COMPARISON OF STATE SHARE OF FEDERAL OPIOID FUNDING TO STATE SHARE OF OPIOID-INVOLVED OVERDOSE DEATHS

ALEX COHEN, PH.D., DIRECTOR OF LEARNING AND EVALUATION | AUGUST 2019

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Abstract

Deaths from opioid-involved drug overdoses continue to rise, prompting substantial federal funding to states. Properly addressing the opioid epidemic requires targeting funding to areas of highest need. I examine the extent to which states' shares of federal opioid funding match their shares of opioid-involved overdose deaths, using both standard reported measures of opioid-involved overdose deaths and corrected measures that take into account differential underreporting across states. Pennsylvania, Ohio, New Jersey and Indiana had the greatest underinvestment, with their share of federal opioid funding being roughly half of their share of opioid-involved overdose deaths. They received $398-$409 million, $325-$329 million, $204-$223 million and $157-$176 million less, respectively, than they would have received if federal funding were allocated based exclusively on share of opioid-involved overdose deaths. California, Texas, Washington and Oregon had the greatest overinvestment. They received $506-$512 million, $255-$286 million, $87-$91 million and $66-$67 million more, respectively, than they would have received if federal funding were allocated exclusively based on share of opioid-involved overdose deaths. To the extent that opioid-involved overdose deaths are a proxy for the need for funding to address the opioid epidemic, the observed mismatch between funding and opioid-involved overdose deaths may indicate a misallocation of resources.

Introduction

Drug overdoses involving opioids were responsible for almost 400,000 deaths from 1999-2017 in the United States, with 47,600 in 2017 alone (Scholl et al. 2019).

These figures have prompted the federal government to appropriate nearly $11 billion in fiscal years 2017 and 2018 to address the opioid epidemic (Bipartisan Policy Center 2019).

Because the impact of the opioid epidemic varies across states, properly addressing it requires targeting funding to areas of highest need. It might be expected that federal allocations would vary based on the impact of the opioid epidemic, with more funding flowing to states that have higher mortality from opioid-related overdose.

In this paper, I compare states' shares of federal opioid funding to their shares of U.S. opioid-related overdose deaths.

To measure opioid-related overdose deaths, I use the number of overdose deaths involving opioids from the Centers for Disease Control and Prevention (CDC) for 2017. However, as has widely been discussed, overdoses involving opioids are undercounted. To address this issue, I apply state-specific corrections from Ruhm (2017) and Buchanich et al. (2018) to state-level 2017 opioid-involved overdose death counts from the CDC.

Drug overdoses involving opioids were responsible for almost 400,000 deaths from 1999-2017 in the United States, with 47,600 in 2017 alone.

First, I compare each state's share of federal opioid funding to its share of opioid-involved overdose deaths, using reported estimates from the CDC and corrected estimates based on Ruhm and Buchanich et al. Second, I compute what states' federal opioid funding would be if federal opioid funding were allocated exclusively based on share of opioid-related overdose deaths, using both reported and corrected estimates.

* Director of Learning and Evaluation, Richard M. Fairbanks Foundation, and Adjunct Faculty, Indiana University Purdue University Indianapolis. E-mail: cohen@rmff.org. All replication files are available for download here.

Data and Methods

Data on federal opioid funding by state are from the Bipartisan Policy Center's report on federal opioid appropriations by state for fiscal year 2017 and fiscal year 2018 (Bipartisan Policy Center 2019). The report provides a comprehensive state-level accounting of federal funding for programs aimed at addressing the opioid epidemic through prevention, treatment and recovery, research, interdiction, criminal justice and law enforcement.

Data on reported opioid-involved overdoses come from the CDC's National Vital Statistics System, as reported by the Kaiser Family Foundation (Kaiser Family Foundation n.d.). Drug overdose deaths are identified based on the following ICD-10 codes: X40–44 (unintentional), X60–64 (suicide), X85 (homicide), or Y10–Y14 (undetermined intent). Among drug overdose deaths, opioid involvement is identified using the following ICD-10 codes: opioids (T40.0, T40.1, T40.2, T40.3, T40.4, or T40.6); natural and semisynthetic opioids (T40.2); methadone (T40.3); synthetic opioids, other than methadone (T40.4); and heroin (T40.1).

Drug involvement in overdoses is determined by death certificates, but for many death certificates, drug involvement is "unspecified" (ICD-10 code T50.9) (Ruhm 2017, Buchanich et al. 2018, Vestal 2016).

Those deaths with drugs unspecified are automatically counted as not involving opioids (or another substance). This leads to underestimates of overdose deaths involving opioids, and this underreporting can vary dramatically across states.

Ruhm (2017) and Buchanich et al. (2018) apply imputation procedures that aim to correct opioid-involved overdose death counts. Ruhm applies an imputation procedure to data from 2008-2014, and Buchanich et al. apply an imputation procedure to data from 1999-2015. Though each uses a different imputation approach, both use overdose deaths certificates where drugs involved are specified to impute overdoses involving opioids for those overdose death certificates where no drug is specified. Both find that many states have dramatically underreported overdoses involving opioids.

Taking this underreporting into account leads to substantial changes not just in counts of opioid-involved overdose deaths, but in the distribution of these counts across states.

Ruhm and Buchanich et al. each provide reported opioid-involved overdose death rates and corrected opioid-involved overdose death rates. I use the ratio of corrected to reported rates to impute a correction ratio. For the Ruhm correction ratio, I use Ruhm's estimates of reported and corrected opioid-involved overdoses for 2014, the most recent year of data in his dataset. For the Buchanich et al. correction ratio, I use Buchanich et al.'s estimates of reported and corrected opioid-involved overdoses for 2015, the most recent year of data in their dataset.

Those deaths with drugs unspecified are automatically counted as not involving opioids (or another substance). This leads to underestimates of overdose deaths involving opioids, and this underreporting can vary dramatically across states.

I then multiply reported opioid-involved overdose death rates for 2017 by the correction ratio to estimate corrected opioid-involved overdose death rates for 2017. From these estimates, I calculate each state's share of all corrected opioid-involved overdoses in the U.S.

Finally, to calculate what federal opioid funding by state would have been if it were allocated based on each state's share of opioid-involved overdoses, I multiply state-level federal opioid funding for fiscal years 2017 and 2018 by each state's share of opioid-involved overdoses, using both reported and corrected measures of opioid-involved overdoses.

Results

Tables 1-3 compare state share of federal opioid funding to state share of all U.S. opioid-related overdose deaths then present what federal opioid funding would have been if funding were allocated exclusively based on each state's share of opioid-involved overdose deaths.

Table 1. State Share of Federal Opioid Funding, State Share of Opioid-Involved Overdose Deaths and Counterfactual Funding, Based on Reported Opioid-Involved Overdose Deaths

State	Federal opioid funding to state, FY2017 & FY2018 total	Opioid-involved overdose deaths, 2017	State share of all federal opioid funding, FY2017 and FY2018	State share of all reported opioid-involved overdose deaths, 2017	Counterfactual funding based on state share of reported deaths	Difference between actual & counterfactual funding
Ohio	$343,952,384	4293	4.09%	9.02%	$757,622,016	-$413,669,632
Maryland	$183,941,168	1985	2.19%	4.17%	$350,309,728	-$166,368,560
New Jersey	$192,026,352	1969	2.29%	4.14%	$347,486,048	-$155,459,696
North Carolina	$207,969,312	1953	2.48%	4.10%	$344,662,432	-$136,693,120
Pennsylvania	$344,670,880	2548	4.10%	5.35%	$449,667,104	-$104,996,224
Illinois	$285,054,048	2202	3.39%	4.63%	$388,605,568	-$103,551,520
Michigan	$255,924,240	2033	3.05%	4.27%	$358,780,704	-$102,856,464
Massachusetts	$241,918,624	1913	2.88%	4.02%	$337,603,296	-$95,684,672
New York	$496,172,384	3224	5.91%	6.77%	$568,966,528	-$72,794,144
Florida	$501,853,024	3245	5.97%	6.82%	$572,672,576	-$70,819,552
Connecticut	$102,651,912	955	1.22%	2.01%	$168,536,928	-$65,885,016
West Virginia	$96,556,168	833	1.15%	1.75%	$147,006,544	-$50,450,376
Indiana	$158,797,120	1176	1.89%	2.47%	$207,538,672	-$48,741,552
Tennessee	$178,006,192	1269	2.12%	2.67%	$223,951,152	-$45,944,960
Virginia	$185,890,496	1241	2.21%	2.61%	$219,009,760	-$33,119,264
South Carolina	$102,799,528	749	1.22%	1.57%	$132,182,368	-$29,382,840
Kentucky	$187,284,240	1160	2.23%	2.44%	$204,715,008	-$17,430,768
Missouri	$156,013,936	952	1.86%	2.00%	$168,007,488	-$11,993,552
Wisconsin	$152,712,944	926	1.82%	1.95%	$163,419,040	-$10,706,096
Maine	$54,006,956	360	0.64%	0.76%	$63,532,244	-$9,525,288
New Hampshire	$75,525,304	424	0.90%	0.89%	$74,826,864	$698,440
Delaware	$49,287,672	250	0.59%	0.53%	$44,119,616	$5,168,056
Utah	$86,315,976	456	1.03%	0.96%	$80,474,176	$5,841,800
Washington D.C.	$56,055,580	244	0.67%	0.51%	$43,060,740	$12,994,840
Wyoming	$25,562,936	47	0.30%	0.10%	$8,294,487	$17,268,449
Nevada	$89,998,008	412	1.07%	0.87%	$72,709,120	$17,288,888
Rhode Island	$69,710,400	277	0.83%	0.58%	$48,884,532	$20,825,868
Vermont	$42,023,512	114	0.50%	0.24%	$20,118,544	$21,904,968
Idaho	$40,188,224	103	0.48%	0.22%	$18,177,280	$22,010,944
North Dakota	$34,105,152	35	0.41%	0.07%	$6,176,746	$27,928,406

Table 1. State Share of Federal Opioid Funding, State Share of Opioid-Involved Overdose Deaths and Counterfactual Funding, Based on Reported Opioid-Involved Overdose Deaths [Continued]

State	Federal opioid funding to state, FY2017 & FY2018 total	Opioid-involved overdose deaths, 2017	State share of all federal opioid funding, FY2017 and FY2018	State share of all reported opioid-involved overdose deaths, 2017	Counterfactual funding based on state share of reported deaths	Difference between actual & counterfactual funding
Arizona	$192,932,368	928	2.30%	1.95%	$163,772,000	$29,160,368
Arkansas	$64,395,928	188	0.77%	0.39%	$33,177,948	$31,217,980
New Mexico	$90,067,016	332	1.07%	0.70%	$58,590,844	$31,476,172
Nebraska	$42,061,816	59	0.50%	0.12%	$10,412,229	$31,649,587
South Dakota	$38,650,976	35	0.46%	0.07%	$6,176,746	$32,474,230
Hawaii	$42,146,272	53	0.50%	0.11%	$9,353,358	$32,792,914
Mississippi	$67,674,592	185	0.81%	0.39%	$32,648,514	$35,026,078
Kansas	$62,086,108	144	0.74%	0.30%	$25,412,896	$36,673,212
Iowa	$73,343,608	206	0.87%	0.43%	$36,354,560	$36,989,048
Colorado	$139,633,680	578	1.66%	1.21%	$102,004,552	$37,629,128
Georgia	$217,428,416	1014	2.59%	2.13%	$178,949,152	$38,479,264
Alabama	$113,772,400	422	1.35%	0.89%	$74,473,912	$39,298,488
Minnesota	$117,266,800	422	1.40%	0.89%	$74,473,912	$42,792,888
Montana	$53,480,952	38	0.64%	0.08%	$6,706,182	$46,774,771
Oklahoma	$119,687,632	388	1.42%	0.82%	$68,473,640	$51,213,992
Alaska	$74,249,024	102	0.88%	0.21%	$18,000,802	$56,248,222
Louisiana	$130,193,352	415	1.55%	0.87%	$73,238,560	$56,954,792
Oregon	$118,257,648	344	1.41%	0.72%	$60,708,588	$57,549,060
Washington	$200,217,936	742	2.38%	1.56%	$130,947,008	$69,270,928
Texas	$533,238,272	1458	6.35%	3.06%	$257,305,568	$275,932,704
California	$912,614,912	2199	10.86%	4.62%	$388,076,096	$524,538,816

Table 1 provides these estimates using reported opioid-involved overdose death data from the CDC. I find that states with the lowest federal opioid funding, relative to their share of reported opioid-involved overdose deaths, are Ohio, Maryland, New Jersey and North Carolina. Each of these states' share of opioid-involved overdose deaths was much higher than its share of federal opioid funding. Ohio, for example, saw 9.0% of all reported opioid-involved overdose deaths but received just 4.1% of all federal opioid funding.

Ohio, Maryland, New Jersey and North Carolina received $413 million, $166 million, $155 million and $137 million less, respectively, than they would have received if federal funding were allocated based on share of opioid-involved overdose deaths.

Oregon, Washington, Texas and California, on the other hand, received the most federal opioid funding, relative to their share of opioid-involved overdose deaths. California, for example, received 10.9% of all federal opioid funding but had just 4.6% of all opioid-involved overdose deaths. Texas received 6.4% of all federal opioid funding but had just 3.1% of all opioid-involved overdose deaths. Oregon, Washington, Texas and California received $57 million, $69 million, $276 million and $524 million more, respectively than they would have received if federal funding were allocated based on share of opioid-involved overdose deaths.

Ohio saw 9.0% of all reported opioid-involved overdose deaths but received just 4.1% of all federal opioid funding.

Table 2. State Share of Federal Opioid Funding, State Share of Opioid-Involved Overdose Deaths and Counterfactual Funding, Based on Ruhm-Corrected Opioid-Involved Overdose Deaths

State	Federal opioid funding to state, FY2017 & FY2018 total	Corrected opioid-involved overdose deaths, 2017, based on Ruhm	State share of all federal opioid funding, FY2017 and FY2018	State share of all Ruhm-corrected opioid-involved overdose deaths, 2017	Counterfactual funding based on state share of Ruhm-corrected deaths	Difference between actual & counterfactual funding
Pennsylvania	$344,670,880	5336	4.10%	8.84%	$742,736,512	-$398,065,632
Ohio	$343,952,384	4836	4.09%	8.01%	$673,096,896	-$329,144,512
New Jersey	$192,026,352	2844	2.29%	4.71%	$395,895,712	-$203,869,360
Indiana	$158,797,120	2402	1.89%	3.98%	$334,410,304	-$175,613,184
Michigan	$255,924,240	2819	3.05%	4.67%	$392,448,896	-$136,524,656
Florida	$501,853,024	4497	5.97%	7.45%	$625,925,568	-$124,072,544
Maryland	$183,941,168	2037	2.19%	3.37%	$283,485,696	-$99,544,528
North Carolina	$207,969,312	2134	2.48%	3.54%	$297,078,144	-$89,108,832
Illinois	$285,054,048	2436	3.39%	4.04%	$339,122,880	-$54,068,832
Connecticut	$102,651,912	962	1.22%	1.59%	$133,844,992	-$31,193,080
Massachusetts	$241,918,624	1936	2.88%	3.21%	$269,437,888	-$27,519,264
Tennessee	$178,006,192	1452	2.12%	2.41%	$202,068,656	-$24,062,464
West Virginia	$96,556,168	844	1.15%	1.40%	$117,503,472	-$20,947,304
Kentucky	$187,284,240	1462	2.23%	2.42%	$203,550,256	-$16,266,016
Alabama	$113,772,400	874	1.35%	1.45%	$121,679,312	-$7,906,912
South Carolina	$102,799,528	791	1.22%	1.31%	$110,105,960	-$7,306,432
Missouri	$156,013,936	1159	1.86%	1.92%	$161,324,896	-$5,310,960
Louisiana	$130,193,352	934	1.55%	1.55%	$129,976,520	$216,832
Maine	$54,006,956	363	0.64%	0.60%	$50,499,892	$3,507,064
Delaware	$49,287,672	316	0.59%	0.52%	$43,957,392	$5,330,280
Virginia	$185,890,496	1268	2.21%	2.10%	$176,541,840	$9,348,656
Wisconsin	$152,712,944	1028	1.82%	1.70%	$143,088,320	$9,624,624
Mississippi	$67,674,592	389	0.81%	0.65%	$54,214,120	$13,460,472
Arizona	$192,932,368	1276	2.30%	2.11%	$177,617,184	$15,315,184
Idaho	$40,188,224	176	0.48%	0.29%	$24,493,120	$15,695,104
New Hampshire	$75,525,304	428	0.90%	0.71%	$59,547,100	$15,978,204
Wyoming	$25,562,936	68	0.30%	0.11%	$9,457,927	$16,105,009
Washington D.C.	$56,055,580	252	0.67%	0.42%	$35,025,800	$21,029,780
Utah	$86,315,976	465	1.03%	0.77%	$64,703,016	$21,612,960
Vermont	$42,023,512	116	0.50%	0.19%	$16,179,768	$25,843,744
Arkansas	$64,395,928	269	0.77%	0.45%	$37,449,172	$26,946,756
New York	$496,172,384	3371	5.91%	5.59%	$469,174,560	$26,997,824
North Dakota	$34,105,152	38	0.41%	0.06%	$5,219,941	$28,885,211
Nevada	$89,998,008	437	1.07%	0.72%	$60,825,496	$29,172,512

Table 2. State Share of Federal Opioid Funding, State Share of Opioid-Involved Overdose Deaths and Counterfactual Funding, Based on Ruhm-Corrected Opioid-Involved Overdose Deaths [Continued]

State	Federal opioid funding to state, FY2017 & FY2018 total	Corrected opioid-involved overdose deaths, 2017, based on Ruhm	State share of all federal opioid funding, FY2017 and FY2018	State share of all Ruhm-corrected opioid-involved overdose deaths, 2017	Counterfactual funding based on state share of Ruhm-corrected deaths	Difference between actual & counterfactual funding
Nebraska	$42,061,816	85	0.50%	0.14%	$11,771,547	$30,290,269
Rhode Island	$69,710,400	278	0.83%	0.46%	$38,756,712	$30,953,688
Hawaii	$42,146,272	69	0.50%	0.12%	$9,661,033	$32,485,239
South Dakota	$38,650,976	37	0.46%	0.06%	$5,121,788	$33,529,188
Kansas	$62,086,108	194	0.74%	0.32%	$27,060,174	$35,025,934
Colorado	$139,633,680	715	1.66%	1.18%	$99,534,048	$40,099,632
Iowa	$73,343,608	226	0.87%	0.37%	$31,486,138	$41,857,470
New Mexico	$90,067,016	339	1.07%	0.56%	$47,171,680	$42,895,336
Georgia	$217,428,416	1246	2.59%	2.06%	$173,409,424	$44,018,992
Montana	$53,480,952	62	0.64%	0.10%	$8,646,364	$44,834,588
Minnesota	$117,266,800	487	1.40%	0.81%	$67,856,824	$49,409,976
Alaska	$74,249,024	114	0.88%	0.19%	$15,852,401	$58,396,623
Oklahoma	$119,687,632	415	1.42%	0.69%	$57,777,056	$61,910,576
Oregon	$118,257,648	368	1.41%	0.61%	$51,225,012	$67,032,636
Washington	$200,217,936	781	2.38%	1.29%	$108,721,296	$91,496,640
Texas	$533,238,272	2001	6.35%	3.31%	$278,468,032	$254,770,240
California	$912,614,912	2918	10.86%	4.84%	$406,167,616	$506,447,296

Table 2 uses corrected estimates of opioid-involved overdose death data, based on Ruhm. These estimates aim to account for differences across states in underreporting of opioid-involved overdoses and, in turn, present more accurate estimates of states' shares of opioid-involved overdose deaths. I find that states with the lowest federal opioid funding, relative to their share of corrected opioid-involved overdose deaths, are Pennsylvania, Ohio, New Jersey and Indiana. Each of these states' share of opioid-involved overdose deaths was much higher than its share of federal opioid funding. Pennsylvania and Indiana were two of the states with the most dramatic underreporting of opioid-involved overdose deaths. Based on the correction from Ruhm, 8.8% of all opioid-involved overdose deaths occurred in Pennsylvania, but the state received just 4.1% of federal opioid funding. Similarly, Indiana had 4.0% of all opioid-involved overdose deaths but received 1.9% of all federal opioid funding.

Pennsylvania, Ohio, New Jersey and Indiana received $398 million, $329 million, $204 million and $176 million less, respectively, than they would have received if federal funding were allocated based on share of opioid-involved overdose deaths.

Pennsylvania, Ohio, New Jersey and Indiana received $398 million, $329 million, $204 million and $176 million less, respectively, than they would have received if federal funding were allocated based on share of opioid-involved overdose deaths.

In this case, Oregon, Washington, Texas and California also received the most federal opioid funding, relative to their share of corrected opioid-involved overdose deaths. They received $67 million, $91 million, $255 million and $506 million more, respectively, than they would have received if federal funding were allocated based on share of corrected opioid-involved overdose deaths.

Table 3. State Share of Federal Opioid Funding, State Share of Opioid-Involved Overdose Deaths and Counterfactual Funding, Based on Buchanich et al.-Corrected Opioid-Involved Overdose Deaths

State	Federal opioid funding to state, FY2017 & FY2018 total	Corrected opioid-involved overdose deaths, 2017, based on Buchanich et al.	State share of all federal opioid funding, FY2017 and FY2018	State share of all Buchanich et al.-corrected opioid-involved overdose deaths, 2017	Counterfactual funding based on state share of Buchanich et al.-corrected deaths	Difference between actual & counterfactual funding
Pennsylvania	$344,670,880	5178	4.10%	8.97%	$753,858,560	-$409,187,680
Ohio	$343,952,384	4593	4.09%	7.96%	$668,649,664	-$324,697,280
New Jersey	$192,026,352	2856	2.29%	4.95%	$415,729,184	-$223,702,832
Indiana	$158,797,120	2171	1.89%	3.76%	$316,044,160	-$157,247,040
Maryland	$183,941,168	2108	2.19%	3.65%	$306,914,272	-$122,973,104
Florida	$501,853,024	4285	5.97%	7.43%	$623,777,152	-$121,924,128
North Carolina	$207,969,312	2090	2.48%	3.62%	$304,276,448	-$96,307,136
Michigan	$255,924,240	2404	3.05%	4.17%	$349,952,640	-$94,028,400
Illinois	$285,054,048	2358	3.39%	4.09%	$343,230,336	-$58,176,288
Massachusetts	$241,918,624	1936	2.88%	3.36%	$281,875,936	-$39,957,312
Connecticut	$102,651,912	963	1.22%	1.67%	$140,184,864	-$37,532,952
West Virginia	$96,556,168	843	1.15%	1.46%	$122,783,808	-$26,227,640
Kentucky	$187,284,240	1444	2.23%	2.50%	$210,246,000	-$22,961,760
Tennessee	$178,006,192	1380	2.12%	2.39%	$200,831,552	-$22,825,360
South Carolina	$102,799,528	771	1.22%	1.34%	$112,288,568	-$9,489,040
Alabama	$113,772,400	818	1.35%	1.42%	$119,093,080	-$5,320,680
Missouri	$156,013,936	1104	1.86%	1.91%	$160,732,608	-$4,718,672
Maine	$54,006,956	363	0.64%	0.63%	$52,881,304	$1,125,652
Virginia	$185,890,496	1269	2.21%	2.20%	$184,727,472	$1,163,024
Delaware	$49,287,672	325	0.59%	0.56%	$47,301,480	$1,986,192
Wisconsin	$152,712,944	1029	1.82%	1.78%	$149,784,224	$2,928,720
New York	$496,172,384	3349	5.91%	5.80%	$487,581,856	$8,590,528
Louisiana	$130,193,352	826	1.55%	1.43%	$120,319,136	$9,874,216
New Hampshire	$75,525,304	426	0.90%	0.74%	$62,069,532	$13,455,772
Wyoming	$25,562,936	62	0.30%	0.11%	$9,004,851	$16,558,085
Utah	$86,315,976	463	1.03%	0.80%	$67,475,096	$18,840,880
Washington D.C.	$56,055,580	244	0.67%	0.42%	$35,521,188	$20,534,392
Idaho	$40,188,224	129	0.48%	0.22%	$18,820,808	$21,367,416
Vermont	$42,023,512	115	0.50%	0.20%	$16,795,230	$25,228,282
Mississippi	$67,674,592	287	0.81%	0.50%	$41,712,540	$25,962,052
Nevada	$89,998,008	430	1.07%	0.75%	$62,652,904	$27,345,104
Arkansas	$64,395,928	252	0.77%	0.44%	$36,662,764	$27,733,164
North Dakota	$34,105,152	41	0.41%	0.07%	$5,986,620	$28,118,533
Rhode Island	$69,710,400	279	0.83%	0.48%	$40,606,908	$29,103,492

Table 3. State Share of Federal Opioid Funding, State Share of Opioid-Involved Overdose Deaths and Counterfactual Funding, Based on Buchanich et al.-Corrected Opioid-Involved Overdose Deaths [Continued]

State	Federal opioid funding to state, FY2017 & FY2018 total	Corrected opioid-involved overdose deaths, 2017, based on Buchanich et al.	State share of all federal opioid funding, FY2017 and FY2018	State share of all Buchanich et al.-corrected opioid-involved overdose deaths, 2017	Counterfactual funding based on state share of Buchanich et al.-corrected deaths	Difference between actual & counterfactual funding
Arizona	$192,932,368	1119	2.30%	1.94%	$162,963,776	$29,968,592
Nebraska	$42,061,816	77	0.50%	0.13%	$11,175,459	$30,886,357
South Dakota	$38,650,976	39	0.46%	0.07%	$5,632,642	$33,018,334
Hawaii	$42,146,272	57	0.50%	0.10%	$8,312,581	$33,833,691
Kansas	$62,086,108	191	0.74%	0.33%	$27,777,586	$34,308,522
Colorado	$139,633,680	714	1.66%	1.24%	$103,955,672	$35,678,008
New Mexico	$90,067,016	345	1.07%	0.60%	$50,264,096	$39,802,920
Iowa	$73,343,608	223	0.87%	0.39%	$32,519,934	$40,823,674
Montana	$53,480,952	53	0.64%	0.09%	$7,665,012	$45,815,941
Minnesota	$117,266,800	487	1.40%	0.84%	$70,947,312	$46,319,488
Georgia	$217,428,416	1105	2.59%	1.91%	$160,796,800	$56,631,616
Alaska	$74,249,024	112	0.88%	0.19%	$16,236,779	$58,012,245
Oklahoma	$119,687,632	401	1.42%	0.69%	$58,382,212	$61,305,420
Oregon	$118,257,648	358	1.41%	0.62%	$52,095,112	$66,162,536
Washington	$200,217,936	777	2.38%	1.35%	$113,138,752	$87,079,184
Texas	$533,238,272	1701	6.35%	2.95%	$247,629,264	$285,609,008
California	$912,614,912	2751	10.86%	4.77%	$400,508,736	$512,106,176

Table 3 uses corrected estimates of opioid-involved overdose death data, based on Buchanich et al. Like the estimates in Table 2, these estimates aim to account for differences across states in underreporting of opioid-involved overdoses. The results are very similar to those based on Ruhm's correction. As in Table 2, Pennsylvania, Ohio, New Jersey and Indiana received the least federal opioid funding, relative to their share of corrected opioid-involved overdose deaths. They received $409 million, $325 million, $224 million and $157 million less, respectively, than they would have received if federal funding were allocated based on share of opioid-involved overdose deaths. Also, as in Table 2, Oregon, Washington, Texas and California received the most federal funding, relative to their share of corrected opioid-involved overdose deaths. They received $66 million, $87 million, $286 million and $512 million more, respectively, than they would have received if federal funding were allocated based on share of corrected opioid-involved overdose deaths.

Figure 1 visually compares each state's actual federal funding to its counterfactual federal funding--that is, what its funding would have been if it were allocated exclusively based on either reported or corrected opioid-involved overdoses. The figure illustrates the sizable gaps between federal opioid funding and opioid-involved overdose deaths by state.

Figure 1. Actual Federal Opioid Funding vs. Counterfactual Funding Based on State Share of Opioid-Involved Overdose Deaths

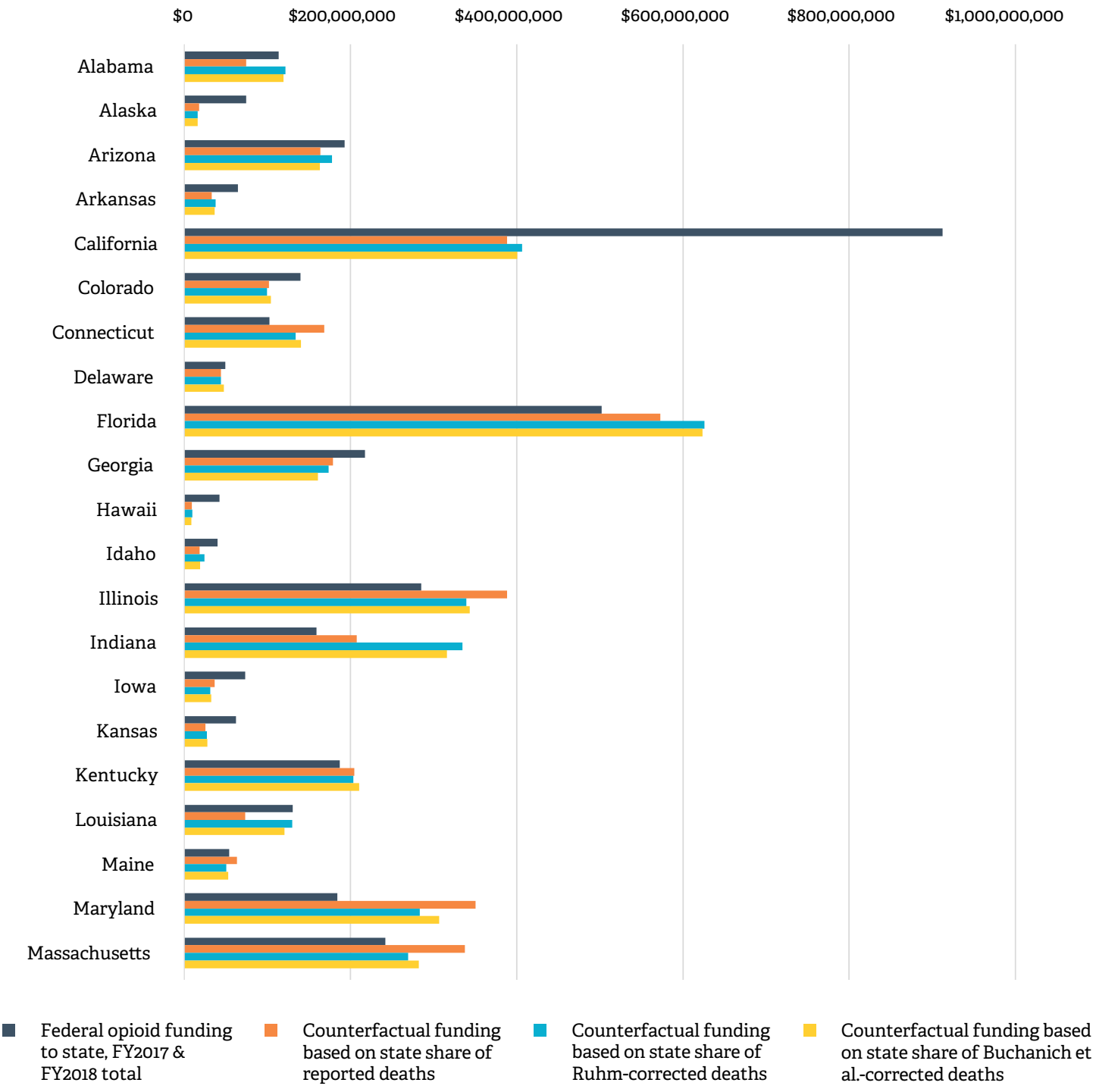


Figure 1. Actual Federal Opioid Funding vs. Counterfactual Funding Based on State Share of Opioid-Involved Overdose Deaths

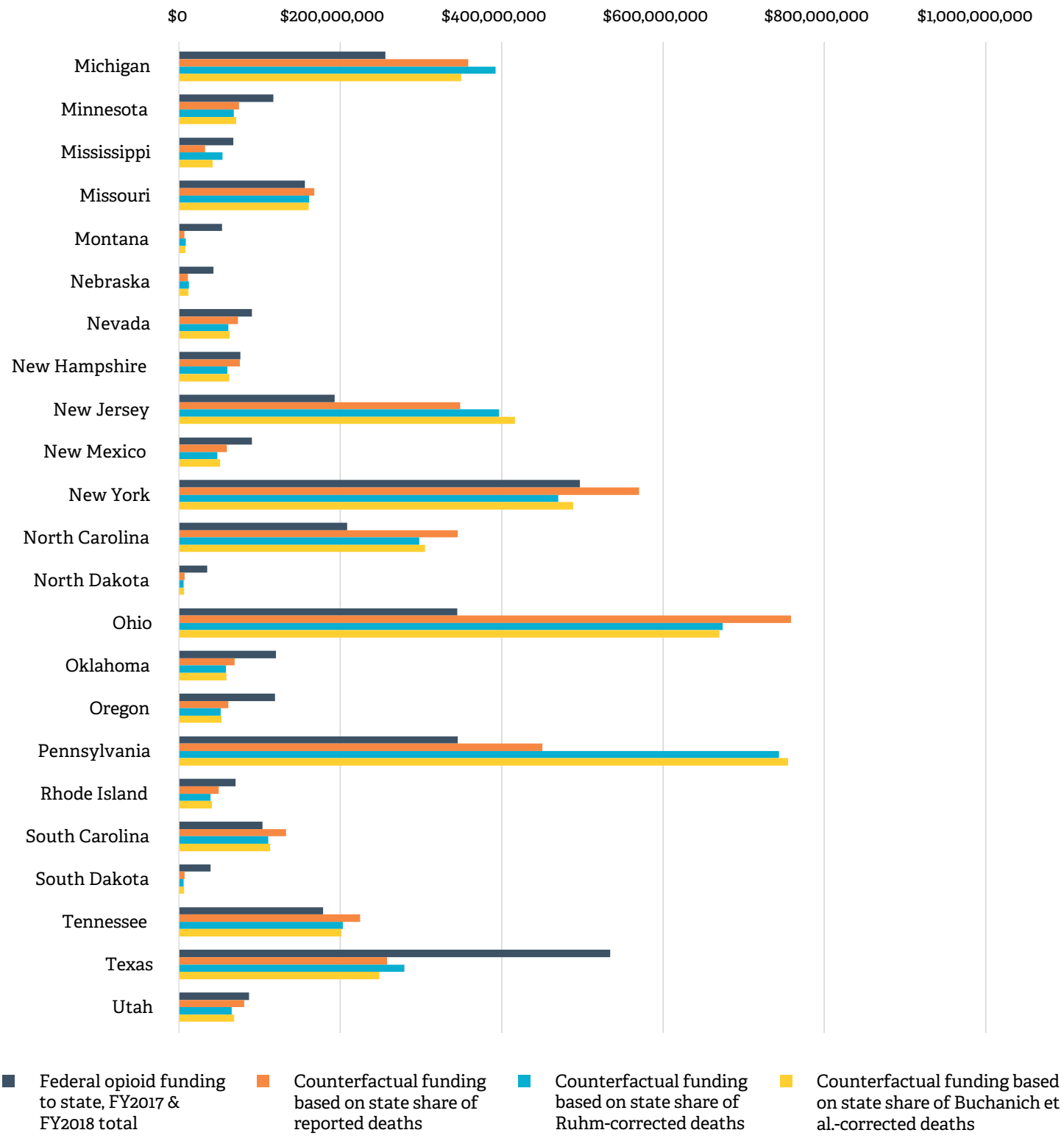
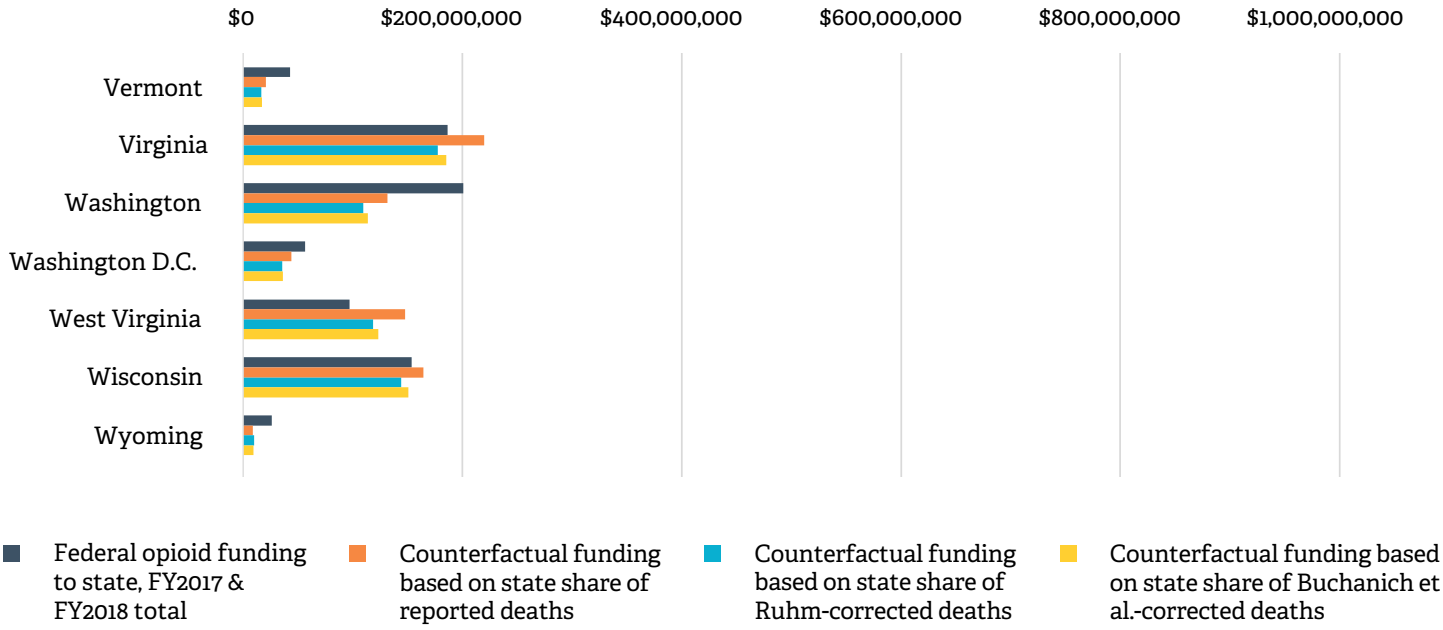


Figure 1. Actual Federal Opioid Funding vs. Counterfactual Funding Based on State Share of Opioid-Involved Overdose Deaths



Limitations

There are at least three limitations to keep in mind when interpreting these results.

First, the corrections applied from Ruhm and Buchanich et al. are based on data from 2014 and 2015, respectively. Applying them to 2017 assumes that the extent of underreporting across states is stable over time. However, if some states saw greater improvements in their tracking of opioid-involved overdoses over time, then these corrections would be different.

Second, the corrections themselves rely on reasonable, but untested assumptions. These are discussed in Ruhm (2017) and Buchanich et al. (2018). Testing whether these assumptions are accurate is the subject of ongoing work (Gupta et al. 2018).

Third, this paper does not explore what drives differences between states' shares of federal opioid funding and their shares of opioid-related overdose deaths. This is left for future research.

Conclusion

There is a substantial mismatch between states' shares of federal opioid funding and their shares of opioid-related overdose deaths. To the extent that opioid-involved overdose deaths are a proxy for the need for funding to address the opioid epidemic, this may indicate a misallocation of resources.

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