Supplementary Materials for

Longitudinal Changes in the County-Level Relationship between Opioid Prescriptions and Child Maltreatment Reports, United States, 2009-2018

This file includes:

Tables S1a-S18b

Table S1a. Unadjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among All Children, U.S. Counties, 2009-2018.

Fixed effects	Coefficient	Standard error	t	p
Intercept	42.7862	2.7977	15.293	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	0.0730	0.7996	0.091	.9273
Year 2011	0.9926	0.8003	1.240	.2149
Year 2012	1.1092	0.7910	1.402	.1609
Year 2013	2.1312	0.7990	2.667	.0077
Year 2014	4.9015	0.8104	6.049	.0000
Year 2015	8.3643	0.8422	9.932	.0000
Year 2016	12.2977	0.8877	13.853	.0000
Year 2017	18.2479	1.0144	17.989	.0000
Year 2018	26.1191	1.2343	21.161	.0000
Opioid prescription rate	0.2529	0.0209	12.105	.0000
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0136	0.0270	0.506	.6131
Opioid prescription rate × Year 2011	0.0271	0.0271	0.997	.3186
Opioid prescription rate × Year 2012	0.0499	0.0266	1.875	.0609
Opioid prescription rate × Year 2013	0.0903	0.0270	3.339	.0008
Opioid prescription rate × Year 2014	0.1176	0.0276	4.266	.0000
Opioid prescription rate × Year 2015	0.1698	0.0286	5.936	.0000
Opioid prescription rate × Year 2016	0.2191	0.0294	7.453	.0000
Opioid prescription rate × Year 2017	0.2883	0.0311	9.265	.0000
Opioid prescription rate × Year 2018	0.3785	0.0339	11.164	.0000

Random effect	Variance
State-level: Intercept	379.488
Observation-level	176.688

Note. N = 6,151 county-year observations. All estimates were weighted by county child populations. This model is corresponding to the results of Model 1 in Table 2 in the main text.

Table S1b. Post Hoc Tests on Pairwise Comparisons between Unadjusted Yearly Opioid Coefficients on County CMR Rates among All Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0136	.0270	-0.506	1.0000
Year 2009 – Year 2011	-.0271	.0271	-0.998	.9924
Year 2009 – Year 2012	-.0499	.0266	-1.876	.6858
Year 2009 – Year 2013	-.0903	.0270	-3.340	.0291
Year 2009 – Year 2014	-.1176	.0276	-4.268	.0009
Year 2009 – Year 2015	-.1698	.0286	-5.939	<.0001
Year 2009 – Year 2016	-.2191	.0294	-7.456	<.0001
Year 2009 – Year 2017	-.2883	.0311	-9.269	<.0001
Year 2009 – Year 2018	-.3785	.0339	-11.168	<.0001
Year 2010 – Year 2011	-.0134	.0260	-0.517	1.0000
Year 2010 – Year 2012	-.0363	.0255	-1.425	.9196
Year 2010 – Year 2013	-.0766	.0259	-2.959	.0905
Year 2010 – Year 2014	-.1040	.0265	-3.930	.0035
Year 2010 – Year 2015	-.1561	.0275	-5.675	<.0001
Year 2010 – Year 2016	-.2055	.0283	-7.249	<.0001
Year 2010 – Year 2017	-.2746	.0301	-9.119	<.0001
Year 2010 – Year 2018	-.3648	.0330	-11.060	<.0001
Year 2011 – Year 2012	-.0228	.0256	-0.891	.9968
Year 2011 – Year 2013	-.0632	.0261	-2.423	.3123
Year 2011 – Year 2014	-.0905	.0266	-3.399	.0240
Year 2011 – Year 2015	-.1427	.0277	-5.155	<.0001
Year 2011 – Year 2016	-.1920	.0285	-6.737	<.0001
Year 2011 – Year 2017	-.2612	.0303	-8.630	<.0001
Year 2011 – Year 2018	-.3514	.0331	-10.609	<.0001
Year 2012 – Year 2013	-.0403	.0255	-1.582	.8569
Year 2012 – Year 2014	-.0677	.0261	-2.597	.2196
Year 2012 – Year 2015	-.1199	.0271	-4.415	.0004
Year 2012 – Year 2016	-.1692	.0280	-6.045	<.0001
Year 2012 – Year 2017	-.2383	.0298	-8.002	<.0001
Year 2012 – Year 2018	-.3286	.0327	-10.050	<.0001
Year 2013 – Year 2014	-.0273	.0265	-1.033	.9903
Year 2013 – Year 2015	-.0795	.0275	-2.889	.1092
Year 2013 – Year 2016	-.1288	.0284	-4.544	.0002
Year 2013 – Year 2017	-.1980	.0301	-6.573	<.0001
Year 2013 – Year 2018	-.2882	.0330	-8.736	<.0001
Year 2014 – Year 2015	-.0522	.0280	-1.861	.6958
Year 2014 – Year 2016	-.1015	.0289	-3.518	.0160
Year 2014 – Year 2017	-.1707	.0306	-5.580	<.0001
Year 2014 – Year 2018	-.2609	.0334	-7.809	<.0001
Year 2015 – Year 2016	-.0493	.0298	-1.655	.8204
Year 2015 – Year 2017	-.1185	.0315	-3.764	.0066
Year 2015 – Year 2018	-.2087	.0342	-6.100	<.0001
Year 2016 – Year 2017	-.0692	.0322	-2.150	.4917
Year 2016 – Year 2018	-.1594	.0348	-4.576	.0002
Year 2017 – Year 2018	-.0902	.0362	-2.492	.2730

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey's method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 1 in Table 2 in the main text.

Table S2a. Unadjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Age 0-5 Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	53.4881	3.2644	16.385	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	0.2469	1.0085	0.245	.8066
Year 2011	1.5383	1.0097	1.524	.1277
Year 2012	1.6212	0.9984	1.624	.1045
Year 2013	2.9995	1.0098	2.970	.0030
Year 2014	5.6414	1.0254	5.502	.0000
Year 2015	9.8589	1.0677	9.234	.0000
Year 2016	14.9520	1.1268	13.270	.0000
Year 2017	22.9888	1.2885	17.842	.0000
Year 2018	33.2530	1.5685	21.200	.0000
Opioid prescription rate	0.4179	0.0263	15.915	.0000
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0163	0.0339	0.481	.6303
Opioid prescription rate × Year 2011	0.0331	0.0341	0.972	.3311
Opioid prescription rate × Year 2012	0.0568	0.0334	1.698	.0896
Opioid prescription rate × Year 2013	0.1088	0.0340	3.205	.0014
Opioid prescription rate × Year 2014	0.1422	0.0347	4.103	.0000
Opioid prescription rate × Year 2015	0.2163	0.0360	6.009	.0000
Opioid prescription rate × Year 2016	0.2863	0.0370	7.731	.0000
Opioid prescription rate × Year 2017	0.3798	0.0392	9.682	.0000
Opioid prescription rate × Year 2018	0.4986	0.0428	11.650	.0000

Random effect	**Variance**
State-level: Intercept	512.248
Observation-level	282.614

Note. N = 6,151 county-year observations. All estimates were weighted by county age 0-5 child populations. This model is corresponding to the results of Model 2 in Table 2 in the main text.

Table S2b. Post Hoc Tests on Pairwise Comparisons between Unadjusted Yearly Opioid Coefficients on County CMR Rates among Age 0-5 Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0163	.0339	-0.481	1.0000
Year 2009 – Year 2011	-.0331	.0341	-0.972	.9937
Year 2009 – Year 2012	-.0568	.0334	-1.699	.7965
Year 2009 – Year 2013	-.1088	.0339	-3.206	.0444
Year 2009 – Year 2014	-.1422	.0347	-4.105	.0017
Year 2009 – Year 2015	-.2163	.0360	-6.011	<.0001
Year 2009 – Year 2016	-.2863	.0370	-7.734	<.0001
Year 2009 – Year 2017	-.3798	.0392	-9.686	<.0001
Year 2009 – Year 2018	-.4986	.0428	-11.655	<.0001
Year 2010 – Year 2011	-.0168	.0327	-0.516	1.0000
Year 2010 – Year 2012	-.0405	.0320	-1.266	.9610
Year 2010 – Year 2013	-.0925	.0325	-2.844	.1224
Year 2010 – Year 2014	-.1259	.0333	-3.786	.0061
Year 2010 – Year 2015	-.2000	.0346	-5.774	<.0001
Year 2010 – Year 2016	-.2700	.0357	-7.561	<.0001
Year 2010 – Year 2017	-.3635	.0380	-9.571	<.0001
Year 2010 – Year 2018	-.4823	.0417	-11.578	<.0001
Year 2011 – Year 2012	-.0236	.0322	-0.734	.9993
Year 2011 – Year 2013	-.0757	.0327	-2.311	.3819
Year 2011 – Year 2014	-.1091	.0335	-3.259	.0377
Year 2011 – Year 2015	-.1831	.0348	-5.258	<.0001
Year 2011 – Year 2016	-.2531	.0359	-7.051	<.0001
Year 2011 – Year 2017	-.3466	.0382	-9.085	<.0001
Year 2011 – Year 2018	-.4655	.0418	-11.132	<.0001
Year 2012 – Year 2013	-.0520	.0320	-1.626	.8357
Year 2012 – Year 2014	-.0855	.0328	-2.608	.2141
Year 2012 – Year 2015	-.1595	.0342	-4.669	.0001
Year 2012 – Year 2016	-.2295	.0353	-6.510	<.0001
Year 2012 – Year 2017	-.3230	.0376	-8.600	<.0001
Year 2012 – Year 2018	-.4418	.0413	-10.703	<.0001
Year 2013 – Year 2014	-.0334	.0333	-1.004	.9921
Year 2013 – Year 2015	-.1075	.0347	-3.101	.0608
Year 2013 – Year 2016	-.1775	.0357	-4.967	<.0001
Year 2013 – Year 2017	-.2710	.0380	-7.132	<.0001
Year 2013 – Year 2018	-.3898	.0417	-9.355	<.0001
Year 2014 – Year 2015	-.0740	.0353	-2.095	.5310
Year 2014 – Year 2016	-.1440	.0364	-3.959	.0031
Year 2014 – Year 2017	-.2375	.0386	-6.154	<.0001
Year 2014 – Year 2018	-.3564	.0422	-8.442	<.0001
Year 2015 – Year 2016	-.0700	.0376	-1.862	.6948
Year 2015 – Year 2017	-.1635	.0397	-4.114	.0016
Year 2015 – Year 2018	-.2824	.0432	-6.529	<.0001
Year 2016 – Year 2017	-.0935	.0406	-2.301	.3886
Year 2016 – Year 2018	-.2123	.0440	-4.821	.0001
Year 2017 – Year 2018	-.1188	.0458	-2.595	.2203

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 2 in Table 2 in the main text.

Table S3a. Unadjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Age 6-11 Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	43.0981	2.9998	14.367	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	0.0404	0.8338	0.048	.9614
Year 2011	0.9179	0.8336	1.101	.2709
Year 2012	1.3170	0.8232	1.600	.1097
Year 2013	2.5721	0.8307	3.096	.0020
Year 2014	6.0956	0.8418	7.242	.0000
Year 2015	10.0785	0.8739	11.533	.0000
Year 2016	14.1986	0.9202	15.430	.0000
Year 2017	20.0949	1.0509	19.122	.0000
Year 2018	28.2482	1.2795	22.078	.0000
Opioid prescription rate	0.2355	0.0219	10.767	.0000
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0146	0.0282	0.518	.6045
Opioid prescription rate × Year 2011	0.0333	0.0284	1.172	.2411
Opioid prescription rate × Year 2012	0.0577	0.0278	2.073	.0382
Opioid prescription rate × Year 2013	0.0991	0.0282	3.512	.0004
Opioid prescription rate × Year 2014	0.1304	0.0288	4.534	.0000
Opioid prescription rate × Year 2015	0.1811	0.0298	6.078	.0000
Opioid prescription rate × Year 2016	0.2276	0.0306	7.439	.0000
Opioid prescription rate × Year 2017	0.2920	0.0324	9.020	.0000
Opioid prescription rate × Year 2018	0.3868	0.0353	10.961	.0000

Random effect	**Variance**
State-level: Intercept	437.466
Observation-level	189.956

Note. N = 6,151 county-year observations. All estimates were weighted by county age 6-11 child populations. This model is corresponding to the results of Model 3 in Table 2 in the main text.

Table S3b. Post Hoc Tests on Pairwise Comparisons between Unadjusted Yearly Opioid Coefficients on County CMR Rates among Age 6-11 Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0146	.0282	-0.518	1.0000
Year 2009 – Year 2011	-.0333	.0284	-1.173	.9764
Year 2009 – Year 2012	-.0577	.0278	-2.074	.5466
Year 2009 – Year 2013	-.0991	.0282	-3.513	.0163
Year 2009 – Year 2014	-.1304	.0287	-4.536	.0003
Year 2009 – Year 2015	-.1811	.0298	-6.081	<.0001
Year 2009 – Year 2016	-.2276	.0306	-7.442	<.0001
Year 2009 – Year 2017	-.2920	.0324	-9.024	<.0001
Year 2009 – Year 2018	-.3868	.0353	-10.966	<.0001
Year 2010 – Year 2011	-.0187	.0271	-0.688	.9996
Year 2010 – Year 2012	-.0430	.0265	-1.621	.8381
Year 2010 – Year 2013	-.0845	.0270	-3.131	.0555
Year 2010 – Year 2014	-.1157	.0275	-4.203	.0011
Year 2010 – Year 2015	-.1665	.0286	-5.818	<.0001
Year 2010 – Year 2016	-.2130	.0295	-7.233	<.0001
Year 2010 – Year 2017	-.2774	.0313	-8.866	<.0001
Year 2010 – Year 2018	-.3721	.0343	-10.853	<.0001
Year 2011 – Year 2012	-.0244	.0267	-0.912	.9961
Year 2011 – Year 2013	-.0658	.0271	-2.425	.3111
Year 2011 – Year 2014	-.0971	.0277	-3.506	.0167
Year 2011 – Year 2015	-.1478	.0288	-5.139	<.0001
Year 2011 – Year 2016	-.1944	.0296	-6.567	<.0001
Year 2011 – Year 2017	-.2588	.0314	-8.234	<.0001
Year 2011 – Year 2018	-.3535	.0344	-10.273	<.0001
Year 2012 – Year 2013	-.0414	.0265	-1.564	.8655
Year 2012 – Year 2014	-.0727	.0271	-2.685	.1801
Year 2012 – Year 2015	-.1234	.0282	-4.381	.0005
Year 2012 – Year 2016	-.1700	.0290	-5.856	<.0001
Year 2012 – Year 2017	-.2344	.0309	-7.585	<.0001
Year 2012 – Year 2018	-.3291	.0339	-9.697	<.0001
Year 2013 – Year 2014	-.0313	.0275	-1.138	.9808
Year 2013 – Year 2015	-.0820	.0286	-2.871	.1143
Year 2013 – Year 2016	-.1285	.0294	-4.372	.0005
Year 2013 – Year 2017	-.1929	.0312	-6.176	<.0001
Year 2013 – Year 2018	-.2877	.0342	-8.402	<.0001
Year 2014 – Year 2015	-.0507	.0291	-1.745	.7696
Year 2014 – Year 2016	-.0973	.0299	-3.254	.0383
Year 2014 – Year 2017	-.1617	.0317	-5.100	<.0001
Year 2014 – Year 2018	-.2564	.0347	-7.399	<.0001
Year 2015 – Year 2016	-.0465	.0309	-1.508	.8892
Year 2015 – Year 2017	-.1110	.0326	-3.403	.0237
Year 2015 – Year 2018	-.2057	.0355	-5.799	<.0001
Year 2016 – Year 2017	-.0644	.0333	-1.934	.6454
Year 2016 – Year 2018	-.1591	.0361	-4.409	.0005
Year 2017 – Year 2018	-.0947	.0375	-2.524	.2558

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 3 in Table 2 in the main text.

Table S4a. Unadjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Age 12-17 Children, U.S. Counties, 2009-2018.

Fixed effects	Coefficient	Standard error	t	p
Intercept	32.7723	2.4214	13.535	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	-0.1594	0.6262	-0.255	.7991
Year 2011	0.4248	0.6274	0.677	.4984
Year 2012	0.3010	0.6203	0.485	.6275
Year 2013	0.8237	0.6265	1.315	.1887
Year 2014	3.0552	0.6351	4.810	.0000
Year 2015	5.4278	0.6596	8.229	.0000
Year 2016	8.2046	0.6951	11.804	.0000
Year 2017	12.4277	0.7942	15.649	.0000
Year 2018	18.0724	0.9653	18.723	.0000
Opioid prescription rate	0.1204	0.0164	7.362	.0000
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0088	0.0211	0.418	.6757
Opioid prescription rate × Year 2011	0.0142	0.0213	0.669	.5038
Opioid prescription rate × Year 2012	0.0354	0.0209	1.694	.0904
Opioid prescription rate × Year 2013	0.0656	0.0212	3.089	.0020
Opioid prescription rate × Year 2014	0.0850	0.0217	3.927	.0001
Opioid prescription rate × Year 2015	0.1193	0.0225	5.309	.0000
Opioid prescription rate × Year 2016	0.1532	0.0231	6.631	.0000
Opioid prescription rate × Year 2017	0.2058	0.0244	8.426	.0000
Opioid prescription rate × Year 2018	0.2685	0.0266	10.101	.0000

Random effect	Variance
State-level: Intercept	286.881
Observation-level	108.949

Note. N = 6,151 county-year observations. All estimates were weighted by county age 12-17 child populations. This model is corresponding to the results of Model 4 in Table 2 in the main text.

Table S4b. Post Hoc Tests on Pairwise Comparisons between Unadjusted Yearly Opioid Coefficients on County CMR Rates among Age 12-17 Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0088	.0211	-0.419	1.0000
Year 2009 – Year 2011	-.0142	.0213	-0.669	.9997
Year 2009 – Year 2012	-.0354	.0209	-1.694	.7989
Year 2009 – Year 2013	-.0656	.0212	-3.091	.0626
Year 2009 – Year 2014	-.0850	.0216	-3.928	.0035
Year 2009 – Year 2015	-.1193	.0225	-5.312	<.0001
Year 2009 – Year 2016	-.1532	.0231	-6.633	<.0001
Year 2009 – Year 2017	-.2058	.0244	-8.429	<.0001
Year 2009 – Year 2018	-.2685	.0266	-10.105	<.0001
Year 2010 – Year 2011	-.0054	.0204	-0.264	1.0000
Year 2010 – Year 2012	-.0266	.0200	-1.327	.9476
Year 2010 – Year 2013	-.0568	.0204	-2.786	.1417
Year 2010 – Year 2014	-.0762	.0208	-3.661	.0097
Year 2010 – Year 2015	-.1105	.0217	-5.103	<.0001
Year 2010 – Year 2016	-.1443	.0223	-6.472	<.0001
Year 2010 – Year 2017	-.1970	.0237	-8.322	<.0001
Year 2010 – Year 2018	-.2596	.0259	-10.031	<.0001
Year 2011 – Year 2012	-.0212	.0202	-1.048	.9892
Year 2011 – Year 2013	-.0514	.0205	-2.500	.2686
Year 2011 – Year 2014	-.0708	.0210	-3.375	.0260
Year 2011 – Year 2015	-.1051	.0218	-4.819	.0001
Year 2011 – Year 2016	-.1389	.0225	-6.188	<.0001
Year 2011 – Year 2017	-.1916	.0238	-8.046	<.0001
Year 2011 – Year 2018	-.2542	.0260	-9.775	<.0001
Year 2012 – Year 2013	-.0302	.0201	-1.501	.8920
Year 2012 – Year 2014	-.0496	.0206	-2.414	.3177
Year 2012 – Year 2015	-.0839	.0214	-3.920	.0036
Year 2012 – Year 2016	-.1178	.0221	-5.337	<.0001
Year 2012 – Year 2017	-.1704	.0235	-7.266	<.0001
Year 2012 – Year 2018	-.2330	.0257	-9.074	<.0001
Year 2013 – Year 2014	-.0194	.0209	-0.931	.9955
Year 2013 – Year 2015	-.0537	.0217	-2.474	.2830
Year 2013 – Year 2016	-.0876	.0224	-3.916	.0037
Year 2013 – Year 2017	-.1402	.0237	-5.910	<.0001
Year 2013 – Year 2018	-.2029	.0259	-7.824	<.0001
Year 2014 – Year 2015	-.0343	.0221	-1.551	.8713
Year 2014 – Year 2016	-.0681	.0227	-2.996	.0819
Year 2014 – Year 2017	-.1208	.0241	-5.015	<.0001
Year 2014 – Year 2018	-.1834	.0263	-6.988	<.0001
Year 2015 – Year 2016	-.0339	.0235	-1.441	.9143
Year 2015 – Year 2017	-.0865	.0248	-3.490	.0177
Year 2015 – Year 2018	-.1491	.0269	-5.547	<.0001
Year 2016 – Year 2017	-.0527	.0253	-2.080	.5422
Year 2016 – Year 2018	-.1153	.0274	-4.213	.0011
Year 2017 – Year 2018	-.0626	.0284	-2.203	.4546

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 4 in Table 2 in the main text.

Table S5a. Unadjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Male Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	41.4513	2.7744	14.941	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	0.1248	0.7835	0.159	.8734
Year 2011	1.1301	0.7842	1.441	.1496
Year 2012	1.3387	0.7752	1.727	.0842
Year 2013	2.4527	0.7831	3.132	.0017
Year 2014	5.2008	0.7943	6.548	.0000
Year 2015	8.5283	0.8254	10.333	.0000
Year 2016	12.3350	0.8700	14.177	.0000
Year 2017	18.0260	0.9942	18.132	.0000
Year 2018	25.7206	1.2097	21.262	.0000
Opioid prescription rate	0.2481	0.0205	12.117	.0000
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0111	0.0264	0.422	.6731
Opioid prescription rate × Year 2011	0.0265	0.0266	0.994	.3201
Opioid prescription rate × Year 2012	0.0477	0.0261	1.827	.0677
Opioid prescription rate × Year 2013	0.0894	0.0265	3.376	.0007
Opioid prescription rate × Year 2014	0.1152	0.0270	4.262	.0000
Opioid prescription rate × Year 2015	0.1672	0.0280	5.962	.0000
Opioid prescription rate × Year 2016	0.2132	0.0288	7.397	.0000
Opioid prescription rate × Year 2017	0.2815	0.0305	9.228	.0000
Opioid prescription rate × Year 2018	0.3682	0.0332	11.079	.0000

Random effect	**Variance**
State-level: Intercept	373.668
Observation-level	169.823

Note. N = 6,151 county-year observations. All estimates were weighted by county male child populations. This model is corresponding to the results of Model 5 in Table 2 in the main text.

Table S5b. Post Hoc Tests on Pairwise Comparisons between Unadjusted Yearly Opioid Coefficients on County CMR Rates among Male Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0111	.0264	-0.422	1.0000
Year 2009 – Year 2011	-.0265	.0266	-0.995	.9926
Year 2009 – Year 2012	-.0477	.0261	-1.828	.7172
Year 2009 – Year 2013	-.0894	.0265	-3.377	.0258
Year 2009 – Year 2014	-.1152	.0270	-4.264	.0009
Year 2009 – Year 2015	-.1672	.0280	-5.965	<.0001
Year 2009 – Year 2016	-.2132	.0288	-7.401	<.0001
Year 2009 – Year 2017	-.2815	.0305	-9.232	<.0001
Year 2009 – Year 2018	-.3682	.0332	-11.084	<.0001
Year 2010 – Year 2011	-.0153	.0255	-0.601	.9999
Year 2010 – Year 2012	-.0365	.0250	-1.464	.9060
Year 2010 – Year 2013	-.0783	.0254	-3.085	.0636
Year 2010 – Year 2014	-.1040	.0259	-4.012	.0025
Year 2010 – Year 2015	-.1560	.0270	-5.784	<.0001
Year 2010 – Year 2016	-.2021	.0278	-7.271	<.0001
Year 2010 – Year 2017	-.2703	.0295	-9.156	<.0001
Year 2010 – Year 2018	-.3570	.0323	-11.041	<.0001
Year 2011 – Year 2012	-.0212	.0251	-0.845	.9979
Year 2011 – Year 2013	-.0630	.0256	-2.464	.2886
Year 2011 – Year 2014	-.0887	.0261	-3.399	.0240
Year 2011 – Year 2015	-.1407	.0271	-5.184	<.0001
Year 2011 – Year 2016	-.1867	.0279	-6.682	<.0001
Year 2011 – Year 2017	-.2550	.0297	-8.594	<.0001
Year 2011 – Year 2018	-.3417	.0325	-10.525	<.0001
Year 2012 – Year 2013	-.0418	.0250	-1.670	.8123
Year 2012 – Year 2014	-.0675	.0256	-2.641	.1992
Year 2012 – Year 2015	-.1195	.0266	-4.488	.0003
Year 2012 – Year 2016	-.1655	.0274	-6.030	<.0001
Year 2012 – Year 2017	-.2338	.0292	-8.004	<.0001
Year 2012 – Year 2018	-.3205	.0321	-10.000	<.0001
Year 2013 – Year 2014	-.0257	.0260	-0.992	.9927
Year 2013 – Year 2015	-.0777	.0270	-2.879	.1121
Year 2013 – Year 2016	-.1238	.0278	-4.450	.0004
Year 2013 – Year 2017	-.1920	.0295	-6.500	<.0001
Year 2013 – Year 2018	-.2787	.0323	-8.617	<.0001
Year 2014 – Year 2015	-.0520	.0275	-1.890	.6762
Year 2014 – Year 2016	-.0980	.0283	-3.463	.0193
Year 2014 – Year 2017	-.1663	.0300	-5.543	<.0001
Year 2014 – Year 2018	-.2530	.0328	-7.723	<.0001
Year 2015 – Year 2016	-.0460	.0292	-1.575	.8603
Year 2015 – Year 2017	-.1143	.0309	-3.703	.0083
Year 2015 – Year 2018	-.2010	.0335	-5.993	<.0001
Year 2016 – Year 2017	-.0683	.0315	-2.164	.4820
Year 2016 – Year 2018	-.1550	.0341	-4.539	.0003
Year 2017 – Year 2018	-.0867	.0355	-2.444	.3001

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 5 in Table 2 in the main text.

Table S6a. Unadjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Female Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	43.7745	2.7698	15.804	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	0.0066	0.8058	0.008	.9935
Year 2011	0.8545	0.8065	1.059	.2895
Year 2012	0.8100	0.7970	1.016	.3095
Year 2013	1.7195	0.8051	2.136	.0327
Year 2014	4.4835	0.8164	5.491	.0000
Year 2015	7.9216	0.8486	9.335	.0000
Year 2016	11.8875	0.8944	13.291	.0000
Year 2017	17.9472	1.0221	17.560	.0000
Year 2018	25.9684	1.2437	20.880	.0000
Opioid prescription rate	0.2562	0.0211	12.171	.0000
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0149	0.0272	0.549	.5832
Opioid prescription rate × Year 2011	0.0256	0.0274	0.936	.3491
Opioid prescription rate × Year 2012	0.0503	0.0268	1.875	.0608
Opioid prescription rate × Year 2013	0.0884	0.0272	3.246	.0012
Opioid prescription rate × Year 2014	0.1181	0.0278	4.255	.0000
Opioid prescription rate × Year 2015	0.1687	0.0288	5.856	.0000
Opioid prescription rate × Year 2016	0.2199	0.0296	7.427	.0000
Opioid prescription rate × Year 2017	0.2880	0.0313	9.188	.0000
Opioid prescription rate × Year 2018	0.3822	0.0342	11.192	.0000

Random effect	**Variance**
State-level: Intercept	371.254
Observation-level	179.259

Note. N = 6,151 county-year observations. All estimates were weighted by county female child populations. This model is corresponding to the results of Model 6 in Table 2 in the main text.

Table S6b. Post Hoc Tests on Pairwise Comparisons between Unadjusted Yearly Opioid Coefficients on County CMR Rates among Female Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0149	.0272	-0.549	.9999
Year 2009 – Year 2011	-.0256	.0273	-0.937	.9953
Year 2009 – Year 2012	-.0503	.0268	-1.876	.6855
Year 2009 – Year 2013	-.0884	.0272	-3.247	.0391
Year 2009 – Year 2014	-.1181	.0278	-4.257	.0009
Year 2009 – Year 2015	-.1687	.0288	-5.859	<.0001
Year 2009 – Year 2016	-.2199	.0296	-7.430	<.0001
Year 2009 – Year 2017	-.2880	.0313	-9.192	<.0001
Year 2009 – Year 2018	-.3822	.0341	-11.197	<.0001
Year 2010 – Year 2011	-.0107	.0262	-0.408	1.0000
Year 2010 – Year 2012	-.0354	.0257	-1.380	.9336
Year 2010 – Year 2013	-.0735	.0261	-2.817	.1311
Year 2010 – Year 2014	-.1032	.0266	-3.875	.0043
Year 2010 – Year 2015	-.1538	.0277	-5.549	<.0001
Year 2010 – Year 2016	-.2050	.0285	-7.181	<.0001
Year 2010 – Year 2017	-.2730	.0303	-9.000	<.0001
Year 2010 – Year 2018	-.3673	.0332	-11.053	<.0001
Year 2011 – Year 2012	-.0247	.0258	-0.956	.9945
Year 2011 – Year 2013	-.0628	.0263	-2.391	.3318
Year 2011 – Year 2014	-.0925	.0268	-3.451	.0202
Year 2011 – Year 2015	-.1431	.0279	-5.133	<.0001
Year 2011 – Year 2016	-.1943	.0287	-6.769	<.0001
Year 2011 – Year 2017	-.2623	.0305	-8.606	<.0001
Year 2011 – Year 2018	-.3566	.0334	-10.689	<.0001
Year 2012 – Year 2013	-.0381	.0257	-1.484	.8989
Year 2012 – Year 2014	-.0678	.0262	-2.585	.2251
Year 2012 – Year 2015	-.1184	.0273	-4.331	.0006
Year 2012 – Year 2016	-.1696	.0282	-6.019	<.0001
Year 2012 – Year 2017	-.2377	.0300	-7.922	<.0001
Year 2012 – Year 2018	-.3319	.0329	-10.080	<.0001
Year 2013 – Year 2014	-.0298	.0266	-1.117	.9831
Year 2013 – Year 2015	-.0803	.0277	-2.898	.1066
Year 2013 – Year 2016	-.1316	.0286	-4.607	.0002
Year 2013 – Year 2017	-.1996	.0303	-6.578	<.0001
Year 2013 – Year 2018	-.2939	.0332	-8.843	<.0001
Year 2014 – Year 2015	-.0506	.0282	-1.790	.7414
Year 2014 – Year 2016	-.1018	.0291	-3.504	.0169
Year 2014 – Year 2017	-.1698	.0308	-5.513	<.0001
Year 2014 – Year 2018	-.2641	.0336	-7.849	<.0001
Year 2015 – Year 2016	-.0512	.0300	-1.707	.7917
Year 2015 – Year 2017	-.1192	.0317	-3.762	.0066
Year 2015 – Year 2018	-.2135	.0345	-6.197	<.0001
Year 2016 – Year 2017	-.0680	.0324	-2.100	.5274
Year 2016 – Year 2018	-.1623	.0351	-4.627	.0002
Year 2017 – Year 2018	-.0943	.0365	-2.586	.2248

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 6 in Table 2 in the main text.

Table S7a. Unadjusted Multilevel Model of County Opioid Prescription Rates on County Neglect Report Rates among All Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	26.8004	2.1381	12.535	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	0.3648	0.6421	0.568	.5699
Year 2011	0.9217	0.6427	1.434	.1516
Year 2012	0.6123	0.6352	0.964	.3351
Year 2013	1.7683	0.6417	2.756	.0059
Year 2014	3.5138	0.6508	5.400	.0000
Year 2015	6.7919	0.6763	10.043	.0000
Year 2016	8.9614	0.7129	12.571	.0000
Year 2017	13.9794	0.8146	17.161	.0000
Year 2018	20.0818	0.9912	20.260	.0000
Opioid prescription rate	0.2201	0.0168	13.118	.0000
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0171	0.0217	0.792	.4286
Opioid prescription rate × Year 2011	0.0237	0.0218	1.085	.2779
Opioid prescription rate × Year 2012	0.0280	0.0214	1.310	.1904
Opioid prescription rate × Year 2013	0.0633	0.0217	2.918	.0035
Opioid prescription rate × Year 2014	0.0787	0.0221	3.553	.0004
Opioid prescription rate × Year 2015	0.1371	0.0230	5.968	.0000
Opioid prescription rate × Year 2016	0.1533	0.0236	6.493	.0000
Opioid prescription rate × Year 2017	0.2141	0.0250	8.568	.0000
Opioid prescription rate × Year 2018	0.2833	0.0272	10.404	.0000

Random effect	**Variance**
State-level: Intercept	220.448
Observation-level	113.943

Note. N = 6,151 county-year observations. All estimates were weighted by county child populations. This model is corresponding to the results of Model 7 in Table 2 in the main text.

Table S7b. Post Hoc Tests on Pairwise Comparisons between Unadjusted Yearly Opioid Coefficients on County Neglect Report Rates among All Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0171	.0216	-0.792	.9987
Year 2009 – Year 2011	-.0237	.0218	-1.086	.9861
Year 2009 – Year 2012	-.0280	.0214	-1.310	.9515
Year 2009 – Year 2013	-.0633	.0217	-2.919	.1008
Year 2009 – Year 2014	-.0787	.0221	-3.555	.0141
Year 2009 – Year 2015	-.1371	.0230	-5.970	<.0001
Year 2009 – Year 2016	-.1533	.0236	-6.496	<.0001
Year 2009 – Year 2017	-.2141	.0250	-8.572	<.0001
Year 2009 – Year 2018	-.2833	.0272	-10.409	<.0001
Year 2010 – Year 2011	-.0065	.0209	-0.312	1.0000
Year 2010 – Year 2012	-.0109	.0204	-0.531	1.0000
Year 2010 – Year 2013	-.0462	.0208	-2.222	.4418
Year 2010 – Year 2014	-.0615	.0212	-2.896	.1071
Year 2010 – Year 2015	-.1199	.0221	-5.427	<.0001
Year 2010 – Year 2016	-.1362	.0228	-5.982	<.0001
Year 2010 – Year 2017	-.1969	.0242	-8.143	<.0001
Year 2010 – Year 2018	-.2661	.0265	-10.045	<.0001
Year 2011 – Year 2012	-.0044	.0206	-0.211	1.0000
Year 2011 – Year 2013	-.0397	.0209	-1.895	.6724
Year 2011 – Year 2014	-.0550	.0214	-2.572	.2314
Year 2011 – Year 2015	-.1134	.0222	-5.101	<.0001
Year 2011 – Year 2016	-.1296	.0229	-5.663	<.0001
Year 2011 – Year 2017	-.1904	.0243	-7.834	<.0001
Year 2011 – Year 2018	-.2596	.0266	-9.760	<.0001
Year 2012 – Year 2013	-.0353	.0205	-1.726	.7806
Year 2012 – Year 2014	-.0507	.0209	-2.420	.3139
Year 2012 – Year 2015	-.1091	.0218	-5.003	<.0001
Year 2012 – Year 2016	-.1253	.0225	-5.574	<.0001
Year 2012 – Year 2017	-.1861	.0239	-7.779	<.0001
Year 2012 – Year 2018	-.2553	.0263	-9.723	<.0001
Year 2013 – Year 2014	-.0153	.0213	-0.721	.9994
Year 2013 – Year 2015	-.0737	.0221	-3.334	.0297
Year 2013 – Year 2016	-.0900	.0228	-3.950	.0032
Year 2013 – Year 2017	-.1507	.0242	-6.230	<.0001
Year 2013 – Year 2018	-.2199	.0265	-8.301	<.0001
Year 2014 – Year 2015	-.0584	.0225	-2.593	.2214
Year 2014 – Year 2016	-.0746	.0232	-3.221	.0424
Year 2014 – Year 2017	-.1354	.0246	-5.512	<.0001
Year 2014 – Year 2018	-.2046	.0268	-7.626	<.0001
Year 2015 – Year 2016	-.0162	.0239	-0.679	.9996
Year 2015 – Year 2017	-.0770	.0253	-3.047	.0710
Year 2015 – Year 2018	-.1462	.0275	-5.322	<.0001
Year 2016 – Year 2017	-.0608	.0258	-2.353	.3550
Year 2016 – Year 2018	-.1300	.0280	-4.647	.0002
Year 2017 – Year 2018	-.0692	.0291	-2.380	.3381

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 7 in Table 2 in the main text.

Table S8a. Unadjusted Multilevel Model of County Opioid Prescription Rates on County Physical Abuse Report Rates among All Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	10.8571	1.1202	9.692	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	0.1841	0.2876	0.640	.5222
Year 2011	0.3585	0.2879	1.245	.2131
Year 2012	0.7802	0.2845	2.742	.0061
Year 2013	0.7251	0.2874	2.523	.0117
Year 2014	0.7193	0.2915	2.468	.0136
Year 2015	1.7661	0.3029	5.830	.0000
Year 2016	3.3981	0.3193	10.643	.0000
Year 2017	4.6120	0.3649	12.640	.0000
Year 2018	6.2691	0.4440	14.120	.0000
Opioid prescription rate	0.0107	0.0075	1.417	.1564
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	-0.0003	0.0097	-0.036	.9715
Opioid prescription rate × Year 2011	0.0056	0.0098	0.578	.5631
Opioid prescription rate × Year 2012	0.0255	0.0096	2.667	.0077
Opioid prescription rate × Year 2013	0.0324	0.0097	3.332	.0009
Opioid prescription rate × Year 2014	0.0245	0.0099	2.466	.0137
Opioid prescription rate × Year 2015	0.0528	0.0103	5.131	.0000
Opioid prescription rate × Year 2016	0.0897	0.0106	8.488	.0000
Opioid prescription rate × Year 2017	0.1065	0.0112	9.516	.0000
Opioid prescription rate × Year 2018	0.1272	0.0122	10.430	.0000

Random effect	**Variance**
State-level: Intercept	61.448
Observation-level	22.858

Note. N = 6,151 county-year observations. All estimates were weighted by county child populations. This model is corresponding to the results of Model 8 in Table 2 in the main text.

Table S8b. Post Hoc Tests on Pairwise Comparisons between Unadjusted Yearly Opioid Coefficients on County Physical Abuse Report Rates among All Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	.0003	.0097	0.036	1.0000
Year 2009 – Year 2011	-.0056	.0098	-0.579	.9999
Year 2009 – Year 2012	-.0255	.0096	-2.668	.1874
Year 2009 – Year 2013	-.0324	.0097	-3.333	.0298
Year 2009 – Year 2014	-.0245	.0099	-2.467	.2869
Year 2009 – Year 2015	-.0528	.0103	-5.133	<.0001
Year 2009 – Year 2016	-.0897	.0106	-8.491	<.0001
Year 2009 – Year 2017	-.1065	.0112	-9.520	<.0001
Year 2009 – Year 2018	-.1272	.0122	-10.435	<.0001
Year 2010 – Year 2011	-.0060	.0094	-0.641	.9998
Year 2010 – Year 2012	-.0259	.0092	-2.827	.1280
Year 2010 – Year 2013	-.0327	.0093	-3.516	.0162
Year 2010 – Year 2014	-.0248	.0095	-2.607	.2149
Year 2010 – Year 2015	-.0531	.0099	-5.368	<.0001
Year 2010 – Year 2016	-.0901	.0102	-8.837	<.0001
Year 2010 – Year 2017	-.1068	.0108	-9.863	<.0001
Year 2010 – Year 2018	-.1275	.0119	-10.749	<.0001
Year 2011 – Year 2012	-.0199	.0092	-2.157	.4874
Year 2011 – Year 2013	-.0267	.0094	-2.852	.1200
Year 2011 – Year 2014	-.0188	.0096	-1.963	.6250
Year 2011 – Year 2015	-.0471	.0100	-4.734	.0001
Year 2011 – Year 2016	-.0841	.0103	-8.203	<.0001
Year 2011 – Year 2017	-.1008	.0109	-9.264	<.0001
Year 2011 – Year 2018	-.1215	.0119	-10.202	<.0001
Year 2012 – Year 2013	-.0069	.0092	-0.747	.9992
Year 2012 – Year 2014	.0011	.0094	0.116	1.0000
Year 2012 – Year 2015	-.0272	.0098	-2.790	.1403
Year 2012 – Year 2016	-.0642	.0101	-6.378	<.0001
Year 2012 – Year 2017	-.0809	.0107	-7.555	<.0001
Year 2012 – Year 2018	-.1017	.0118	-8.644	<.0001
Year 2013 – Year 2014	.0079	.0095	0.834	.9980
Year 2013 – Year 2015	-.0204	.0099	-2.059	.5567
Year 2013 – Year 2016	-.0574	.0102	-5.623	<.0001
Year 2013 – Year 2017	-.0741	.0108	-6.838	<.0001
Year 2013 – Year 2018	-.0948	.0119	-7.988	<.0001
Year 2014 – Year 2015	-.0283	.0101	-2.809	.1340
Year 2014 – Year 2016	-.0653	.0104	-6.292	<.0001
Year 2014 – Year 2017	-.0820	.0110	-7.456	<.0001
Year 2014 – Year 2018	-.1027	.0120	-8.550	<.0001
Year 2015 – Year 2016	-.0370	.0107	-3.448	.0204
Year 2015 – Year 2017	-.0537	.0113	-4.744	.0001
Year 2015 – Year 2018	-.0744	.0123	-6.047	<.0001
Year 2016 – Year 2017	-.0167	.0116	-1.447	.9120
Year 2016 – Year 2018	-.0374	.0125	-2.989	.0834
Year 2017 – Year 2018	-.0207	.0130	-1.590	.8532

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 8 in Table 2 in the main text.

Table S9a. Unadjusted Multilevel Model of County Opioid Prescription Rates on County Sexual Abuse Report Rates among All Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	3.5828	0.3169	11.306	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	0.0316	0.0800	0.395	.6927
Year 2011	-0.0555	0.0801	-0.693	.4882
Year 2012	0.0451	0.0791	0.570	.5686
Year 2013	0.0091	0.0800	0.114	.9089
Year 2014	-0.0105	0.0811	-0.129	.8970
Year 2015	0.1768	0.0843	2.098	.0360
Year 2016	0.4425	0.0888	4.981	.0000
Year 2017	0.8299	0.1015	8.176	.0000
Year 2018	1.4238	0.1235	11.527	.0000
Opioid prescription rate	0.0231	0.0021	11.032	.0000
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0010	0.0027	0.372	.7102
Opioid prescription rate × Year 2011	0.0004	0.0027	0.135	.8930
Opioid prescription rate × Year 2012	0.0037	0.0027	1.374	.1695
Opioid prescription rate × Year 2013	0.0041	0.0027	1.504	.1326
Opioid prescription rate × Year 2014	0.0027	0.0028	0.996	.3193
Opioid prescription rate × Year 2015	0.0047	0.0029	1.650	.0989
Opioid prescription rate × Year 2016	0.0078	0.0029	2.643	.0082
Opioid prescription rate × Year 2017	0.0113	0.0031	3.629	.0003
Opioid prescription rate × Year 2018	0.0162	0.0034	4.788	.0000

Random effect	**Variance**
State-level: Intercept	4.924
Observation-level	1.769

Note. N = 6,151 county-year observations. All estimates were weighted by county child populations. This model is corresponding to the results of Model 9 in Table 2 in the main text.

Table S9b. Post Hoc Tests on Pairwise Comparisons between Unadjusted Yearly Opioid Coefficients on County Sexual Abuse Report Rates among All Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0010	.0027	-0.372	1.0000
Year 2009 – Year 2011	-.0004	.0027	-0.135	1.0000
Year 2009 – Year 2012	-.0037	.0027	-1.375	.9350
Year 2009 – Year 2013	-.0041	.0027	-1.505	.8906
Year 2009 – Year 2014	-.0027	.0028	-0.996	.9925
Year 2009 – Year 2015	-.0047	.0029	-1.651	.8226
Year 2009 – Year 2016	-.0078	.0029	-2.644	.1980
Year 2009 – Year 2017	-.0113	.0031	-3.631	.0108
Year 2009 – Year 2018	-.0162	.0034	-4.790	.0001
Year 2010 – Year 2011	.0006	.0026	0.245	1.0000
Year 2010 – Year 2012	-.0027	.0026	-1.043	.9895
Year 2010 – Year 2013	-.0031	.0026	-1.183	.9749
Year 2010 – Year 2014	-.0017	.0027	-0.659	.9997
Year 2010 – Year 2015	-.0037	.0028	-1.351	.9414
Year 2010 – Year 2016	-.0068	.0028	-2.387	.3338
Year 2010 – Year 2017	-.0103	.0030	-3.417	.0226
Year 2010 – Year 2018	-.0152	.0033	-4.617	.0002
Year 2011 – Year 2012	-.0033	.0026	-1.284	.9573
Year 2011 – Year 2013	-.0037	.0026	-1.419	.9214
Year 2011 – Year 2014	-.0024	.0027	-0.894	.9967
Year 2011 – Year 2015	-.0044	.0028	-1.573	.8612
Year 2011 – Year 2016	-.0074	.0029	-2.597	.2193
Year 2011 – Year 2017	-.0109	.0030	-3.610	.0116
Year 2011 – Year 2018	-.0159	.0033	-4.791	.0001
Year 2012 – Year 2013	-.0004	.0026	-0.160	1.0000
Year 2012 – Year 2014	.0009	.0026	0.350	1.0000
Year 2012 – Year 2015	-.0011	.0027	-0.391	1.0000
Year 2012 – Year 2016	-.0041	.0028	-1.468	.9045
Year 2012 – Year 2017	-.0076	.0030	-2.562	.2363
Year 2012 – Year 2018	-.0126	.0033	-3.846	.0048
Year 2013 – Year 2014	.0013	.0027	0.499	1.0000
Year 2013 – Year 2015	-.0007	.0028	-0.238	1.0000
Year 2013 – Year 2016	-.0037	.0028	-1.306	.9525
Year 2013 – Year 2017	-.0072	.0030	-2.399	.3270
Year 2013 – Year 2018	-.0122	.0033	-3.688	.0088
Year 2014 – Year 2015	-.0020	.0028	-0.704	.9995
Year 2014 – Year 2016	-.0050	.0029	-1.741	.7719
Year 2014 – Year 2017	-.0086	.0031	-2.794	.1389
Year 2014 – Year 2018	-.0135	.0033	-4.037	.0023
Year 2015 – Year 2016	-.0031	.0030	-1.023	.9909
Year 2015 – Year 2017	-.0066	.0032	-2.088	.5362
Year 2015 – Year 2018	-.0115	.0034	-3.365	.0268
Year 2016 – Year 2017	-.0035	.0032	-1.095	.9852
Year 2016 – Year 2018	-.0085	.0035	-2.430	.3080
Year 2017 – Year 2018	-.0049	.0036	-1.365	.9376

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 9 in Table 2 in the main text.

Table S10a. Adjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among All Children, U.S. Counties, 2009-2018.

Fixed effects	Coefficient	Standard error	t	p
Intercept	46.0429	2.7504	16.741	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	-0.6712	0.5909	-1.136	.2561
Year 2011	-0.7548	0.5947	-1.269	.2045
Year 2012	-0.9633	0.5925	-1.626	.1041
Year 2013	-0.8046	0.6052	-1.329	.1838
Year 2014	1.5855	0.6243	2.540	.0111
Year 2015	4.3447	0.6656	6.527	.0000
Year 2016	7.4787	0.7192	10.399	.0000
Year 2017	11.4309	0.8463	13.507	.0000
Year 2018	16.9306	1.0607	15.961	.0000
Opioid prescription rate	0.0181	0.0336	0.537	.5926
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0137	0.0199	0.687	.4922
Opioid prescription rate × Year 2011	0.0224	0.0201	1.116	.2645
Opioid prescription rate × Year 2012	0.0484	0.0198	2.448	.0144
Opioid prescription rate × Year 2013	0.0766	0.0201	3.814	.0001
Opioid prescription rate × Year 2014	0.0896	0.0205	4.373	.0000
Opioid prescription rate × Year 2015	0.1252	0.0213	5.875	.0000
Opioid prescription rate × Year 2016	0.1559	0.0220	7.084	.0000
Opioid prescription rate × Year 2017	0.1972	0.0236	8.360	.0000
Opioid prescription rate × Year 2018	0.2665	0.0263	10.143	.0000
Control variables				
% children in poverty	0.9388	0.0456	20.570	.0000
% owner-occupied housing units	-0.1913	0.0393	-4.874	.0000
% Black among children	-0.1977	0.0227	-8.719	.0000
% Latino among children	0.0695	0.0208	3.347	.0008
% foreign-born among persons	-0.6767	0.0394	-17.182	.0000
% children among persons	-1.0543	0.1188	-8.874	.0000
% elderly (≥ age 65) among persons	-0.3645	0.1047	-3.482	.0005
% male among adults aged 20-64	0.5627	0.1670	3.370	.0008
% with disabilities among children	2.7587	0.2135	12.924	.0000
% moved in one year among persons	0.3339	0.0756	4.414	.0000
Urbanicity				
Large urban	reference			
Small urban	0.8694	0.4269	2.037	.0417
Rural	-0.2359	0.6501	-0.363	.7168

Random effect	Variance
State-level: Intercept	361.388
State-level: Opioid prescription rate	0.036
Observation-level	95.911

Note. N = 6,151 county-year observations. All estimates were weighted by county child populations. This model is corresponding to the results of Model 10 in Table 3 in the main text.

Table S10b. Post Hoc Tests on Pairwise Comparisons between Adjusted Yearly Opioid Coefficients on County CMR Rates among All Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0137	.0199	-0.687	.9996
Year 2009 – Year 2011	-.0224	.0201	-1.116	.9831
Year 2009 – Year 2012	-.0484	.0198	-2.449	.2972
Year 2009 – Year 2013	-.0766	.0201	-3.816	.0054
Year 2009 – Year 2014	-.0896	.0205	-4.375	.0005
Year 2009 – Year 2015	-.1252	.0213	-5.877	<.0001
Year 2009 – Year 2016	-.1559	.0220	-7.087	<.0001
Year 2009 – Year 2017	-.1972	.0236	-8.363	<.0001
Year 2009 – Year 2018	-.2665	.0263	10.145	<.0001
Year 2010 – Year 2011	-.0087	.0192	-0.455	1.0000
Year 2010 – Year 2012	-.0347	.0188	-1.841	.7085
Year 2010 – Year 2013	-.0629	.0192	-3.276	.0358
Year 2010 – Year 2014	-.0759	.0196	-3.863	.0045
Year 2010 – Year 2015	-.1115	.0205	-5.435	<.0001
Year 2010 – Year 2016	-.1422	.0213	-6.685	<.0001
Year 2010 – Year 2017	-.1835	.0230	-7.993	<.0001
Year 2010 – Year 2018	-.2528	.0258	-9.811	<.0001
Year 2011 – Year 2012	-.0260	.0190	-1.370	.9362
Year 2011 – Year 2013	-.0542	.0193	-2.804	.1354
Year 2011 – Year 2014	-.0672	.0198	-3.399	.0240
Year 2011 – Year 2015	-.1028	.0206	-4.982	<.0001
Year 2011 – Year 2016	-.1335	.0214	-6.242	<.0001
Year 2011 – Year 2017	-.1748	.0231	-7.576	<.0001
Year 2011 – Year 2018	-.2441	.0259	-9.432	<.0001
Year 2012 – Year 2013	-.0282	.0188	-1.499	.8929
Year 2012 – Year 2014	-.0412	.0193	-2.137	.5015
Year 2012 – Year 2015	-.0768	.0202	-3.806	.0056
Year 2012 – Year 2016	-.1075	.0210	-5.128	<.0001
Year 2012 – Year 2017	-.1488	.0227	-6.550	<.0001
Year 2012 – Year 2018	-.2181	.0256	-8.517	<.0001
Year 2013 – Year 2014	-.0130	.0195	-0.665	.9997
Year 2013 – Year 2015	-.0487	.0204	-2.384	.3357
Year 2013 – Year 2016	-.0793	.0211	-3.751	.0069
Year 2013 – Year 2017	-.1206	.0228	-5.282	<.0001
Year 2013 – Year 2018	-.1899	.0257	-7.399	<.0001
Year 2014 – Year 2015	-.0357	.0207	-1.722	.7829
Year 2014 – Year 2016	-.0663	.0214	-3.099	.0610
Year 2014 – Year 2017	-.1076	.0230	-4.680	.0001
Year 2014 – Year 2018	-.1769	.0257	-6.878	<.0001
Year 2015 – Year 2016	-.0306	.0220	-1.393	.9295
Year 2015 – Year 2017	-.0720	.0234	-3.072	.0660
Year 2015 – Year 2018	-.1412	.0259	-5.443	<.0001
Year 2016 – Year 2017	-.0413	.0238	-1.736	.7747
Year 2016 – Year 2018	-.1106	.0262	-4.226	.0010
Year 2017 – Year 2018	-.0693	.0268	-2.582	.2269

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 10 in Table 3 in the main text.

Table S11a. Adjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Age 0-5 Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	57.4998	3.3443	17.193	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	-0.6013	0.7324	-0.821	.4117
Year 2011	-0.5291	0.7371	-0.718	.4729
Year 2012	-0.6761	0.7346	-0.920	.3574
Year 2013	-0.4063	0.7518	-0.540	.5889
Year 2014	1.7814	0.7777	2.291	.0220
Year 2015	4.8594	0.8320	5.841	.0000
Year 2016	8.6753	0.9009	9.629	.0000
Year 2017	13.2813	1.0604	12.525	.0000
Year 2018	19.2241	1.3282	14.474	.0000
Opioid prescription rate	0.0336	0.0424	0.794	.4296
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0176	0.0246	0.714	.4753
Opioid prescription rate × Year 2011	0.0266	0.0248	1.074	.2828
Opioid prescription rate × Year 2012	0.0544	0.0244	2.228	.0259
Opioid prescription rate × Year 2013	0.0901	0.0248	3.636	.0003
Opioid prescription rate × Year 2014	0.1015	0.0253	4.009	.0001
Opioid prescription rate × Year 2015	0.1475	0.0264	5.593	.0000
Opioid prescription rate × Year 2016	0.1907	0.0272	6.999	.0000
Opioid prescription rate × Year 2017	0.2376	0.0292	8.133	.0000
Opioid prescription rate × Year 2018	0.3127	0.0326	9.598	.0000
Control variables				
% children aged 0-5 in poverty	1.1930	0.0482	24.748	.0000
% owner-occupied housing units	-0.1190	0.0465	-2.561	.0105
% Black among children	-0.3047	0.0278	10.953	.0000
% Latino among children	0.0402	0.0250	1.610	.1075
% foreign-born among persons	-0.8496	0.0486	17.480	.0000
% children among persons	-1.5079	0.1465	10.292	.0000
% elderly (≥ age 65) among persons	-0.3977	0.1304	-3.050	.0023
% male among adults aged 20-64	0.6006	0.2036	2.949	.0032
% with disabilities among children	3.6011	0.2634	13.674	.0000
% moved in one year among persons	0.3254	0.0933	3.489	.0005
Urbanicity				
Large urban	reference			
Small urban	1.2512	0.5342	2.342	.0192
Rural	-0.0903	0.8155	-0.111	.9118

Random effect	**Variance**
State-level: Intercept	532.476
State-level: Opioid prescription rate	0.058
Observation-level	148.165

Note. N = 6,151 county-year observations. All estimates were weighted by county age 0-5 child populations. This model is corresponding to the results of Model 11 in Table 3 in the main text.

Table S11b. Post Hoc Tests on Pairwise Comparisons between Adjusted Yearly Opioid Coefficients on County CMR Rates among Age 0-5 Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0176	.0246	-0.714	.9994
Year 2009 – Year 2011	-.0266	.0248	-1.074	.9871
Year 2009 – Year 2012	-.0544	.0244	-2.229	.4369
Year 2009 – Year 2013	-.0901	.0248	-3.638	.0105
Year 2009 – Year 2014	-.1015	.0253	-4.011	.0025
Year 2009 – Year 2015	-.1475	.0264	-5.595	<.0001
Year 2009 – Year 2016	-.1907	.0272	-7.002	<.0001
Year 2009 – Year 2017	-.2376	.0292	-8.135	<.0001
Year 2009 – Year 2018	-.3127	.0326	-9.600	<.0001
Year 2010 – Year 2011	-.0091	.0237	-0.383	1.0000
Year 2010 – Year 2012	-.0368	.0233	-1.582	.8571
Year 2010 – Year 2013	-.0726	.0237	-3.061	.0681
Year 2010 – Year 2014	-.0839	.0243	-3.457	.0198
Year 2010 – Year 2015	-.1299	.0254	-5.116	<.0001
Year 2010 – Year 2016	-.1731	.0263	-6.573	<.0001
Year 2010 – Year 2017	-.2201	.0284	-7.738	<.0001
Year 2010 – Year 2018	-.2951	.0320	-9.236	<.0001
Year 2011 – Year 2012	-.0277	.0234	-1.186	.9746
Year 2011 – Year 2013	-.0635	.0238	-2.664	.1890
Year 2011 – Year 2014	-.0749	.0244	-3.066	.0671
Year 2011 – Year 2015	-.1208	.0255	-4.735	.0001
Year 2011 – Year 2016	-.1640	.0265	-6.198	<.0001
Year 2011 – Year 2017	-.2110	.0286	-7.385	<.0001
Year 2011 – Year 2018	-.2861	.0321	-8.917	<.0001
Year 2012 – Year 2013	-.0358	.0232	-1.542	.8751
Year 2012 – Year 2014	-.0471	.0238	-1.979	.6140
Year 2012 – Year 2015	-.0931	.0250	-3.729	.0075
Year 2012 – Year 2016	-.1363	.0259	-5.254	<.0001
Year 2012 – Year 2017	-.1833	.0281	-6.515	<.0001
Year 2012 – Year 2018	-.2583	.0317	-8.139	<.0001
Year 2013 – Year 2014	-.0113	.0241	-0.470	1.0000
Year 2013 – Year 2015	-.0573	.0252	-2.271	.4085
Year 2013 – Year 2016	-.1005	.0262	-3.841	.0049
Year 2013 – Year 2017	-.1475	.0283	-5.215	<.0001
Year 2013 – Year 2018	-.2225	.0318	-6.994	<.0001
Year 2014 – Year 2015	-.0460	.0256	-1.793	.7396
Year 2014 – Year 2016	-.0892	.0265	-3.365	.0269
Year 2014 – Year 2017	-.1362	.0285	-4.777	.0001
Year 2014 – Year 2018	-.2112	.0319	-6.620	<.0001
Year 2015 – Year 2016	-.0432	.0273	-1.584	.8559
Year 2015 – Year 2017	-.0902	.0291	-3.104	.0603
Year 2015 – Year 2018	-.1652	.0322	-5.129	<.0001
Year 2016 – Year 2017	-.0470	.0295	-1.590	.8533
Year 2016 – Year 2018	-.1220	.0325	-3.753	.0069
Year 2017 – Year 2018	-.0750	.0334	-2.250	.4230

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 11 in Table 3 in the main text.

Table S12a. Adjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Age 6-11 Children, U.S. Counties, 2009-2018.

Fixed effects	Coefficient	Standard error	t	p
Intercept	46.4495	2.8956	16.041	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	-0.7477	0.6306	-1.186	.2358
Year 2011	-0.8751	0.6340	-1.380	.1675
Year 2012	-0.9109	0.6313	-1.443	.1491
Year 2013	-0.6976	0.6440	-1.083	.2788
Year 2014	2.2054	0.6628	3.327	.0009
Year 2015	5.2881	0.7045	7.506	.0000
Year 2016	8.4263	0.7590	11.101	.0000
Year 2017	12.2653	0.8925	13.743	.0000
Year 2018	18.0814	1.1205	16.137	.0000
Opioid prescription rate	0.0144	0.0351	0.411	.6826
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0132	0.0214	0.616	.5378
Opioid prescription rate × Year 2011	0.0273	0.0215	1.271	.2036
Opioid prescription rate × Year 2012	0.0540	0.0211	2.557	.0106
Opioid prescription rate × Year 2013	0.0837	0.0214	3.903	.0001
Opioid prescription rate × Year 2014	0.1013	0.0219	4.635	.0000
Opioid prescription rate × Year 2015	0.1375	0.0227	6.051	.0000
Opioid prescription rate × Year 2016	0.1659	0.0234	7.078	.0000
Opioid prescription rate × Year 2017	0.2054	0.0251	8.177	.0000
Opioid prescription rate × Year 2018	0.2835	0.0280	10.132	.0000
Control variables				
% children aged 6-11 in poverty	0.7705	0.0450	17.106	.0000
% owner-occupied housing units	-0.2642	0.0415	-6.372	.0000
% Black among children	-0.1706	0.0239	-7.131	.0000
% Latino among children	0.1128	0.0221	5.108	.0000
% foreign-born among persons	-0.6997	0.0418	16.721	.0000
% children among persons	-0.9854	0.1251	-7.875	.0000
% elderly (≥ age 65) among persons	-0.2618	0.1105	-2.368	.0179
% male among adults aged 20-64	0.6520	0.1775	3.672	.0002
% with disabilities among children	3.0316	0.2259	13.421	.0000
% moved in one year among persons	0.2686	0.0804	3.342	.0008
Urbanicity				
Large urban	reference			
Small urban	1.3357	0.4511	2.961	.0031
Rural	0.2909	0.6841	0.425	.6707

Random effect	Variance
State-level: Intercept	400.257
State-level: Opioid prescription rate	0.039
Observation-level	107.968

Note. N = 6,151 county-year observations. All estimates were weighted by county age 6-11 child populations. This model is corresponding to the results of Model 12 in Table 3 in the main text.

Table S12b. Post Hoc Tests on Pairwise Comparisons between Adjusted Yearly Opioid Coefficients on County CMR Rates among Age 6-11 Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0132	.0213	-0.616	.9998
Year 2009 – Year 2011	-.0273	.0215	-1.272	.9598
Year 2009 – Year 2012	-.0540	.0211	-2.558	.2385
Year 2009 – Year 2013	-.0837	.0214	-3.904	.0039
Year 2009 – Year 2014	-.1013	.0218	-4.637	.0002
Year 2009 – Year 2015	-.1375	.0227	-6.053	<.0001
Year 2009 – Year 2016	-.1659	.0234	-7.080	<.0001
Year 2009 – Year 2017	-.2054	.0251	-8.179	<.0001
Year 2009 – Year 2018	-.2835	.0280	-10.134	<.0001
Year 2010 – Year 2011	-.0142	.0205	-0.692	.9996
Year 2010 – Year 2012	-.0409	.0201	-2.033	.5754
Year 2010 – Year 2013	-.0705	.0205	-3.446	.0205
Year 2010 – Year 2014	-.0881	.0209	-4.213	.0011
Year 2010 – Year 2015	-.1243	.0218	-5.692	<.0001
Year 2010 – Year 2016	-.1527	.0226	-6.753	<.0001
Year 2010 – Year 2017	-.1922	.0244	-7.874	<.0001
Year 2010 – Year 2018	-.2703	.0274	-9.863	<.0001
Year 2011 – Year 2012	-.0267	.0202	-1.322	.9488
Year 2011 – Year 2013	-.0564	.0206	-2.740	.1583
Year 2011 – Year 2014	-.0740	.0210	-3.519	.0160
Year 2011 – Year 2015	-.1102	.0219	-5.020	<.0001
Year 2011 – Year 2016	-.1386	.0227	-6.099	<.0001
Year 2011 – Year 2017	-.1781	.0245	-7.263	<.0001
Year 2011 – Year 2018	-.2562	.0275	-9.312	<.0001
Year 2012 – Year 2013	-.0297	.0200	-1.483	.8992
Year 2012 – Year 2014	-.0473	.0205	-2.308	.3841
Year 2012 – Year 2015	-.0834	.0214	-3.891	.0041
Year 2012 – Year 2016	-.1118	.0222	-5.027	<.0001
Year 2012 – Year 2017	-.1514	.0241	-6.276	<.0001
Year 2012 – Year 2018	-.2295	.0272	-8.435	<.0001
Year 2013 – Year 2014	-.0176	.0207	-0.849	.9978
Year 2013 – Year 2015	-.0538	.0217	-2.483	.2782
Year 2013 – Year 2016	-.0822	.0224	-3.665	.0095
Year 2013 – Year 2017	-.1217	.0242	-5.022	<.0001
Year 2013 – Year 2018	-.1998	.0273	-7.331	<.0001
Year 2014 – Year 2015	-.0362	.0220	-1.646	.8250
Year 2014 – Year 2016	-.0646	.0227	-2.846	.1218
Year 2014 – Year 2017	-.1041	.0244	-4.267	.0009
Year 2014 – Year 2018	-.1822	.0273	-6.673	<.0001
Year 2015 – Year 2016	-.0284	.0233	-1.219	.9695
Year 2015 – Year 2017	-.0679	.0248	-2.736	.1601
Year 2015 – Year 2018	-.1460	.0275	-5.304	<.0001
Year 2016 – Year 2017	-.0395	.0252	-1.568	.8636
Year 2016 – Year 2018	-.1176	.0278	-4.238	.0010
Year 2017 – Year 2018	-.0781	.0285	-2.744	.1569

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 12 in Table 3 in the main text.

Table S13a. Adjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Age 12-17 Children, U.S. Counties, 2009-2018.

Fixed effects	Coefficient	Standard error	t	p
Intercept	35.2343	2.2780	15.467	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	-0.6979	0.4762	-1.465	.1428
Year 2011	-0.8409	0.4797	-1.753	.0796
Year 2012	-1.2563	0.4782	-2.627	.0086
Year 2013	-1.3647	0.4884	-2.794	.0052
Year 2014	0.5246	0.5034	1.042	.2974
Year 2015	2.4939	0.5358	4.654	.0000
Year 2016	4.8139	0.5782	8.326	.0000
Year 2017	8.0517	0.6801	11.840	.0000
Year 2018	12.6001	0.8514	14.800	.0000
Opioid prescription rate	-0.0019	0.0266	-0.071	.9435
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0087	0.0161	0.542	.5875
Opioid prescription rate × Year 2011	0.0112	0.0162	0.688	.4916
Opioid prescription rate × Year 2012	0.0345	0.0160	2.160	.0308
Opioid prescription rate × Year 2013	0.0563	0.0162	3.469	.0005
Opioid prescription rate × Year 2014	0.0669	0.0166	4.041	.0001
Opioid prescription rate × Year 2015	0.0934	0.0172	5.419	.0000
Opioid prescription rate × Year 2016	0.1171	0.0178	6.580	.0000
Opioid prescription rate × Year 2017	0.1575	0.0191	8.259	.0000
Opioid prescription rate × Year 2018	0.2138	0.0212	10.082	.0000
Control variables				
% children aged 12-17 in poverty	0.5793	0.0387	14.983	.0000
% owner-occupied housing units	-0.3131	0.0321	-9.767	.0000
% Black among children	-0.0908	0.0178	-5.094	.0000
% Latino among children	0.1046	0.0168	6.231	.0000
% foreign-born among persons	-0.5480	0.0319	-17.192	.0000
% children among persons	-0.6237	0.0947	-6.583	.0000
% elderly (≥ age 65) among persons	-0.2462	0.0828	-2.973	.0030
% male among adults aged 20-64	0.3969	0.1370	2.898	.0038
% with disabilities among children	2.1325	0.1722	12.383	.0000
% moved in one year among persons	0.1921	0.0619	3.104	.0019
Urbanicity				
Large urban	reference			
Small urban	0.1694	0.3419	0.495	.6204
Rural	-0.0061	0.5174	-0.012	.9906

Random effect	Variance
State-level: Intercept	248.898
State-level: Opioid prescription rate	0.022
Observation-level	62.662

Note. N = 6,151 county-year observations. All estimates were weighted by county age 12-17 child populations. This model is corresponding to the results of Model 13 in Table 3 in the main text.

Table S13b. Post Hoc Tests on Pairwise Comparisons between Adjusted Yearly Opioid Coefficients on County CMR Rates among Age 12-17 Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0087	.0161	-0.543	.9999
Year 2009 – Year 2011	-.0112	.0162	-0.688	.9996
Year 2009 – Year 2012	-.0345	.0160	-2.161	.4844
Year 2009 – Year 2013	-.0563	.0162	-3.470	.0189
Year 2009 – Year 2014	-.0669	.0166	-4.042	.0022
Year 2009 – Year 2015	-.0934	.0172	-5.421	<.0001
Year 2009 – Year 2016	-.1171	.0178	-6.582	<.0001
Year 2009 – Year 2017	-.1575	.0191	-8.261	<.0001
Year 2009 – Year 2018	-.2138	.0212	-10.084	<.0001
Year 2010 – Year 2011	-.0024	.0155	-0.157	1.0000
Year 2010 – Year 2012	-.0258	.0153	-1.691	.8009
Year 2010 – Year 2013	-.0476	.0155	-3.061	.0681
Year 2010 – Year 2014	-.0582	.0159	-3.659	.0097
Year 2010 – Year 2015	-.0847	.0166	-5.096	<.0001
Year 2010 – Year 2016	-.1084	.0172	-6.293	<.0001
Year 2010 – Year 2017	-.1487	.0186	-8.007	<.0001
Year 2010 – Year 2018	-.2051	.0208	-9.852	<.0001
Year 2011 – Year 2012	-.0234	.0154	-1.520	.8845
Year 2011 – Year 2013	-.0452	.0157	-2.884	.1106
Year 2011 – Year 2014	-.0558	.0160	-3.481	.0182
Year 2011 – Year 2015	-.0823	.0167	-4.916	<.0001
Year 2011 – Year 2016	-.1059	.0173	-6.112	<.0001
Year 2011 – Year 2017	-.1463	.0187	-7.829	<.0001
Year 2011 – Year 2018	-.2026	.0209	-9.686	<.0001
Year 2012 – Year 2013	-.0218	.0153	-1.428	.9186
Year 2012 – Year 2014	-.0324	.0156	-2.071	.5483
Year 2012 – Year 2015	-.0589	.0164	-3.594	.0123
Year 2012 – Year 2016	-.0826	.0170	-4.855	.0001
Year 2012 – Year 2017	-.1229	.0184	-6.676	<.0001
Year 2012 – Year 2018	-.1793	.0207	-8.654	<.0001
Year 2013 – Year 2014	-.0106	.0159	-0.668	.9997
Year 2013 – Year 2015	-.0371	.0166	-2.239	.4298
Year 2013 – Year 2016	-.0608	.0172	-3.542	.0148
Year 2013 – Year 2017	-.1011	.0185	-5.462	<.0001
Year 2013 – Year 2018	-.1575	.0208	-7.583	<.0001
Year 2014 – Year 2015	-.0265	.0168	-1.577	.8592
Year 2014 – Year 2016	-.0502	.0174	-2.891	.1086
Year 2014 – Year 2017	-.0906	.0186	-4.857	.0001
Year 2014 – Year 2018	-.1469	.0208	-7.058	<.0001
Year 2015 – Year 2016	-.0237	.0178	-1.327	.9476
Year 2015 – Year 2017	-.0640	.0190	-3.373	.0262
Year 2015 – Year 2018	-.1204	.0210	-5.734	<.0001
Year 2016 – Year 2017	-.0404	.0193	-2.093	.5329
Year 2016 – Year 2018	-.0967	.0212	-4.567	.0002
Year 2017 – Year 2018	-.0563	.0217	-2.597	.2194

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 13 in Table 3 in the main text.

Table S14a. Adjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Male Children, U.S. Counties, 2009-2018.

Fixed effects	Coefficient	Standard error	t	p
Intercept	44.7246	2.7104	16.501	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	-0.5898	0.5812	-1.015	.3102
Year 2011	-0.5554	0.5851	-0.949	.3425
Year 2012	-0.6592	0.5830	-1.131	.2582
Year 2013	-0.3880	0.5955	-0.651	.5148
Year 2014	1.9893	0.6142	3.239	.0012
Year 2015	4.6283	0.6549	7.067	.0000
Year 2016	7.6535	0.7077	10.815	.0000
Year 2017	11.3963	0.8327	13.686	.0000
Year 2018	16.7904	1.0437	16.088	.0000
Opioid prescription rate	0.0187	0.0329	0.569	.5710
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0117	0.0196	0.597	.5502
Opioid prescription rate × Year 2011	0.0226	0.0198	1.143	.2531
Opioid prescription rate × Year 2012	0.0469	0.0195	2.413	.0159
Opioid prescription rate × Year 2013	0.0766	0.0198	3.875	.0001
Opioid prescription rate × Year 2014	0.0882	0.0202	4.375	.0000
Opioid prescription rate × Year 2015	0.1240	0.0210	5.912	.0000
Opioid prescription rate × Year 2016	0.1519	0.0217	7.013	.0000
Opioid prescription rate × Year 2017	0.1931	0.0232	8.318	.0000
Opioid prescription rate × Year 2018	0.2594	0.0258	10.037	.0000
Control variables				
% children in poverty	0.9104	0.0449	20.262	.0000
% owner-occupied housing units	-0.1905	0.0386	-4.930	.0000
% Black among children	-0.2003	0.0223	-8.972	.0000
% Latino among children	0.0678	0.0205	3.313	.0009
% foreign-born among persons	-0.6682	0.0388	-17.239	.0000
% children among persons	-1.0359	0.1169	-8.858	.0000
% elderly (≥ age 65) among persons	-0.3645	0.1030	-3.538	.0004
% male among adults aged 20-64	0.5079	0.1643	3.091	.0020
% with disabilities among children	2.6662	0.2101	12.692	.0000
% moved in one year among persons	0.3499	0.0745	4.700	.0000
Urbanicity				
Large urban	reference			
Small urban	0.7661	0.4202	1.823	.0683
Rural	-0.5120	0.6395	-0.801	.4234

Random effect	Variance
State-level: Intercept	351.067
State-level: Opioid prescription rate	0.035
Observation-level	92.904

Note. N = 6,151 county-year observations. All estimates were weighted by county male child populations. This model is corresponding to the results of Model 14 in Table 3 in the main text.

Table S14b. Post Hoc Tests on Pairwise Comparisons between Adjusted Yearly Opioid Coefficients on County CMR Rates among Male Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0117	.0196	-0.598	.9999
Year 2009 – Year 2011	-.0226	.0198	-1.143	.9801
Year 2009 – Year 2012	-.0469	.0194	-2.414	.3180
Year 2009 – Year 2013	-.0766	.0198	-3.877	.0043
Year 2009 – Year 2014	-.0882	.0201	-4.377	.0005
Year 2009 – Year 2015	-.1240	.0210	-5.914	<.0001
Year 2009 – Year 2016	-.1519	.0216	-7.016	<.0001
Year 2009 – Year 2017	-.1931	.0232	-8.321	<.0001
Year 2009 – Year 2018	-.2594	.0258	-10.039	<.0001
Year 2010 – Year 2011	-.0109	.0189	-0.576	.9999
Year 2010 – Year 2012	-.0352	.0185	-1.899	.6698
Year 2010 – Year 2013	-.0649	.0189	-3.433	.0215
Year 2010 – Year 2014	-.0765	.0193	-3.956	.0031
Year 2010 – Year 2015	-.1123	.0202	-5.560	<.0001
Year 2010 – Year 2016	-.1401	.0209	-6.696	<.0001
Year 2010 – Year 2017	-.1814	.0226	-8.028	<.0001
Year 2010 – Year 2018	-.2477	.0254	-9.771	<.0001
Year 2011 – Year 2012	-.0243	.0187	-1.304	.9529
Year 2011 – Year 2013	-.0540	.0190	-2.840	.1239
Year 2011 – Year 2014	-.0656	.0194	-3.373	.0261
Year 2011 – Year 2015	-.1014	.0203	-4.993	<.0001
Year 2011 – Year 2016	-.1293	.0210	-6.143	<.0001
Year 2011 – Year 2017	-.1705	.0227	-7.509	<.0001
Year 2011 – Year 2018	-.2369	.0255	-9.302	<.0001
Year 2012 – Year 2013	-.0296	.0185	-1.602	.8476
Year 2012 – Year 2014	-.0413	.0190	-2.175	.4744
Year 2012 – Year 2015	-.0771	.0199	-3.879	.0043
Year 2012 – Year 2016	-.1049	.0206	-5.086	<.0001
Year 2012 – Year 2017	-.1461	.0224	-6.537	<.0001
Year 2012 – Year 2018	-.2125	.0252	-8.434	<.0001
Year 2013 – Year 2014	-.0116	.0192	-0.604	.9999
Year 2013 – Year 2015	-.0475	.0201	-2.362	.3497
Year 2013 – Year 2016	-.0753	.0208	-3.618	.0113
Year 2013 – Year 2017	-.1165	.0225	-5.183	<.0001
Year 2013 – Year 2018	-.1829	.0253	-7.240	<.0001
Year 2014 – Year 2015	-.0358	.0204	-1.757	.7620
Year 2014 – Year 2016	-.0637	.0211	-3.023	.0758
Year 2014 – Year 2017	-.1049	.0226	-4.634	.0002
Year 2014 – Year 2018	-.1713	.0253	-6.765	<.0001
Year 2015 – Year 2016	-.0278	.0216	-1.286	.9568
Year 2015 – Year 2017	-.0691	.0231	-2.995	.0820
Year 2015 – Year 2018	-.1354	.0255	-5.303	<.0001
Year 2016 – Year 2017	-.0412	.0234	-1.759	.7609
Year 2016 – Year 2018	-.1076	.0258	-4.176	.0013
Year 2017 – Year 2018	-.0664	.0264	-2.513	.2621

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 14 in Table 3 in the main text.

Table S15a. Adjusted Multilevel Model of County Opioid Prescription Rates on County CMR Rates among Female Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	46.8510	2.7314	17.153	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	-0.7575	0.5935	-1.276	.2019
Year 2011	-0.9221	0.5974	-1.544	.1227
Year 2012	-1.2937	0.5951	-2.174	.0297
Year 2013	-1.2526	0.6078	-2.061	.0394
Year 2014	1.1409	0.6269	1.820	.0688
Year 2015	3.8791	0.6684	5.803	.0000
Year 2016	7.0411	0.7222	9.750	.0000
Year 2017	11.0924	0.8498	13.053	.0000
Year 2018	16.7329	1.0652	15.709	.0000
Opioid prescription rate	0.0164	0.0339	0.484	.6295
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0144	0.0200	0.721	.4709
Opioid prescription rate × Year 2011	0.0205	0.0202	1.015	.3100
Opioid prescription rate × Year 2012	0.0480	0.0199	2.416	.0157
Opioid prescription rate × Year 2013	0.0738	0.0202	3.660	.0003
Opioid prescription rate × Year 2014	0.0892	0.0206	4.340	.0000
Opioid prescription rate × Year 2015	0.1234	0.0214	5.764	.0000
Opioid prescription rate × Year 2016	0.1558	0.0221	7.053	.0000
Opioid prescription rate × Year 2017	0.1959	0.0237	8.270	.0000
Opioid prescription rate × Year 2018	0.2692	0.0264	10.207	.0000
Control variables				
% children in poverty	0.9619	0.0458	21.000	.0000
% owner-occupied housing units	-0.1803	0.0394	-4.578	.0000
% Black among children	-0.1968	0.0227	-8.651	.0000
% Latino among children	0.0730	0.0208	3.502	.0005
% foreign-born among persons	-0.6718	0.0395	-16.993	.0000
% children among persons	-1.0583	0.1193	-8.875	.0000
% elderly (≥ age 65) among persons	-0.3764	0.1051	-3.580	.0003
% male among adults aged 20-64	0.6258	0.1676	3.733	.0002
% with disabilities among children	2.7637	0.2143	12.897	.0000
% moved in one year among persons	0.3141	0.0759	4.136	.0000
Urbanicity				
Large urban	reference			
Small urban	0.9400	0.4285	2.194	.0283
Rural	0.1279	0.6529	0.196	.8447

Random effect	**Variance**
State-level: Intercept	355.846
State-level: Opioid prescription rate	0.037
Observation-level	96.665

Note. N = 6,151 county-year observations. All estimates were weighted by county female child populations. This model is corresponding to the results of Model 15 in Table 3 in the main text.

Table S15b. Post Hoc Tests on Pairwise Comparisons between Adjusted Yearly Opioid Coefficients on County CMR Rates among Female Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0144	.0200	-0.721	.9994
Year 2009 – Year 2011	-.0205	.0202	-1.016	.9914
Year 2009 – Year 2012	-.0480	.0198	-2.417	.3157
Year 2009 – Year 2013	-.0738	.0201	-3.662	.0096
Year 2009 – Year 2014	-.0892	.0206	-4.342	.0006
Year 2009 – Year 2015	-.1234	.0214	-5.766	<.0001
Year 2009 – Year 2016	-.1558	.0221	-7.056	<.0001
Year 2009 – Year 2017	-.1959	.0237	-8.273	<.0001
Year 2009 – Year 2018	-.2692	.0264	-10.209	<.0001
Year 2010 – Year 2011	-.0060	.0192	-0.314	1.0000
Year 2010 – Year 2012	-.0335	.0189	-1.772	.7530
Year 2010 – Year 2013	-.0593	.0193	-3.079	.0648
Year 2010 – Year 2014	-.0748	.0197	-3.794	.0059
Year 2010 – Year 2015	-.1089	.0206	-5.286	<.0001
Year 2010 – Year 2016	-.1414	.0213	-6.621	<.0001
Year 2010 – Year 2017	-.1814	.0230	-7.871	<.0001
Year 2010 – Year 2018	-.2548	.0259	-9.849	<.0001
Year 2011 – Year 2012	-.0275	.0190	-1.444	.9133
Year 2011 – Year 2013	-.0533	.0194	-2.749	.1550
Year 2011 – Year 2014	-.0688	.0198	-3.467	.0191
Year 2011 – Year 2015	-.1029	.0207	-4.966	<.0001
Year 2011 – Year 2016	-.1353	.0215	-6.305	<.0001
Year 2011 – Year 2017	-.1754	.0232	-7.572	<.0001
Year 2011 – Year 2018	-.2488	.0260	-9.576	<.0001
Year 2012 – Year 2013	-.0258	.0189	-1.368	.9369
Year 2012 – Year 2014	-.0413	.0193	-2.134	.5032
Year 2012 – Year 2015	-.0754	.0203	-3.720	.0078
Year 2012 – Year 2016	-.1078	.0210	-5.126	<.0001
Year 2012 – Year 2017	-.1479	.0228	-6.486	<.0001
Year 2012 – Year 2018	-.2213	.0257	-8.608	<.0001
Year 2013 – Year 2014	-.0155	.0196	-0.789	.9987
Year 2013 – Year 2015	-.0496	.0205	-2.421	.3136
Year 2013 – Year 2016	-.0820	.0212	-3.867	.0045
Year 2013 – Year 2017	-.1221	.0229	-5.326	<.0001
Year 2013 – Year 2018	-.1955	.0258	-7.587	<.0001
Year 2014 – Year 2015	-.0341	.0208	-1.642	.8275
Year 2014 – Year 2016	-.0666	.0215	-3.100	.0609
Year 2014 – Year 2017	-.1066	.0231	-4.619	.0002
Year 2014 – Year 2018	-.1800	.0258	-6.972	<.0001
Year 2015 – Year 2016	-.0324	.0221	-1.470	.9039
Year 2015 – Year 2017	-.0725	.0235	-3.084	.0639
Year 2015 – Year 2018	-.1459	.0260	-5.601	<.0001
Year 2016 – Year 2017	-.0401	.0239	-1.677	.8086
Year 2016 – Year 2018	-.1135	.0263	-4.318	.0007
Year 2017 – Year 2018	-.0734	.0269	-2.724	.1646

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 15 in Table 3 in the main text.

Table S16a. Adjusted Multilevel Model of County Opioid Prescription Rates on County Neglect Report Rates among All Children, U.S. Counties, 2009-2018.

Fixed effects	**Coefficient**	**Standard error**	**t**	**p**
Intercept	29.7571	2.2475	13.240	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	-0.1038	0.4946	-0.210	.8338
Year 2011	-0.2673	0.4978	-0.537	.5913
Year 2012	-0.7513	0.4959	-1.515	.1298
Year 2013	-0.2549	0.5065	-0.503	.6148
Year 2014	1.1371	0.5224	2.177	.0295
Year 2015	3.7230	0.5567	6.687	.0000
Year 2016	5.1581	0.6015	8.576	.0000
Year 2017	8.2024	0.7073	11.597	.0000
Year 2018	11.7223	0.8852	13.243	.0000
Opioid prescription rate	0.0114	0.0242	0.470	.6393
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0139	0.0167	0.831	.4061
Opioid prescription rate × Year 2011	0.0162	0.0168	0.965	.3347
Opioid prescription rate × Year 2012	0.0256	0.0165	1.546	.1222
Opioid prescription rate × Year 2013	0.0499	0.0168	2.970	.0030
Opioid prescription rate × Year 2014	0.0510	0.0171	2.973	.0030
Opioid prescription rate × Year 2015	0.0918	0.0178	5.149	.0000
Opioid prescription rate × Year 2016	0.0906	0.0184	4.923	.0000
Opioid prescription rate × Year 2017	0.1221	0.0197	6.191	.0000
Opioid prescription rate × Year 2018	0.1629	0.0219	7.432	.0000
Control variables				
% children in poverty	0.7444	0.0382	19.512	.0000
% owner-occupied housing units	-0.0402	0.0328	-1.226	.2204
% Black among children	-0.1672	0.0189	-8.827	.0000
% Latino among children	0.0435	0.0174	2.503	.0123
% foreign-born among persons	-0.5307	0.0328	-16.161	.0000
% children among persons	-0.6298	0.0992	-6.347	.0000
% elderly (≥ age 65) among persons	-0.1784	0.0875	-2.039	.0415
% male among adults aged 20-64	0.4983	0.1396	3.570	.0004
% with disabilities among children	2.4072	0.1785	13.486	.0000
% moved in one year among persons	0.4071	0.0632	6.441	.0000
Urbanicity				
Large urban	reference			
Small urban	0.4711	0.3568	1.320	.1867
Rural	-0.9413	0.5431	-1.733	.0831

Random effect	**Variance**
State-level: Intercept	241.162
State-level: Opioid prescription rate	0.016
Observation-level	67.201

Note. N = 6,151 county-year observations. All estimates were weighted by county child populations. This model is corresponding to the results of Model 16 in Table 3 in the main text.

Table S16b. Post Hoc Tests on Pairwise Comparisons between Adjusted Yearly Opioid Coefficients on County Neglect Report Rates among All Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0139	.0167	-0.831	.9981
Year 2009 – Year 2011	-.0162	.0168	-0.965	.9941
Year 2009 – Year 2012	-.0256	.0165	-1.546	.8732
Year 2009 – Year 2013	-.0499	.0168	-2.971	.0876
Year 2009 – Year 2014	-.0510	.0171	-2.974	.0869
Year 2009 – Year 2015	-.0918	.0178	-5.151	<.0001
Year 2009 – Year 2016	-.0906	.0184	-4.924	<.0001
Year 2009 – Year 2017	-.1221	.0197	-6.192	<.0001
Year 2009 – Year 2018	-.1629	.0219	-7.433	<.0001
Year 2010 – Year 2011	-.0024	.0160	-0.147	1.0000
Year 2010 – Year 2012	-.0117	.0158	-0.742	.9992
Year 2010 – Year 2013	-.0360	.0161	-2.243	.4271
Year 2010 – Year 2014	-.0371	.0164	-2.257	.4179
Year 2010 – Year 2015	-.0780	.0172	-4.541	.0003
Year 2010 – Year 2016	-.0768	.0178	-4.314	.0007
Year 2010 – Year 2017	-.1082	.0192	-5.640	<.0001
Year 2010 – Year 2018	-.1491	.0215	-6.935	<.0001
Year 2011 – Year 2012	-.0094	.0159	-0.589	.9999
Year 2011 – Year 2013	-.0337	.0162	-2.084	.5389
Year 2011 – Year 2014	-.0347	.0165	-2.101	.5267
Year 2011 – Year 2015	-.0756	.0173	-4.380	.0005
Year 2011 – Year 2016	-.0744	.0179	-4.160	.0014
Year 2011 – Year 2017	-.1058	.0193	-5.490	<.0001
Year 2011 – Year 2018	-.1467	.0216	-6.797	<.0001
Year 2012 – Year 2013	-.0243	.0157	-1.547	.8731
Year 2012 – Year 2014	-.0254	.0161	-1.574	.8605
Year 2012 – Year 2015	-.0663	.0169	-3.923	.0036
Year 2012 – Year 2016	-.0650	.0175	-3.711	.0080
Year 2012 – Year 2017	-.0965	.0190	-5.085	<.0001
Year 2012 – Year 2018	-.1374	.0213	-6.434	<.0001
Year 2013 – Year 2014	-.0011	.0163	-0.064	1.0000
Year 2013 – Year 2015	-.0419	.0171	-2.456	.2933
Year 2013 – Year 2016	-.0407	.0177	-2.302	.3877
Year 2013 – Year 2017	-.0721	.0191	-3.781	.0062
Year 2013 – Year 2018	-.1130	.0214	-5.281	<.0001
Year 2014 – Year 2015	-.0409	.0173	-2.358	.3517
Year 2014 – Year 2016	-.0397	.0179	-2.215	.4464
Year 2014 – Year 2017	-.0711	.0192	-3.698	.0084
Year 2014 – Year 2018	-.1120	.0215	-5.217	<.0001
Year 2015 – Year 2016	.0012	.0184	0.067	1.0000
Year 2015 – Year 2017	-.0302	.0196	-1.542	.8752
Year 2015 – Year 2018	-.0711	.0217	-3.279	.0354
Year 2016 – Year 2017	-.0314	.0199	-1.579	.8587
Year 2016 – Year 2018	-.0723	.0219	-3.305	.0326
Year 2017 – Year 2018	-.0409	.0225	-1.820	.7223

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 16 in Table 3 in the main text.

Table S17a. Adjusted Multilevel Model of County Opioid Prescription Rates on County Physical Abuse Report Rates among All Children, U.S. Counties, 2009-2018.

Fixed effects	Coefficient	Standard error	t	p
Intercept	12.2112	1.3350	9.147	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	0.0322	0.2359	0.136	.8914
Year 2011	-0.0276	0.2374	-0.116	.9075
Year 2012	0.2979	0.2365	1.260	.2079
Year 2013	0.1166	0.2416	0.483	.6293
Year 2014	0.0837	0.2492	0.336	.7369
Year 2015	1.0378	0.2657	3.906	.0001
Year 2016	2.5000	0.2871	8.707	.0000
Year 2017	3.3593	0.3381	9.937	.0000
Year 2018	4.6019	0.4243	10.846	.0000
Opioid prescription rate	-0.0326	0.0179	-1.819	.0735
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0027	0.0080	0.345	.7301
Opioid prescription rate × Year 2011	0.0066	0.0080	0.821	.4118
Opioid prescription rate × Year 2012	0.0262	0.0079	3.326	.0009
Opioid prescription rate × Year 2013	0.0282	0.0080	3.524	.0004
Opioid prescription rate × Year 2014	0.0166	0.0082	2.034	.0420
Opioid prescription rate × Year 2015	0.0394	0.0085	4.632	.0000
Opioid prescription rate × Year 2016	0.0701	0.0088	7.982	.0000
Opioid prescription rate × Year 2017	0.0800	0.0094	8.490	.0000
Opioid prescription rate × Year 2018	0.0960	0.0105	9.140	.0000
Control variables				
% children in poverty	0.2034	0.0182	11.165	.0000
% owner-occupied housing units	-0.0007	0.0157	-0.046	.9631
% Black among children	-0.0198	0.0091	-2.181	.0292
% Latino among children	0.0393	0.0083	4.735	.0000
% foreign-born among persons	-0.1195	0.0157	-7.601	.0000
% children among persons	-0.3479	0.0474	-7.333	.0000
% elderly (≥ age 65) among persons	-0.1498	0.0418	-3.585	.0003
% male among adults aged 20-64	-0.1726	0.0667	-2.590	.0096
% with disabilities among children	0.7651	0.0852	8.984	.0000
% moved in one year among persons	0.1490	0.0302	4.940	.0000
Urbanicity				
Large urban	reference			
Small urban	-0.6579	0.1704	-3.860	.0001
Rural	-0.2253	0.2593	-0.869	.3850

Random effect	Variance
State-level: Intercept	87.141
State-level: Opioid prescription rate	0.013
Observation-level	15.283

Note. N = 6,151 county-year observations. All estimates were weighted by county child populations. This model is corresponding to the results of Model 17 in Table 3 in the main text.

Table S17b. Post Hoc Tests on Pairwise Comparisons between Adjusted Yearly Opioid Coefficients on County Physical Abuse Report Rates among All Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0028	.0080	-0.345	1.0000
Year 2009 – Year 2011	-.0066	.0080	-0.821	.9983
Year 2009 – Year 2012	-.0263	.0079	-3.327	.0304
Year 2009 – Year 2013	-.0283	.0080	-3.526	.0156
Year 2009 – Year 2014	-.0166	.0082	-2.035	.5743
Year 2009 – Year 2015	-.0394	.0085	-4.634	.0002
Year 2009 – Year 2016	-.0701	.0088	-7.985	<.0001
Year 2009 – Year 2017	-.0800	.0094	-8.493	<.0001
Year 2009 – Year 2018	-.0960	.0105	-9.143	<.0001
Year 2010 – Year 2011	-.0038	.0077	-0.501	1.0000
Year 2010 – Year 2012	-.0235	.0075	-3.124	.0568
Year 2010 – Year 2013	-.0255	.0077	-3.328	.0303
Year 2010 – Year 2014	-.0139	.0078	-1.771	.7537
Year 2010 – Year 2015	-.0367	.0082	-4.476	.0003
Year 2010 – Year 2016	-.0674	.0085	-7.934	<.0001
Year 2010 – Year 2017	-.0773	.0092	-8.423	<.0001
Year 2010 – Year 2018	-.0933	.0103	-9.052	<.0001
Year 2011 – Year 2012	-.0197	.0076	-2.598	.2191
Year 2011 – Year 2013	-.0217	.0077	-2.810	.1335
Year 2011 – Year 2014	-.0101	.0079	-1.274	.9594
Year 2011 – Year 2015	-.0328	.0082	-3.985	.0028
Year 2011 – Year 2016	-.0635	.0085	-7.442	<.0001
Year 2011 – Year 2017	-.0734	.0092	-7.965	<.0001
Year 2011 – Year 2018	-.0894	.0104	-8.642	<.0001
Year 2012 – Year 2013	-.0020	.0075	-0.266	1.0000
Year 2012 – Year 2014	.0096	.0077	1.251	.9639
Year 2012 – Year 2015	-.0132	.0081	-1.634	.8315
Year 2012 – Year 2016	-.0439	.0084	-5.242	<.0001
Year 2012 – Year 2017	-.0538	.0091	-5.921	<.0001
Year 2012 – Year 2018	-.0698	.0102	-6.811	<.0001
Year 2013 – Year 2014	.0116	.0078	1.491	.8962
Year 2013 – Year 2015	-.0112	.0082	-1.371	.9359
Year 2013 – Year 2016	-.0419	.0084	-4.961	<.0001
Year 2013 – Year 2017	-.0518	.0091	-5.671	<.0001
Year 2013 – Year 2018	-.0678	.0103	-6.601	<.0001
Year 2014 – Year 2015	-.0228	.0083	-2.756	.1524
Year 2014 – Year 2016	-.0535	.0085	-6.263	<.0001
Year 2014 – Year 2017	-.0634	.0092	-6.898	<.0001
Year 2014 – Year 2018	-.0794	.0103	-7.719	<.0001
Year 2015 – Year 2016	-.0307	.0088	-3.499	.0172
Year 2015 – Year 2017	-.0406	.0094	-4.339	.0006
Year 2015 – Year 2018	-.0566	.0104	-5.459	<.0001
Year 2016 – Year 2017	-.0099	.0095	-1.040	.9898
Year 2016 – Year 2018	-.0259	.0105	-2.477	.2815
Year 2017 – Year 2018	-.0160	.0107	-1.495	.8945

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 17 in Table 3 in the main text.

Table S18a. Adjusted Multilevel Model of County Opioid Prescription Rates on County Sexual Abuse Report Rates among All Children, U.S. Counties, 2009-2018.

Fixed effects	Coefficient	Standard error	t	p
Intercept	3.7457	0.3382	11.076	.0000
Year fixed effects				
Year 2009	reference			
Year 2010	-0.0345	0.0632	-0.546	.5853
Year 2011	-0.2140	0.0636	-3.367	.0008
Year 2012	-0.1407	0.0633	-2.222	.0263
Year 2013	-0.2540	0.0647	-3.927	.0001
Year 2014	-0.3092	0.0667	-4.634	.0000
Year 2015	-0.1910	0.0711	-2.684	.0073
Year 2016	0.0057	0.0769	0.075	.9406
Year 2017	0.2168	0.0904	2.398	.0165
Year 2018	0.5889	0.1132	5.201	.0000
Opioid prescription rate	0.0012	0.0038	0.324	.7471
Opioid × Year interaction effects				
Opioid prescription rate × Year 2010	0.0011	0.0021	0.526	.5989
Opioid prescription rate × Year 2011	-0.0001	0.0021	-0.027	.9788
Opioid prescription rate × Year 2012	0.0038	0.0021	1.803	.0714
Opioid prescription rate × Year 2013	0.0036	0.0021	1.665	.0959
Opioid prescription rate × Year 2014	0.0011	0.0022	0.505	.6137
Opioid prescription rate × Year 2015	0.0020	0.0023	0.869	.3849
Opioid prescription rate × Year 2016	0.0038	0.0024	1.621	.1051
Opioid prescription rate × Year 2017	0.0051	0.0025	2.043	.0411
Opioid prescription rate × Year 2018	0.0083	0.0028	2.946	.0032
Control variables				
% children in poverty	0.0819	0.0049	16.798	.0000
% owner-occupied housing units	-0.0008	0.0042	-0.187	.8520
% Black among children	-0.0163	0.0024	-6.717	.0000
% Latino among children	0.0148	0.0022	6.654	.0000
% foreign-born among persons	-0.0652	0.0042	-15.491	.0000
% children among persons	-0.1238	0.0127	-9.749	.0000
% elderly (≥ age 65) among persons	-0.0438	0.0112	-3.913	.0001
% male among adults aged 20-64	0.0655	0.0178	3.672	.0002
% with disabilities among children	0.2106	0.0228	9.225	.0000
% moved in one year among persons	0.0096	0.0081	1.184	.2366
Urbanicity				
Large urban	reference			
Small urban	0.0944	0.0456	2.068	.0386
Rural	0.2435	0.0695	3.503	.0005

Random effect	Variance
State-level: Intercept	5.5425
State-level: Opioid prescription rate	0.0005
Observation-level	1.0957

Note. N = 6,151 county-year observations. All estimates were weighted by county child populations. This model is corresponding to the results of Model 18 in Table 3 in the main text.

Table S18b. Post Hoc Tests on Pairwise Comparisons between Adjusted Yearly Opioid Coefficients on County Sexual Abuse Report Rates among All Children.

Contrast	Estimate	Standard error	t	p
Year 2009 – Year 2010	-.0011	.0021	-0.526	1.0000
Year 2009 – Year 2011	.0001	.0022	0.027	1.0000
Year 2009 – Year 2012	-.0038	.0021	-1.804	.7331
Year 2009 – Year 2013	-.0036	.0021	-1.666	.8145
Year 2009 – Year 2014	-.0011	.0022	-0.505	1.0000
Year 2009 – Year 2015	-.0020	.0023	-0.869	.9973
Year 2009 – Year 2016	-.0038	.0024	-1.621	.8379
Year 2009 – Year 2017	-.0052	.0025	-2.044	.5679
Year 2009 – Year 2018	-.0083	.0028	-2.947	.0937
Year 2010 – Year 2011	.0012	.0021	0.575	.9999
Year 2010 – Year 2012	-.0027	.0020	-1.335	.9456
Year 2010 – Year 2013	-.0025	.0021	-1.195	.9732
Year 2010 – Year 2014	.0000	.0021	0.008	1.0000
Year 2010 – Year 2015	-.0009	.0022	-0.391	1.0000
Year 2010 – Year 2016	-.0027	.0023	-1.184	.9749
Year 2010 – Year 2017	-.0040	.0025	-1.642	.8272
Year 2010 – Year 2018	-.0071	.0028	-2.597	.2196
Year 2011 – Year 2012	-.0039	.0020	-1.908	.6639
Year 2011 – Year 2013	-.0036	.0021	-1.759	.7611
Year 2011 – Year 2014	-.0012	.0021	-0.550	.9999
Year 2011 – Year 2015	-.0020	.0022	-0.923	.9957
Year 2011 – Year 2016	-.0039	.0023	-1.693	.7997
Year 2011 – Year 2017	-.0052	.0025	-2.112	.5189
Year 2011 – Year 2018	-.0083	.0028	-3.013	.0783
Year 2012 – Year 2013	.0002	.0020	0.117	1.0000
Year 2012 – Year 2014	.0027	.0021	1.314	.9508
Year 2012 – Year 2015	.0018	.0022	0.848	.9978
Year 2012 – Year 2016	.0000	.0022	-0.001	1.0000
Year 2012 – Year 2017	-.0013	.0024	-0.552	.9999
Year 2012 – Year 2018	-.0045	.0027	-1.630	.8333
Year 2013 – Year 2014	.0025	.0021	1.183	.9750
Year 2013 – Year 2015	.0016	.0022	0.731	.9993
Year 2013 – Year 2016	-.0002	.0023	-0.105	1.0000
Year 2013 – Year 2017	-.0016	.0024	-0.646	.9998
Year 2013 – Year 2018	-.0047	.0027	-1.712	.7886
Year 2014 – Year 2015	-.0009	.0022	-0.395	1.0000
Year 2014 – Year 2016	-.0027	.0023	-1.184	.9749
Year 2014 – Year 2017	-.0040	.0025	-1.646	.8253
Year 2014 – Year 2018	-.0072	.0028	-2.607	.2147
Year 2015 – Year 2016	-.0018	.0024	-0.780	.9989
Year 2015 – Year 2017	-.0032	.0025	-1.266	.9609
Year 2015 – Year 2018	-.0063	.0028	-2.268	.4106
Year 2016 – Year 2017	-.0013	.0025	-0.526	1.0000
Year 2016 – Year 2018	-.0045	.0028	-1.593	.8519
Year 2017 – Year 2018	-.0031	.0029	-1.087	.9860

Estimate = difference in opioid coefficients between years (e.g., the opioid coefficient in 2009 – the opioid coefficient in 2010). We used the *emmeans* package (the *emtrends* function) for the post hoc tests on pairwise comparisons between yearly opioid coefficients. The p-values were adjusted by Tukey′s method to control the type I error rate by multiple comparisons. These post hoc tests are corresponding to the results of Model 18 in Table 3 in the main text.