

## Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

**eTable 1. Annual Opioid Prescribing Practices, 2006-2018, stratified by age groups**

Year	Total Opioid Prescriptions	Amount of Opioid Dispensed <sup>a</sup>	Prescription Duration			High-dosage Prescription, % <sup>b</sup>	ER/LA Formulation Prescription, % <sup>c</sup>
			(Mean [Median], days)	≤ 3 days, %	≥ 30 days, %		
<b>2006 (total)</b>	14773325		6.08	46.55	4.97	6.58	1.48
			5	n=6876795	n=733987	n=972821	n=21906
0-5 yrs	946722	1.39	8.12	27.72	7.28	15.45	1.79
			5				
6-9 yrs	849948	0.95	7.27	34.74	6.66	7.04	1.58
			5				
10-14 yrs	1370929	0.74	5.91	47.33	4.74	2.69	1.22
			4				
15-19 yrs	4311719	41.21	5.11	51.53	2.98	5.32	1.02
			3				
20-24 yrs	7294007	44.30	6.28	47.28	5.69	6.86	1.76
			4				
<b>2007 (total)</b>	15689779		6.38	44.97	5.72	6.48	1.92
			4	n=7055536	n=897312	n=1016135	n=302552
0-5 yrs	935126	1.40	8.26	26.61	7.56	14.63	2.01
			5				
6-9 yrs	902452	1.00	7.69	39.94	7.66	7.22	2.01
			5				
10-14 yrs	1418546	0.75	6.16	45.72	5.31	2.64	1.57
			4				
15-19 yrs	4618779	40.92	5.28	50.02	3.33	5.12	1.29
			3				

20-24 yrs	7814876	44.13	6.70	45.44	6.76	6.91	2.35
			4				
<b>2008 (total)</b>	15576197		6.51	43.98	5.98	6.17	2.12
			4	n=6857032	n=931937	n=960634	n=329696
0-5 yrs	881277	1.30	8.14	25.89	7.09	12.99	1.99
			5				
6-9 yrs	848684	0.94	7.56	32.37	7.23	6.22	2.11
			5				
10-14 yrs	1365832	0.73	6.08	44.85	5.05	2.44	1.59
			4				
15-19 yrs	4609396	40.52	5.34	49.10	3.40	4.84	1.40
			4				
20-24 yrs	7871008	44.09	6.96	44.11	7.40	6.82	2.64
			4				
<b>2009 (total)</b>	15455285		6.64	43.60	6.36	6.13	2.20
			4	n=6738643	n=983492	n=947591	n=339327
0-5 yrs	853973	1.33	8.25	25.65	7.01	12.36	2.00
			5				
6-9 yrs	817713	0.91	7.54	32.09	6.78	5.25	2.00
			5				
10-14 yrs	1346799	0.72	6.11	44.46	4.90	2.30	1.58
			4				
15-19 yrs	4567951	40.08	5.36	48.78	3.41	4.70	1.45
			4				
20-24 yrs	7868849	44.31	7.21	43.59	8.21	7.03	2.78
			4				
<b>2010 (total)</b>	14702258		6.83	42.81	6.82	6.27	2.04
			4	n=6294375	n=1003263	n=922387	n=299482

0-5 yrs	837968	1.34	8.51	24.93	7.49	12.38	20.5
			5				
6-9 yrs	771093	0.87	7.66	31.47	6.78	4.81	1.81
			5				
10-14 yrs	1315686	0.72	6.58	42.26	5.86	2.37	1.64
			4				
15-19 yrs	4259631	39.64	5.40	48.05	3.45	4.58	1.30
			3				
20-24 yrs	7517880	44.97	7.42	43.10	8.34	7.39	2.55
<b>2011 (total)</b>	14581087		6.90	42.67	7.04	6.13	2.06
			4	n=6222040	n=1027113	n=893268	n=300578
0-5 yrs	813033	1.32	8.62	24.62	7.91	12.35	2.08
			6				
6-9 yrs	741615	0.82	7.38	31.33	6.13	4.27	1.60
			5				
10-14 yrs	1313135	0.71	6.84	41.37	6.45	2.38	1.78
			4				
15-19 yrs	4115312	38.79	5.44	47.86	3.59	4.50	1.35
			4				
20-24 yrs	7597992	43.40	7.47	43.12	9.01	7.17	2.54
			4				
<b>2012 (total)</b>	15181533		6.95	42.14	7.12	5.97	2.01
			4	n=6398068	n=1080783	n=906955	n=304436
0-5 yrs	817788	1.33	8.93	24.52	8.90	13.55	2.23
			6				
6-9 yrs	760909	0.81	7.59	31.09	6.74	4.47	1.63
			5				
10-14 yrs	1357488	0.69	7.21	39.82	7.26	2.35	1.77
			4				

15-19 yrs	4224756	38.64	5.54	47.04	3.73	4.53	1.38
			4				
20-24 yrs	8020592	42.04	7.39	42.81	8.74	6.72	2.39
			4				
<b>2013 (total)</b>	14211606		7.05	41.61	7.46	5.65	2.12
			4	n=5913078	n=1059433	n=803194	n=301142
0-5 yrs	742016	1.63	9.75	24.46	11.94	18.93	3.23
			6				
6-9 yrs	707746	0.83	7.98	30.68	8.01	5.38	2.15
			5				
10-14 yrs	1275427	0.69	7.48	38.63	8.03	2.46	2.13
			5				
15-19 yrs	4016059	37.99	5.66	45.92	3.99	4.21	1.45
			4				
20-24 yrs	7470358	39.99	7.36	42.54	8.72	5.68	2.37
			4				
<b>2014 (total)</b>	13162867		7.21	40.52	7.96	5.95	2.32
			4	n=5333945	n=1048343	n=783350	n=306004
0-5 yrs	751597	2.34	11.22	23.07	17.18	29.98	5.07
			6				
6-9 yrs	639665	0.89	8.54	29.58	9.73	6.60	2.73
			5				
10-14 yrs	1171582	0.70	7.92	37.06	9.30	2.66	2.53
			5				
15-19 yrs	3717078	37.56	5.78	44.54	4.28	3.92	1.62
			4				
20-24 yrs	6882945	38.48	7.30	41.86	8.56	4.93	2.34
			4				

<b>2015</b> (total )	11670555		7.11	40.17	7.50	5.69	2.38
			4	n=468812 3	n=904404	n=664149	n=278226
0-5 yrs	634319	2.12	11.58	23.25	18.72	28.01	5.58
			6				
6-9 yrs	562400	0.87	8.69	29.20	10.18	6.48	2.89
			5				
10-14 yrs	1038889	0.69	7.71	37.05	8.85	2.53	2.51
			5				
15-19 yrs	3418316	37.36	5.80	43.00	4.20	3.91	1.67
			4				
20-24 yrs	6016631	37.83	7.14	41.91	8.19	4.82	2.38
			4				

<b>2016 (total)</b>	10137950		6.97	40.52	7.40	5.20	2.29
			4	n=4108311	n=749800	n=527468	n=232186
0-5 yrs	524432	1.88	11.60	23.50	18.91	25.40	5.39
			6				
6-9 yrs	493823	0.85	8.87	28.39	10.44	6.26	2.86
			5				
10-14 yrs	901470	0.67	7.46	37.34	8.21	2.25	2.32
			4				
15-19 yrs	3098725	36.83	5.77	43.19	4.19	3.66	1.67
			4				
20-24 yrs	5119500	36.98	6.96	42.39	7.72	4.49	2.29
			4				
<b>2017 (total)</b>	8473713		6.67	42.35	6.83	4.59	2.19
			4	n=3588748	n=578914	n=388579	n=185347
0-5 yrs	394655	1.68	11.47	24.88	18.95	23.39	5.26
			6				
6-9 yrs	388789	0.85	8.97	28.76	11.06	6.07	2.90
			5				
10-14 yrs	747044	0.66	7.28	38.51	7.95	1.98	2.20
			4				
15-19 yrs	2719486	35.95	5.46	43.58	3.67	3.18	1.52
			4				
20-24 yrs	4223739	36.04	6.67	43.96	7.15	4.06	2.26
			4				
<b>2018 (total)</b>	6705478		6.24	46.68	6.42	3.68	2.11
			4	n=3129814	n=430280	n=246456	n=141650
0-5 yrs	288841	1.54	11.22	29.30	19.87	20.76	5.30
			6				
6-9 yrs	282695	0.89	9.19	31.32	13.09	6.61	3.26
			5				
10-14 yrs	564809	0.66	7.38	41.33	9.17	1.99	2.46
			4				
15-19 yrs	2260473	33.90	5.09	50.63	3.40	2.34	1.47
			3				
20-24 yrs	3308660	34.02	6.15	47.72	6.27	3.14	2.12
			4				

<sup>a</sup> Mean MME/day per prescription for persons  $\geq 15$  years old and mean MME/kg/day for persons  $< 15$  years old. Trends not reported for Total strata ( $< 25$  years) as mean MME is not comparable throughout all age groups.

<sup>b</sup> Percent of prescriptions for  $\geq 90$  MME/day for persons  $\geq 15$  years old and the percent of prescriptions for  $> 2$  MME/kg/day for persons  $< 15$  years old.

<sup>c</sup> Percent of prescriptions for extended-release or long-acting opioid formulations.

**eTable 2. Patients < 25 years old dispensed one versus multiple opioid prescriptions, by year, 2006-2018**

	Year												
Unique patients (counts & proportion) <sup>a</sup>	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
<b>Total</b>	9008235	9265660	9163826	8913473	8550526	8636028	9017890	8531810	8045410	7541857	6820891	5939791	4903521
<b>1 Rx</b>	6700458	6778546	6696159	6423515	6180764	6306076	6567811	6261669	5975573	5779531	5349060	4773122	4049804
	74.4	73.2	73.1	72.1	72.3	73.0	72.8	73.4	74.3	76.6	78.4	80.4	82.6
<b>2-4 Rx</b>	1957412	2090860	2069764	2080369	1985013	1961513	2069859	1923425	1756132	1518353	1282827	1028938	759996
	21.7	22.6	22.6	23.3	23.2	22.7	23.0	22.5	21.8	20.1	18.8	17.3	15.5
<b>5+ Rx</b>	350365	396254	397903	409589	384749	368439	380220	346716	313705	243973	189004	137731	93721
	3.9	4.3	4.3	4.6	4.5	4.3	4.2	4.1	3.9	3.2	2.8	2.3	1.9

<sup>a</sup> Proportions may not add up to 100.0 due to rounding.



**eTable 3. Sensitivity Analysis Removing Oncology, Hematology, and Hospice Prescriber Subspecialties**

Prescribing Characteristic by Year	Mean or Rate		Average Annual Percent Change (AAPC), (95% CI) <sup>a</sup>		Annual Percent Change (APC), (95% CI) & Joinpoint Segments <sup>a</sup>		
	2006	2018	2006-2013	2014-2018	Trend Years	APC	95% CI
<b>Opioid Dispensing Rate, per 100 persons</b>							
Total Under 25	13.23	6.28	-1.10	-14.49	2006-2012	0.44	(-1.20, 2.11)
			(-2.28, 0.10)	(-17.97, -10.86) <sup>b</sup>	2012-2016	-9.38	(-14.12, -5.32) <sup>b</sup>
					2016-2018	-18.91	(-26.45, -10.61) <sup>b</sup>
0-5 yrs	4.02	1.38	-2.25	-20.17	2006-2012	-0.19	(-2.51, 2.20)
			(-3.91, -0.55) <sup>b</sup>	(-24.78, -15.28) <sup>b</sup>	2012-2016	-13.75	(-19.56, -7.52) <sup>b</sup>
					2016-2018	-26.12	(-35.74, -15.07) <sup>b</sup>
6-9 yrs	3.82	1.32	-3.30	-17.02	2006-2012	-2.19	(-4.10, -0.24) <sup>b</sup>
			(-4.68, -1.90) <sup>b</sup>	(-21.04, -12.78) <sup>b</sup>	2012-2016	-9.68	(-14.80, -4.25) <sup>b</sup>
					2016-2018	-23.76	(-32.16, -14.32) <sup>b</sup>
10-14 yrs	5.96	2.47	-1.38	-16.24	2006-2012	-0.07	(-1.38, 1.27)
			(-2.33, -0.42) <sup>b</sup>	(-19.00, -13.40) <sup>b</sup>	2012-2016	-8.91	(-12.41, -5.26) <sup>b</sup>
					2016-2018	-22.99	(-28.80, -16.71) <sup>b</sup>
15-19 yrs	18.31	10.31	-0.61	-11.27	2006-2013	-0.61	(-2.27, 1.08)
			(-2.27, 1.08)	(-13.73, -8.74) <sup>b</sup>	2013-2018	-11.27	(-13.73, -8.74) <sup>b</sup>
20-24 yrs	32.26	14.96	-1.01	-15.05	2006-2012	0.72	(-1.12, 2.60)
			(-2.33, 0.33)	(-18.91, -11.01) <sup>b</sup>	2012-2016	-10.79	(-15.53, -5.80) <sup>b</sup>
					2016-2018	-19.11	(-27.47, -9.79) <sup>b</sup>
<b>Mean Amount Opioid Dispensed,</b>							

<b>MME/kg/day or MME/day<sup>c</sup></b>							
0-5 yrs	1.40	1.51	1.66	-10.38	2006-2011	-2.38	(-3.71, -1.04) <sup>b</sup>
			(0.12, 3.22) <sup>b</sup>	(-12.10, -8.64) <sup>b</sup>	2011-2014	12.51	(5.85, 19.60) <sup>b</sup>
					2014-2018	-10.38	(-12.10, -8.64) <sup>b</sup>
6-9 yrs	0.93	0.87	-2.24	-2.24	<sup>d</sup>		
			(-3.10, -1.38) <sup>b</sup>	(-3.10, -1.38) <sup>b</sup>			
10-14 yrs	0.74	0.66	-1.22	-1.22	<sup>d</sup>		
			(-1.43, -1.02) <sup>b</sup>	(-1.43, -1.02) <sup>b</sup>			
15-19 yrs	41.11	33.77	-1.16	-2.48	2006-2016	-1.16	(-1.25, -1.06) <sup>b</sup>
			(-1.28, -1.04) <sup>b</sup>	(-3.13, -1.82) <sup>b</sup>	2016-2018	-3.78	(-5.05, -2.61) <sup>b</sup>
20-24 yrs	44.10	33.73	-1.23	-3.16	2006-2010	0.24	(-0.93, 1.41)
			(-1.81, -0.65) <sup>b</sup>	(-3.55, -2.77) <sup>b</sup>	2010-2018	-3.16	(-3.55, -2.77) <sup>b</sup>
<b>Mean Duration per Prescription, days</b>							
Total Under 25	6.09	6.10	1.72	-3.25	2006-2015	1.72	(1.37, 2.07) <sup>b</sup>
			(1.37, 2.07) <sup>b</sup>	(-4.40, -2.09) <sup>b</sup>	2015-2018	-4.86	(-3.06, -6.13) <sup>b</sup>
0-5 yrs	8.12	11.21	2.25	0.54	2006-2011	0.50	(-0.37, 1.38)
			(1.60, 2.90) <sup>b</sup>	(-0.63, 1.73)	2011-2015	6.75	(4.69, 8.84) <sup>b</sup>
					2015-2018	-1.45	(-3.35, 0.49)
6-9 yrs	7.23	8.87	0.42	0.42	<sup>d</sup>		
			(-0.32, 1.16)	(-0.32, 1.16)			
10-14 yrs	5.84	6.92	2.34	-1.53	2006-2010	0.84	(-0.74, 2.44)
			(1.26, 3.44) <sup>b</sup>	(-3.07, 0.03)	2010-2014	4.39	(1.82, 7.03) <sup>b</sup>
					2014-2018	-1.53	(-3.07, 0.03)
15-19 yrs	5.07	4.98	1.09	-3.04	2006-2016	1.09	(0.85, 1.33) <sup>b</sup>

			(0.85, 1.33) <sup>b</sup>	(-4.30, -1.76) <sup>b</sup>	2016-2018	-7.00	(-9.81, -4.10) <sup>b</sup>
20-24 yrs	6.30	6.09	1.99	-4.50	2006-2010	4.04	(2.03, 6.08) <sup>b</sup>
			(0.92, 3.08) <sup>b</sup>	(-6.20, -2.77) <sup>b</sup>	2010-2016	-0.67	(-2.58, 1.28)
					2016-2018	-5.75	(-8.60, -2.81) <sup>b</sup>
<b>Prescription by Duration, rate per 100 persons dispensed an opioid</b>							
≤ 3 days							
Total Under 25	75.48	64.18	-1.48	-1.48	<sup>d</sup>		
			(-2.05, -0.91) <sup>b</sup>	(-2.05, -0.91) <sup>b</sup>			
0-5 yrs	35.06	45.22	0.01	0.01	<sup>d</sup>		
			(-1.24, 1.27)	(-1.24, 1.27)			
6-9 yrs	46.55	43.11	-1.65	-1.65	<sup>d</sup>		
			(-2.43, -0.86) <sup>b</sup>	(-2.43, -0.86) <sup>b</sup>			
10-14 yrs	64.54	55.13	-2.58	0.61	2006-2016	-2.51	(-2.79, -2.24) <sup>b</sup>
			(-3.19, -1.96) <sup>b</sup>	(-2.80, 4.15)	2016-2018	4.32	(0.56, 8.22) <sup>b</sup>
15-19 yrs	77.65	63.73	-1.76	-1.76	<sup>d</sup>		
			(-2.45, -1.07) <sup>b</sup>	(-2.45, -1.07) <sup>b</sup>			
20-24 yrs	88.33	69.50	-1.75	-1.75	<sup>d</sup>		
			(-2.37, -1.13) <sup>b</sup>	(-2.37, -1.13) <sup>b</sup>			
≥ 30 days							

Total Under 25	8.01	8.35	5.86	-9.99	2006-2008	13.07	(7.08, 18.51) <sup>b</sup>
			(4.63, 7.11) <sup>b</sup>	(-11.32, -8.64) <sup>b</sup>	2008-2014	3.11	(2.03, 4.20)
					2014-2018	-9.99	(-11.32, -8.64) <sup>b</sup>
0-5 yrs	9.40	30.83	8.10	1.73	2006-2011	-0.65	(-3.21, 1.98)
			(5.00, 11.30) <sup>b</sup>	(-1.95, 5.56)	2011-2014	33.49	(18.78, 50.02) <sup>b</sup>
					2014-2018	1.73	(-1.95, 5.56)
6-9 yrs	8.88	16.77	-1.03	8.13	2006-2011	-4.47	(-11.15, 2.71)
			(-5.41, 3.55)	(3.55, 12.92) <sup>b</sup>	2011-2018	8.13	(3.55, 12.92) <sup>b</sup>
10-14 yrs	6.28	10.53	5.72	-2.69	2006-2010	0.45	(-6.96, 8.45)
			(0.39, 11.34) <sup>b</sup>	(-9.87, 5.06)	2010-2014	13.18	(0.27, 27.76) <sup>b</sup>
					2014-2018	-2.69	(-9.87, 5.06)
15-19 yrs	4.40	3.97	2.94	-10.27	2006-2013	2.94	(1.11, 4.80) <sup>b</sup>
			(1.11, 4.80) <sup>b</sup>	(-12.92, -7.54) <sup>b</sup>	2013-2018	-10.27	(-12.92, -7.54) <sup>b</sup>
20-24 yrs	10.72	8.92	6.41	-12.86	2006-2009	17.23	(11.07, 23.74) <sup>b</sup>
			(3.98, 8.91) <sup>b</sup>	(-15.69, -9.83) <sup>b</sup>	2009-2014	-1.04	(-4.37, 2.40)
					2014-2018	-12.86	(-15.79, -9.83) <sup>b</sup>
<b>High-dosage Prescription, rate per 100 persons dispensed an opioid<sup>e</sup></b>							
Total Under 25	8.77	3.66	-1.71	-14.06	2006-2010	2.57	(-0.70, 5.94)
			(-3.27, -0.13) <sup>b</sup>	(-17.43, -10.56) <sup>b</sup>	2010-2016	-7.14	(-9.25, -4.99) <sup>b</sup>
					2016-2018	-20.47	(-28.21, -11.89) <sup>b</sup>

0-5 yrs	21.36	31.67	3.06	-10.76	2006-2011	-7.14	(-9.38, -4.84) <sup>b</sup>
			(0.29, 5.90) <sup>b</sup>	(-13.79, -7.63) <sup>b</sup>	2011-2014	33.72	(19.89, 49.15) <sup>b</sup>
					2014-2018	-10.76	(-13.79, -7.63) <sup>b</sup>
6-9 yrs	9.64	8.71	-6.04	-1.22	2006-2011	-12.72	(-17.81, -7.32) <sup>b</sup>
			(-12.13, 0.47)	(-9.26, 7.53)	2011-2014	12.99	(-13.61, 47.79)
					2014-2018	-1.22	(-9.26, 7.53)
10-14 yrs	3.63	2.52	-4.67	-9.55	2006-2009	-5.78	(-12.27, 1.18)
			(-4.62, 1.37)	(-13.54, -5.26) <sup>b</sup>	2009-2014	1.53	(-2.94, 6.22)
					2014-2018	-9.55	(-13.54, -5.38) <sup>b</sup>
15-19 yrs	7.77	2.81	-3.36	-14.30	2006-2016	-3.36	(-4.32, -2.38) <sup>b</sup>
			(-4.32, -2.38) <sup>b</sup>	(-18.88, -9.47) <sup>b</sup>	2016-2018	-24.01	(-33.19, -13.56) <sup>b</sup>
20-24 yrs	12.52	4.29	-2.65	-15.35	2006-2011	2.95	(-1.09, 7.16)
			(-5.05, -0.19) <sup>b</sup>	(-17.36, -13.30) <sup>b</sup>	2011-2018	-15.35	(-17.36, -13.30) <sup>b</sup>
<b>Prescription for ER/LA Formulation, rate per 100 persons dispensed an opioid<sup>f</sup></b>							
Total Under 25	2.21	2.54	4.58	-7.21	2006-2008	23.38	(4.84, 45.18) <sup>b</sup>
			(0.64, 8.69) <sup>b</sup>	(-11.46, -2.77) <sup>b</sup>	2008-2015	-2.10	(-4.76, 0.63)
					2015-2018	-8.86	(-15.98, -1.13) <sup>b</sup>
0-5 yrs	2.27	7.88	7.84	-0.42	2006-2011	-0.08	(-4.03, 4.03)
			(3.10, 12.81) <sup>b</sup>	(-5.94, 5.42)	2011-2014	30.53	(8.99, 56.32) <sup>b</sup>
					2014-2018	-0.42	(-5.94, 5.42)
6-9 yrs	2.01	4.18	0.21	0.21	<sup>d</sup>		
			(-2.69, 3.20)	(-2.69, 3.20)			
10-14 yrs	1.49	2.87	6.36	-4.09	2006-2014	6.36	(3.41, 9.40) <sup>b</sup>
			(3.41, 9.40) <sup>b</sup>	(-11.60, 4.06)	2014-2018	-4.09	(-11.60, 4.06)

15-19 yrs	1.34	1.52	3.96	-7.10	2006-2008	20.23	(-0.89, 45.86)
			(-0.55, 8.68)	(-13.75, 0.07)	2008-2016	-1.91	(-4.41, 0.65)
					2016-2018	-12.01	(-27.47, 6.74)
20-24 yrs	3.06	2.72	2.92	-8.08	2006-2013	19.65	(11.31, 28.61) <sup>b</sup>
			(0.17, 5.74) <sup>b</sup>	(-9.28, -6.86) <sup>b</sup>	2013-2018	-8.08	(-9.28, -6.86) <sup>b</sup>

<sup>a</sup>Joinpoint allowed up to 2 joinpoints. Due to retail channel data coverage, 2014 was added as a jump point.

<sup>b</sup>Indicates that APC and AAPC is statistically significant ( $P < 0.05$ ) using a 2-sided test based on the permutation methods.

<sup>c</sup>Mean MME/day per prescription for persons  $\geq 15$  years old and mean MME/kg/day for persons  $< 15$  years old. Trends not reported for Total strata ( $< 25$  years) as mean MME is not comparable throughout all age groups.

<sup>d</sup>No joinpoint detected for this strata and outcome. APC is constant and equal to AAPC.

<sup>e</sup>Prescription for  $\geq 90$  MME/day for persons  $\geq 15$  years old and prescription for  $> 2$  MME/kg/day for persons  $< 15$  years old.

<sup>f</sup>Prescriptions for extended-release or long-acting opioid formulations

**eTable 4. Sensitivity Analysis Removing Long-Duration and High-Dosage Prescriptions**

Prescribing Characteristic by Year	Mean or Rate		Average Annual Percent Change (AAPC), (95% CI) <sup>a</sup>		Annual Percent Change (APC), (95% CI) & Joinpoint Segments <sup>a</sup>		
	2006	2018	2006-2013	2014-2018	Trend Years	APC	95% CI
<b>Opioid Dispensing Rate, per 100 persons</b>							
Total Under 25	14.00	6.37	-0.98 (-2.46, 0.53)	-15.04 (-17.15, -12.87) <sup>b</sup>	2006-2013 2013-2018	-0.98 -15.04	(-2.46, 0.53) (-17.15, -12.87) <sup>b</sup>
0-5 yrs	4.34	1.33	-2.31 (-3.56, -1.03) <sup>b</sup>	-20.95 (-24.97, -16.71) <sup>b</sup>	2006-2013 2013-2016 2016-2018	-2.31 -16.62 -25.05	(-3.56, -1.03) <sup>b</sup> (-24.33, -8.14) <sup>b</sup> (-31.97, -17.42) <sup>b</sup>
6-9 yrs	4.14	1.38	-3.50 (-4.64, -2.34) <sup>b</sup>	-16.40 (-19.81, -12.84) <sup>b</sup>	2006-2015 2015-2018	-3.50 -20.30	(-4.64, -2.34) <sup>b</sup> (-25.34, -14.93) <sup>b</sup>
10-14 yrs	6.48	2.61	-1.10 (-2.31, 0.13)	-17.00 (-21.03, -12.77) <sup>b</sup>	2006-2013 2013-2016 2016-2018	-1.10 -11.44 -22.22	(-2.31, 0.13) (-19.24, -2.89) <sup>b</sup> (-29.07, -14.70) <sup>b</sup>
15-19 yrs	19.62	10.49	-1.39 (-2.54, -0.24) <sup>b</sup>	-10.71 (-14.27, -7.01) <sup>b</sup>	2006-2015 2015-2018	-1.39 -13.62	(-2.53, -0.24) <sup>b</sup> (-18.95, -7.94) <sup>b</sup>
20-24 yrs	34.28	15.13	-0.95 (-2.14, 0.25)	-15.57 (-18.47, -12.57) <sup>b</sup>	2006-2014 2014-2018	-0.95 -15.57	(-2.14, 0.25) (-18.47, -12.57) <sup>b</sup>
<b>Mean Amount Opioid Dispensed, MME/kg/day or MME/day<sup>c</sup></b>							

0-5 yrs	1.23	1.19	0.42	-9.99	2006-2011	-2.96	(-5.27, -0.59) <sup>b</sup>
			(-2.25, 3.16)	(-13.01, -6.87) <sup>b</sup>	2011-2014	9.38	(-1.81, 21.84)
					2014-2018	-9.99	(-13.01, -6.87) <sup>b</sup>
6-9 yrs	0.88	0.79	-2.76	-2.76			
			(-3.62, -1.89) <sup>b</sup>	(-3.62, -1.89) <sup>b</sup>	<sup>d</sup>		
10-14 yrs	0.72	0.63	-1.36	-1.36			
			(-1.50, -1.22) <sup>b</sup>	(-1.50, -1.22) <sup>b</sup>	<sup>d</sup>		
15-19 yrs	40.71	33.53	-1.17	-2.37	2006-2016	-1.17	(-1.25, -1.08) <sup>b</sup>
			(-1.25, -1.08) <sup>b</sup>	(-2.85, -1.90) <sup>b</sup>	2016-2018	-3.57	(-4.66, -2.46) <sup>b</sup>
20-24 yrs	42.33	33.35	-1.23	-2.64	2006-2010	-0.16	(-1.17, 0.85)
			(-1.73, -0.73) <sup>b</sup>	(-2.98, -2.30) <sup>b</sup>	2010-2018	-2.64	(-2.98, -2.30) <sup>b</sup>
<b>Mean Duration per Prescription, days</b>							
Total Under 25	5.87	5.99	1.87	-2.85	2006-2015	1.87	(1.37, 2.07) <sup>b</sup>
			(1.58, 2.16) <sup>b</sup>	(-3.81, -1.88) <sup>b</sup>	2015-2018	-4.38	(-3.06, -6.13) <sup>b</sup>
0-5 yrs	7.39	9.21	1.79	0.69	2006-2011	0.95	(0.12, 1.78) <sup>b</sup>
			(1.18, 2.40) <sup>b</sup>	(-0.42, 1.81)	2011-2015	3.94	(2.05, 5.86) <sup>b</sup>
					2015-2018	-0.37	(-2.19, 1.47)
6-9 yrs	6.87	8.50	0.81	0.81	<sup>d</sup>		
			(0.32, 1.31) <sup>b</sup>	(0.32, 1.31) <sup>b</sup>			



10-14 yrs	5.72	7.16	3.37 (2.32, 4.42) <sup>b</sup>	-1.82 (-3.28, -0.33) <sup>b</sup>	2006-2009	1.41	(-0.97, 3.84)
					2009-2014	4.86	(3.30, 6.45) <sup>b</sup>
					2014-2018	-1.82	(-3.28, -0.33) <sup>b</sup>
15-19 yrs	5.00	5.00	0.38 (-4.26, 3.66)	0.38 (-4.26, 3.66)	<sup>d</sup>		
20-24 yrs	6.08	6.00	2.20 (1.56, 2.84) <sup>b</sup>	-3.48 (-4.40, -2.56) <sup>b</sup>	2006-2010	4.34	(2.63, 6.07) <sup>b</sup>
					2010-2016	0.63	(-0.11, 1.37)
					2016-2018	-4.82	(-6.38, -3.23) <sup>b</sup>
<b>Prescription by Duration, rate per 100 persons dispensed an opioid</b>							
≤ 3 days							
Total Under 25	77.31	63.94	-1.49 (-1.97, -1.01) <sup>b</sup>	-1.07 (-2.99, 0.89)	2006-2013	-1.49	(-1.97, -1.01) <sup>b</sup>
					2013-2016	-5.10	(-8.49, -1.59) <sup>b</sup>
					2016-2018	3.14	(-0.54, 6.95)
0-5 yrs	38.08	45.46	-1.12 (-3.04, 0.84)	4.36 (2.42, 6.34) <sup>b</sup>	2006-2011	-3.23	(-6.22, -0.14) <sup>b</sup>
					2011-2018	4.36	(2.42, 6.34)
6-9 yrs	48.37	42.86	-1.73 (-2.44, -1.01) <sup>b</sup>	-1.73 (-2.44, -1.01) <sup>b</sup>	<sup>d</sup>		
10-14 yrs	66.07	54.41	-2.66 (-2.92, -2.41) <sup>b</sup>	0.79 (-0.66, 2.26)	2006-2016	-2.66	(-2.92, -2.41) <sup>b</sup>
					2016-2018	4.29	(0.87, 7.98) <sup>b</sup>
15-19 yrs	79.27	63.55	-2.15 (-2.57, -1.74) <sup>b</sup>	-0.53 (-1.98, 0.95) <sup>b</sup>	2006-2012	-1.60	(-2.17, -1.02) <sup>b</sup>
					2012-2016	-5.42	(-7.04, -3.77) <sup>b</sup>
					2016-2018	4.62	(1.07, 8.30) <sup>b</sup>
20-24 yrs	90.48	69.46	-1.33 (-2.77, 0.13)	-2.62 (-3.31, -1.92) <sup>b</sup>	2006-2009	0.42	(-3.45, 4.44)
					2009-2018	-2.62	(-3.31, -1.92) <sup>b</sup>

≥ 30 days							
Total Under 25	6.72	7.36	6.19	-8.86	2006-2009	11.94	(8.74, 15.24) <sup>b</sup>
			(5.34, 7.05) <sup>b</sup>	(-9.45, -8.27) <sup>b</sup>	2009-2018	3.97	(3.02, 4.93) <sup>b</sup>
0-5 yrs	5.43	15.95	6.36	7.67	2006-2011	-0.83	(-4.91, 3.42)
			(1.49, 11.47) <sup>b</sup>	(1.46, 14.25) <sup>b</sup>	2011-2014	26.72	(5.03, 52.89) <sup>b</sup>
					2014-2018	7.67	(1.46, 14.25) <sup>b</sup>
6-9 yrs	6.84	13.53	-0.11	8.23	2006-2011	-3.26	(-8.72, 2.53)
			(-5.67, 3.58)	(4.53, 12.06) <sup>b</sup>	2011-2018	8.23	(4.53, 12.06) <sup>b</sup>
10-14 yrs	5.55	10.81	8.54	-2.70	2006-2014	8.54	(5.31, 11.87) <sup>b</sup>
			(5.31, 11.87) <sup>b</sup>	(-10.86, 6.20)	2014-2018	-2.70	(-10.86, 6.20)
15-19 yrs	4.53	4.26	2.95	-9.20	2006-2014	2.95	(1.58, 4.35) <sup>b</sup>
			(1.58, 4.35) <sup>b</sup>	(-12.67, -5.58) <sup>b</sup>	2014-2018	-9.20	(-12.67, -5.58) <sup>b</sup>
20-24 yrs	9.27	8.24	6.46	-12.02	2006-2009	14.94	(8.49, 21.77) <sup>b</sup>
			(3.16, 9.86) <sup>b</sup>	(-14.26, -9.72) <sup>b</sup>	2009-2013	0.51	(-5.31, 6.48)
					2013-2018	-12.02	(-14.26, -9.72) <sup>b</sup>
<b>High-dosage Prescription, rate per 100 persons dispensed an opioid<sup>e</sup></b>							
Total Under 25	9.55	3.63	-3.27	-14.89	2006-2015	-3.27	(-4.03, 2.51)
			(-4.03, -2.51) <sup>b</sup>	(-17.20, -12.52) <sup>b</sup>	2015-2018	-18.45	(-21.88, -14.86) <sup>b</sup>
0-5 yrs	17.28	17.38	0.74	-14.35	2006-2011	-9.04	(-11.79, -6.20) <sup>b</sup>
			(-2.66, 4.25)	(-17.99, -10.54) <sup>b</sup>	2011-2014	30.04	(13.35, 49.19) <sup>b</sup>
					2014-2018	-14.35	(-17.99, -10.54) <sup>b</sup>

6-9 yrs	7.78	4.64	-10.50	-1.95	2006-2011	-13.70	(-20.55, -7.26) <sup>b</sup>
			(-15.00, -5.76) <sup>b</sup>	(-6.67, 3.02)	2011-2018	1.95	(-6.67, 3.02)
10-14 yrs	2.99	1.40	-4.46	-12.37	2006-2009	-7.84	(-12.18, -3.29) <sup>b</sup>
			(-4.41, -2.47) <sup>b</sup>	(-15.00, -9.66) <sup>b</sup>	2009-2014	1.84	(-4.79, 1.20)
					2014-2018	-12.37	(-15.00, -9.66) <sup>b</sup>
15-19 yrs	7.61	2.52	-3.88	-14.76	2006-2016	-3.88	(-4.86, -2.88) <sup>b</sup>
			(-4.86, -2.88) <sup>b</sup>	(-19.43, -9.82) <sup>b</sup>	2016-2018	-24.41	(-33.77, -13.74) <sup>b</sup>
20-24 yrs	11.55	3.69	-3.65	-15.27	2006-2012	-1.56	(-4.66, -1.64) <sup>b</sup>
			(-5.90, -1.35) <sup>b</sup>	(-17.94, -12.52) <sup>b</sup>	2012-2018	-15.27	(-17.94, -12.52) <sup>b</sup>
<b>Prescription for ER/LA Formulation, rate per 100 persons dispensed an opioid<sup>f</sup></b>							
Total Under 25	1.72	2.25	5.22	-4.78	2006-2008	21.05	(6.39, 37.73) <sup>b</sup>
			(2.06, 8.49) <sup>b</sup>	(-8.25, -1.17) <sup>b</sup>	2008-2015	-0.51	(-2.66, 1.68)
					2015-2018	-6.16	(-12.02, 0.10)
0-5 yrs	1.14	4.29	5.83	5.43	<sup>d</sup>		
			(1.43, 9.58) <sup>b</sup>	(1.43, 9.58) <sup>b</sup>			
6-9 yrs	1.07	2.77	1.47	1.47	<sup>d</sup>		
			(-1.65, 4.70)	(-1.65, 4.70)			
10-14 yrs	1.12	2.51	5.35	5.35	<sup>d</sup>		
			(3.60, 7.13) <sup>b</sup>	(3.60, 7.13) <sup>b</sup>			
15-19 yrs	1.20	1.48	4.34	-5.35	2006-2008	18.21	(-1.80, 42.29)
			(-0.01, 8.88)	(-11.86, 1.65)	2008-2016	-0.74	(-0.74, 1.75)
					2016-2018	-9.74	(-25.01, 8.66)

20-24 yrs	2.47	2.59	3.70	-5.56	2006-2009	17.47	(9.29, 26.27) <sup>b</sup>
			(0.93, 6.55) <sup>b</sup>	(-6.79, -4.30) <sup>b</sup>	2009-2018	-5.56	(-6.79, -4.30) <sup>b</sup>

<sup>a</sup>Joinpoint allowed up to 2 joinpoints. Due to retail channel data coverage, 2014 was added as a jump point.

<sup>b</sup>Indicates that APC and AAPC is statistically significant ( $P < 0.05$ ) using a 2-sided test based on the permutation methods.

<sup>c</sup>Mean MME/day per prescription for persons  $\geq 15$  years old and mean MME/kg/day for persons  $< 15$  years old. Trends not reported for Total strata ( $< 25$  years) as mean MME is not comparable throughout all age groups.

<sup>d</sup>No joinpoint detected for this strata and outcome. APC is constant and equal to AAPC.

<sup>e</sup>Prescription for  $\geq 90$  MME/day for persons  $\geq 15$  years old and prescription for  $> 2$  MME/kg/day for persons  $< 15$  years old.

<sup>f</sup>Prescriptions for extended-release or long-acting opioid formulations.