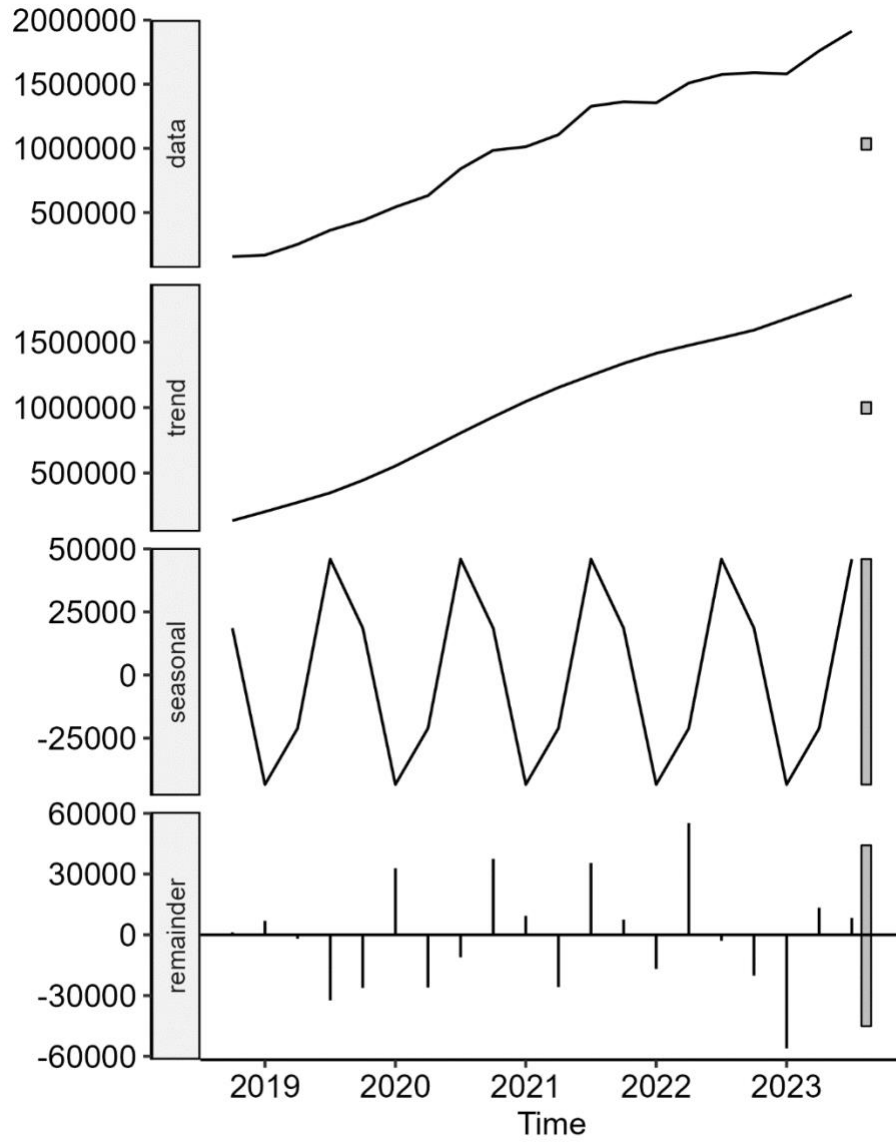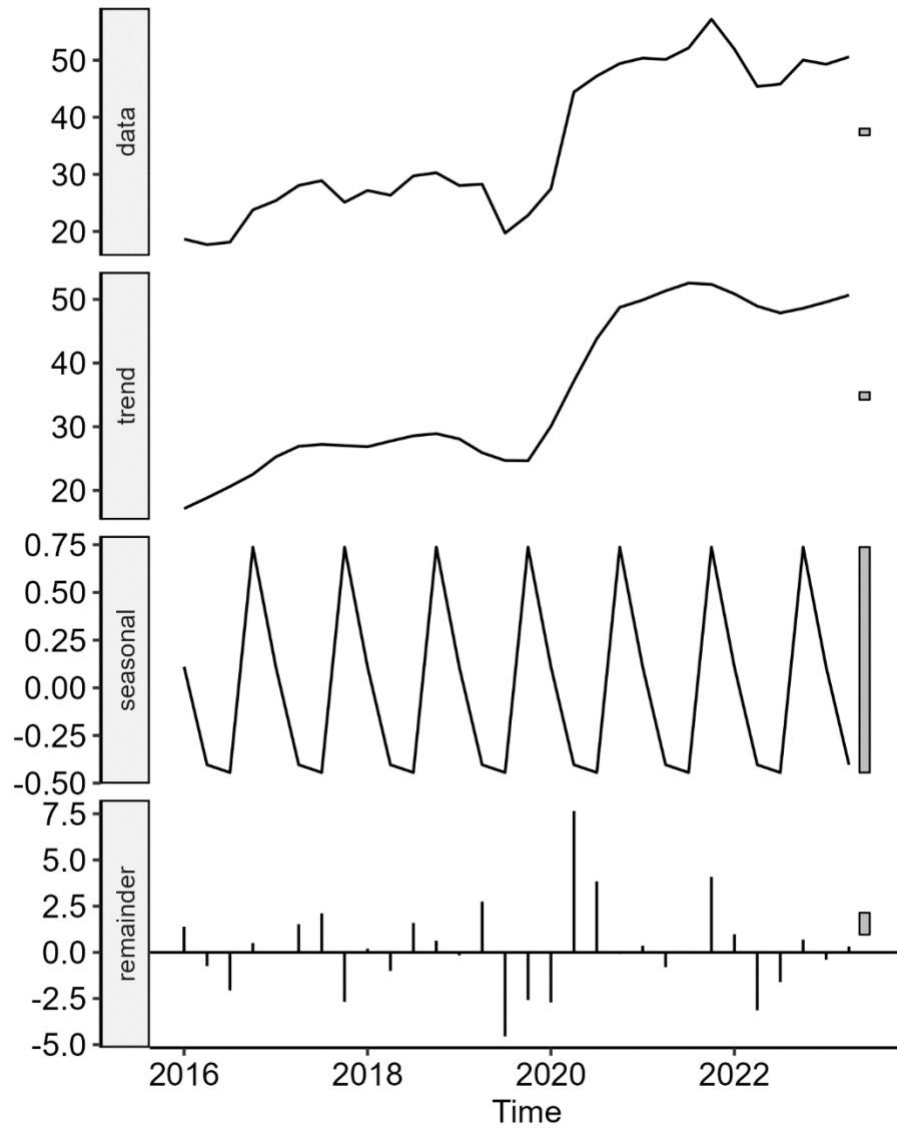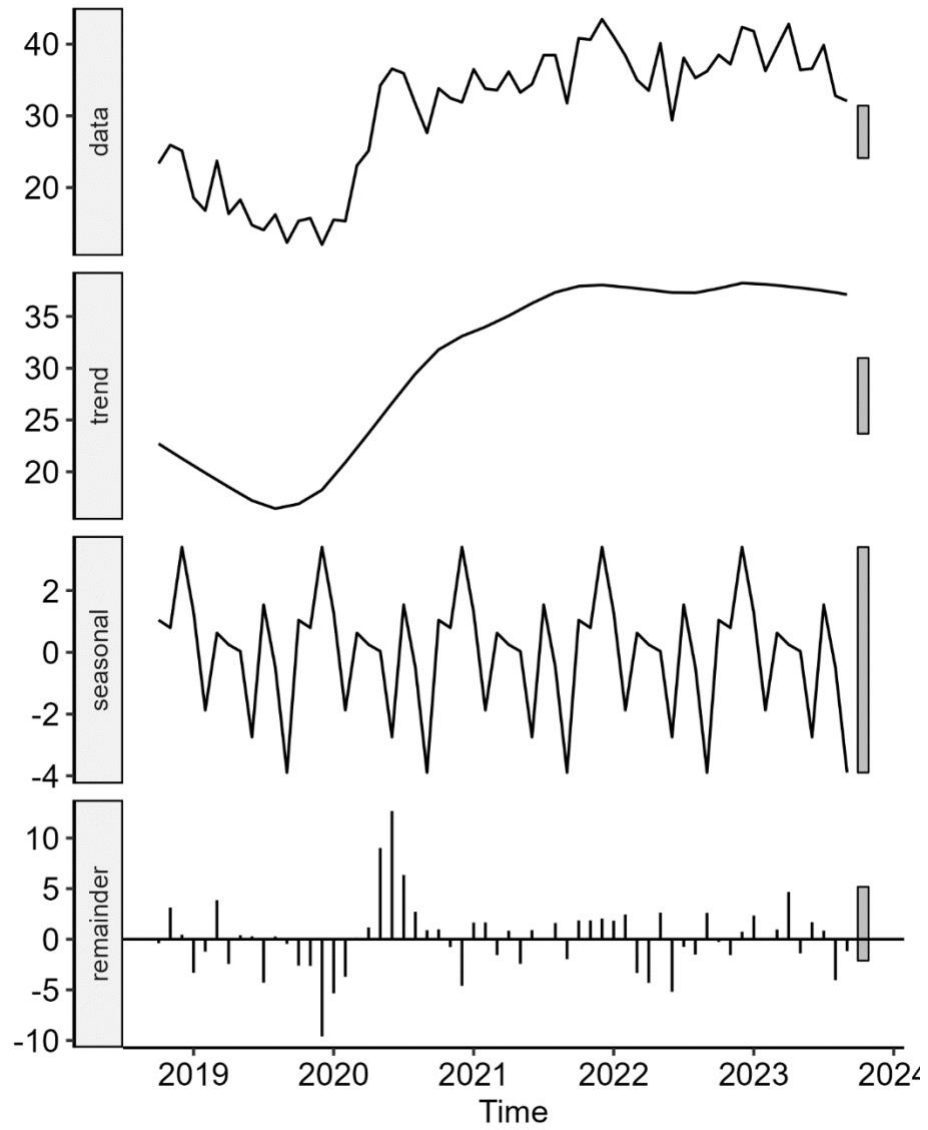eFigure 1. *STL Decomposition of Quarterly Cannabis Sales ($) in Canada Between October 2018 and September 2023*

eFigure 2. *STL Decomposition of Quarterly Opioid-Related Mortality Rate per 1 Million in Canada Between January 2016 and June 2023*

eFigure 3. *STL Decomposition of Monthly Cannabis Sales in British Columbia Between October 2018 and September 2023.*

eFigure 4. *STL Decomposition of Monthly Opioid-Related Mortality Rate per 1 Million in British Columbia Between October 2018 and September 2023*
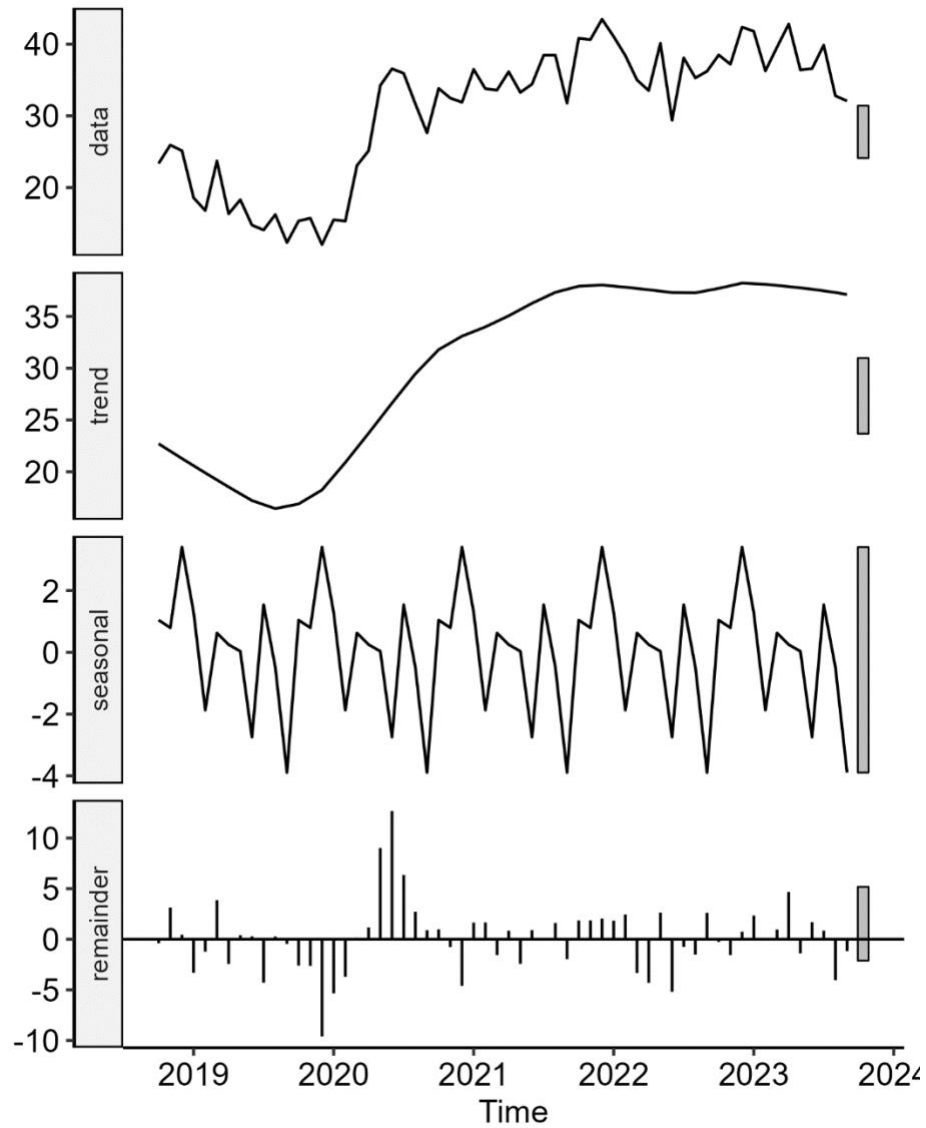
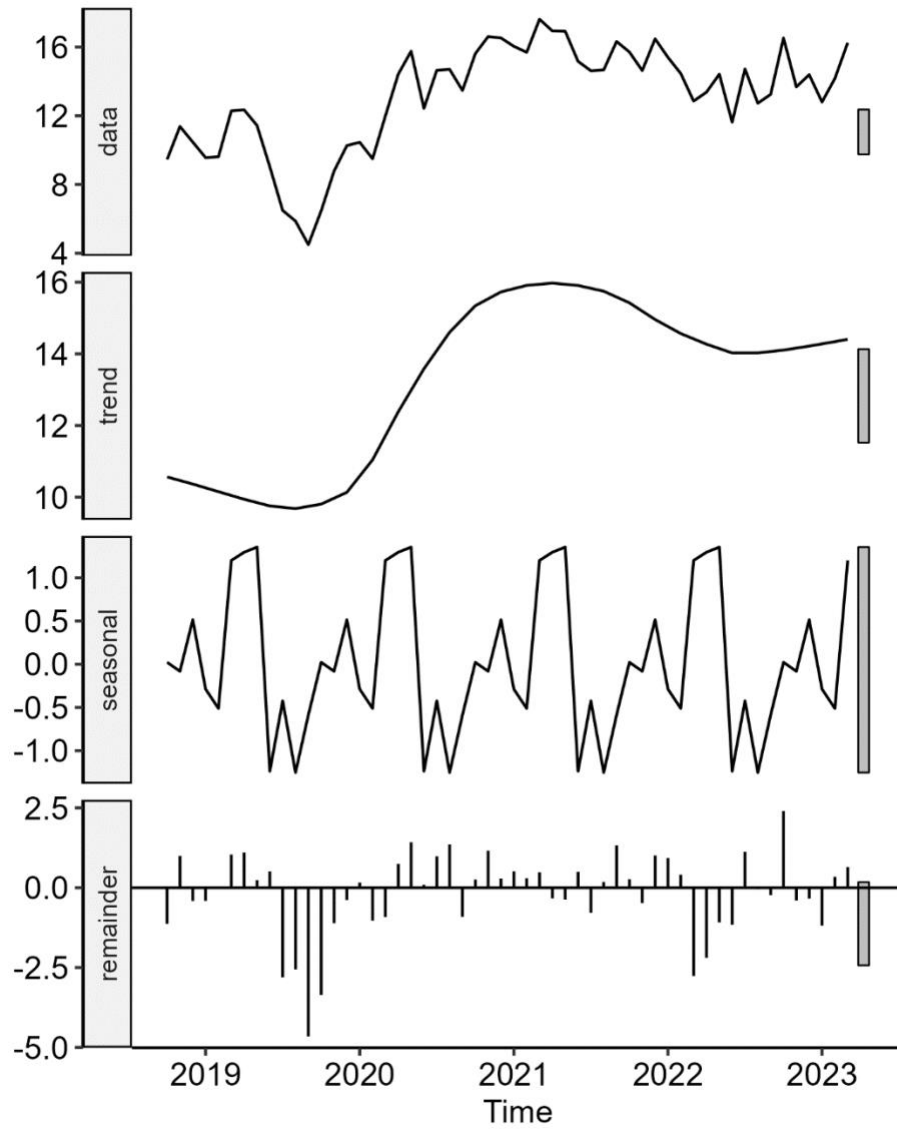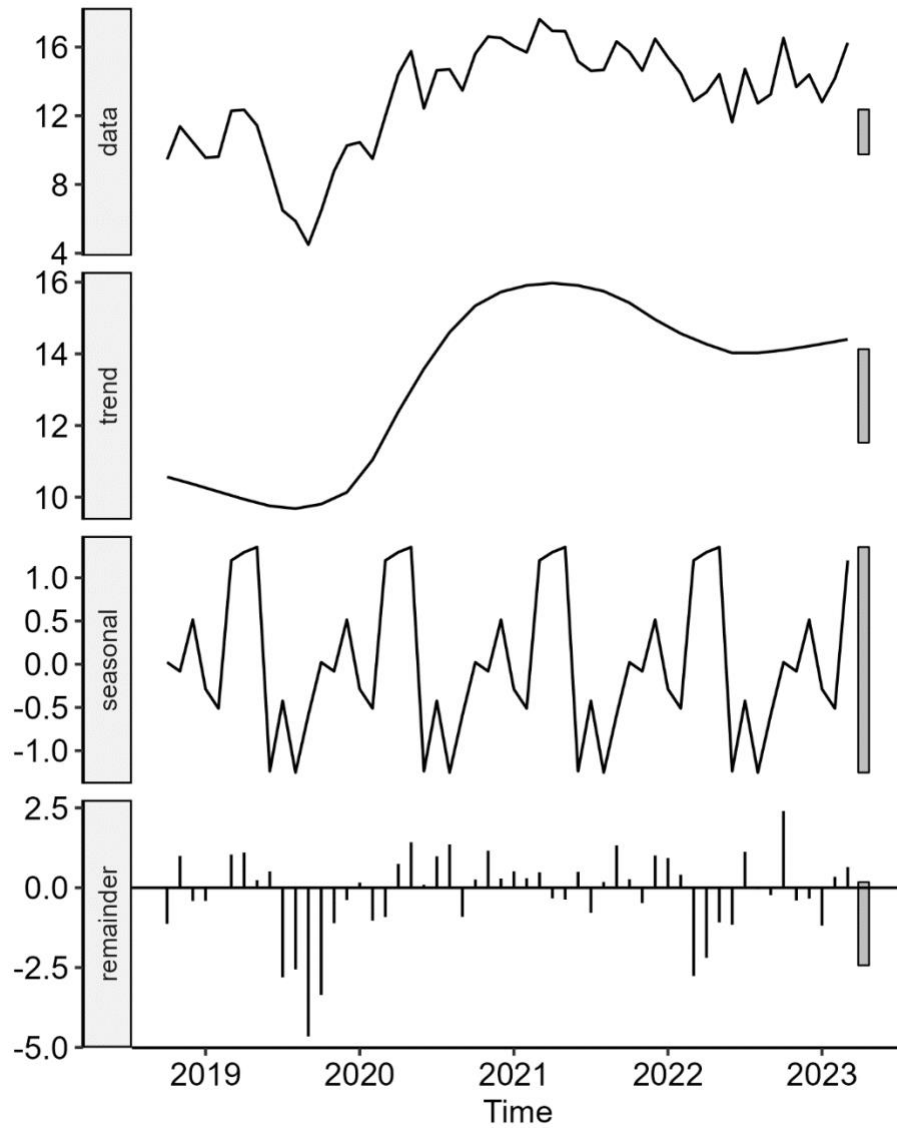eFigure 5. *STL Decomposition of Monthly Cannabis Sales in Ontario Between October 2018 and September 2023*

eFigure 6. *STL Decomposition of Monthly Opioid-Related Mortality Rate per 1 Million in Ontario Between October 2018 and March 2023*

eResults 1

Cannabis Sales and Provincial Opioid Mortality Rate. Two separate VAR models were fit for the relation between cannabis sales and opioid mortality rates in BC and ON when order of integration was taken into consideration inside the model. Both VAR models accounted for changes in the provincial opioid mortality rate due to the onset of COVID-19. In the BC model, four exogenous variables were required to account for the change in intercept and trend due to the onset of COVID-19 (March 2020) and the lifting of many COVID-19 restrictions (February 2022). Only the change in intercept in March 2020 was included in the ON model as a significant change in trend was not found in ON. Four lags were selected for the BC model on account of preferred information criteria and meeting model assumptions. All information criteria selected a single lag in the ON model. In each model, one additional lag was added to account for the order of integration of the series. No evidence of serial correlation among model residuals was found for either model. However, the ON model had significant heteroskedasticity of model residuals at lag 1 ($p < .01$), which was accounted for with heteroskedastic-consistent standard errors when evaluating Granger causality. In addition, the residuals did not violate the normality assumption in the BC model, $\chi^2(4) = 9.459$, $p = .051$, or the ON model, $\chi^2(4) = 3.356$, $p = .500$, and the parameter estimates were found to be stable over time. No significant associations were found between past cannabis sales and current mortality rate nor were significant associations found between past mortality rates and current cannabis sales in either VAR model. The Toda-Yamamoto Granger causality test did not find evidence to suggest that cannabis sales Granger caused changes in the opioid mortality rate in BC, $\chi^2(4) = 4.839$, $p = .304$, or ON, $\chi^2(1) = 1.196$, $p = .274$.

Given the structural break relating to COVID-19 and overdose death, the Fourier Toda Yamamoto method (Nazlioglu, Gormus & Soytas, 2016) was conducted to verify robustness of our findings when treating the structural break as unknown. The Fourier Toda Yamamoto method incorporates the Fourier terms $\sin(\frac{2\pi kt}{T})$ and $\cos(\frac{2\pi kt}{T})$ as exogenous variables in the VAR model where k denotes the period and is chosen in combination with number of lags to minimize BIC, T is the number of time points, and t is the trend. These terms can capture structural shifts at an unknown date in the deterministic components of the model. For BC, the combination of k and lag length which minimized BIC was $k = 1$ and lag length of 4 while for ON, it was $k = 1$ and lag length of 1. Again, one additional lag was added to each model to account for the order of integration of the series. After verifying all assumptions were met, the modified Wald test was conducted to determine Granger causality. It was further confirmed that cannabis sales did not Granger cause the BC opioid mortality rate, $\chi^2(4) = 7.211$, $p = 0.125$, or ON opioid mortality rate, $\chi^2(1) = 0.463$, $p = .496$.

eTable 1. *Time Series Data for Ontario, British Columbia, and Canada.*

	Opioid deaths			Population			Cannabis sales ($) x1000			Cannabis CPI		
Date	ON	BC	CA	ON	BC	CA	ON	BC	CA	ON	BC	CA
18-Oct	137	118		14,487,784	5,052,131		11,454	539	42,084	100	100	100
18-Nov	165	131	1,128	14,504,059	5,052,131	37,259,485	8,919	1,077	55,395	100	100	100
18-Dec	152	127		14,520,334	5,052,131		8,720	1,239	58,847	100	100	100
19-Jan	139	94		14,536,609	5,061,132		8,945	1,963	55,449	100	100	100
19-Feb	140	85	1,047	14,552,884	5,061,132	37,336,956	7,537	1,888	52,080	100	100	100
19-Mar	179	120		14,569,159	5,061,132		7,690	2,732	60,762	100	100	100
19-Apr	180	83		14,585,435	5,080,515		19,677	2,533	74,626	100	100	100.4
19-May	167	93	1,058	14,601,710	5,080,515	37,437,243	22,807	3,563	85,933	100	100	100.8
19-Jun	132	75		14,617,985	5,080,515		25,839	4,230	91,676	95	100	98.8
19-Jul	95	72		14,634,260	5,111,022		29,593	5,965	106,044	95	100	98.4
19-Aug	86	83	741	14,649,317	5,111,022	37,618,495	33,747	12,037	125,930	95	95.6	97.7
19-Sep	66	63		14,664,375	5,111,022		31,761	12,088	122,902	95	95.6	97.8
19-Oct	95	79		14,679,432	5,148,047		32,820	12,937	129,952	95	95.6	97.7
19-Nov	129	81	863	14,694,490	5,148,047	37,828,162	31,590	19,021	136,746	95	95.6	97.3
19-Dec	151	62		14,709,547	5,148,047		33,653	17,768	147,852	85	95.6	90.5
20-Jan	154	80		14,724,605	5,157,053		37,022	19,949	154,128	85	95.6	89.6
20-Feb	140	79	1,042	14,739,662	5,157,053	37,928,208	37,846	21,171	150,703	85	95.6	89.4
20-Mar	177	119		14,754,719	5,157,053		46,740	23,699	180,636	85	95.6	89.2
20-Apr	213	130		14,769,777	5,169,535		40,204	23,850	178,378	85	95.6	89.4
20-May	233	177	1,688	14,784,834	5,169,535	38,006,941	41,079	27,460	186,298	84.5	95.6	89.6
20-Jun	184	189		14,799,892	5,169,535		48,783	29,393	201,036	84.5	95.6	89.6
20-Jul	217	186	1,796	14,814,949	5,176,101	38,028,638	60,236	34,715	232,635	84.5	95.6	89.2

20-Aug	218	164		14,828,736	5,176,101		71,121	35,899	248,140	84.5	95.6	88.3
20-Sep	200	143		14,842,524	5,176,101		77,863	36,559	256,540	84.5	86.7	85.8
20-Oct	232	175		14,856,311	5,173,896		81,970	37,701	268,158	80.7	86.7	84
20-Nov	247	168	1,879	14,870,098	5,173,896	38,027,406	81,103	36,444	259,262	80.7	86.7	83.8
20-Dec	246	165		14,883,886	5,173,896		92,339	42,823	297,303	80.7	86.7	83.5
21-Jan	239	189		14,897,673	5,180,015		87,009	40,386	278,803	79.9	86.7	82.9
21-Feb	234	175	1,917	14,911,460	5,180,015	38,058,291	86,550	36,953	261,851	79.9	86.7	82.9
21-Mar	263	174		14,925,248	5,180,015		103,122	41,587	298,033	79.9	86.7	82.7
21-Apr	253	188		14,939,035	5,200,393		97,941	43,655	296,058	79.9	86.7	82.8
21-May	253	173	1,912	14,952,822	5,200,393	38,140,918	110,887	46,354	312,902	79.9	86.7	82.8
21-Jun	227	179		14,966,610	5,200,393		107,804	44,347	306,870	79.9	86.7	82.7
21-Jul	219	201		14,980,397	5,226,665		122,324	48,976	335,164	70.6	85.3	78.2
21-Aug	220	201	1,994	14,994,296	5,226,665	38,239,864	134,102	49,785	348,395	69.1	85.3	77.4
21-Sep	245	166		15,008,196	5,226,665		135,077	49,197	347,465	69.1	85.3	77.4
21-Oct	236	215		15,022,095	5,267,184		137,443	50,511	355,444	69.1	84.4	77.2
21-Nov	220	214	2,199	15,035,994	5,267,184	38,451,454	134,874	47,659	339,511	69.1	84.4	77.2
21-Dec	248	229		15,049,893	5,267,184		126,895	52,320	354,270	68.1	83.1	76.5
22-Jan	232	217		15,063,793	5,286,478		136,495	49,865	346,494	68.1	83.1	76.3
22-Feb	218	203	2,004	15,077,692	5,286,478	38,567,576	130,745	46,305	324,082	68.1	83.1	76
22-Mar	194	185		15,091,591	5,286,478		144,865	56,343	359,273	68.1	83.1	75.8
22-Apr	202	178		15,105,490	5,310,164		150,880	52,931	373,326	65.3	83.1	74.7
22-May	218	213	1,756	15,119,390	5,310,164	38,683,567	147,370	54,993	373,618	65.3	81.3	74.3
22-Jun	176	156		15,133,289	5,310,164		152,722	54,102	377,940	65.3	83.7	74.6
22-Jul	223	204	1,784	15,147,188	5,356,284	38,939,056	157,315	57,278	392,867	65.3	84.2	74.5
22-Aug	193	189		15,161,183	5,356,284		153,877	59,089	389,850	65.3	84.2	74.7

22-Sep	201	194		15,175,178	5,356,284		155,542	61,654	392,259	65.3	84.2	74.6
22-Oct	251	208		15,189,174	5,403,528		153,687	58,309	390,167	65.3	85	74.8
22-Nov	208	201	1,965	15,203,169	5,403,528	39,276,140	148,771	55,656	374,286	65.3	85.8	75.2
22-Dec	219	229		15,217,164	5,403,528		171,170	63,073	425,871	65.3	85.8	74.6
23-Jan	195	227		15,231,159	5,431,355		154,956	60,624	395,444	65.3	83.6	73.7
23-Feb	216	197	1,947	15,245,154	5,431,355	39,498,018	141,848	56,873	364,299	65.3	83.6	73.7
23-Mar	248	215		15,259,149	5,431,355		158,832	63,049	406,352	65.3	83.6	74
23-Apr	-	234		-	5,466,646		160,065	68,508	410,620	60.7	83.6	72
23-May	-	199	2,010	-	5,466,646	39,739,633	162,473	64,880	415,694	60.7	82.9	72
23-Jun	-	200		-	5,466,646		177,523	66,314	437,702	60.7	80.1	71.5
23-Jul	-	220		-	5,519,013		176,080	70,996	446,706	60.7	77.4	71.1
23-Aug	-	181	-	-	5,519,013	40,097,761	188,443	74,720	466,990	60.7	76.3	70.9
23-Sep	-	177		-	5,519,013		175,455	70,365	444,003	60.7	76.3	70.9

Note. ON = Ontario; BC = British Columbia; CA = Canada; CPI = consumer price index. Opioid-related death data often have a reporting lag, therefore provincial and national estimates periodically change. All analyses were based on the figures in this table, which were extracted on January 24, 2024. Opioid death and population estimates were available only quarterly at the national level. For the tests of Granger causality at the national level, only 2018 Q4 to 2023 Q2 data were used, however, additional pre-legalization time points were used in the pre-processing stages of the analysis (2016 Q1 to 2018 Q3). All data are publicly available (see section 2.1 of the manuscript for data sources).