

## BRFSS data

The BRFSS uses a multistage-cluster design based on random-digit dialing to select a representative sample from each state's non-institutionalized civilian residents aged 18 years or older. BRFSS data are directly weighted based on the probability of selection of a telephone number (including cell phones from 2009), the number of telephones in a household, the number of adults in selected households, and geographic or density stratification (Centers for Disease Control [CDC], 2019b). Median cross-state response rates for the BRFSS ranged from 65% (range 38-93) in 1990 (CDC, 1990) to a median of 45% (range 28–60) in 2012 (CDC, 2012a, 2012b). Additional information on the full survey design is available in other publications (CDC, 1990; Dwyer-Lindgren et al., 2013) and online (CDC, 2019a).

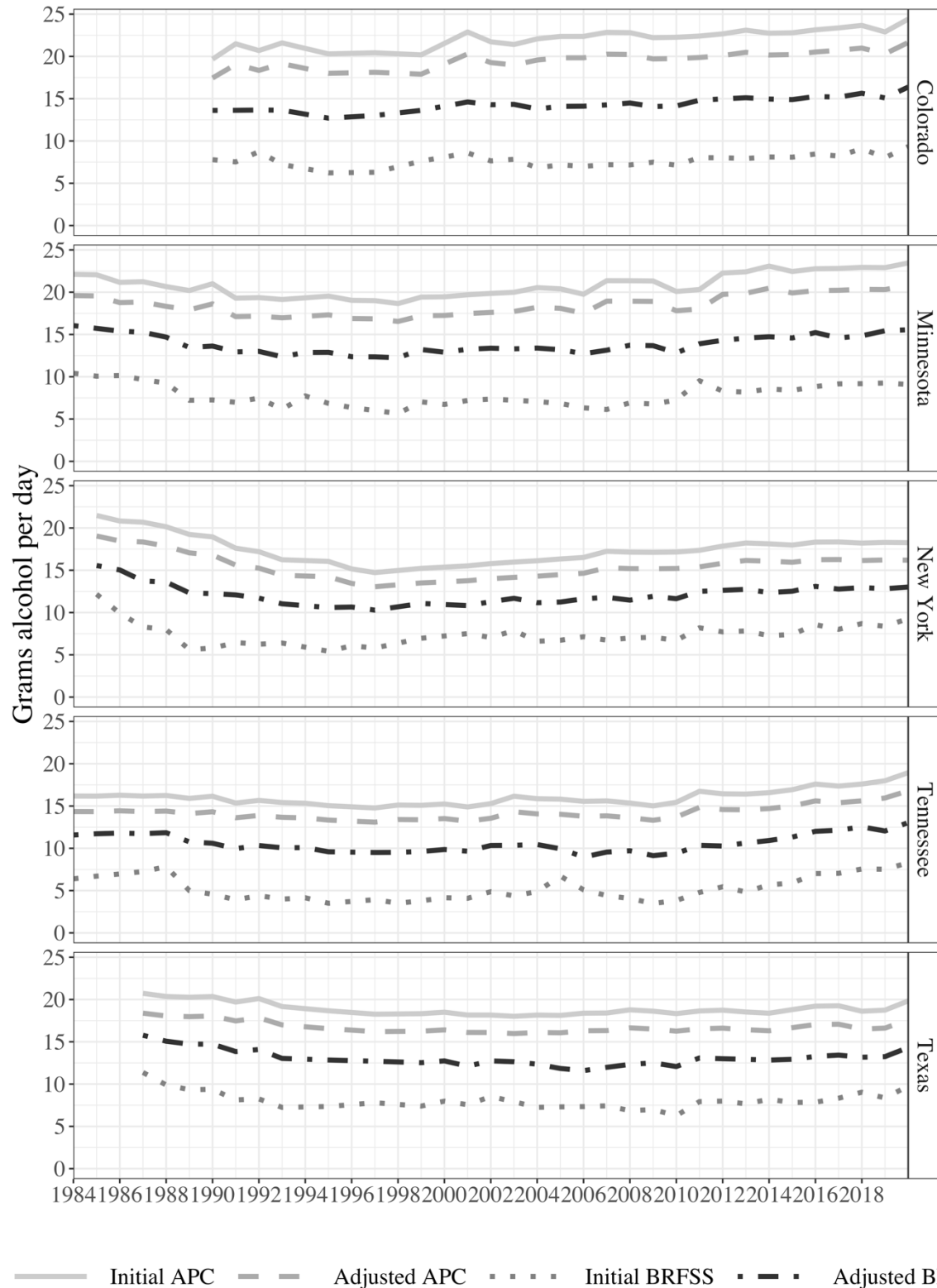
The BRFSS did not consistently collect alcohol use data from every state until after the year 2000 (Yi et al., 2003). In particular, only data from 12 states was collected on alcohol use in 1994, 1996 and 2000, and 17 states in 1996. Therefore, estimates from these survey years may not be nationally representative and should be approached with caution. For an overview of which states collected alcohol consumption data in each year between 1984 and 2001, see Table 2 in Yi et al., 2003. Table A1 summarises the proportion of missing data in each year from 1984 – 2020 for the key demographic indicators used to impute annual drinking prevalence (sex, race and ethnicity and age) as well as alcohol consumption variables. In all years there is a very small proportion (less than 2.5% of observations missing) of missing data for demographic variables. In the years other than 1994, 1996, 1998 and 2000, there is a low proportion of missing data on alcohol use variables (less than 8% of observations missing).

Whilst we have included years with reduced participation from individual states in our national estimates for upshifting, please note that in some of these years up to 80% of the sample are missing alcohol use data. In our approach, we removed all missing data and suggest that data from consecutive years should be pooled if data from individual survey years is missing.

In our approach, we removed all missing data prior to re-allocating the drinking status and up-shifting alcohol use. We suggest that if data from these years with low response are required for individual-level modelling, data from consecutive years should be pooled (i.e. data from 1993 or 1995 used for 1994 estimates).

**Figure S1**

*Comparison of Initial and Adjusted BRFSS Data Compared to Alcohol Per Capita (APC) Sales Data on Alcohol Consumption in Selected US States 1984–2019*



Note: Adjusted APC refers to 90% of the APC value that was adjusted to remove alcohol consumed by special populations. Adjusted BRFSS refers to the final adjusted value for the BRFSS after performing the upshifting procedure.

**Table S1*****Mean Volume and Drinking Prevalence by Sex and Age, 2005 National Alcohol Survey***

	<b>30 Day Volume</b>	<b>GF Volume (30 Day (daily) Drinkers)</b>	<b>GF Volume (No 30 day - yearly)</b>	<b>% Monthly Drinkers</b>	<b>% Yearly Drinkers</b>	<b>% Former Drinker</b>	<b>% Abstainer</b>
<b>Male</b>							
Age 18-34	34.82	642.31	153.49	55.5	19.2	12.5	12.9
Age 35-64	23.22	417.52	168.00	53.4	17.7	20.5	8.4
Age 65+	18.26	314.81	67.05	44.7	15.6	26.5	13.2
<b>Female</b>							
Age 18-34	12.43	336.86	65.87	40.4	27.0	14.1	18.6
Age 35-64	16.62	232.57	22.84	43.1	23.4	19.3	14.3
Age 65+	12.88	212.70	42.20	32.7	16.9	24.1	26.4

**Table S2**

*Drinking Prevalence by Race/Ethnicity, Sex, and Age, 2005 National Alcohol Survey*

	Age	White				Black				Hispanic				Other			
		% Monthly drinkers	% Yearly drinkers	% Former drinker	% Abstainer	% Monthly drinkers	% Yearly drinkers	% Former drinker	% Abstainer	% Monthly drinkers	% Yearly drinkers	% Former drinker	% Abstainer	% Monthly drinkers	% Yearly drinkers	% Former drinker	% Abstainer
<b>Male</b>	18-34	61.8	19.0	11.1	8.1	44.2	14.4	16.6	24.8	49.6	22.3	11.0	17.1	34.4	20.1	22.6	22.9
	35-64	58.2	15.	18.8	7.5	42.1	19.1	30.7	8.1	38.5	24.1	25.6	11.8	43.0	29.2	15.3	12.5
	65+	46.6	14.6	24.6	14.	38.1	17.2	37.5	7.2	39.3	25.5	25.2	10.0	35.2	15.2	37.6	12.0
<b>Female</b>	18-34	45.1	30.0	13.5	11.4	31.2	25.0	19.6	24.2	29.3	17.8	17.6	35.3	43.3	27.1	3.4	26.2
	35-64	49.8	23.9	16.8	9.5	22.3	19.8	30.2	27.7	23.6	19.3	23.5	33.6	27.4	34.3	22.7	15.6
	65+	37.4	17.3	22.0	23.3	5.3	19.9	43.1	31.7	8.0	7.3	19.9	64.8	18.4	10.6	30.3	40.7

**Table S3**

*Mean Volume by Race/Ethnicity, Sex, and Age, 2005 National Alcohol Survey*

	White			Black			Hispanic			Other		
	30 Day Volume	GF Volume (30 Day Drinkers)	GF Volume (No 30 day)	30 Day Volume	GF Volume (30 Day Drinkers)	GF Volume (No 30 day)	30 Day Volume	GF Volume (30 Day Drinkers)	GF Volume (No 30 day)	30 Day Volume	GF Volume (30 Day Drinkers)	GF Volume (No 30 day)
<b>Male</b>												
Age 18–34	35.24	660.96	159.53	20.99	460.34	85.10	36.86	555.60	213.03	48.86	1058.61	24.23
Age 35–64	24.40	419.73	126.60	16.89	485.75	373.37	20.67	401.88	189.13	18.77	305.82	177.64
Age 65+	19.71	296.44	63.26	17.32	661.41	87.26	8.83	310.48	109.98	7.09	142.10	1.56
<b>Female</b>												
Age 18–34	13.61	362.85	77.93	7.95	269.82	51.02	12.59	387.78	36.18	8.75	159.82	27.93
Age 35–64	17.91	243.72	18.25	7.02	167.63	58.53	11.32	176.50	27.70	6.48	120.71	14.35
Age 65+	13.28	209.56	42.78	1.94	106.73	13.52	1.39	51.45	198.88	6.33	588.44	5.00

**Table S4**

*Percentage of missing data in each year for Behavioral Risk Factor Surveillance System data at the national level for key demographic indicators and alcohol consumption*

<b>Year</b>	<b>% Sex</b>	<b>% Age</b>	<b>% Race/ ethnicity</b>	<b>% Drinking status</b>	<b>%Frequency of alcohol use</b>	<b>% Quantity of alcohol use</b>
1984	0	0	0	0	0	0
1985	0	0	0	0	0	0
1986	0	0	0	0	0	0
1987	0	0	0	0	0	0
1988	0	0	0	0	0	0
1989	0	0	0	0	1	2
1990	0	1	0	0	1	2
1991	0	1	0	0	1	2
1992	0	1	0	0	1	1
1993	0	1	0	0	1	2
1994	0	0	0	79	79	80
1995	0	0	1	2	5	5
1996	0	0	1	65	67	67
1997	0	1	1	1	2	3
1998	0	0	1	78	78	78
1999	0	1	1	1	2	3
2000	0	1	1	79	79	79
2001	0	1	1	1	1	2
2002	0	1	1	1	1	1
2003	0	1	1	0	0	1
2004	0	1	1	1	1	1
2005	0	1	1	1	1	2
2006	0	1	1	1	2	3
2007	0	1	1	1	2	3
2008	0	1	1	1	2	3
2009	0	1	1	2	3	4
2010	0	1	1	1	2	3
2011	0	1	1	7	7	7
2012	0	1	1	3	3	4
2013	0	0	2	4	4	5
2014	0	0	2	6	6	6
2015	0	0	2	5	5	6
2016	0	0	2	5	5	6
2017	0	0	2	6	6	7
2018	0	0	2	5	5	6
2019	0	0	2	6	6	7
2020	0	0	2	7	7	8

**Table S5**

*Total N Available in Each Year of Behavioral Risk Factor Surveillance System Data at the National Level (after removing missing data)*

<b>Year</b>	<b>N respondents</b>
1984	11,764
1985	24,268
1986	33,146
1987	48,204
1988	54,454
1989	62,456
1990	77,418
1991	83,176
1992	91,012
1993	96,684
1994	20,994
1995	103,499
1996	36,740
1997	123,573
1998	30,791
1999	144,915
2000	35,486
2001	187,736
2002	222,912
2003	239,054
2004	275,284
2005	322,542
2006	315,636
2007	386,883
2008	371,871
2009	385,312
2010	403,411
2011	432,291
2012	420,093
2013	430,672
2014	399,096
2015	375,037
2016	412,681
2017	380,743
2018	371,845
2019	351,149
2020	330,446

**Table S6***Initial (Monthly) and Adjusted (Annual) Prevalence of Current Drinkers in the United States for Men and Women from the Behavioral Risk Factor Surveillance System (BRFSS)*

Year	Women		Men	
	Raw prevalence %	Adjusted prevalence %	Raw prevalence %	Adjusted prevalence %
1984	47.6	69.5	64.7	78.4
1985	45.9	67.9	64.0	77.6
1986	46.1	67.8	64.0	77.4
1987	44.3	66.8	62.7	77.1
1988	43.8	66.7	61.7	76.0
1989	41.0	65.0	59.0	74.3
1990	40.5	64.1	58.8	74.1
1991	40.3	64.4	57.4	73.5
1992	40.3	64.3	57.6	73.6
1993	42.4	65.3	58.5	74.1
1994	41.7	65.1	57.3	72.6
1995	40.8	64.3	57.5	73.1
1996	44.4	66.5	58.9	73.9
1997	41.7	65.1	57.9	73.5
1998	44.6	66.4	58.9	73.9
1999	42.5	65.4	58.9	74.1
2000	48.3	68.9	64.3	77.5
2001	45.5	67.3	61.7	75.9
2002	46.4	67.4	62.2	76.0
2003	47.5	68.1	63.0	76.6
2004	45.3	66.6	60.8	74.9
2005	43.4	65.0	58.7	73.6
2006	43.3	64.6	57.7	72.9
2007	42.9	64.3	57.8	72.8
2008	43.1	64.2	57.8	72.6
2009	41.8	63.2	56.7	71.9
2010	41.6	62.6	56.0	71.3
2011	46.1	65.6	60.0	74.1
2012	44.5	64.5	58.9	73.5
2013	44.3	64.4	58.3	73.0
2014	44.8	64.7	58.0	72.7
2015	44.9	64.6	58.2	72.7
2016	46.2	65.3	58.8	73.3
2017	46.7	65.7	59.1	73.6
2018	46.2	65.3	58.3	73.0
2019	45.2	64.5	57.2	72.1
2020	46.3	65.5	57.1	72.2

**Table S7**

***Initial (Monthly) and Adjusted (Annual) Prevalence of Current Drinkers in Individual US States for men and Women from the Behavioral Risk Factor Surveillance System (BRFSS)***

\*Table provided in separate .csv file as too large to insert directly into the document\*



**Table S8**

*Proportions (%) of Individuals in Each New 30-Day Abstainer Category for the US in Each Year Compared to Proportions from the National Alcohol Survey data for an Exemplar Year (2010).*

Sex	Age	Race and ethnicity	Former drinkers		Lifetime abstainers		Yearly drinkers	
			Simulated	NAS data	Simulated	NAS data	Simulated	NAS data
Female	18–34	Black	28.34	28.49	34.03	35.17	37.63	36.34
Female	18–34	Hispanic	24.73	24.89	49.74	49.93	25.53	25.18
Female	18–34	Other	5.60	6.00	46.86	46.21	47.55	47.80
Female	18–34	White	24.25	24.59	21.33	20.77	54.42	54.64
Female	35–64	Black	38.81	38.87	35.22	35.65	25.97	25.48
Female	35–64	Hispanic	30.85	30.76	44.98	43.98	24.17	25.26
Female	35–64	Other	31.28	31.27	20.77	21.49	47.95	47.25
Female	35–64	White	33.07	33.47	19.03	18.92	47.89	47.61
Female	65+	Black	46.58	45.51	32.15	33.47	21.28	21.01
Female	65+	Hispanic	21.89	21.63	71.07	70.43	7.04	7.93
Female	65+	Other	38.07	37.13	49.10	49.88	12.83	12.99
Female	65+	White	35.13	35.14	37.02	37.22	27.85	27.64
Male	18–34	Black	31.68	29.75	42.90	44.44	25.43	25.81
Male	18–34	Hispanic	24.76	21.83	32.90	33.93	42.35	44.25
Male	18–34	Other	34.04	34.45	34.17	34.91	31.79	30.64
Male	18–34	White	29.27	29.06	21.02	21.2	49.71	49.74
Male	35–64	Black	51.82	53.02	14.15	13.99	34.04	32.99
Male	35–64	Hispanic	42.38	41.63	19.21	19.19	38.41	39.19
Male	35–64	Other	28.03	26.84	21.24	21.93	50.73	51.23
Male	35–64	White	44.81	44.98	18.36	17.94	36.83	37.08
Male	65+	Black	58.97	60.58	10.96	11.63	30.07	27.79
Male	65+	Hispanic	42.79	41.52	13.26	16.47	43.96	42.01
Male	65+	Other	57.06	58.02	17.89	18.52	25.05	23.46
Male	65+	White	46.19	46.07	26.41	26.59	27.41	27.34

**Table S9**

*Coverage of Initial and Adjusted Alcohol Consumption Volume Data from the BRFSS Compared to Alcohol Per Capita (APC) Sales Data for the United States 1984–2019.*

Year	BRFSS (mean grams per day)		APC (mean grams per day)		Coverage (%)	
	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted
1984	10.5	15.7	21.8	19.4	54.1	80.9
1985	9.6	15.3	21.6	19.1	50.3	80.1
1986	9.9	15.2	21.3	18.8	52.7	80.9
1987	9.2	14.8	20.9	18.6	49.5	79.6
1988	8.9	14.4	20.5	18.1	49.2	79.6
1989	7.3	13.5	20.0	17.7	41.2	76.3
1990	6.9	13.3	20.1	17.8	38.8	74.7
1991	6.9	12.8	18.9	16.7	41.3	76.6
1992	6.8	12.7	18.9	16.8	40.5	75.6
1993	6.3	12.1	18.3	16.2	38.9	74.7
1994	6.6	12.1	17.9	15.9	41.5	76.1
1995	6.1	11.7	17.7	15.7	38.9	74.5
1996	6.7	12.1	17.8	15.8	42.4	76.6
1997	6.4	11.9	17.7	15.7	40.8	75.8
1998	6.8	12.1	17.7	15.7	43.3	77.1
1999	6.8	12.1	17.8	15.8	43.0	76.6
2000	7.6	12.5	18.0	16.0	47.5	78.1
2001	7.2	12.3	17.9	15.9	45.3	77.4
2002	7.4	12.5	18.1	16.0	46.2	78.1
2003	7.3	12.5	18.3	16.2	45.1	77.2
2004	6.7	12.2	18.4	16.3	41.1	74.8
2005	6.9	12.1	18.5	16.4	42.1	73.8
2006	6.8	12.3	18.7	16.6	41.0	74.1
2007	7.1	12.4	19	16.8	42.3	73.8
2008	7.1	12.6	19	16.8	42.3	75.0
2009	7	12.5	18.8	16.7	41.9	74.9
2010	6.9	12.4	18.6	16.5	41.8	75.2
2011	8.1	13.0	18.9	16.7	48.5	77.8
2012	7.7	13.1	19.2	17.1	45.0	76.6
2013	7.8	13.0	19.2	17.0	45.9	76.5
2014	7.8	13.0	19.1	16.9	46.2	76.9
2015	7.8	13.0	19.1	17.0	45.9	76.5
2016	8.4	13.3	19.4	17.2	48.8	77.3
2017	8.3	13.2	19.3	17.1	48.5	77.2
2018	8.6	13.4	19.4	17.2	50.0	77.9
2019	8.8	13.3	19.5	17.3	50.9	76.9
2020	8.9	13.9	20.1	17.9	49.7	77.7

**Table S10**

*Mean Coverage of Initial and Adjusted Alcohol Volume of Consumption Data from the BRFSS Compared to Alcohol Per Capita (APC) Sales Data for States in the US 1984–2019.*

State	Baseline (%) coverage		Adjusted (%) coverage	
	Mean	SD	Mean	SD
Alabama	46.8	6.9	79.0	3.8
Alaska	41.5	4.7	74.3	2.4
Arizona	44.0	6.7	76.0	3.4
Arkansas	48.8	5.1	80.2	2.1
California	48.4	15.9	77.6	6.8
Colorado	39.3	3.3	73.2	2.0
Connecticut	45.1	4.1	76.8	1.8
DC	30.1	4.6	67.8	2.2
Delaware	32.4	3.2	67.6	3.3
Florida	46.2	6.2	74.9	2.6
Georgia	46.1	9.1	77.3	3.1
Hawaii	53.0	5.6	80.1	2.3
Idaho	44.5	7.3	77.6	3.0
Illinois	45.2	7.6	76.4	3.3
Indiana	46.6	6.9	78.0	3.1
Iowa	45.9	3.9	78.1	2.2
Kansas	45.9	6.4	78.3	2.9
Kentucky	42.9	9.3	77.4	4.7
Louisiana	39.4	5.7	73.4	3.1
Maine	42.9	4.9	75.4	2.6
Maryland	42.0	6.2	75.5	2.8
Massachusetts	46.6	4.3	76.4	2.6
Michigan	47.0	3.8	77.6	2.1
Minnesota	42.1	5.5	74.9	2.9
Mississippi	36.8	4.5	73.5	2.4
Missouri	41.7	4.9	74.8	2.3
Montana	37.9	5.3	72.0	2.3
Nebraska	41.6	6.2	75.5	3.0
Nevada	37.0	4.6	69.1	2.9
New Hampshire	26.3	3.3	63.4	2.6
New Jersey	40.9	4.0	73.7	1.5
New Mexico	43.2	6.0	76.0	2.9
New York	47.6	6.4	78.3	2.6
North Carolina	44.7	7.1	78.1	3.2
North Dakota	34.0	3.7	70.0	3.0
Ohio	49.6	9.1	79.0	3.8
Oklahoma	41.2	5.6	76.7	2.7
Oregon	44.6	4.6	75.9	2.1
Pennsylvania	47.4	5.3	78.4	3.3
Rhode Island	44.9	4.0	76.3	2.3
South Carolina	45.6	19.8	77.0	4.3
South Dakota	36.6	5.8	71.4	3.0
Tennessee	36.8	8.3	74.3	4.2
Texas	48.1	4.7	78.0	3.1

<b>State</b>	<b>Baseline (%) coverage</b>		<b>Adjusted (%) coverage</b>	
	<b>Mean</b>	<b><i>SD</i></b>	<b>Mean</b>	<b><i>SD</i></b>
Utah	56.2	6.3	88.0	2.5
Vermont	42.7	2.7	75.6	1.6
Virginia	48.2	4.9	78.3	1.8
Washington	45.8	4.5	77.6	2.7
West Virginia	44.8	8.3	78.8	3.6
Wisconsin	43.6	4.5	74.8	3.0
Wyoming	37.2	3.7	71.4	1.8
USA	44.9	4.1	76.7	1.9

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