

# Measuring the Burden of Opioid-related Mortality in Ontario, Canada

## To the Editor:

Opioid overdose is a leading public health problem across Canada that continues to evolve, particularly as clandestinely-produced opioids enter the market (Public Health Agency of Canada, 2017). In 2014, we published a study that found that 1 in 170 deaths in 2010 was related to opioids, and that this varied by age (Gomes et al., 2014). Given the shifting opioid landscape across Canada, we sought to update this analysis to quantify the burden of opioid-related

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Tara Gomes had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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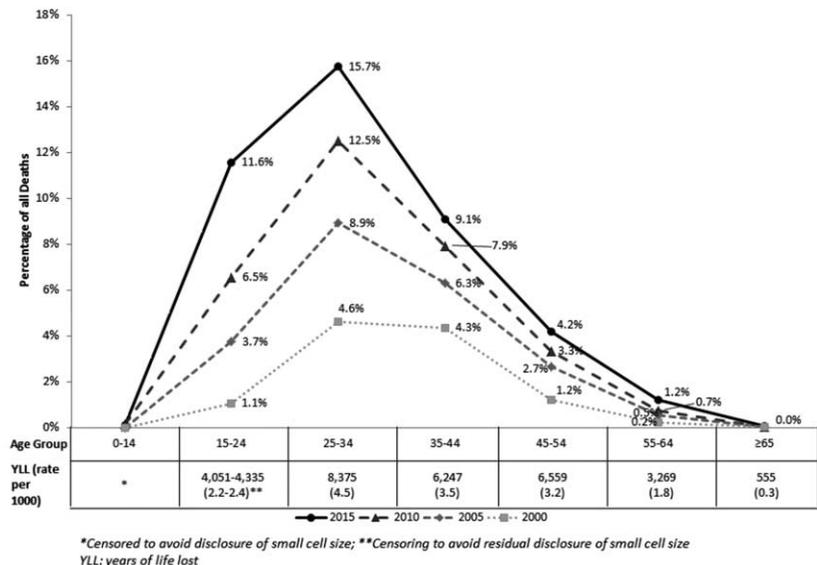
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death in Ontario between 2000 and 2015. To accomplish this, we conducted a cross-sectional study of opioid-related deaths in Ontario, Canada's most populous province. We obtained data on all deaths where prescribed or illicit opioids were determined to be a contributing factor from the Office of the Chief Coroner (Dhalla et al., 2009; Gomes et al., 2011), and used the Ontario Health Insurance Plan (OHIP) Registered Persons Database to determine the total number of deaths from any cause over the study period. Opioid involvement in death was confirmed through post-mortem toxicology and a medical coroner's investigation. The details on this definition have been published previously (Dhalla et al., 2009; Gomes et al., 2011). We examined the burden of opioid-related deaths overall and stratified by age group. We used the Cochran-Armitage test for trend to compare the proportion of deaths in each age group that were opioid-related in each of 4 years (2000, 2005, 2010, and 2015). In a secondary analysis, we used methods adapted from the Global Burden of Disease study (Department of Information Evidence and Research, 2017) to calculate the years of potential life lost (YLL) due to opioid-related deaths using

2015 standard 5-year life expectancy tables developed by the World Health Organization (2017). We did not apply discounting or age weights to align with the World Health Organization's most recent guidance (Department of Information Evidence and Research, 2017). This study was approved by the research ethics board of Sunnybrook Health Sciences Centre, Toronto, Ontario.

Between 2000 and 2015, the rate of opioid-related deaths nearly tripled in Ontario (from 19.3 to 53.1 deaths per million population), as did the proportion of deaths attributable to opioids (from 0.3% to 0.8%; Fig. 1). Furthermore, this proportion also increased steadily over time in each age group studied ( $P < 0.01$ ), with the exception of the 0 to 14-year age group where small numbers precluded analysis. From 2000 to 2015, we observed the largest absolute increase in opioid-attributable mortality in those aged between 25 and 34 years, increasing from 4.6% in 2000 to 15.7% in 2015. However, in the final 5 years of the study period, the most dramatic increase in opioid-attributable mortality occurred among those aged 15 to 24 years (from 6.5% to 11.6% of all deaths).



**FIGURE 1.** Proportion of deaths that are opioid-related, by age group (2000, 2005, 2010 and 2015). Figure shows the proportion of deaths in each age group that involved an opioid, calculated using opioid-related death data and all-cause mortality data. In Ontario, Canada, opioid-related death data were abstracted from the Office of the Chief Coroner of Ontario, and deaths from all causes were identified using the OHIP Registered Persons Database.

In our secondary analysis, we found a total of 29,410 YLL (2.1 YLL/1000 population) due to opioid-related deaths in 2015. The rate was highest among those aged 25 to 34 years (8375 YLL; 4.5 YLL/1000 population) and lowest among those aged 65 and older (555 YLL; 0.3 YLL/1000 population).

We found that 1 of every 133 deaths in Ontario in 2015 were opioid-related, and that this burden was highest among young adults, in whom 1 of every 6 deaths was opioid-related. An emerging concerning trend is the large increase in the proportion of deaths attributable to opioids among youth between 2010 and 2015. This highlights an important demographic where additional resources for harm reduction and treatment for opioid use disorder are urgently needed.

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**REFERENCES**

- Department of Information Evidence and Research. WHO methods and data sources for global burden of disease estimates 2000–2015. World Health Organization ed. Geneva; 2017.
- Dhalla IA, Mamdani MM, Sivilotti ML, et al. Prescribing of opioid analgesics and related mortality before and after the introduction of long-acting oxycodone. *Can Med Assoc J* 2009;181:891–896.
- Gomes T, Mamdani MM, Dhalla IA, et al. Opioid dose and drug-related mortality in patients with nonmalignant pain. *Arch Intern Med* 2011;171:686–691.
- Gomes T, Mamdani MM, Dhalla IA, et al. The burden of premature opioid-related mortality. *Addiction* 2014;109:1482–1488.
- Public Health Agency of Canada. Statement from the Chief Public Health Officer: Pharmacists Help Address the Opioid Public Health Crisis in Canada. Available at: [https://www.canada.ca/en/public-health/news/2017/03/statement\\_from\\_thechiefpublichealthofficerpharmacistshelpaddress.html?=&wbdisable=false](https://www.canada.ca/en/public-health/news/2017/03/statement_from_thechiefpublichealthofficerpharmacistshelpaddress.html?=&wbdisable=false). Accessed May 4, 2017.
- World Health Organization. Global Health Observatory data repository: Life Tables by Country. Available at: <http://apps.who.int/gho/data/?theme=main&vid=60290>. Accessed May 4, 2017.