



**Department
of Health**



HRSA Ryan White HIV/AIDS Program

**CENTER FOR QUALITY
IMPROVEMENT & INNOVATION**

Understanding Run Charts and Control Charts in Quality Improvement (QI)

National Quality Improvement Technical Assistance Webinar

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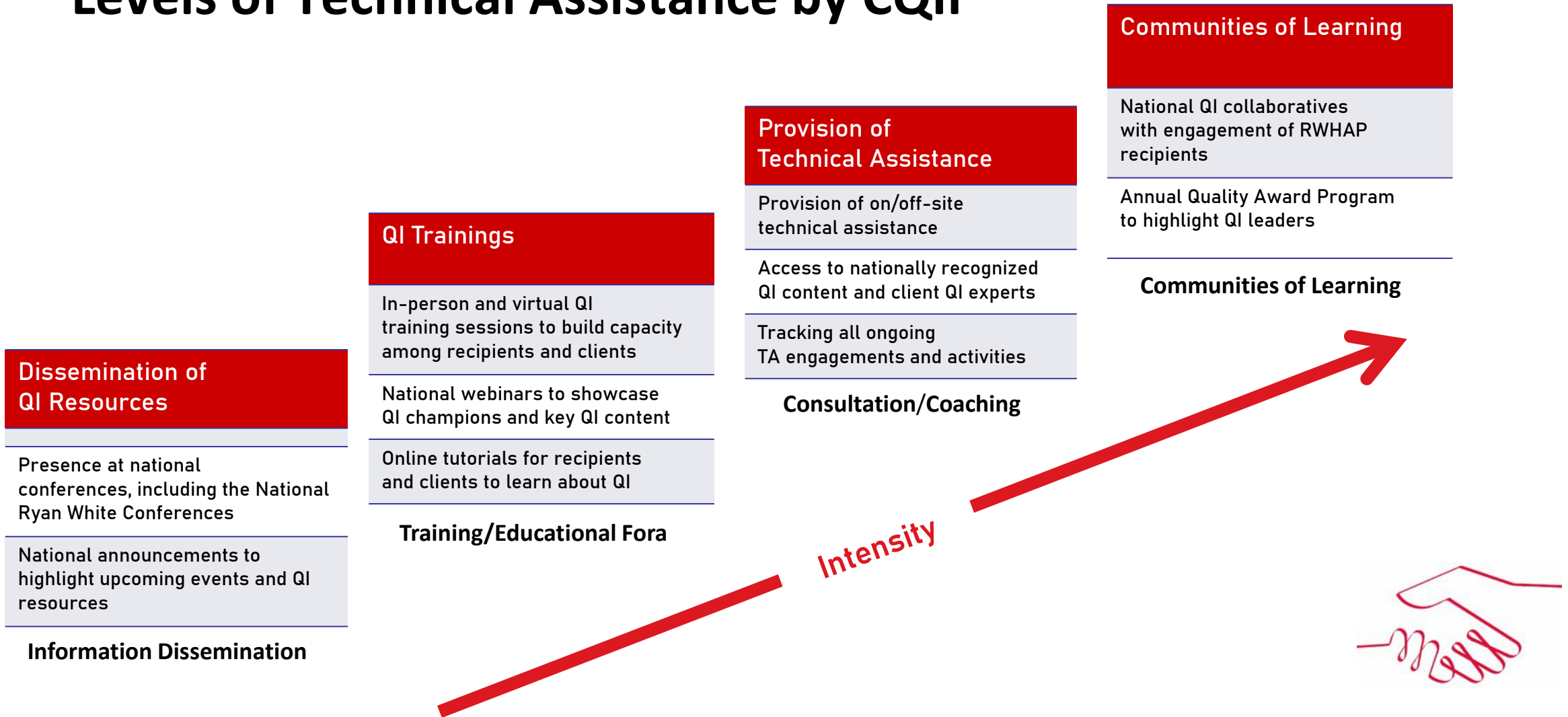
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Center for Quality Improvement & Innovation (CQII)

- Funded by the HRSA HIV/AIDS Bureau [#U28HA53134].
- Managed by the New York State Department of Health AIDS Institute.
- Together, we continue to improve the lives of people with HIV across the United States. CQII provides state-of-the-art technical assistance and training to Ryan White HIV/AIDS Program (RWHAP)-funded recipients and subrecipients that measurably strengthen local clinical quality management programs and improve patient care, health outcomes, and patient satisfaction.



Levels of Technical Assistance by CQII



UNDERSTANDING RUN CHARTS AND CONTROL CHARTS IN QUALITY IMPROVEMENT

Learning Objectives

By the end of this session, participants will be able to:

- Describe the purpose of run charts and control charts in quality improvement (QI)
- Distinguish between run charts and control charts
- Identify common cause and special cause variation
- Apply basic rules for interpreting charts
- Select an appropriate chart for a QI project

Measurement in Quality Improvement

- QI uses data to support learning over time.
- Time-ordered data can support understanding of process behavior.
- Measurement in QI differs from research and performance evaluation.

Why Plot Data Over Time?

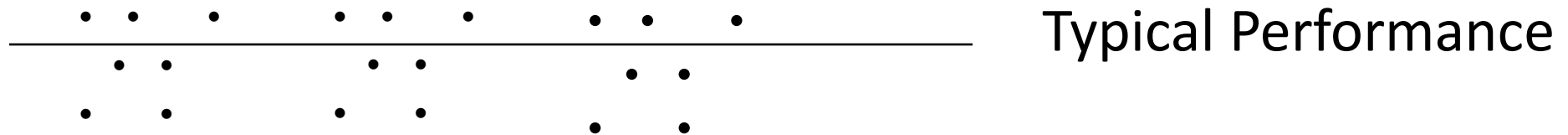
- Single data points may be misleading.
- Averages alone may hide meaningful patterns.
- Data over time can reveal variation and change.

Month	Retention in HIV Care
March	82%

Month	Retention in HIV Care
January	72%
February	74%
March	73%
April	75%
May	76%
June	78%

Variation Is Expected

- All processes demonstrate variation.
- The key question is whether variation appears random or non-random.

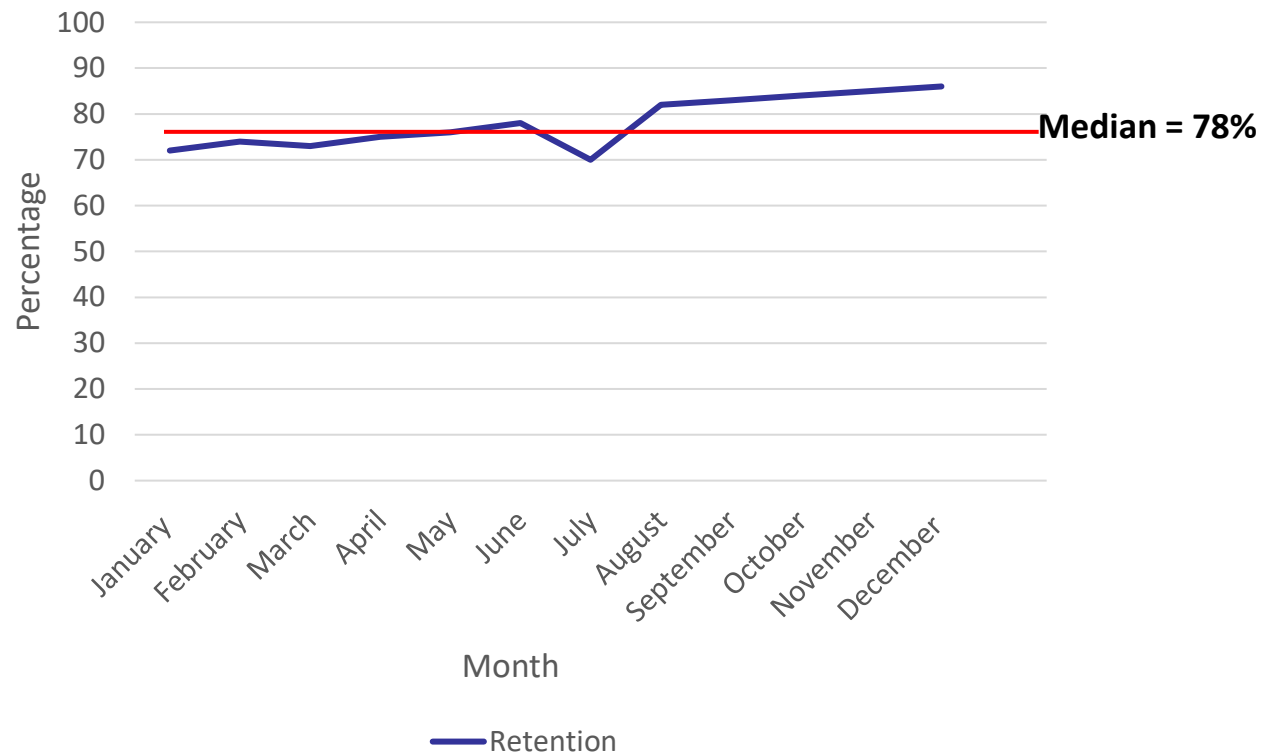


Types of Variation

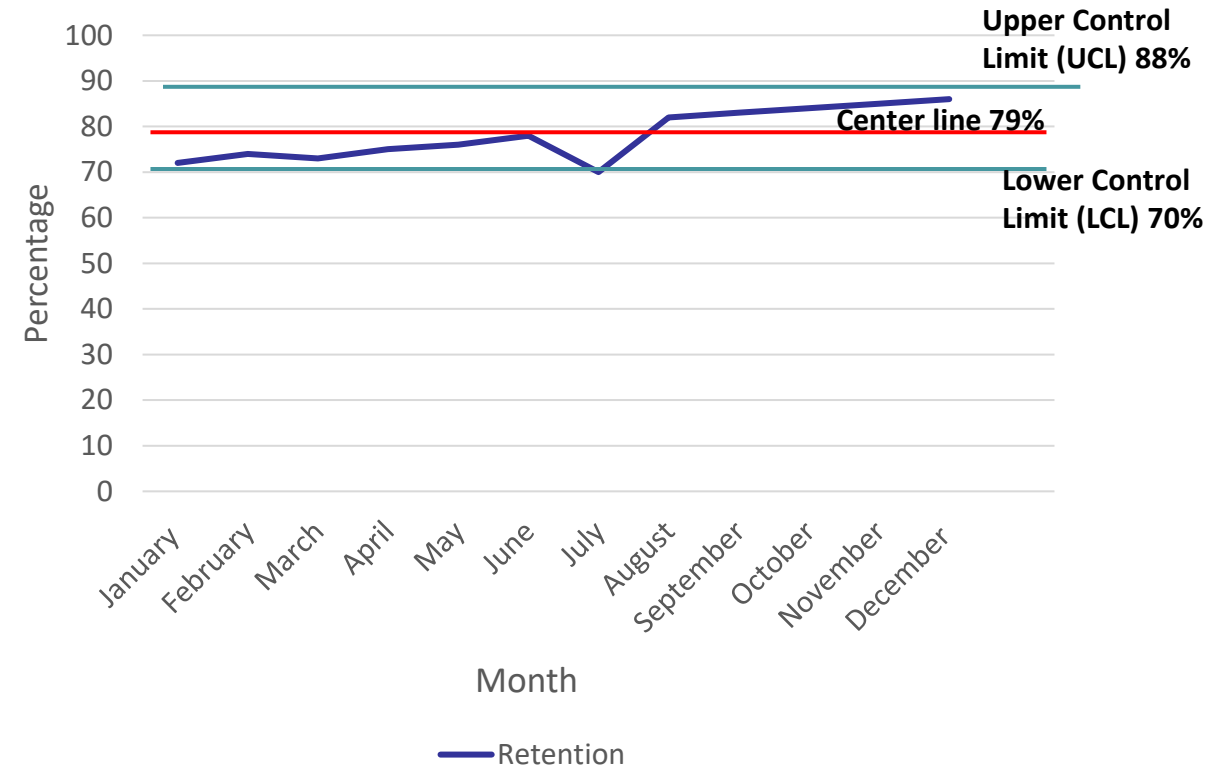
- **Common Cause Variation:**
 - Inherent to the process
 - Typically, predictable within a stable system
- **Special Cause Variation:**
 - Associated with specific, identifiable factors
 - May indicate a change in the process

Tools to Understand Variation

Run Chart: Retention in HIV Care (%)

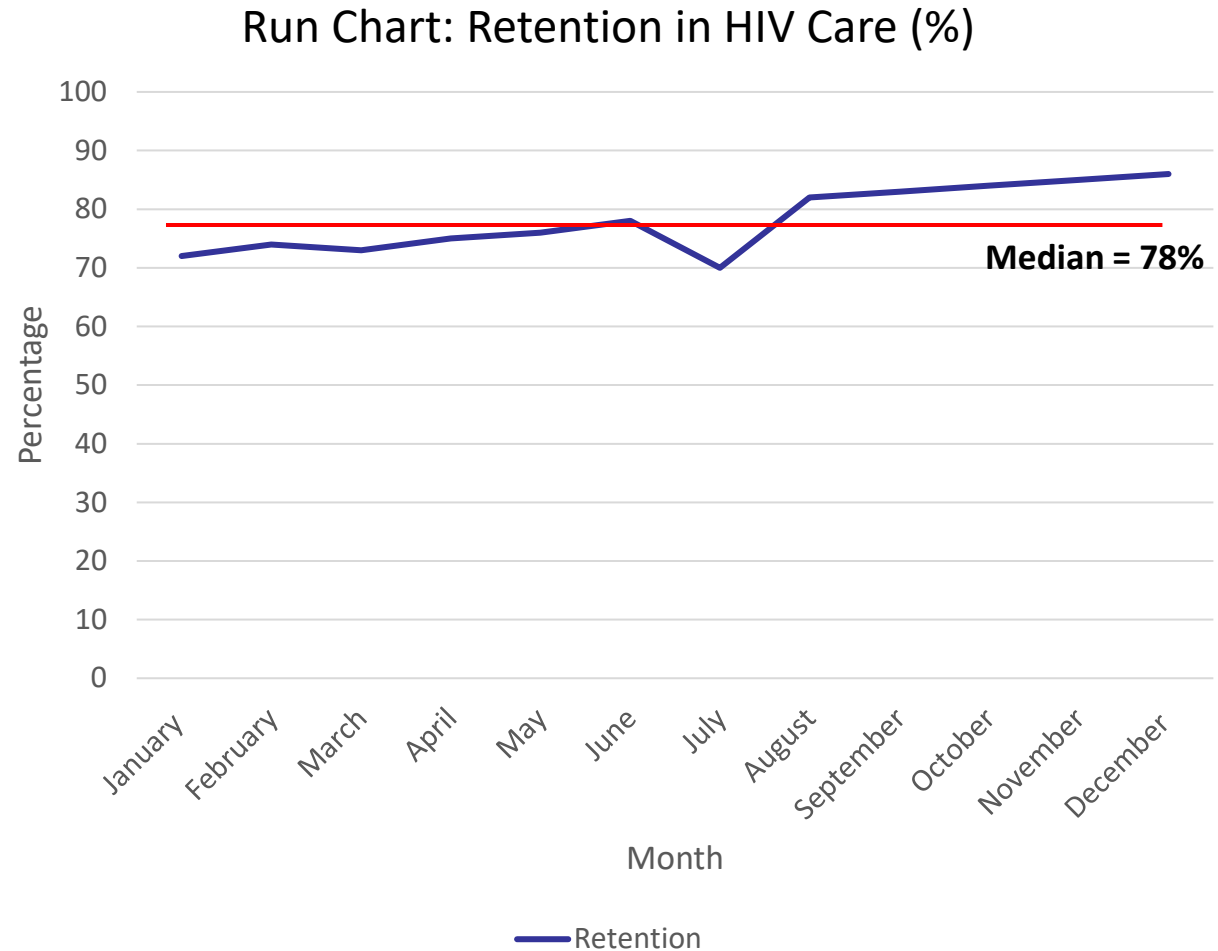


Control Chart: Retention in HIV Care (%)



What Is a Run Chart?

- A graph of data plotted over time
- Includes a median centerline
- Commonly used in the early stages of QI projects



When to Use a Run Chart

- Early stages of a QI project
- Small or developing datasets
- Rapid-cycle learning through Plan-Do-Study-Act (PDSA) cycles

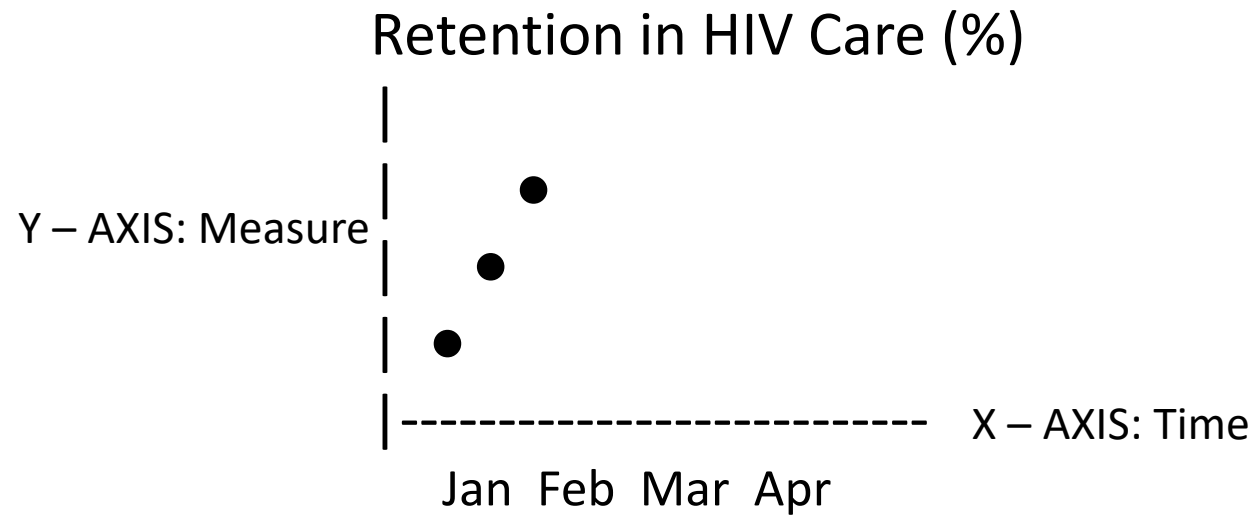
Plan → Do → Study → Act



Review data

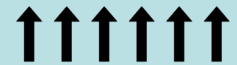
Setting Up a Run Chart

- X-axis: time (e.g., weeks or months)
- Y-axis: measure of interest
- Median calculated from baseline data



Interpreting Run Charts

SHIFT



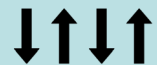
Points on one side
of the median

TREND



Increasing values
over time

RUN



Crossing the median

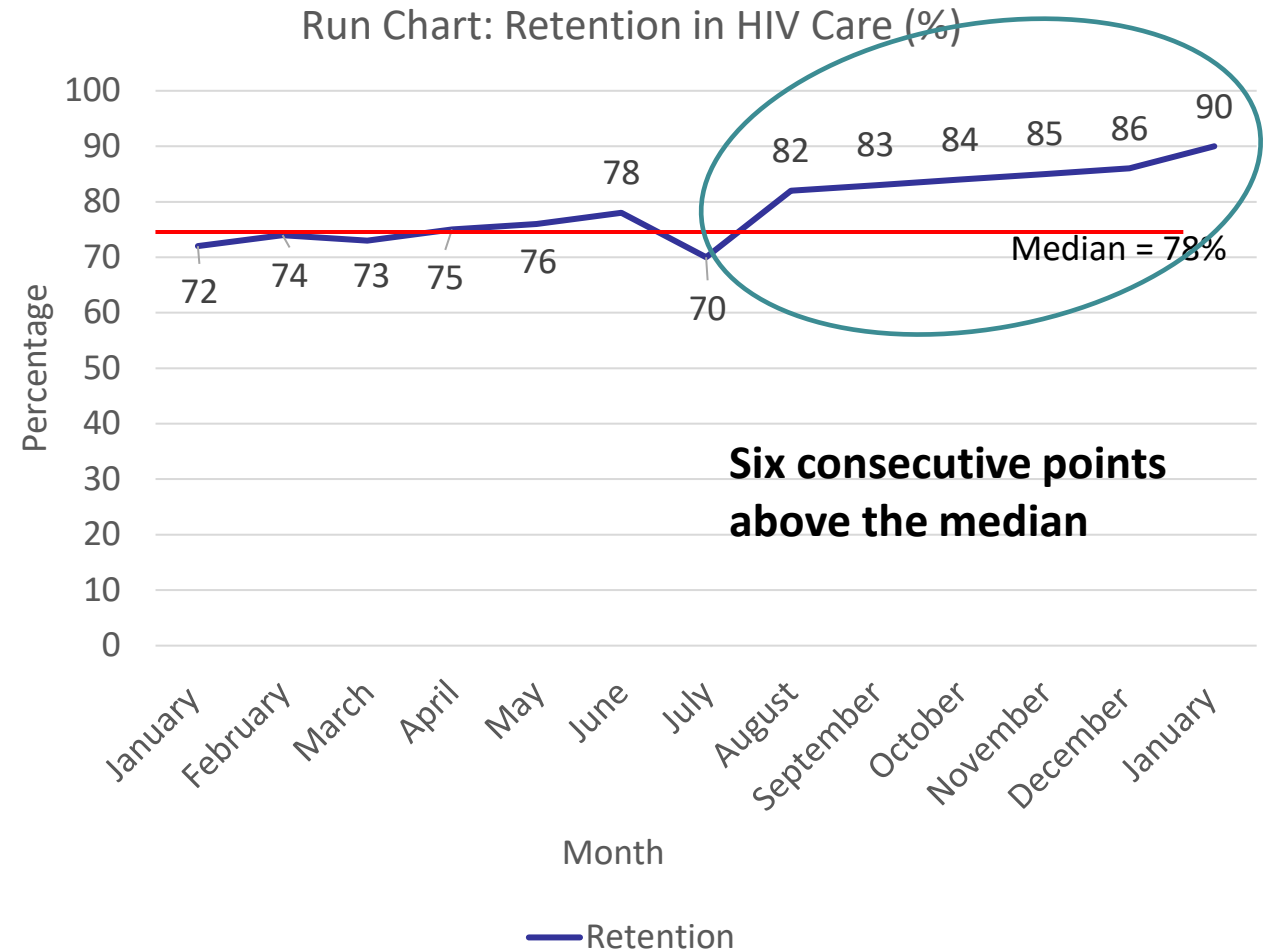
ASTRONOMICAL
POINT



Unusually high or low

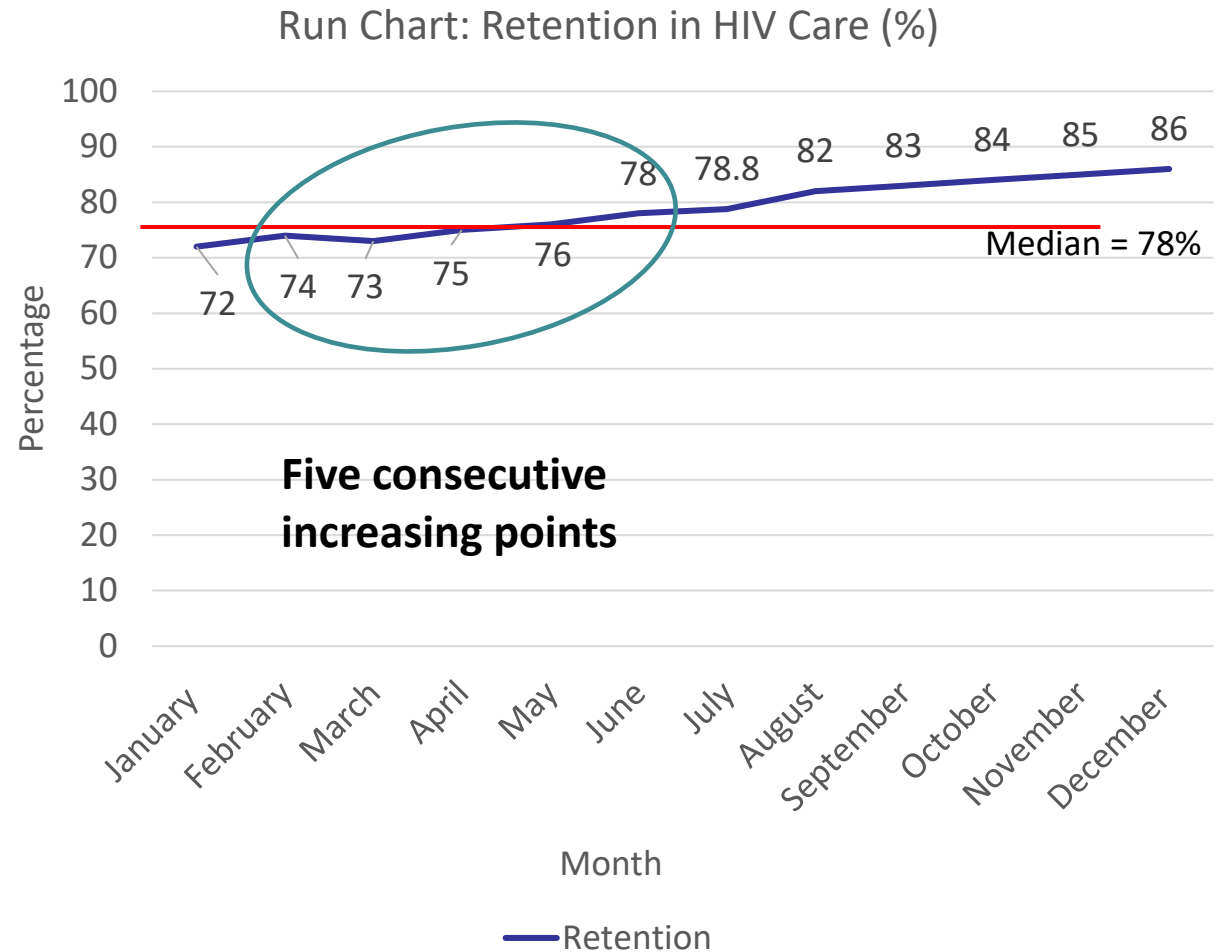
Run Chart Rule: Shift

- Six or more consecutive points above or below the median
- Points on the median are not counted



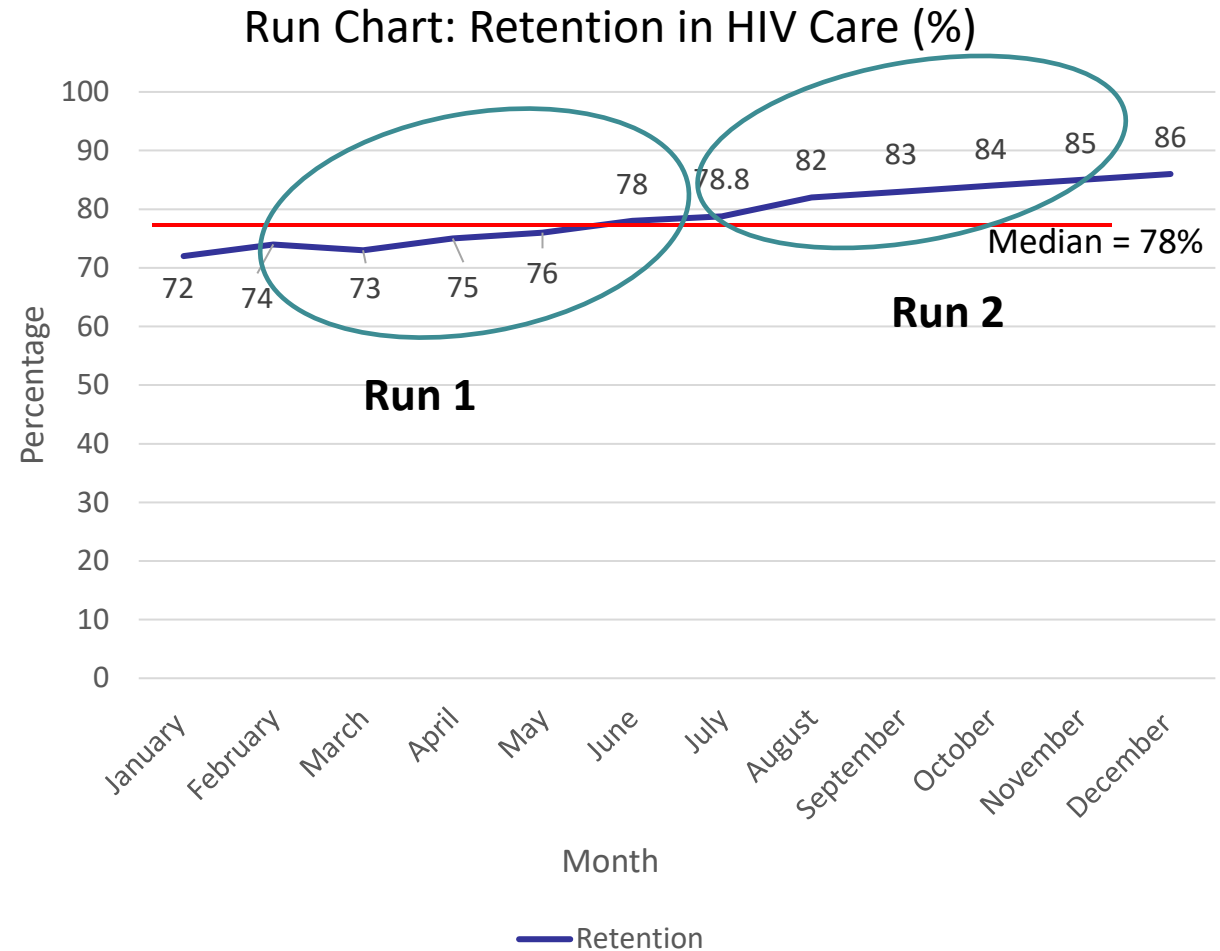
Run Chart Rule: Trend

- Five or more consecutive points increasing or decreasing
- Repeated values interrupt a trend



Run Chart Rule: Runs

- A run is a sequence of points on one side of the median
- Too many or too few runs may indicate non-random variation



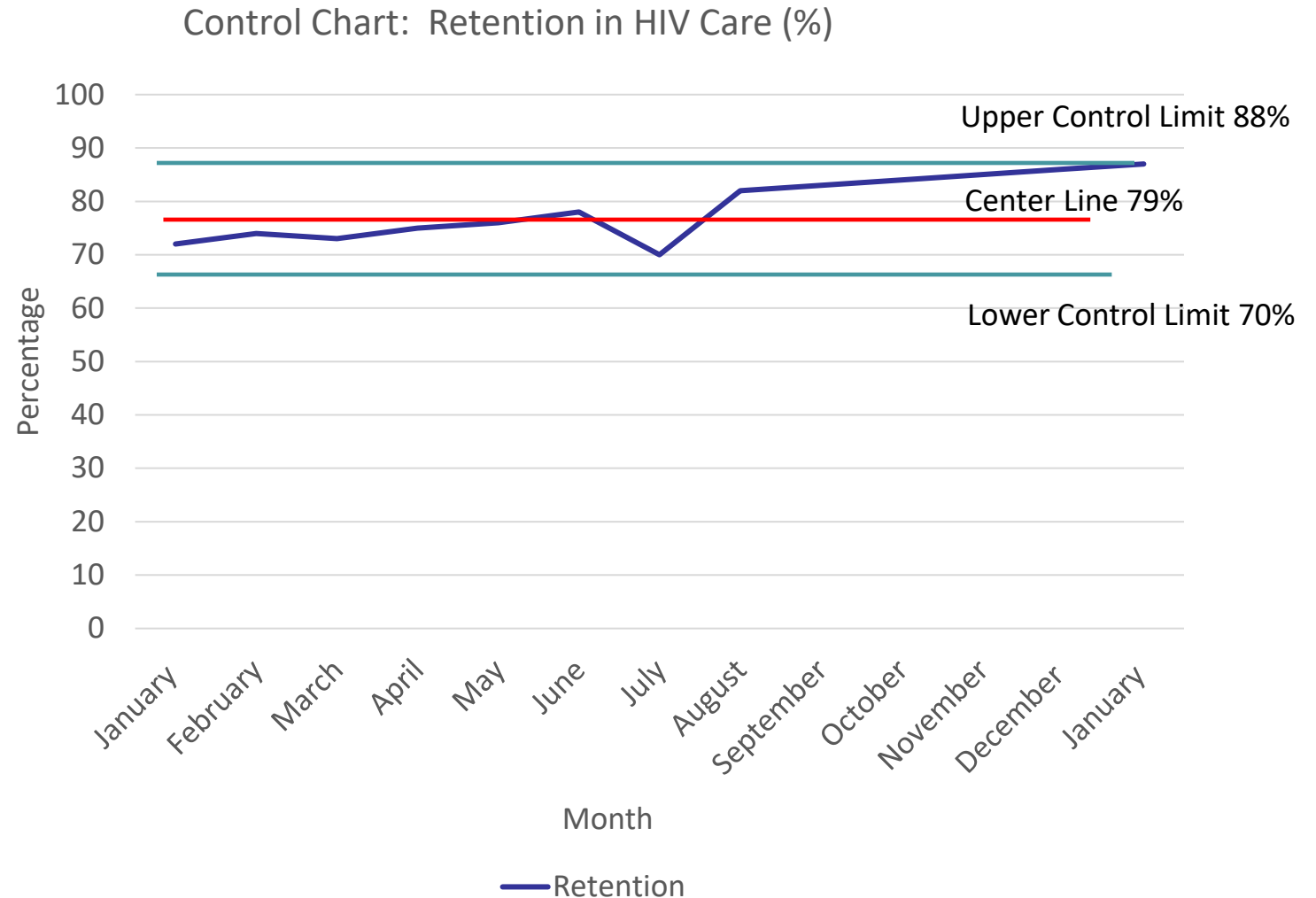
Limitations of Run Charts

Run Charts CAN:	Run charts CANNOT:
Show patters over time	Assess stability
Support early learning	Provide control limits
Be easy to create	Distinguish all variation

Use control charts when stability questions arise

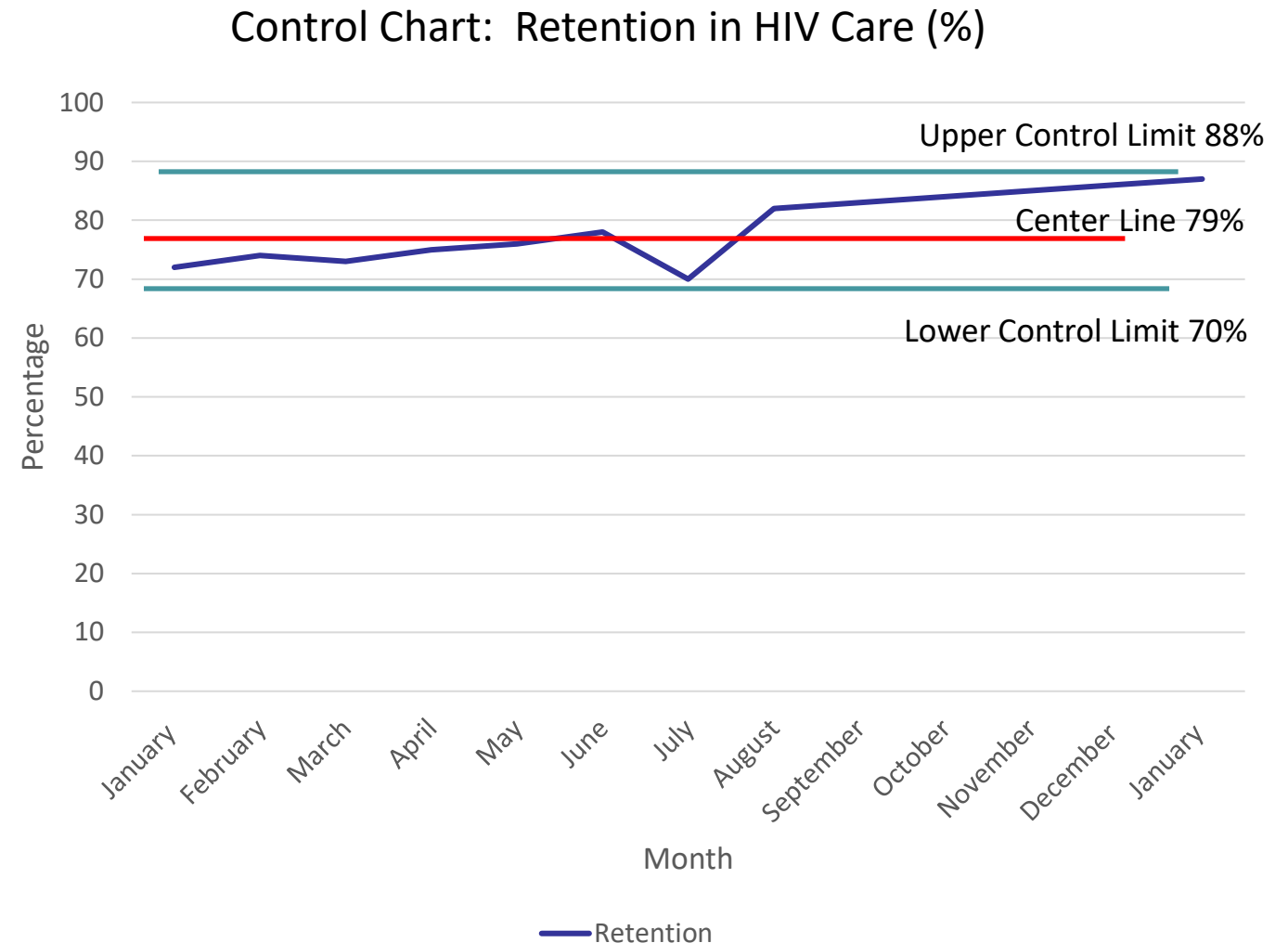
What Is a Control Chart?

- A run chart with statistically derived control limits
- Displays expected range of variation
- Used to assess process stability over time



Key Elements of a Control Chart

- Centerline (mean or median)
- Upper Control Limit (UCL)
- Lower Control Limit (LCL)



Why Use Control Charts in QI?

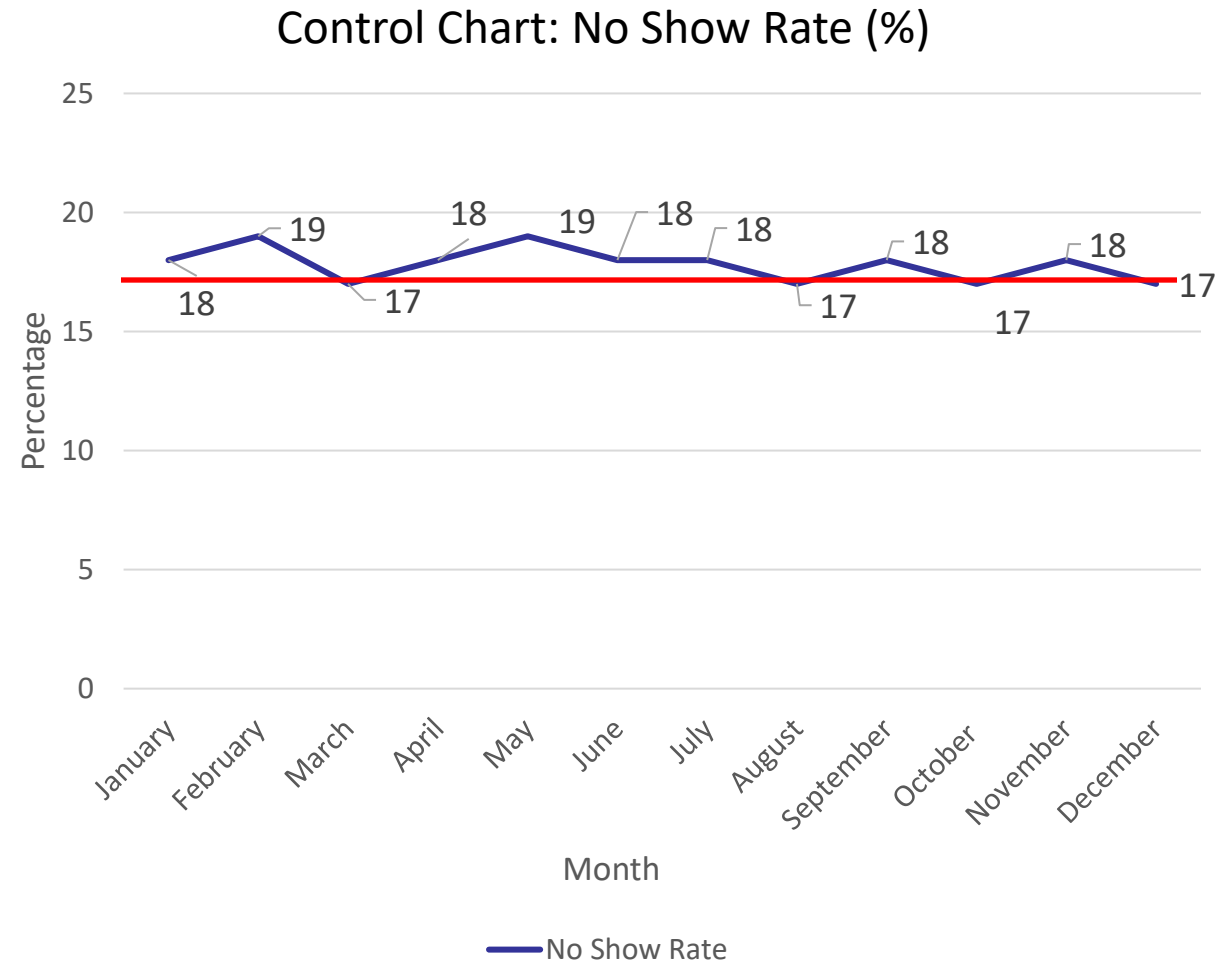
- Support distinction between common and special cause variation
- Help teams avoid over-reacting to random variation
- Support data-informed decision-making

Process Stability

- A stable process shows only common cause variation
- An unstable process shows special cause signals

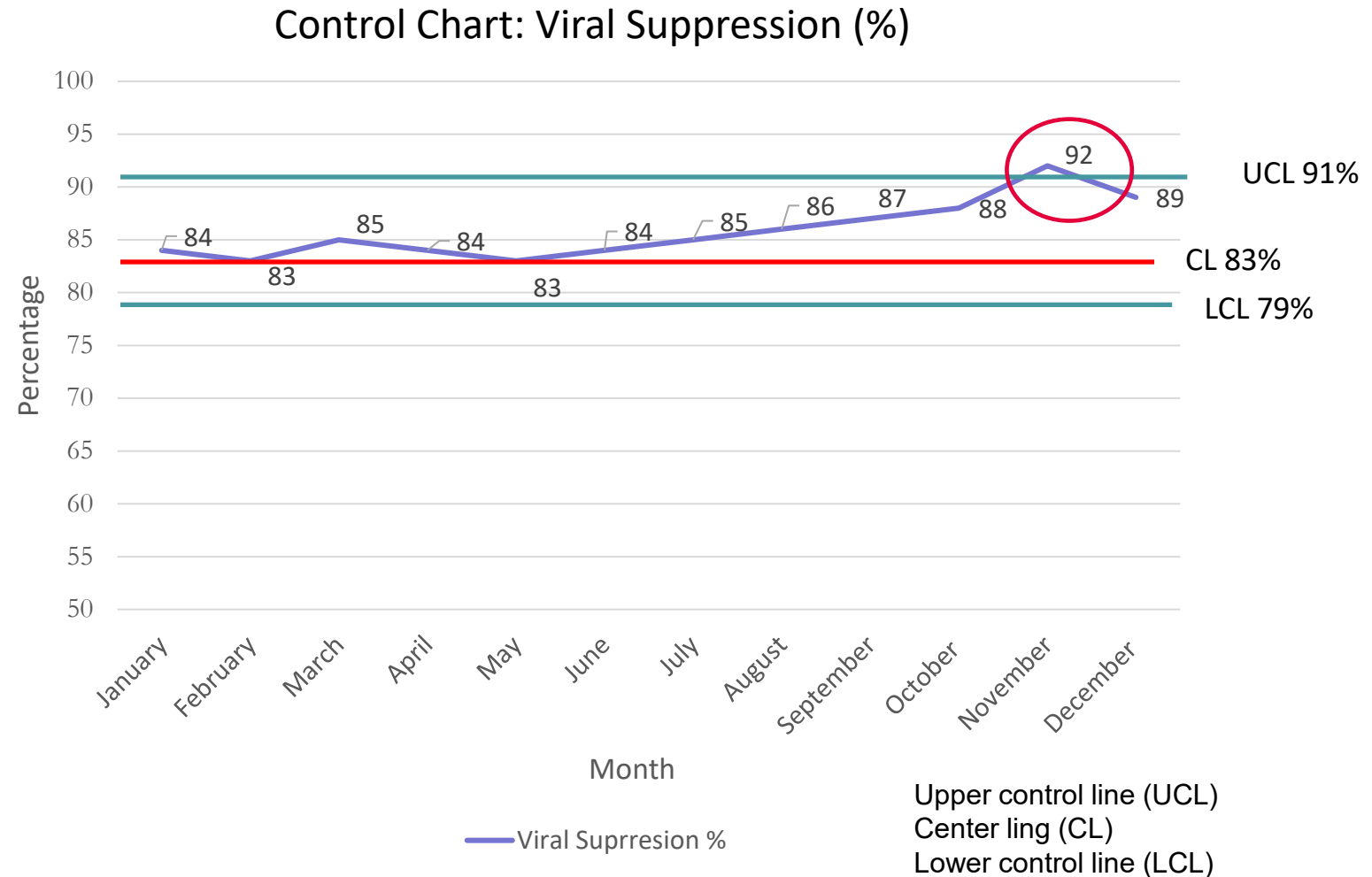
Common Control Chart Signals

- One or more points outside control limits
- Sustained runs on one side of the centerline
- Trends or unusual patterns



Responding to Variation

- Common Cause Variation:
 - Consider system-level changes
- Special Cause Variation:
 - Investigate specific events or changes



Selecting a Control Chart

- Selection depends on:
 - Type of data (continuous or count)
 - Sample size
 - Frequency of measurement

Annotating Charts for Learning

- Label tests of change:
 - Note contextual factors
 - Link data patterns to improvement activities

Using Charts with PDSA Cycles

- Charts can be reviewed alongside PDSA cycles
- PDSA documentation
- Data may support learning across PDSA cycles

Plan → Do → Study → Act



Review data

Common Pitfalls

- Too few data points
- Recalculating limits too frequently
- Using averages without time context

Run Charts vs. Control Charts

Run Charts	Control Charts
Median Centerline	Mean/Median with Limits
Early Learning	Stability Assessment
Simple Setup	More Structured Analysis

Application in Ryan White HIV/AIDS Program Settings

- Examples may include:
 - Appointment access
 - Retention in care
 - Viral suppression measures

Key Takeaways

- Variation is expected
- Charts support learning, not judgment
- Simple tools used consistently are effective

References and Resources

- Perla RJ, Provost LP, Murray SK. *The run chart: a simple analytical tool for learning from variation in healthcare processes*. BMJ Quality & Safety. 2011.
- Institute for Healthcare Improvement. *Quality Improvement Essentials Toolkit*.
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- Provost LP, Murray SK. *The Health Care Data Guide*. Jossey-Bass.

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