

Measuring Prescription Opioid Use

Definitions

2 measures are commonly used when analyzing trends in prescription opioid use:

- **Defined daily dose (DDD)**, defined by the World Health Organization (WHO)¹ as “the assumed average maintenance dose per day for a drug used for its main indication in adults.” DDDs are not the prescribed or recommended dose and are often based on an average of commonly used doses from multiple countries.¹
- **Morphine milligram equivalence (MME)**, also referred to as morphine milligram equivalent, oral morphine equivalent or morphine equivalence, uses a conversion factor or ratio that is relative to the potency of an opioid to convert doses from one opioid to another, using morphine as the standard^{2, 3} for the purpose of pain control.

Calculating DDDs and MMEs

DDD is calculated by multiplying the total quantity of the drug (e.g., number of tablets) by the strength (e.g., milligrams per tablet) to obtain the total number of milligrams and then dividing by the opioid-specific DDD to obtain the total number of DDDs. For example, the calculation for the number of DDDs in 30 tablets of oxycodone 20 mg is

$$30 \text{ tablets} \times 20 \text{ mg oxycodone per tablet} = 600 \text{ mg of oxycodone} \div 75 \text{ mg (the DDD assigned by the WHO)}^1 = 8 \text{ DDDs}$$

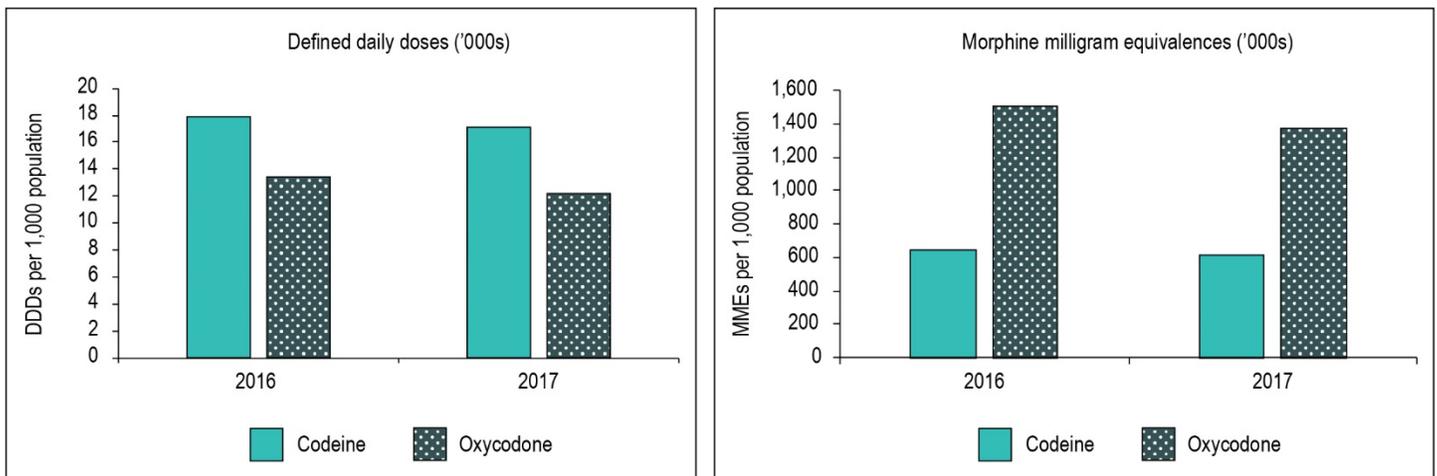
MMEs are calculated by multiplying the total quantity of the drug (e.g., number of tablets) by the strength (e.g., milligrams per tablet) to obtain the total number of milligrams and then multiplying by the opioid-specific morphine conversion factor. For example, in Canada, the calculation for the number of MMEs in 30 tablets of oxycodone 20 mg is

$$30 \text{ tablets} \times 20 \text{ mg oxycodone per tablet} = 600 \text{ mg of oxycodone} \times 1.5 \text{ mg (conversion factor recommended in } \textit{The 2017 Canadian Guideline for Opioids for Chronic Non-Cancer Pain})}^3 = 900 \text{ MMEs}$$

Comparative example

DDDs and MMEs can give very different results, especially if the data includes both weak and strong opioids.² The figure below demonstrates the difference in analytical results when using DDDs compared with MMEs for the same set of data.⁴ When using DDDs, there is a higher number of DDDs per 1,000 population for codeine, a weak opioid, than for oxycodone, a strong opioid. MMEs put more emphasis on the potency of the individual opioids dispensed; therefore, codeine has a lower rate of MMEs per 1,000 population compared with oxycodone.

Figure Defined daily doses per 1,000 population compared with morphine milligram equivalence per 1,000 population, codeine and oxycodone, 2016 and 2017



Source

Canadian Institute for Health Information. [Pan-Canadian Trends in the Prescribing of Opioids and Benzodiazepines, 2012 to 2017 — Data Tables](#). June 2018.

This example illustrates the absolute differences in the numbers reported for both measures of opioid consumption. The DDDs analysis indicates that — from a volume perspective — more doses of codeine than oxycodone are being dispensed. The MME analysis indicates that — from a potency perspective — more of the stronger opioid, oxycodone, is being dispensed. However, regardless of the measure chosen, the change over time is the same: between 2016 and 2017, codeine decreased by 5% and oxycodone by 8%.

Considerations

Considerations when choosing to use DDD:

- The DDD is an international standard based on the “assumed average maintenance dose per day for a drug used for its main indication in adults”;¹ therefore, it may not be suitable in studies focusing on use in seniors or children.
- The DDD does not reflect a recommended or prescribed dose. “Therapeutic doses for individual patients and patient groups will often differ from the DDD as they will be based on individual characteristics, such as age, weight, ethnic differences, type and severity of disease.”¹
- “DDD only give a rough estimate of consumption and not an exact picture of actual use. DDDs provide a fixed unit of measurement . . . enabling the researcher to assess trends in drug consumption and to perform comparisons between population groups.”¹
- The WHO DDD for codeine 100 mg is for the indication “cough”;¹ as a result, the Canadian Institute for Health Information uses the International Narcotics Control Board⁵ standard of 240 mg for codeine when used for pain.

Considerations when choosing to use MME:

- Clinical guidelines, such as *The 2017 Canadian Guideline for Opioids for Chronic Non-Cancer Pain*,³ ordinarily describe doses based on MME. As a result, using the MME in comparative analysis against such guidelines would be reasonable.
- MMEs should always be used to calculate the dose when switching patients from one opioid to another; the exception is that conversions to fentanyl are unilateral and switching back based purely on MMEs is not recommended.⁶
- The conversion of weak opioids to MMEs will lessen the apparent amount of the drug consumed relative to strong opioids, thereby underestimating the potential hazards of long-term use.
- MMEs can vary by country and may not be useful for comparing data internationally.⁷ At the time of this release, there was no Canadian MME conversion factor for tramadol.

Summary

Both DDDs and MMEs are complementary in the measurement of opioid dispensing.⁸ DDDs are appropriate when comparing data internationally, as conversion factors for MMEs can vary across countries, and when conducting analysis of population-based trends. MMEs are appropriate when analyzing clinical approaches to pain treatment and when examining utilization against prescribing guidelines. As a result, understanding the underlying differences and limitations of each measurement is essential for determining which measure should be used. Choosing the appropriate measure is important for ensuring that the interpretation of any prescription opioid use meets the intended goal of the analysis.

Text alternative for figure

Figure Defined daily doses per 1,000 population compared with morphine milligram equivalence per 1,000 population, codeine and oxycodone, 2016 and 2017

Opioid	2016		2017	
	DDDs per 1,000 population	MMEs per 1,000 population	DDDs per 1,000 population	MMEs per 1,000 population
Codeine	17.9	643.9	17.1	614.1
Oxycodone	13.4	1,502.2	12.2	1,375.3

Source

Canadian Institute for Health Information. [Pan-Canadian Trends in the Prescribing of Opioids and Benzodiazepines, 2012 to 2017 — Data Tables](#). June 2018.

References

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