

Basics of the control chart

MDH OFFICE OF PERFORMANCE IMPROVEMENT / UMN SCHOOL OF PUBLIC HEALTH

Control charts provide a way to monitor, control, and improve process performance over time by studying variation and its source.

- Focuses attention on detecting and monitoring process variation over time
- Distinguishes special from common causes of variation, as a guide to local or management action
- Serves as a tool for ongoing control of a process
- Helps improve a process to perform consistently and predictably for higher quality, lower cost, and higher effective capacity
- Provides a common language for discussing process performance

Constructing control charts

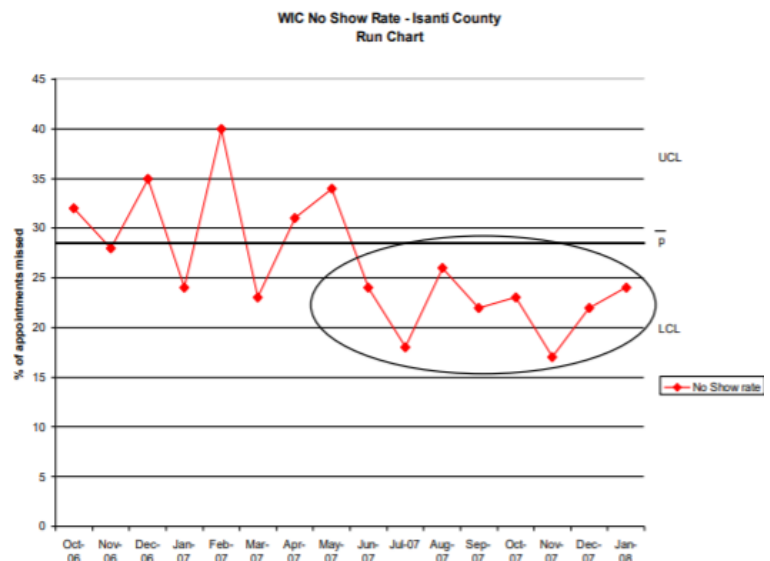
1. Select the process to be charted
2. Determine sampling method and plan
3. Initiate data collection
4. Calculate the appropriate statistics
5. Calculate the control limits
6. Construct the control chart

Run chart

The run chart is a running record of a process over time.

- The vertical axis represents the process being measured
- The horizontal axis represents the units of time by which the measurements are made
- The centerline of the chart is the median

A **run** is defined as one or more consecutive data points on the same side of the median; in this chart there are 8 runs.

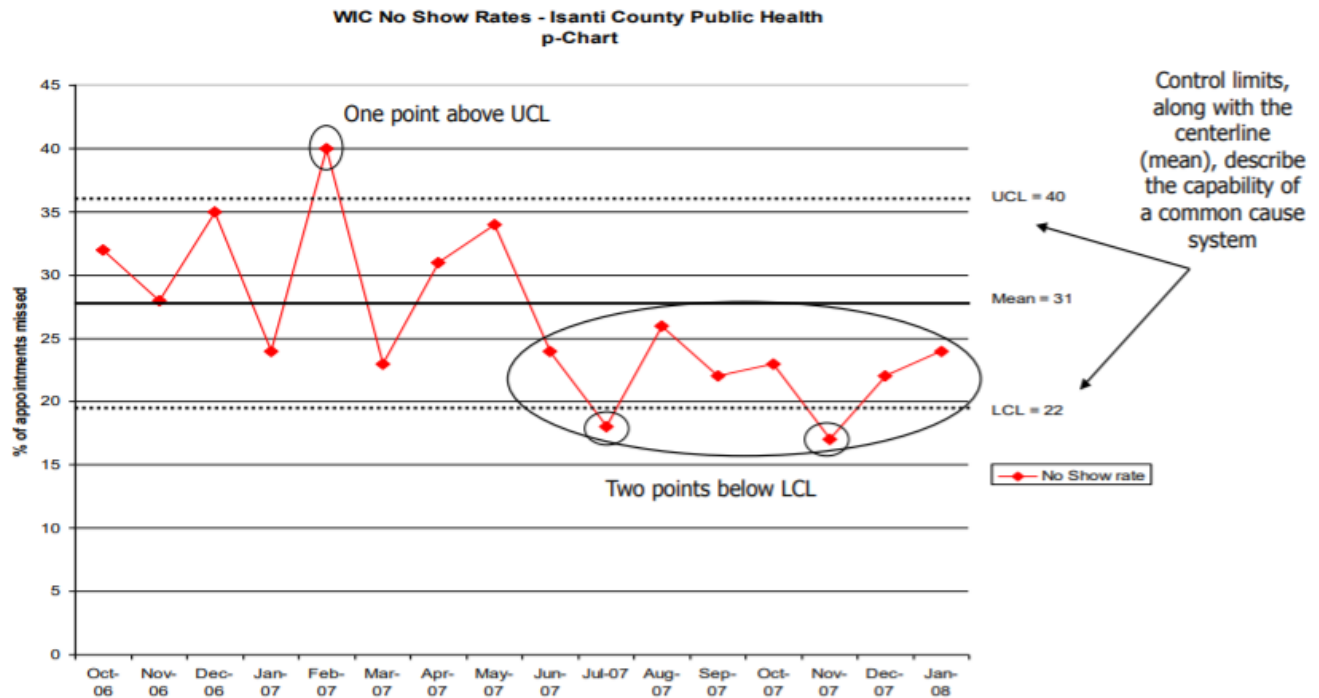


Tests for a special cause

- Test #1: The presence of too much or too little variability:**
 When there are too few or too many runs
- Test #2: The presence of a shift in the process:**
 A special cause exists if a run contains too many data points (i.e., with 20 or more data points, a run of 8 or more data points is considered “too long”; with less than 20 data points, a run of 7 might also be considered “too long”.)
- Test #3: The presence of a trend:**
 A trend is defined as an unusually long series of consecutive increases or decreases in the data, (usually at least 6 or 7).

Constructing control charts

Control limits, along with the centerline (mean), describe the capability of a common cause system



5

Interpreting control charts

Analyze the data relative to the control limits; distinguish between:

- Common causes:** The fluctuation of the points within the limits results from variation inherent in the process. This variation results from common causes within the system (e.g., design, choice of machine, preventive maintenance), and can only be affected by changing that system.

- **Special causes:** Points outside of the limits or patterns within the limits, come from a special cause (e.g., human errors, unplanned events, freak occurrences), that is not part of the way the process normally operates, or is present because of an unlikely combination of process steps. Special causes must be eliminated before the control chart can be used as monitoring tool.

Determine if the process mean (centerline) is in the proper position relative to your customer objectives. If not, this is an indication that something has changed in the process, or the objectives have changed.

The process is in “statistical control” if the process is not being affected by special causes, the influence of an individual or a machine. All points must fall within the control limits and they must be randomly dispersed about the average line for an in-control system.

Tests for special cause

- **Test #1: A special cause is indicated when a single point falls outside a control limit.**
The presence of one or more points outside the upper control limit (UCL) or lower control limit (LCL).
- **Test #2: A special cause is indicated when two out of three successive values are: a) on the same side of the centerline, and b) more than two standard deviations from the centerline.**
A “run test.”
- **Test #3: A special cause is indicated when eight or more successive values fall on the same side of the centerline.**
This test will detect a smaller, but consistent shift in a process that Test #1 and Test #2 might miss.
- **Test #4: A special cause is indicated by a trend of six or more values in a row steadily increasing or decreasing.**

Minnesota Department of Health
Center for Public Health Practice
625 Robert Street N
PO Box 64975
St. Paul, MN 55164-0975
651-201-3880
health.ophp@state.mn.us
www.health.state.mn.us

2013

To obtain this information in a different format, call: 651-201-3880. Printed on recycled paper.