UPDATED FINAL REPORT
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ODPRN ONTARIO DRUG POLICY RESEARCH NETWORK

Opioid Prescribing and Opioid-Related Hospital Visits in Ontario

Ontario Drug Policy Research Network

The Ontario Drug Policy Research Network (ODPRN) is funded to conduct pharmacoepidemiology and drug policy research as part of an initiative to provide evidence to inform policy at the Ontario Ministry of Health and Long-Term Care (MOHLTC). As such, the ODPRN works closely with the Ontario Public Drug Programs (OPDP), MOHLTC and other stakeholders to select key priority areas and topics for analysis.

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Update

This report was updated in March 2016 to reflect revised methodology to define opioid-related ED visits and hospitalizations. The new methodology uses a more specific definition to capture events that resulted in lower rates than previously reported.

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BACKGROUND AND CONTEXT

Over the past two decades there has been growing concern about the use of opioids to treat chronic non-cancer pain (CNCP).[1;2] Studies conducted in Ontario and elsewhere have demonstrated that rates of opioid prescribing in general – and high dose opioid prescribing in particular – are on the rise.[1-3] Furthermore, the rising prevalence of abuse, misuse and addiction related to opioids has driven concerns regarding accidental opioid overdoses that may lead to hospitalization for toxicity, and sometimes death. Indeed, in a recent analysis of opioid-related deaths abstracted from the Office of the Chief Coroner of Ontario, we found that rates of opioid overdose deaths increased 242% between 1991 and 2010.[4] By 2010, there were 550 deaths related to opioid overdoses in Ontario, many of them in young people, representing a major impact on public health.[4]

In 2012, the Ontario Drug Policy Research Network (ODPRN) released a report summarizing rates of opioid prescribing and opioid overdose deaths in Ontario by county between 2004 and 2006.[5;6] This study documented considerable variation in the rate of opioid prescribing and overdose death among Ontario's counties, with regions such as Thunder Bay District and the Regional Municipality of Sudbury demonstrating high rates of both opioid prescription and opioid-related death. In 2014, a new map was released by the ODPRN reporting opioid-related death rates between 2006 and 2010, by county in Ontario.[7] This analysis found similar trends to those reported in our earlier analysis. More recently, we have been asked to update our analyses to reflect the current patterns of opioid use and abuse in Ontario's counties. Because we are currently unable to analyze opioid-related death data beyond 2010, we have instead conducted an analysis of opioid prescribing rates and rates of hospitalizations and emergency department visits related to opioid toxicity in Ontario, by county and age between 2006 and 2013.

METHODS

Setting

We conducted a cross-sectional analysis among individuals aged 15 and older to evaluate rates of opioid prescribing and opioid toxicity-related hospitalizations and emergency department visits, by county and age. We previously described rates of opioid-related mortality among Ontario counties between 2006-2010[7]; to align with the time periods used in this prior work, in this report we describe rates between 2006-2010 and 2011-2013.

All datasets were linked using unique, encoded identifiers and analyzed at the Institute for Clinical Evaluative Sciences (ICES) using SAS Enterprise Guide Version 6.1.

Opioid-prescribing rates

We used the Ontario Drug Benefit (ODB) claims database to identify patients who were active beneficiaries of the Ontario Public Drug Program (OPDP) each year. Active ODB beneficiaries were defined as individuals who filled at least one prescription, during the year, for any drug covered by the ODB. The ODB was also used to identify patients receiving any opioid analgesics (including methadone) funded by the OPDP. Yearly rates of opioid prescribing were calculated as the number of opioid prescriptions dispensed per 1,000 active ODB beneficiaries. Annualized rates for 2006-2010 and 2011-2013 were calculated by averaging yearly opioid prescribing rates during those periods.

Opioid toxicity-related hospital admission rates

We used the Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD) which collects information on all acute inpatient hospitalizations to identify all inpatient hospital admissions related to opioid toxicity. Emergency department visits related to opioid toxicity were identified using the National Ambulatory Care Reporting System (NACRS) database. The International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) codes were used to identify opioid toxicity-related hospital admissions and emergency department visits (Appendix A). We used the Ontario Health Insurance Plan (OHIP) Registered Persons Database (RPDB) to determine which patients were eligible for OHIP coverage as of July 1 of each year. Yearly rates were calculated as the number of opioid toxicity-related inpatient hospital admissions or emergency department visits, divided by the number of residents eligible for OHIP. Annualized rates for 2006-2010 and 2011-2013 were calculated by averaging yearly opioid toxicity-related hospital admission and emergency department visit rates during those periods.

KEY FINDINGS

Opioid Prescribing Rates

- We identified 1,543,775 ODB beneficiaries who were prescribed opioids in the 5-year period, between 2006-2010, and 1,229,249 ODB beneficiaries prescribed opioids in the 3 year period between 2011-2013. Approximately two-thirds (67%) were older beneficiaries (65+) and the remainder were younger (15-64).
- Overall, opioid prescribing rates in Ontario increased between 2006-2010 and 2011-2013 among both younger (7,920 to 11,610 per 1,000 beneficiaries; 47% increase) and older (1,185 to 1,278 per 1,000 beneficiaries; 8% increase) beneficiaries.
- During 2011-2013, there was a 11-fold variation in annualized rates of opioid prescribing among counties, ranging from 3,808 per 1,000 beneficiaries in the Prescott and Russell United Counties to 42,201 per 1,000 beneficiaries in the Thunder Bay District among younger beneficiaries, and a nearly 3-fold variation in these rates ranging from 807 per 1,000

beneficiaries in the York Regional Municipality to 2,037 per 1,000 beneficiaries in the Sudbury Regional Municipality among older beneficiaries.

Table 1: Annualized* opioid prescribing rate per 1,000 public drug plan beneficiaries by county, age group and time period

County Name	January 2006 to December 2010		January 2011 to December 2013	
	15-64	65+	15-64	65+
Ontario	7,920	1,185	11,610	1,278
Algoma District	8,269	1,253	12,671	1,425
Brant County	10,453	1,608	15,750	1,712
Bruce County	4,269	1,172	7,027	1,365
Cochrane District	7,996	1,572	13,429	1,845
Dufferin County	4,966	1,573	7,498	1,781
Durham Regional Municipality	10,732	1,302	14,616	1,390
Elgin County	6,251	1,425	14,132	1,565
Essex County	6,258	1,515	11,210	1,608
Frontenac County	14,518	1,306	20,363	1,623
Grey County	7,924	1,269	10,954	1,454
Haldimand-Norfolk Regional Municipality	6,735	1,282	11,758	1,449
Haliburton County	9,580	1,519	14,219	1,628
Halton Regional Municipality	4,947	1,018	7,409	1,052
Hamilton-Wentworth Regional Municipality	8,545	1,463	12,010	1,634
Hastings County	8,540	1,114	13,673	1,303
Huron County	3,577	1,133	5,265	1,277
Kawartha Lakes, City of	10,514	1,363	15,461	1,500
Kenora District	9,321	1,446	12,240	1,606
Kent County	5,669	1,352	13,829	1,498
Lambton County	9,283	1,205	18,425	1,405
Lanark County	4,664	1,028	8,816	1,053
Leeds and Grenville United Counties	5,229	1,097	8,355	1,229
Lennox and Addington County	11,478	1,432	14,667	1,676
Manitoulin District	12,685	2,024	27,484	1,929
Middlesex County	10,649	1,304	17,272	1,492
Muskoka District Municipality	6,025	1,123	15,560	1,368
Niagara Regional Municipality	13,360	1,313	18,863	1,514
Nipissing District	12,817	1,594	24,204	1,914
Northumberland County	7,696	1,320	13,223	1,380
Ottawa-Carleton Regional Municipality	4,978	960	7,156	1,063

Oxford County	10,245	1,369	18,223	1,684
Parry Sound District	7,206	1,503	13,651	1,757
Peel Regional Municipality	3,968	959	5,136	961
Perth County	4,927	1,188	6,591	1,315
Peterborough County	15,104	1,438	20,911	1,675
Prescott and Russell United Counties	2,867	997	3,808	1,112
Prince Edward County	6,795	1,219	8,964	1,308
Rainy River District	10,365	1,612	27,399	1,694
Renfrew County	6,010	1,379	13,513	1,505
Simcoe County	9,961	1,288	16,496	1,489
Stormont, Dundas and Glengarry United Counties	4,743	1,138	7,018	1,313
Sudbury District	8,527	1,376	12,761	1,603
Sudbury Regional Municipality	14,864	1,819	24,016	2,037
Thunder Bay District	22,241	1,537	42,201	1,589
Timiskaming District	8,491	1,670	14,078	1,898
Toronto Metropolitan Municipality	6,907	1,008	7,763	991
Waterloo Regional Municipality	6,539	1,294	9,653	1,416
Wellington County	8,904	1,103	12,809	1,390
York Regional Municipality	5,672	846	6,985	807

*Rates averaged over the study period

Opioid Toxicity-Related Inpatient Hospitalizations

- There were 10,689 opioid toxicity-related hospital admissions in Ontario between 2006 and 2013, of which 8,349 (78%) occurred in patients aged 15 to 64 years.
- Overall, annualized opioid toxicity-related hospitalization rates in Ontario increased between 2006-2010 and 2011-2013 among both younger (1.1 to 1.3 per 10,000; 18% increase) and older (1.5 to 1.8 per 10,000; 20% increase) patients.
- During 2011-2013, annualized rates of opioid toxicity-related hospital admissions varied nearly 11-fold among counties in Ontario, from 0.5 per 10,000 in the York Regional Municipality to 4.0 per 10,000 in the Algoma District among younger patients and from 0.5 per 10,000 in the Prescott and Russell United Counties to 5.6 per 10,000 in the Rainy River District among older patients.

Table 2: Annualized opioid toxicity-related hospital admission rates per 10,000 individuals eligible for Ontario health insurance coverage* by county, age group and time period

County Name	January 2006 to December 2010		January 2011 to December 2013	
	15-64	65+	15-64	65+
Ontario	1.1	1.5	1.3	1.8
Algoma District	3.2	3.6	4.0	2.2
Brant County	1.4	1.4	2.1	2.4
Bruce County	1.2	1.0	1.2	1.5
Cochrane District	2.1	2.4	1.9	2.7
Dufferin County	1.5	3.0	1.8	2.2
Durham Regional Municipality	1.0	2.1	1.4	2.2
Elgin County	1.6	2.5	1.9	1.7
Essex County	1.1	1.1	1.4	1.2
Frontenac County	1.0	1.0	2.3	4.0
Grey County	1.7	1.8	1.6	1.7
Haldimand-Norfolk Regional Municipality	2.4	2.2	2.3	1.5
Haliburton County	1.6	3.3	2.1	1.4
Halton Regional Municipality	0.8	1.4	0.9	1.8
Hamilton-Wentworth Regional Municipality	1.6	1.7	2.2	2.4
Hastings County	1.5	1.9	1.7	2.6
Huron County	0.9	0.9	1.7	0.9
Kawartha Lakes, City of	0.7	1.4	1.8	3.9
Kenora District	1.7	1.0	2.2	0.8
Kent County	1.8	2.0	2.3	2.6
Lambton County	1.8	2.6	2.6	4.6
Lanark County	1.8	4.7	1.9	4.3
Leeds and Grenville United Counties	1.1	1.9	1.3	2.7
Lennox and Addington County	1.6	1.4	2.0	3.9
Manitoulin District	2.8	0.0	2.9	3.3
Middlesex County	1.5	2.4	1.7	2.3
Muskoka District Municipality	1.3	2.1	2.4	1.0
Niagara Regional Municipality	1.4	0.9	2.1	1.7
Nipissing District	2.5	2.1	2.3	1.7
Northumberland County	1.7	1.9	1.9	2.2
Ottawa-Carleton Regional Municipality	0.5	1.0	0.9	1.7
Oxford County	1.7	1.9	1.7	2.8

Parry Sound District	2.2	3.2	2.3	2.7
Peel Regional Municipality	0.6	1.0	0.7	1.1
Perth County	1.8	1.2	1.7	1.1
Peterborough County	1.8	1.7	1.6	1.6
Prescott and Russell United Counties	0.3	1.1	0.8	0.5
Prince Edward County	1.4	3.7	2.6	3.9
Rainy River District	3.9	5.1	3.7	5.5
Renfrew County	2.0	2.8	2.2	2.7
Simcoe County	2.1	1.9	2.5	2.3
Stormont, Dundas and Glengarry United Counties	1.0	1.1	1.6	2.0
Sudbury District	1.5	1.7	0.9	3.4
Sudbury Regional Municipality	1.8	1.7	2.4	1.6
Thunder Bay District	2.7	1.9	3.4	4.3
Timiskaming District	2.5	2.3	1.8	3.6
Toronto Metropolitan Municipality	0.6	1.0	0.8	1.1
Waterloo Regional Municipality	1.2	1.6	1.7	1.9
Wellington County	1.1	1.9	1.9	2.5
York Regional Municipality	0.4	0.8	0.5	0.7

*Population eligible for Ontario health insurance coverage under OHIP. Rates averaged over the study period

Opioid Toxicity-Related Emergency Department Visits

- There were 19,769 opioid toxicity -related emergency department visits in Ontario between 2006 and 2013, 88% (n=17,395) of which occurred in younger patients aged 15 to 64 years.
- Overall, annualized rates of opioid toxicity-related emergency department visits in Ontario increased slightly between 2006-2010 and 2011-2013 among both younger (2.2 to 2.7 per 10,000; 23% increase) and older (1.5 to 1.8 per 10,000; 20% increase) patients.
- During 2011-2013, annualized rates of opioid toxicity-related emergency department visits varied more than 7-fold across the counties in Ontario, from 1.2 per 10,000 in the York Regional Municipality to 11.3 per 10,000 in the Manitoulin District among younger patients and from 1.0 per 10,000 in the Prince Edward County to 8.6 per 10,000 in the Sudbury District among older patients.

Table 3: Annualized opioid toxicity-related emergency department visit rates per 10,000 individuals eligible for Ontario health insurance coverage* by county, age group and time period

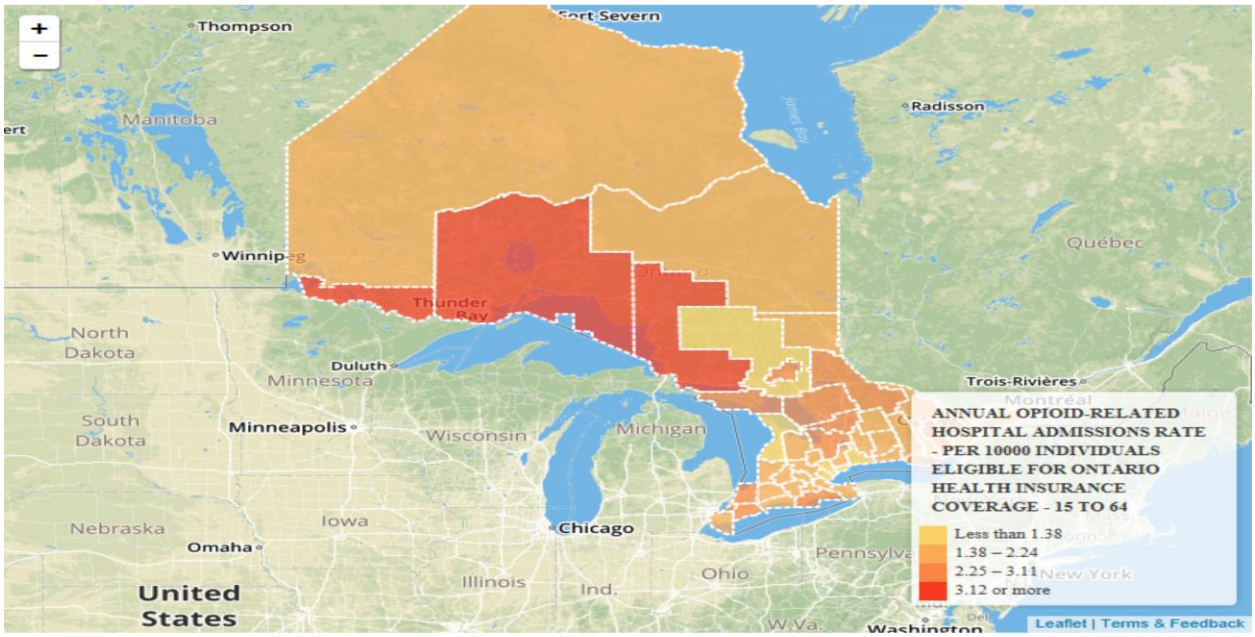
County Name	January 2006 to December 2010		January 2011 to December 2013	
	15-64	65+	15-64	65+
Ontario	2.2	1.5	2.7	1.8
Algoma District	5.0	2.9	4.9	2.2
Brant County	3.8	1.3	4.4	1.6
Bruce County	1.5	0.8	1.9	2.2
Cochrane District	3.3	1.9	4.3	4.2
Dufferin County	3.1	2.9	2.6	5.3
Durham Regional Municipality	2.6	1.9	3.1	2.6
Elgin County	2.8	3.0	3.8	1.4
Essex County	2.7	1.5	3.2	1.4
Frontenac County	3.4	2.1	4.1	3.7
Grey County	2.1	0.8	2.8	2.5
Haldimand-Norfolk Regional Municipality	4.2	1.9	4.1	2.5
Haliburton County	3.1	2.8	1.8	2.1
Halton Regional Municipality	1.5	1.3	1.9	1.4
Hamilton-Wentworth Regional Municipality	3.1	1.6	3.9	1.6
Hastings County	3.8	2.0	5.1	4.5
Huron County	1.9	2.2	2.7	1.4
Kawartha Lakes, City of	3.1	1.1	4.4	2.2
Kenora District	3.4	3.1	3.4	4.7
Kent County	2.9	1.1	4.3	2.3
Lambton County	2.8	1.9	4.0	2.2
Lanark County	2.4	2.0	3.7	2.6
Leeds and Grenville United Counties	2.2	1.3	2.0	2.5
Lennox and Addington County	4.1	4.9	5.6	4.3
Manitoulin District	3.9	0.8	11.3	2.2
Middlesex County	3.5	2.4	3.3	1.9
Muskoka District Municipality	2.3	2.1	3.8	1.8
Niagara Regional Municipality	2.8	1.4	4.9	1.9
Nipissing District	5.8	3.1	4.9	3.7
Northumberland County	2.9	2.3	3.4	2.7
Ottawa-Carleton Regional Municipality	1.4	1.0	2.2	1.5
Oxford County	3.3	2.3	3.5	4.1
Parry Sound District	2.5	1.8	3.0	1.6
Peel Regional Municipality	1.2	1.0	1.5	1.1

Perth County	2.6	1.7	2.9	2.6
Peterborough County	4.5	2.0	6.4	2.6
Prescott and Russell United Counties	1.4	1.9	1.8	1.1
Prince Edward County	1.7	4.0	3.3	1.0
Rainy River District	4.6	3.4	5.5	3.7
Renfrew County	2.8	2.7	3.4	2.7
Simcoe County	3.5	1.6	4.2	2.2
Stormont, Dundas and Glengarry United Counties	2.3	2.3	2.7	2.6
Sudbury District	2.6	2.3	3.1	8.6
Sudbury Regional Municipality	3.0	1.5	4.7	2.0
Thunder Bay District	4.4	1.7	6.0	3.2
Timiskaming District	4.1	2.3	3.2	2.1
Toronto Metropolitan Municipality	1.5	0.9	1.9	1.1
Waterloo Regional Municipality	2.6	1.6	2.9	1.6
Wellington County	2.7	1.8	3.4	2.8
York Regional Municipality	1.0	0.9	1.2	1.1

* Population eligible for Ontario health insurance coverage under OHIP. Rates averaged over the study period

Geographic Analysis in Ontario, by County

An interactive map displaying the opioid prescribing and toxicity-related hospital visit rates in Ontario by county, as outlined in this report can be found here: http://odprn.ca/opioid-prescribing-and-hospital-visits/



DISCUSSION

In general, the rates of opioid prescribing and hospital visits related to opioid toxicity have increased across Ontario's counties between 2006-2010 and 2011-2013 among both younger and older individuals, however in some counties, we did observe a lower rate of hospitalizations or emergency department visits related to opioid toxicity over time. Opioid prescribing rates and emergency department visits for opioid toxicity are higher among younger beneficiaries (11,610 per 1,000 population and 2.7 per 10,000 population, respectively) compared to older beneficiaries (1,278 per 1,000 population and 1.8 per 10,000 population, respectively) between 2011-2013. Interestingly, hospitalization rates for opioid toxicity are higher among older individuals (1.8 per 10,000population) compared to younger individuals (1.3 per 10,000 population) between 2011 and 2013. The higher rate of prescribing in the younger population may reflect the fact that these rates are restricted to those eligible for public drug coverage, a group of individuals who may be more likely to access prescription opioids (i.e. those receiving disability support and/or with low socioeconomic status). Furthermore, higher rates of hospitalizations among older individuals may be due to lower tolerance to high doses of these products among the elderly.

We also observed considerable variation in opioid prescribing and toxicity rates between counties. Thunder Bay District, Manitoulin District and Rainy River District had among the highest rates of opioid prescribing across Ontario, particularly among younger individuals. Interestingly, while Nippissing District had among the highest opioid prescribing rates and emergency department visit rates for opioid toxicity in the province for both age groups, they had much lower rates of inpatient hospitalizations for opioid toxicity. A similar trend was observed for Manitoulin District among younger individuals, which exhibited the second highest prescribing rate and highest emergency department visit rates for opioid toxicity but much lower opioid-related inpatient hospitalization rates. This lower rate of inpatient hospitalizations may be driven by bed availability in some hospitals. More work is needed to understand what is driving these trends, and how distance to hospitals in rural areas of Ontario impacts patient access to inpatient treatment for opioid overdoses.

LIMITATIONS

Although our analysis of rates of hospital and emergency department visits is generalizable to the entire Ontario population, our opioid prescribing rates are restricted to ODB eligible individuals. Therefore, different prescribing rates across counties may be partially influenced by variations in the prevalence of individuals eligible for public drug coverage across Ontario. Furthermore, the diagnosis codes used to define episodes of opioid toxicity have not been validated in Ontario databases, and therefore the sensitivity and specificity of these measures is unknown. However, a validation study conducted using

similar codes by Kaiser Permanente reported a PPV of 71% suggesting that these codes are generally valid, but there may be some misclassification.[8]

CONCLUSIONS

Overall, the rate of opioid prescribing and related adverse events continues to rise across Ontario, and shows considerable variation both by age and geography in the province. As policies and programs continue to be implemented throughout the province with the goal of addressing prescription opioid abuse and misuse, these rates should continue to be monitored to evaluate the impact of these undertakings.

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APPENDIX A

ICD10 codes for opioid toxicity-related inpatient hospitalizations and emergency department visits

Code	Description
T40.0	POISONING BY OPIUM
T40.1	POISONING BY HEROIN
T40.2	POISONING BY OTHER OPIOIDS
T40.3	POISONING BY METHADONE
T40.4	POISONING BY OTHER SYNTHETIC NARCOTICS
T40.6	POISONING BY OTHER AND UNSPECIFIED NARCOTICS