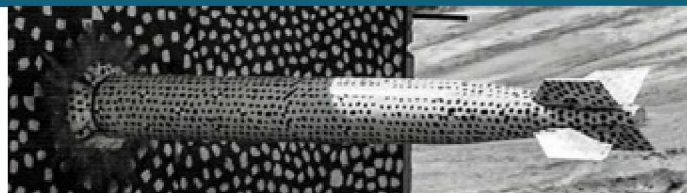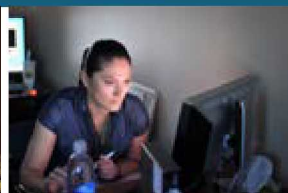Sandia National Laboratories

SAND2019-4623C

Evaluating Safety from Risk to Solution: Using Cross-Organizational Partnerships to Drive Greater Understanding and Improvement

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In June 2018, a member of the workforce at Sandia National Laboratories experienced an electrical shock while working on equipment.

Cross-Organizational Partnership

Environment, Safety & Health (ES&H)

Contractor Assurance System (CAS)

NEW!

Safety Experts

Assurance Data Sciences

Performance Measures & Metrics

Assurance Analytics Experts

Cross-Organizational Partnership

- **CAS data scientists provide predictive modeling capabilities.**

   Example: ASSURE* for Safety (a behavioral predictive model)

- **CAS statisticians and analysts provide statistical rigor for objectively assessing safety performance.**

   Example: Control Charts

*Assurance Safety Software for Uncovering Risks to Evaluate

Cross-Organizational Partnership

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  Example: ASSURE* for Safety (a behavioral predictive model)

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*Assurance Safety Software for Uncovering Risks to Evaluate

ASSURE for Safety

Unique behavioral predictive model developed with two goals:

1. Identify at the end of each quarter those organizations at high risk for one or more safety incidents in the next six months.

2. Identify predictive indicators from corporate data systems that demonstrate significant relationships to future safety incidents .

Unique because it was developed using Sandia data and Sandia safety incidents — specifically developed for Sandia, by Sandia!

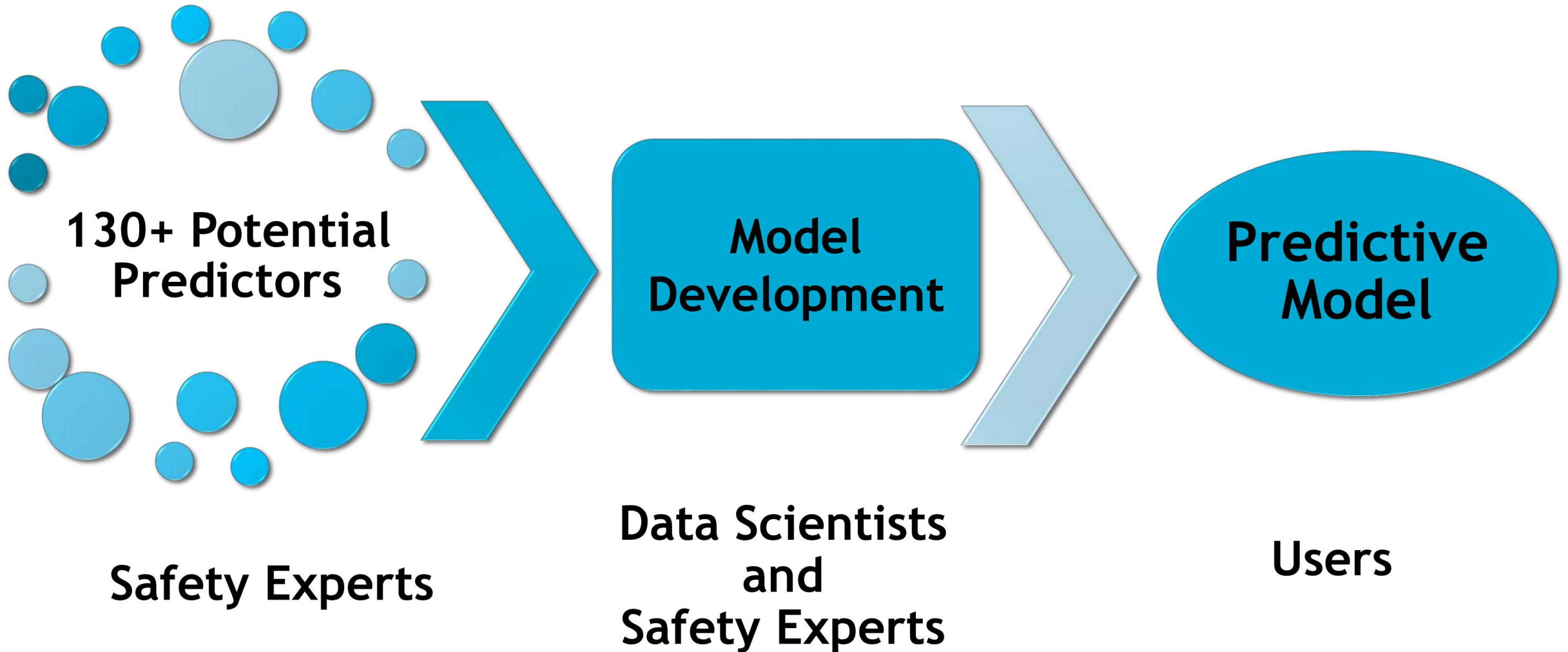# ASSURE for Safety

This behavioral predictive model <u>CAN</u>

Effectively separate two populations:

1. Employees who will have a safety incident in the next six months.

2. Employees who will not have a safety incident in the next six months.

It <u>CANNOT</u>

Identify a specific person who will have a safety incident at a specific time.
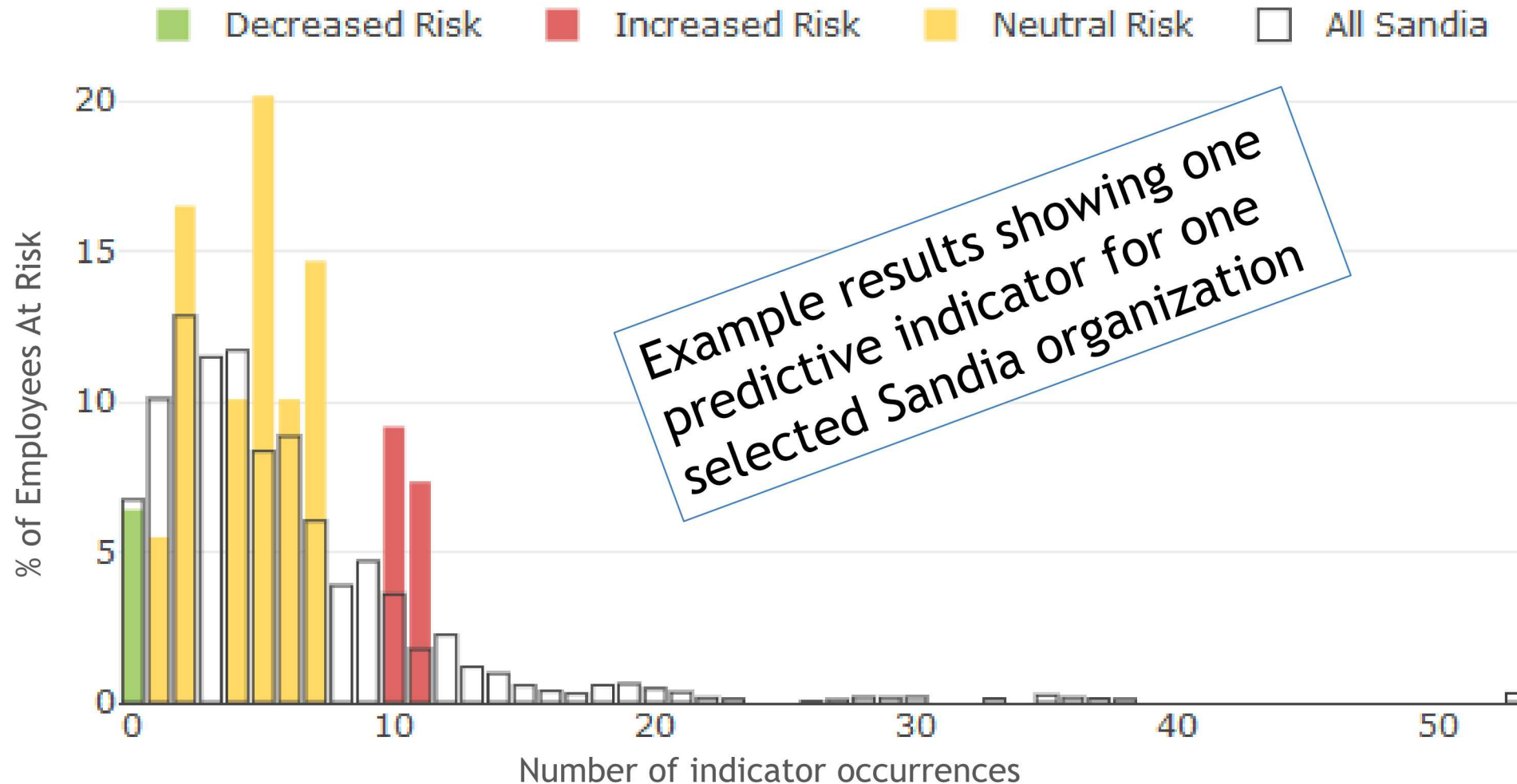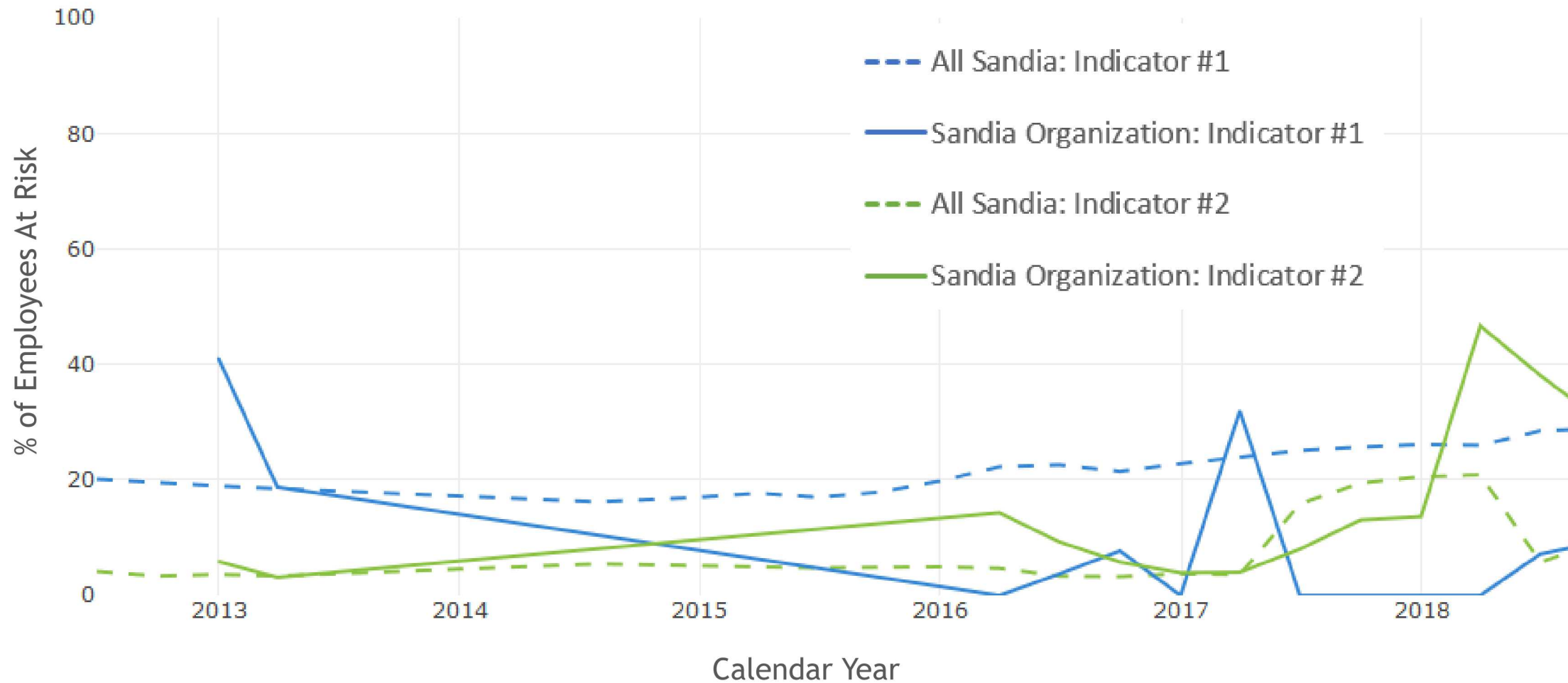
ASSURE for Safety

130+ Potential Predictors

Model Development

Predictive Model

Safety Experts

Data Scientists and Safety Experts

Users

ASSURE for Safety

Model runs in production at the end of each quarter.
Historical quarterly results are available for more than four years.

Example results showing one predictive indicator for one selected Sandia organization

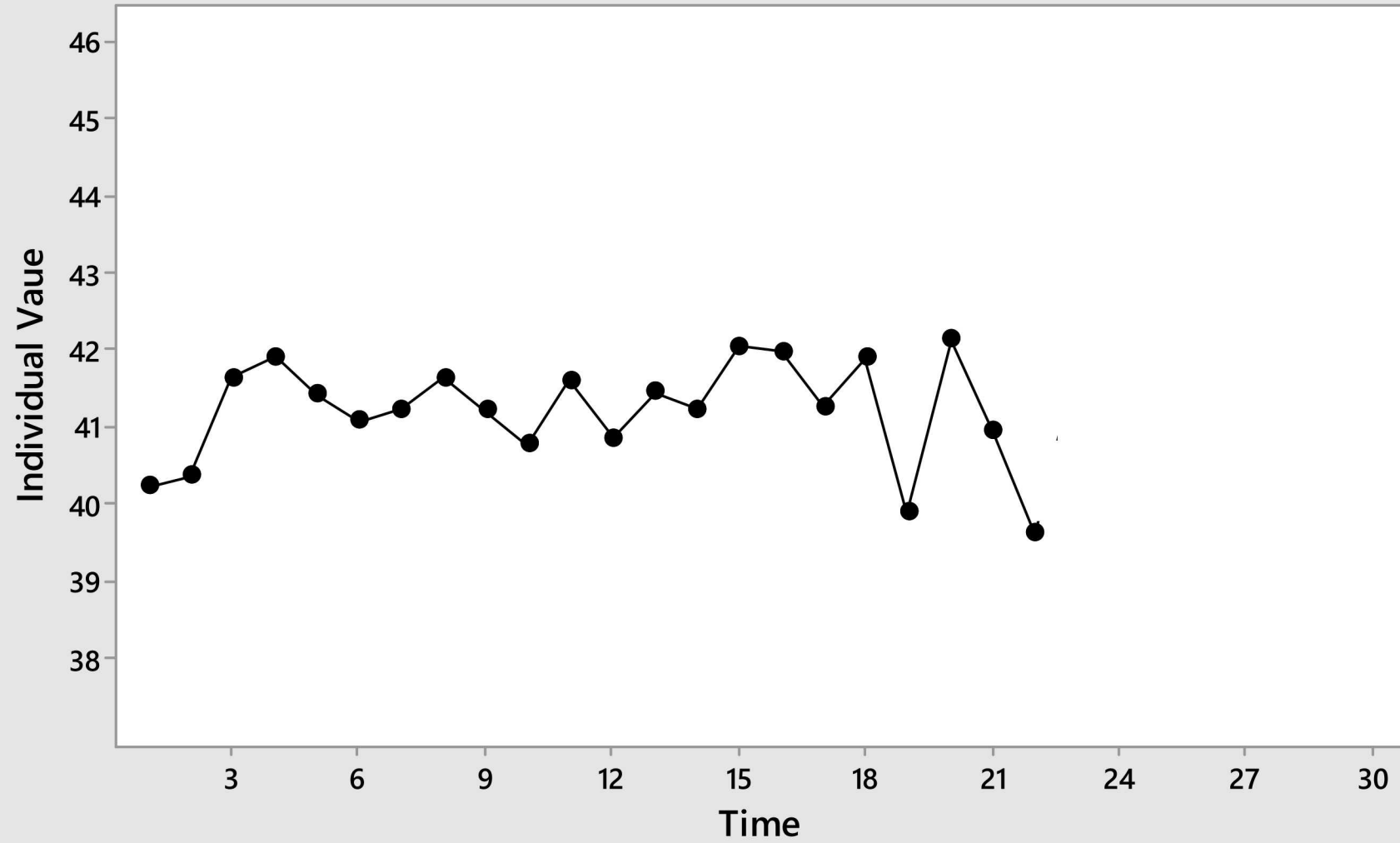# ASSURE for Safety

Cross-Organizational Partnership

- **CAS data scientists provide predictive modeling capabilities.**

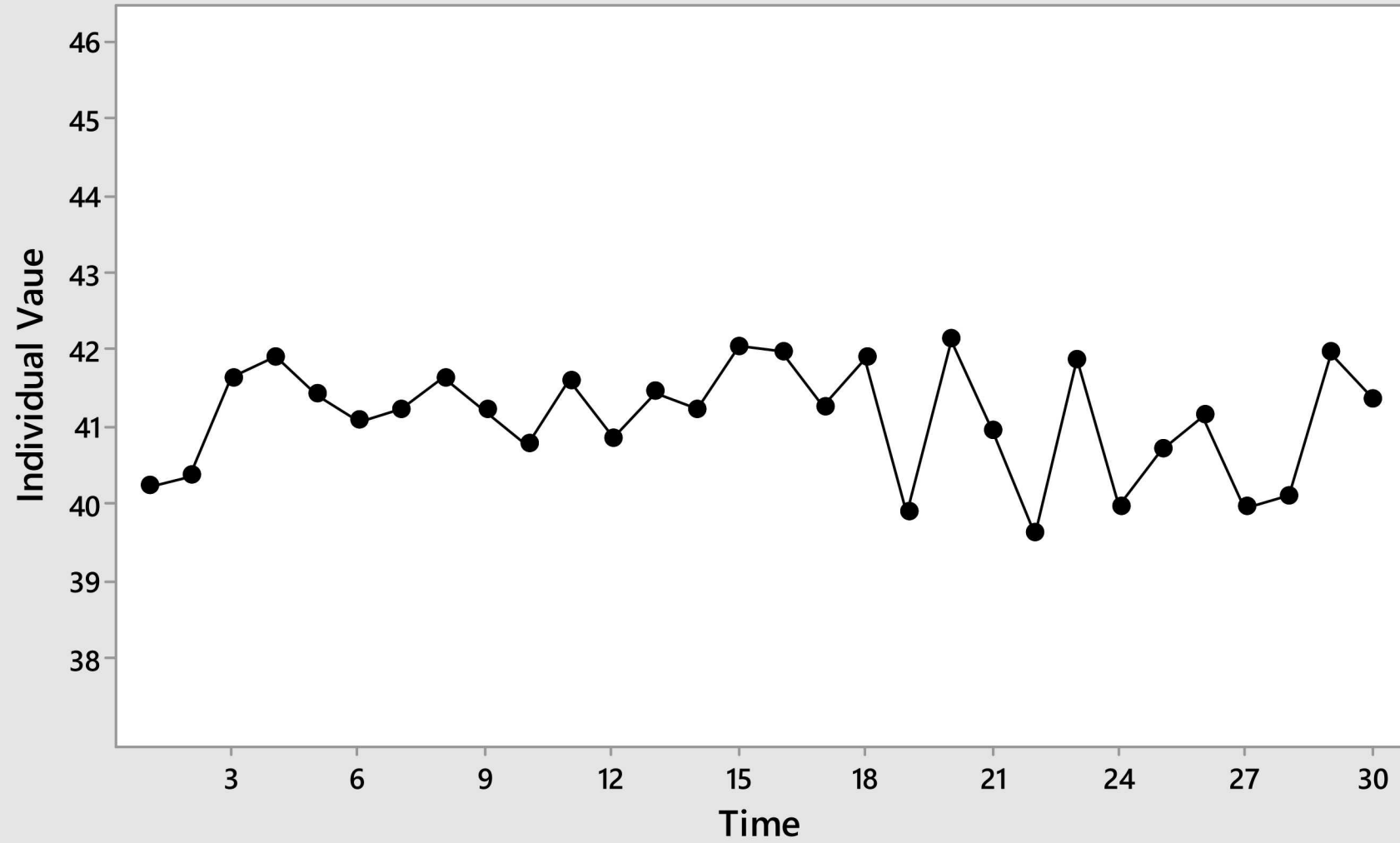 Example: ASSURE* for Safety (a behavioral predictive model)

- **CAS statisticians and analysts provide statistical rigor for objectively assessing safety performance.**

  Example: Control Charts

*Assurance Safety Software for Uncovering Risks to Evaluate

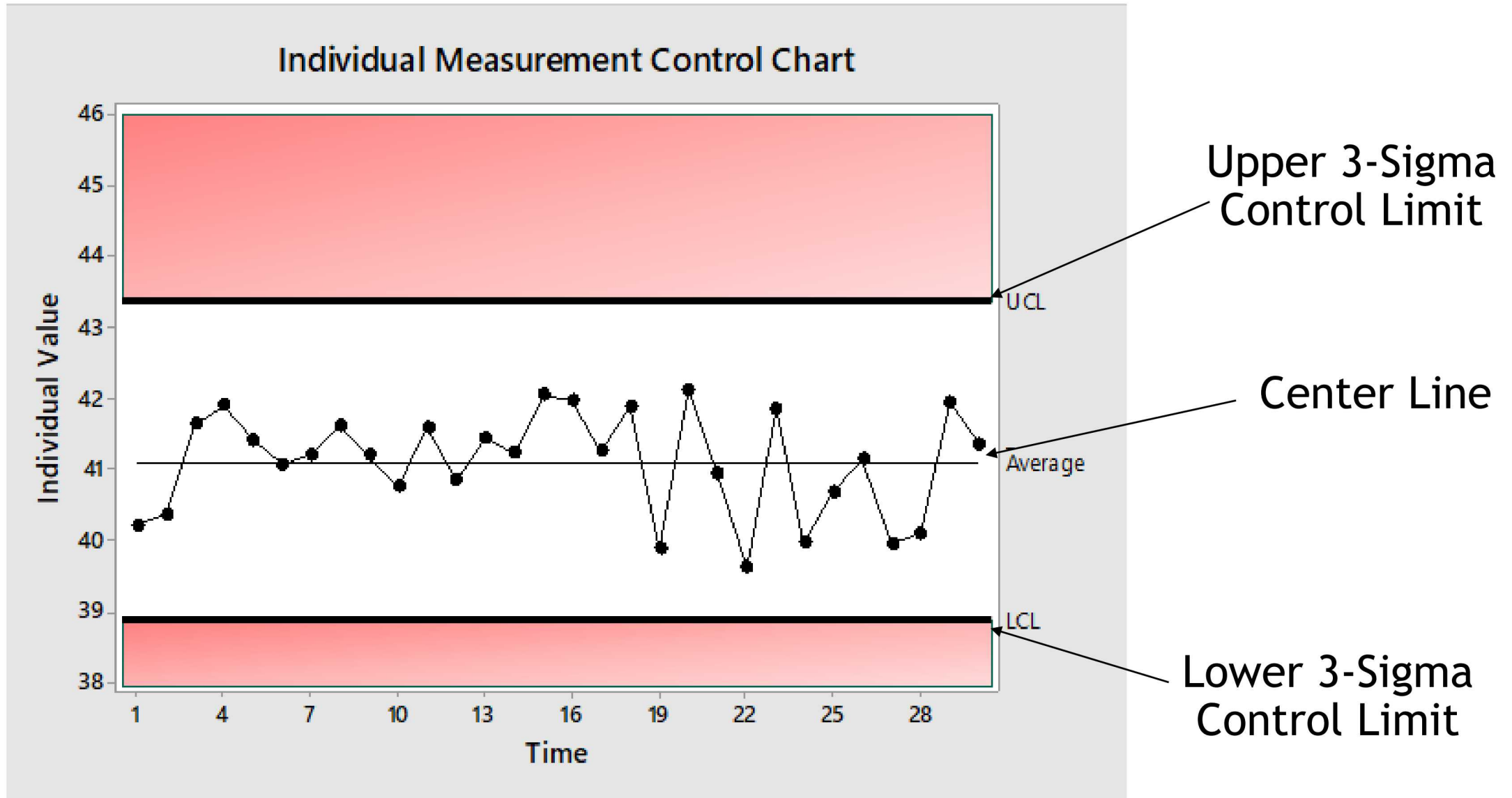Indicator Time Plot

Indicator Time Plot

Why Use Control Charts?

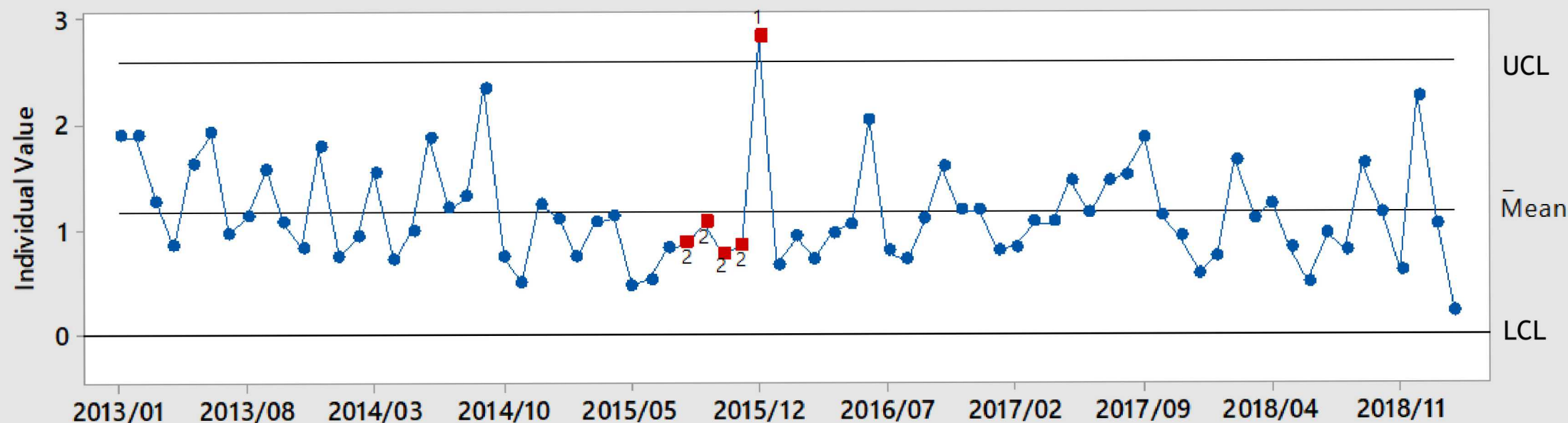We can subjectively assess performance by observing month-to-month changes for a lagging indicator.

But … are the changes we see significant (meaningful)?

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Lagging Indicator	1.16	0.71	2.19	1.04	0.35	0.64
Above/Below Target	above	below	above	above	below	below
Direction Change		decrease	increase	decrease	decrease	increase
Year-to-Date Average	1.16	0.94	1.35	1.28	1.09	1.02
Year-to-Date Change		decrease	increase	decrease	decrease	decrease

Control Charts

Individual Measurement Control Chart

Upper 3-Sigma Control Limit

Center Line

Lower 3-Sigma Control Limit

Control Charts

Lower values are better ↓

Control Charts

Individual Measurement Control Chart
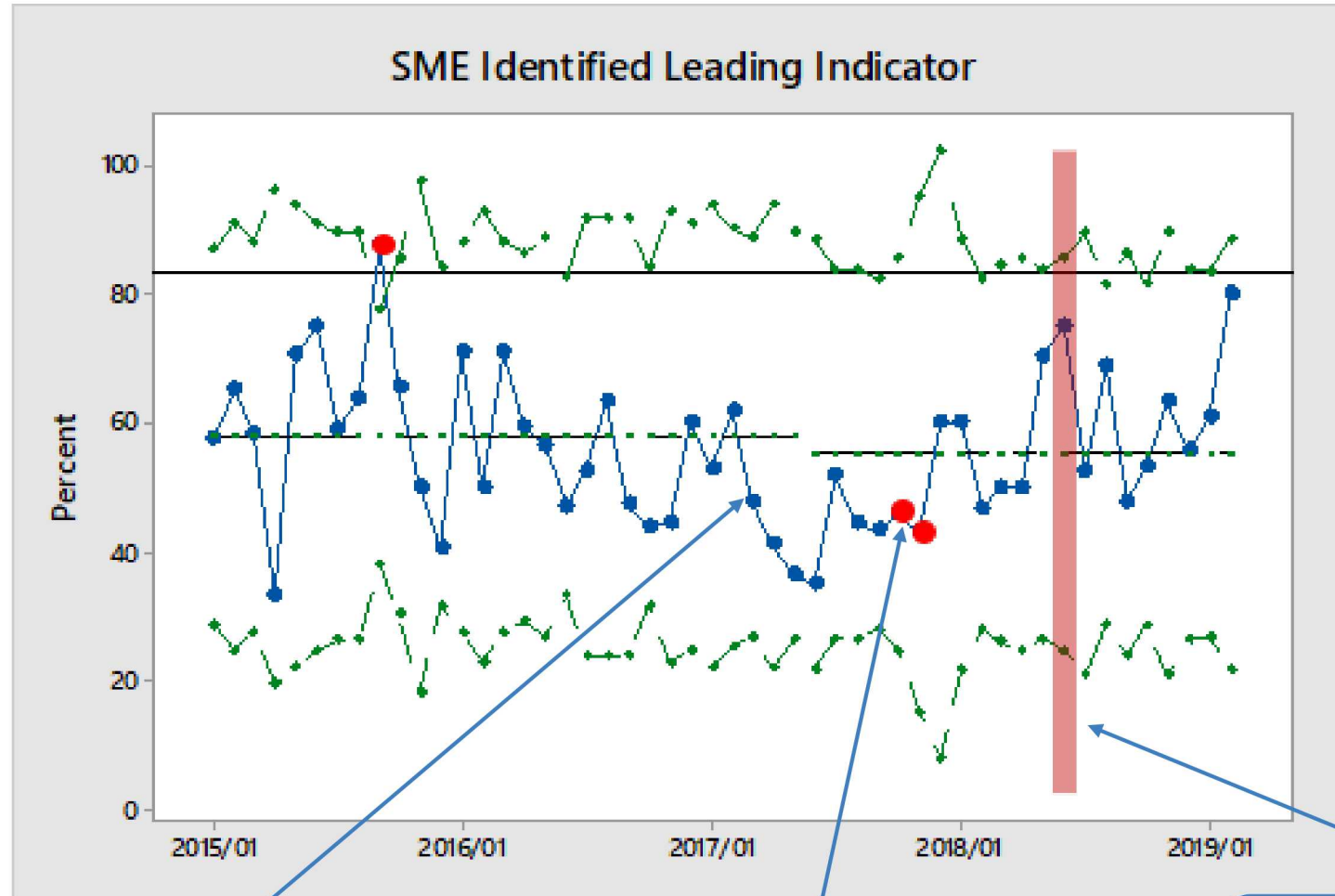
Lower values are better

Target Line

In June 2018, a member of the workforce at Sandia National Laboratories experienced an electrical shock while working on equipment.

Control Charts

Sandia safety experts identified a leading indicator.

Low values indicate trouble might be brewing.

Higher values are better.

SME Identified Leading Indicator

Values appear to progressively decline early in 2017.

Runs rule is violated twice. Performance is significantly low.

Electrical shock occurs.
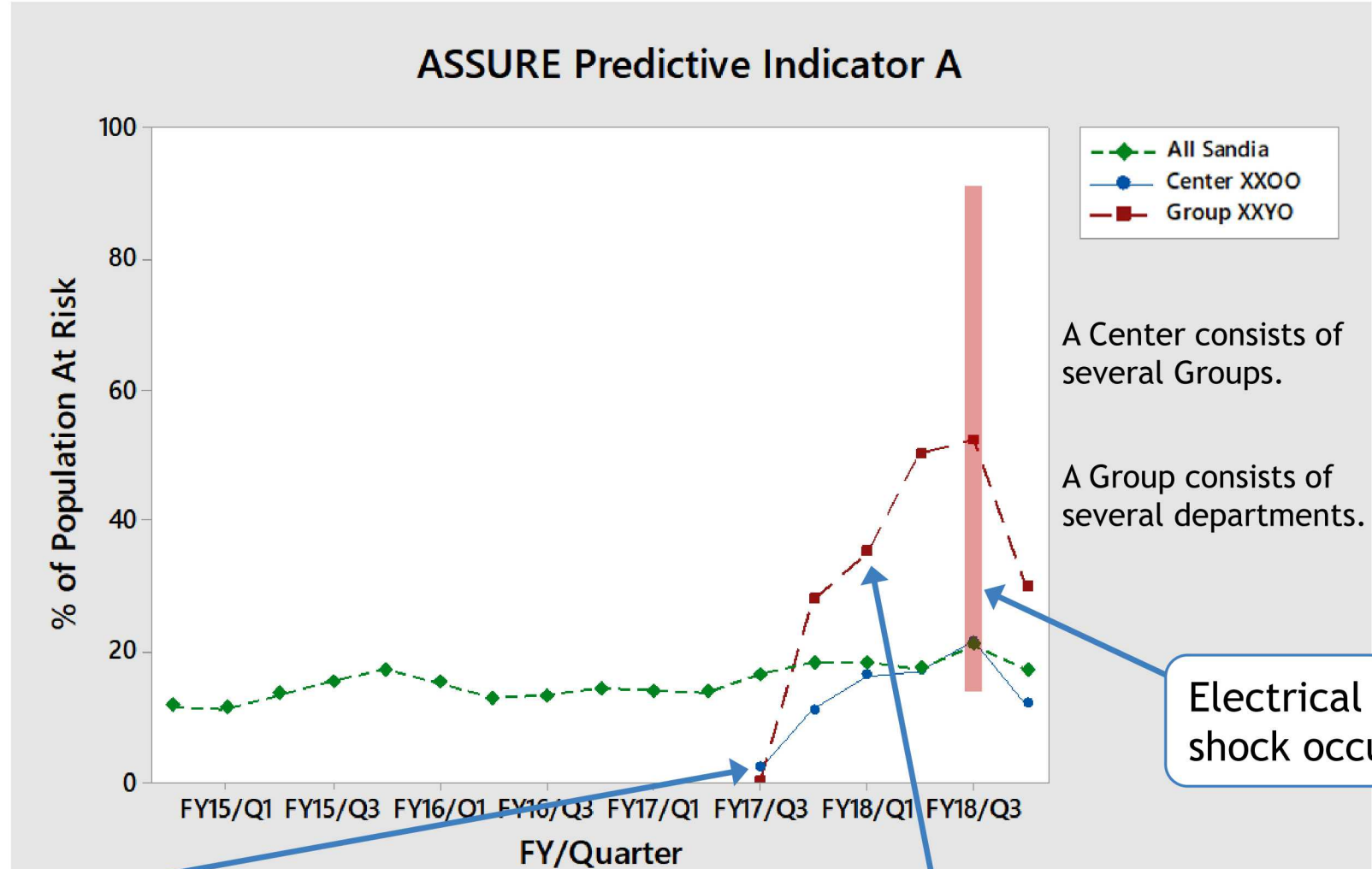
ASSURE: Predictive Indicator A

Populations

All Sandia: ≈ 13,000

Center XX00: ≈ 450

Group XXY0: ≈ 75

ASSURE Predictive Indicator A

Legend: All Sandia, Center XXOO, Group XXYO

A Center consists of several Groups.

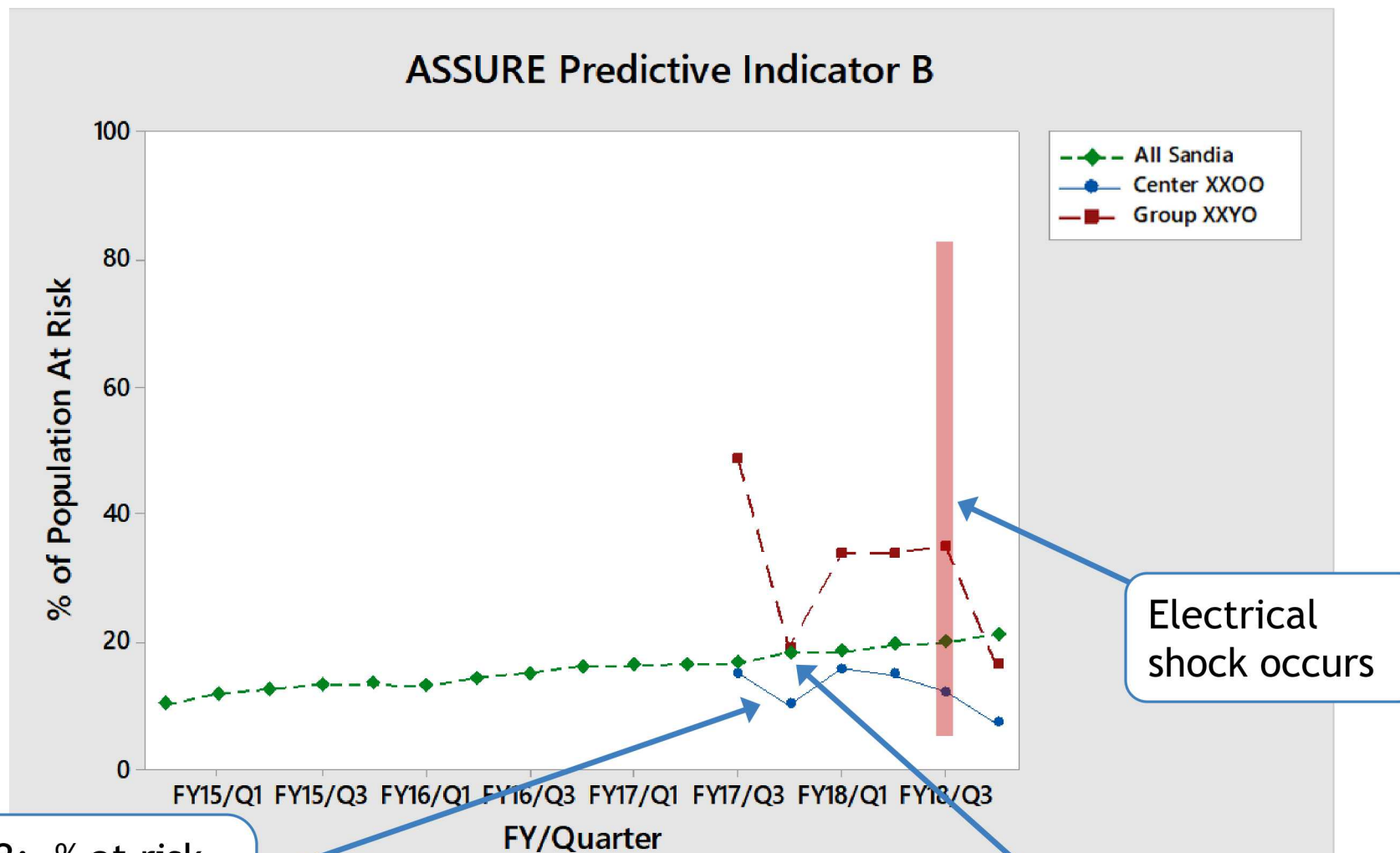A Group consists of several departments.

Electrical shock occurs

FY17/Q3: % at risk in both Center and Group are well below the levels for all of Sandia

FY17/Q4 – FY18/Q3: % at risk in Group exceeds that of the Center *and* Sandia

ASSURE: Predictive Indicator B

ASSURE Predictive Indicator B

Electrical shock occurs

FY17/Q3 – FY18/Q3: % at risk in Center is consistently below the levels for all of Sandia

FY17/Q4: % at risk in Group drops but otherwise is at a level much higher than that of the Center *and* Sandia

In June 2018, a member of the workforce at Sandia National Laboratories experienced an electrical shock while working on equipment.

Prior to this incident

- Changes in a leading indicator showed possible safety concerns for Sandia as a whole.
- Through ASSURE, multiple predictive indicators showed increased risk for Group XXY0 in the quarters leading up to the incident.

Evaluating Safety from Risk to Solution: Using Cross-Organizational Partnerships to Drive Greater Understanding and Improvement

Our journey is just beginning. Vision for the future…

- Continue to nurture our partnership with ES&H
- Further develop leading indicators and predictive modeling to better identify at-risk populations.
- Determine how to effectively monitor the data.
- Improve processes to identify and execute effective mitigations to reduce risk and help our workers stay safe.
- Continue the partnership between Contractor Assurance and safety SMEs.

　　　　- Inform　　　- Anticipate　　　- Be proactive　　　- Prevent

Questions