and discuss alcohol use and alcohol-related risky behaviours like AID. Alcohol screening and brief intervention (SBI), recommended by the US Preventive Services Task Force for all adults in primary care, is effective at identifying and reducing risky drinking behaviours in the primary care setting.<sup>31</sup> Alcohol SBI guidelines recommend either of two brief screens.<sup>32–33</sup> Healthcare staff can then initiate conversations on drinking limits and apply brief interventions<sup>34</sup> tailored to individual patients' motivations. The SBI intervention step is important but often overlooked. Although most people visiting their doctor are asked about alcohol consumption and binge drinking, most who report binge drinking receive no advice about how to reduce their drinking.<sup>35</sup>

The AID prevalence, episodes and rates reported here are likely underestimates of true AID prevalence in the USA for several reasons. First, BRFSS surveys only those aged  $\geq 18$  years, so AID episodes of younger drivers are not included. Second, BRFSS respondents were asked about times when they thought they had had too much to drink, and it is possible that respondents had times where they were impaired but did not recognise it. This might be particularly true for those with a history of AID.<sup>36</sup> Third, respondents could have felt a social stigma associated with AID, which caused them to underreport AID. The 2018 National Survey on Drug Use and Health reported that 8% of the US population aged  $\geq 16$  years (which is an estimated 20.5 million people) reported driving under the influence of alcohol in 2018.<sup>37</sup> This estimate is roughly five times greater than the 2018 BRFSS estimate. This is likely partly because the National Survey on Drug Use and Health included 16 and 17-year-old participants and partly because it used Audio Computer-Assisted Self-Interview software (ie, computer-administered survey) methodology, which might heighten respondents' sense of privacy and, thereby, increase their willingness to report AID compared with BRFSS's telephone survey methodology.<sup>38–39</sup> Another study similarly found that passengers who report riding with a drinking driver might provide a more accurate prevalence of AID than drivers.<sup>40</sup> Although BRFSS estimates are likely underestimates, they can help describe the magnitude of AID in the USA. Additionally, other characteristics that BRFSS collects can help describe those who report AID to facilitate prevention efforts.

There are other limitations to this analysis. First, we assumed that what people reported over the past 30 days represented their experience over the past 12 months. This might not be a reasonable assumption, especially because AID is more common during certain seasons and holidays. However, BRFSS interviews took place year-round, likely minimising any seasonal bias. Second, BRFSS only asked about the number of times a person drove after consuming too much alcohol and not the total miles travelled or length of trip time, which might be more relevant but less precise (because it might be harder for people to self-report accurately) measures of exposure. Third, the BRFSS AID question asked whether respondents perceived that they had had too much to drink before driving, and it is unclear how this might relate to crash risk or blood alcohol concentrations. In the USA, it is illegal for a driver to have a blood alcohol concentration of 0.08 g/dL or higher, except in Utah where it is illegal to have a blood alcohol concentration of 0.05 g/dL or higher. However, studies have shown that even small amounts of alcohol (eg,  $<0.08$  g/dL) can reduce motor skills and reaction

time.<sup>22–41</sup> Finally, there could be unknown differences between people who report AID and people who die or are injured in an AID-related crash.

AID during the years 2014, 2016 and 2018 was prevalent and linked to other risky behaviours including binge drinking and not always wearing seatbelts. AID is preventable. Because 29% of motor vehicle deaths in 2018 involved an alcohol-impaired driver, eliminating or reducing AID could potentially reduce crash-related deaths by 20%–30%, saving roughly 7000 to 11000 lives each year.<sup>1</sup> In addition to saving lives, the impact would also be felt by reduced injuries and burdens on healthcare and emergency response systems. States and communities can consider enacting and enforcing AID-reducing strategies at a population-level while healthcare providers in primary care settings can consider addressing AID at an individual level.

### What is already known on the subject?

- ⇒ Alcohol-impaired driving is a risk factor for traffic crashes and their resulting injuries and deaths.
- ⇒ In 2012, an estimated 1.8% of adults (or 4.2 million adults) in the USA reported alcohol-impaired driving within the past 30 days

### What this study adds

- ⇒ More recent estimates from the years 2014–2018 indicate that reported alcohol-impaired driving remains prevalent. An estimated 1.7%, 2.1% and 1.7% of adults (or 3.7 million, 4.9 million and 4.0 million adults) in the USA reported alcohol-impaired driving in 2014, 2016 and 2018.
- ⇒ Alcohol-impaired driving was more common among men and among people who binge drink.

**Contributors** Author EKSS conceived of and designed the study. Authors VB and ACS performed the statistical analyses. Author VB wrote the manuscript. Authors VB, ACS, and EKSS critically revised the manuscript. VB is the guarantor for this work.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Disclaimer** The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available in a public, open access repository. Not applicable.

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