| IDENTIFYING INFORMATION | |
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| **Name:** | **EMS response time for life-threatening events** |
| **Calculation:** | EMS response time for life-threatening events =<br>(Ambulance arrival at incident time) - (9-1-1 call received time)<br>Metric: Median and 90th percentile time in minutes |
| **Description:** | **9-1-1 call received time:** The time when a 9-1-1 call is received by AHS EMS dispatch, and an event is created in the Computer Assisted Dispatch (CAD) system.<br>**Ambulance arrival at incident time:** The time when the first ambulance arrives at the scene of the event. The time used here is the earliest of the scene arrival time or the staged arrival time. The staged arrival time is used when the scene the ambulance is arriving to is potentially dangerous. In these circumstances, when an ambulance is staged, EMS crews wait away from the scene until the area is secured or deemed safe by law enforcement. |
| **Data source:** | EMS Computer Assisted Dispatch (CAD) data |
| **Assumptions:** | 1. Incident priority is determined by the AHS EMS dispatcher when they receive the 9-1-1 call. All 9-1-1 calls in Alberta are assessed using the Medical Priority Dispatch System (MPDS) and the same triage criteria to determine patients' level of urgency.<br>2. Transport destination is determined by a number of factors, most notably the Regional Emergency Patient Access and Coordination (REPAC) program, which synthesizes real-time capacity and acuity data in order to reflect receiving status and help EMS staff decide where to transport the patient. Additionally, some patient-specific clinical condition criteria, and even patient preference can play a role in determining the transport destination.<br>3. Alberta is a large, geographically diverse province, where EMS response times will vary in relation to travel distances and other subtleties unique to different areas of the province. To account for this, response times are reported by four distinct geographic areas, based on the exact location of the life-threatening medical event: metro / urban areas, smaller communities (population more than 3,000 people), rural areas, and remote areas. |
| **Exclusions:** | 1. A standardized triage criteria is used to determine the priority of each incident. Letters A though E are used to distinguish levels of priority, where A (referred to as "Alpha") is the lowest priority and E (referred to as "Echo") is the highest. Events that are not triaged as being life-threatening (triage levels D or "Delta" and E or "Echo") are excluded.<br>2. Non-ambulance emergency responses are excluded from these results. As such, STARS helicopters, medical first responders, and the use of Automated External Defibrillators (AEDs) are excluded. |

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| | 3. Community paramedicine, where paramedics provide mobile medical care in the community setting, is excluded from these results. |
| **Limitations:** | 1. There are some minor discrepancies in the geographic boundaries used to define borders of Alberta municipalities and health zones compared to other sources (e.g., EMS zones do not always match AHS zone borders exactly).<br>2. The exclusion of non-life-threatening events from these results represents a gap in public reporting on response times; however, from a system performance perspective, this gap is justifiable. There are many events that EMS responds to where response time is not necessarily critical to patient care. Focusing on events that are deemed life threatening at the time of EMS dispatch is a better representation of the capability of the system to respond urgently when patients need it most. |

Alberta Health Services, Emergency Medical Services, System Performance and Innovation. "EMS Computer Assisted Dispatch (CAD) data." (2020) [Data showing median and 90th percentile results for the length of time patients experiencing a life-threatening medical event wait for EMS staff to arrive, from when the 9-1-1 call is received by AHS EMS dispatch to when the first ambulance arrives at the scene of the incident, by zone, geographic area, month, and quarter].

## Appendix A – Sample size and the principles of statistical process control (SPC) methods

Determining appropriate sample sizes for improvement projects is less well-defined than traditional research projects, primarily because data is often collected over time.[53] As a result, there is no "industry consensus" regarding how to determine appropriate sample size.

Donald J. Wheeler proposes the following questions about sample sizes:[54]

- Are the data collected in a manner that will allow the charts to detect process changes that are large enough to be of interest?
- Do the data give us the appropriate information needed to take action on our process?

Additional considerations for determining sample size include, but are not limited to, the following:[53]

- project objectives
- data type
- expected rate of meaningful change in the data
- availability of data
- availability of resources to collect the data
- project importance/visibility

The most desirable methodological solution from the point of view of detecting process shifts for improvement projects would be to take large samples very frequently; however, this is not economically feasible.[55] Sample size issues in improvement efforts are often a balance between resources and the clarity of the results desired.[53] I.e., the sample size determination depends on how many respondents are needed to observe changes in the data (non-random variation), without being so expensive that the project is unsustainable.

This issue of appropriately allocating sampling effort often results in the following choice: take smaller samples at shorter intervals or take larger samples at longer intervals. Industry practice favours smaller, more frequent samples because it allows for quicker corrective action when a process shift occurs.[55] Similarly, healthcare providers and quality improvement personnel benefit from more frequent reporting because it enables iterative improvement (causes of positive changes can be reinforced, while causes of negative changes could lead to corrective action). These benefits support the HQCA's decision to survey fewer patients than is required for the sample to be statistically representative of the population treated at each site for a given time period (month/quarter).

Many applications of SPC methods use sample sizes as small as 5 or 10 observations to monitor the quality of a process.[53,55] The HQCA's previous work with emergency department patient experience surveys and the application of SPC methods to this historical data suggests that a sample size of 30 to 50 emergency department patients per site, per month, is sufficient to detect meaningful (non-

[53] Provost L.P., Murray S.K. The Health Care Data Guide: Learning From Data for Improvement. San Francisco, CA: Jossey-Bass; 2011.
[54] Wheeler D.J. Rational Sampling. Accessed from http://www.qualitydigest.com/inside/statistics-column/070115-rational-sampling.html.
[55] Montgomery D.C. Introduction to Statistical Quality Control. 6th ed. Hoboken, NJ: John Wiley & Sons; 2009.

random) changes in patient experience.[56] For this iteration of the HQCA's emergency department survey, the sample size has been inflated to between 60 and 80 patients per site, per month. This change should result in process shifts being detected more efficiently than in the HQCA's previous application of these methods.

[56] For more information on the HQCA's previous application of SPC methods to the analysis of emergency department patient experience data, please see the HQCA's *Urban and Regional Emergency Department Patient Experience Report (2010-2013)*, accessible at: http://hqca.ca/surveys/emergency-department-patient-experience/.