

Unpacking excess mortality in BC

In April 2020, the BC Centre for Disease Control (BCCDC) and the Office of the Provincial Health Officer initiated systematic surveillance of the societal and unintended impacts of the COVID-19 pandemic. Excess mortality was one of the priority metrics of this initiative. Excess mortality measures the number of deaths that exceed the statistically expected count during a given period and, in turn, contextualizes recent trends in deaths relative to historical data.¹⁻³

Unlike observed mortality, which captures deaths officially attributed to specific causes, such as COVID-19, excess mortality encompasses the magnitude of shifts in mortality broadly, including deaths indirectly related to COVID-19,⁴ in a timely way. However, estimating excess mortality presents methodological challenges, as no single standardized methodology exists.⁵ These complexities are compounded by concurrent public health emergencies in British Columbia along with COVID-19, including the ongoing unregulated drug poisoning crisis (a leading cause of death among people 19–59 years of age)⁶ and the extreme heat event of June 2021, both of which contributed significantly to increased rates of mortality.⁷

A fundamental component of excess mortality estimation is establishing a counterfactual baseline: an estimate of expected deaths under normal circumstances. This requires modeling historical mortality patterns and projecting them into the future based on various assumptions. Many methods can achieve this, but no single approach has gained universal acceptance. Each method involves trade-offs, reflecting differences in complexity, assumptions, and applicability to different contexts.

To provide a robust estimation of excess mortality in British Columbia from 2020 to 2023, we used two methods: a seasonal auto-regressive moving-average (SARIMA) model and a quasi-Poisson regression-based method adapted from the UK Office for National Statistics.⁸

Both methods produced comparable estimates of expected and excess mortality. However, the quasi-Poisson regression model's ability to easily summarize results by age, sex, and geography makes it a more immediately practical tool for monitoring and reporting.

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Out of approximately 169 000 total deaths in BC from 2020 to 2023, we estimate that there were 7270 (95% CI, 1600 to 12 900) excess deaths: 1200 (95% CI, –200 to 2500) in 2020, 3200 (95% CI, 1800 to 4700) in 2021, 2900 (95% CI, 1500 to 4300) in 2022, and –30 (95% CI, –1500 to 1400) in 2023. The imprecision of the estimates is directly related to the uncertainty of estimating expected deaths both during and after a pandemic, with a simultaneously changing and aging population and other co-occurring public health emergencies. Wide confidence intervals for calculations of excess mortality were also seen in the UK using a similar method.⁸ These results suggest that we do not have strong evidence for excess mortality outside of the peak pandemic years (2021 and 2022).

Stratified analyses revealed sex-based disparities in excess mortality estimates

during the first 4 years of the pandemic. Males generally experienced higher levels of excess mortality than females, with differences most pronounced during periods of high COVID-19 community transmission. These disparities also varied by age group: minimal excess mortality was observed in younger age groups (< 40 years of age) for both sexes, while excess deaths among those 40–60 years of age were concentrated in males, largely reflecting the concurrent unregulated drug poisoning crisis.⁹ Among those 60 years of age and older, differences between the sexes in excess mortality were more modest but still evident.

Most of the excess deaths occurred in community settings, compared with acute or long-term/assisted care facilities, based on Vital Statistics data. In fact, mortality in acute care settings was below expected levels at the outset of the pandemic, aligning more closely with historical baselines beginning in mid-2021 across all facility types.

Excess mortality surveillance offers a critical lens into the broader impacts of public health crises, capturing both direct effects, such as COVID-19 deaths, and indirect consequences, including those linked to health system disruptions, social isolation, and environmental disasters. Based on a comparative evaluation of different modeling approaches, we recommend the quasi-Poisson regression approach as the most appropriate method for estimating excess mortality in BC, given its adaptability to stratified analyses. While this approach currently offers the best balance of accuracy and applicability, ongoing methodological refinement remains a priority as the province continues to strengthen its public health response capacity by embedding excess mortality monitoring into routine surveillance. ■

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This article is the opinion of the BC Centre for Disease Control and has not been peer reviewed by the BCMJ Editorial Board.

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