

Hospital Deaths (HSMR)

Name	Hospital Deaths (HSMR)
Short/Other Names	Hospital Standardized Mortality Ratio (HSMR)
Description	<p>The ratio of the actual number of in-hospital deaths in a region or hospital to the number that would have been expected, based on the types of patients a region or hospital treats.</p> <p>For further details, please see the General Methodology Notes.</p>
Interpretation	Lower is better. The HSMR is most useful to follow a hospital's performance over time.
HSP Framework Dimension	Health System Outputs: Appropriate and effective
Areas of Need	Getting Better
Geographic Coverage	All provinces
Reporting Level /Disaggregation	National, Province/Territory, Region, Facility
Indicator Results	Accessing Indicator Results on Your Health System: In Depth
Identifying Information	
Name	Hospital Deaths (HSMR)
Short/Other Names	Hospital Standardized Mortality Ratio (HSMR)
Indicator Description and Calculation	
Description	<p>The ratio of the actual number of in-hospital deaths in a region or hospital to the number that would have been expected, based on the types of patients a region or hospital treats.</p> <p>For further details, please see the General Methodology Notes.</p>
Calculation: Description	<p>The ratio of the actual number of in-hospital deaths to the expected number of in-hospital deaths, for conditions accounting for about 80% of inpatient mortality</p> <p>Unit of Analysis: Hospitalization</p>
Calculation: Geographic Assignment	Place of service
Calculation: Type of Measurement	Ratio
Calculation: Adjustment Applied	<p>The following covariates are used in risk adjustment: For each HSMR diagnosis group, the HSMR logistic regression models are fitted with age, sex, length-of-stay (LOS) group, admission category (urgent and elective), comorbidity (Charlson Index Score) group and transfers as independent variables.</p>
Calculation: Method of Adjustment	Logistic regression
Denominator	<p>Description: Expected deaths, or number of deaths that would have occurred in a hospital or region had the mortality of these patients been the same as the mortality of similar patients across the country, based on the reference years (2015–2016 to 2017–2018)</p> <p>Inclusions:</p> <ol style="list-style-type: none">1. Admission to an acute care institution (Facility Type Code = 1)2. Discharge with diagnosis group of interest (i.e., one of the diagnosis groups that account for about 80% of in-hospital deaths, after excluding patients receiving palliative care)3. Age at admission between 29 days and 120 years4. Sex recorded as male or female5. Length of stay of up to 365 consecutive days6. Admission category recorded as urgent/emergent or elective (Admission Category Code = U or L) <p>Exclusions:</p> <ol style="list-style-type: none">1. Cadavers or stillborns (Discharge Disposition Code = 08 or 09, or Admission Category Code = R or S)2. Records with most responsible diagnosis (MRDx) of palliative care (ICD-10-CA: Z51.5). For Quebec data: records where Z51.5 coded as MRDx, or cancer (C00–C97) coded as MRDx and Z51.5 coded in any secondary diagnosis field3. Medical assistance in dying (MAID):<ul style="list-style-type: none">• 2016–2017 to 2017–2018 data only: Discharge Disposition Code = 07 (in-hospital death) AND either 1 of the following 2:<ul style="list-style-type: none">– Prefix = J in any field; OR– 3 CCI codes: 1.ZZ.35.HA-P7, 1.ZZ.35.HA-P1, 1.ZZ.35.HA-N3 (all present on the same abstract)• 2018–2019 data onward: Discharge Disposition Code = 73

Description:

Observed deaths, or actual number of in-hospital deaths that occurred in a hospital or region

Inclusions:

Death (Discharge Disposition Code = 07, 72*, 74*)

Numerator

Note

*2018–2019 data onward

Exclusions:

Same as for the denominator

Background, Interpretation and Benchmarks

The HSMR is a performance indicator that allows hospitals to measure and monitor their progress in quality of care.

Rationale

Ever since the HSMR measure was first developed and disseminated by CIHI, many hospitals and health providers across Canada have been using it as part of their ongoing efforts to improve care.

The HSMR can be used to track the overall change in mortality resulting from a broad range of factors, including changes in the quality and safety of care delivered.

Interpretation

Lower is better. The HSMR is most useful to follow a hospital's performance over time.

HSP Framework Dimension

Health System Outputs: Appropriate and effective

Areas of Need

Getting Better

Targets

Not applicable

/Benchmarks

Alexandrescu R, Jen MH, Bottle A, Jarman B, Aylin P. Logistic versus hierarchical modeling: an analysis of a statewide inpatient sample. *J Am Coll Surg* 2011;213(3):392-401.

Bottle A, Jarman B, Aylin P. Hospital standardized mortality ratios: sensitivity analyses on the impact of coding. *Health Serv Res* 2011;46(6pt1):1741-1761.

Bottle A, Jarman B, Aylin P. Strengths and weaknesses of hospital standardised mortality ratios. *BMJ* 2011;342:c7116.

References

Breslow NE, Day NE. *Statistical Methods in Cancer Research: Volume II: The Design and Analysis of Cohort Studies*. Lyon: International Agency for Research on Cancer; 1987.

Jarman B, Gault S, Alves B et al. Explaining differences in English hospital death rates using routinely collected data. *BMJ* 1999;318(7197):1515-1520.

Jarman B, Bottle A, Aylin P, Browne M. Monitoring changes in hospital standardised mortality ratios. *BMJ* 2005;330(7487):329.

Quan H, Li B, Couris CM et al. Updating and validating the Charlson comorbidity index and score for risk adjustment in hospital discharge abstracts using data from 6 countries. *Am J Epidemiol* 2011;173(6):676-682.

Availability of Data Sources and Results

Data Sources

DAD, HMDB

Type of Year:

Fiscal

Available Data Years

First Available Year:

2014

Last Available Year:

2018

Geographic Coverage

All provinces

Reporting Level/Disaggregation National, Province/Territory, Region, Facility

Result Updates

Update

Every year

Frequency

Web Tool:

Your Health System: In Depth

Indicator

URL:

[Accessing Indicator Results on Your Health System: In Depth](#)

Results

Changes to the HSMR methodology implemented in November 2019 include the following:

1. Developed an updated top 80 list of diagnosis groups using 2015–2016 to 2017–2018 data; diagnosis groups C85, E86 and I24 were replaced with J10, A49 and I33.

Updates

2. HSMR results are calculated with an updated baseline using 2015–2016 to 2017–2018 data. The previous baseline was calculated using 2012–2013 data.

3. The statistical test of significance is based on comparing results with the peer group averages (as opposed to the national average).

Quality Statement

Cavea Medical assistance in dying (MAID) was decriminalized in Canada with the enactment of Bill C-14 in June 2016. MAID cases are excluded from HSMR calculations for all DAD-submitting provinces and territories. In 2016–2017 and 2017–2018, it was not possible to exclude MAID cases from Limitat Quebec results due to differences in data collection. The impact of the differences of MAID exclusion is not fully known but is estimated to have a small effect on interprovincial comparability.

Trendi

ng Not applicable

Issues

Further information is available in the Technical Notes and other HSMR resources: <https://www.cihi.ca/en/health-system-performance/quality-of-care-and-outcomes/hsmr>

Comm Indicator results are also available in
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- [Your Health System: In Brief](#)
- [Your Health System: Insight](#), updated monthly