

# Charts and Tools for Managing with Paradata

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## The Intersection of Technology and Culture

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U.S. Census Bureau

Paradata Workshop  
Institute for Employment Research  
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# Acknowledgments

- Barbara O'Hare, Cathy Buffington, Tammy Adams, Chandra Erdman, Ben Duffey

# Operational Efficiency at Census

- 2010 Initiative for Operational Efficiency
- **Purpose:** To analyze **historical survey process data** and develop **quantitative survey monitoring tools** that could be used in a field test of a **paradata application** in a demographic survey to **manage survey cost and quality**

# Using Paradata Charts

- The charts themselves
  - What *key performance indicators* (KPIs)?
  - What kinds of charts?
  - Design guidance

# Using Paradata Charts

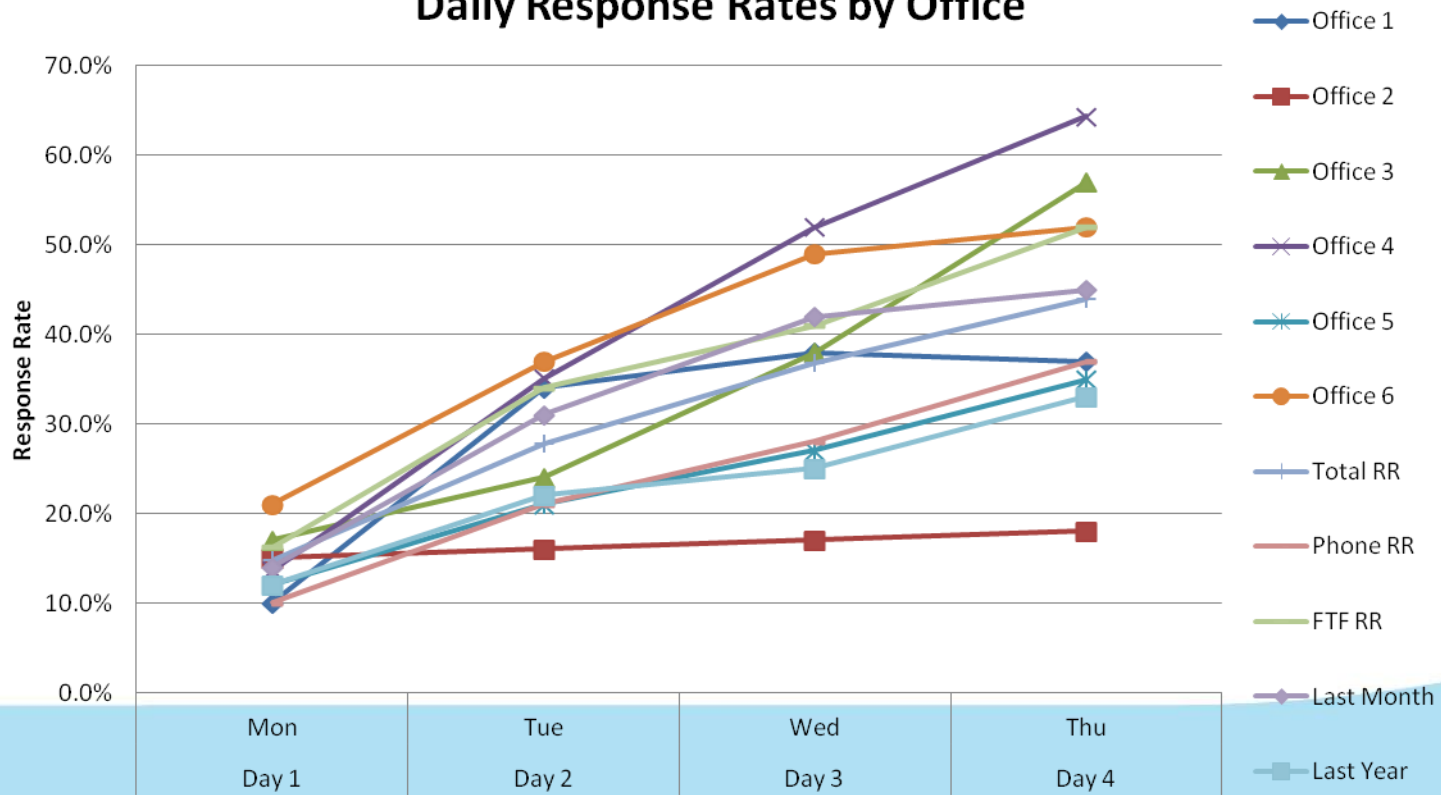
- The environment in which they're used
  - How do they help achieve management goals?
  - How are trends interpreted?
  - How are changes identified and interpreted?

# What is a chart...

- A ***visual message*** about some phenomenon of interest
  - e.g., Change in a KPI over time, or variability in that KPI
- A ***tool*** for taking some ***action***
  - i.e., an alert system

Daily Status Report Response Rate					Previous Waves	
Day -->	Day 1	Day 2	Day 3	Day 4	Last Month End	Last Year End
Office	Mon	Tue	Wed	Thu	Apr-10	May-09
1	10.0%	34.0%	38.0%	37.0%	55.0%	53.0%
2	15.0%	16.0%	17.0%	18.0%	39.0%	31.0%
3	17.0%	24.0%	38.0%	57.0%	64.2%	58.0%
4	13.6%	35.1%	52.0%	64.3%	73.0%	64.4%
5	12.0%	21.0%	27.0%	35.0%	47.0%	42.0%
6	21.0%	37.0%	49.0%	52.0%	59.0%	49.0%
Total	14.8%	27.9%	36.8%	43.9%	56.2%	49.6%
Phone RR	10.0%	21.0%	28.0%	37.0%	53.0%	46.0%
FTF RR	16.2%	34.0%	41.0%	52.0%	59.0%	51.0%
Last Month	14.0%	31.0%	42.0%	45.0%		
Last Year	12.0%	22.0%	25.0%	33.0%		

Daily Response Rates by Office



# Designing Charts

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- Chart goal and content
- Choosing KPIs
  - An explicit design phase
  - Easy to overlook



# Key Performance Indicators

- Reflect management priorities
- Logically or empirically linked to ideals like data quality, sample representativeness, and costs
- Difficulties in large and small organizations

# Key Performance Indicators

- Examples of Survey KPI Families
  - Interviewer productivity
  - Sample representativeness
  - Costs and cost proxies

# Interviewer Productivity

- Interviewer-level response rate
- Estimated response propensity for an interviewer's workload

# Sample Representativeness

- Response rate
  - Overall
  - For key demographic subgroup
- R-indices

# Costs

- Final official costs
- Cost proxies predicting actual costs
  - Miles travelled, Miles/Interview, Miles/Attempt
  - Hours billed, Hours/Interviewer, Hours/Attempt
  - Dials (in phone mode)
- Operationalizing cost as function of key production steps, not just final costs

# Building Charts

“...the summary should not mislead the user into taking any action that the user would not take if the data were presented in a time series”

-Walter A. Shewhart

# Trend Identification

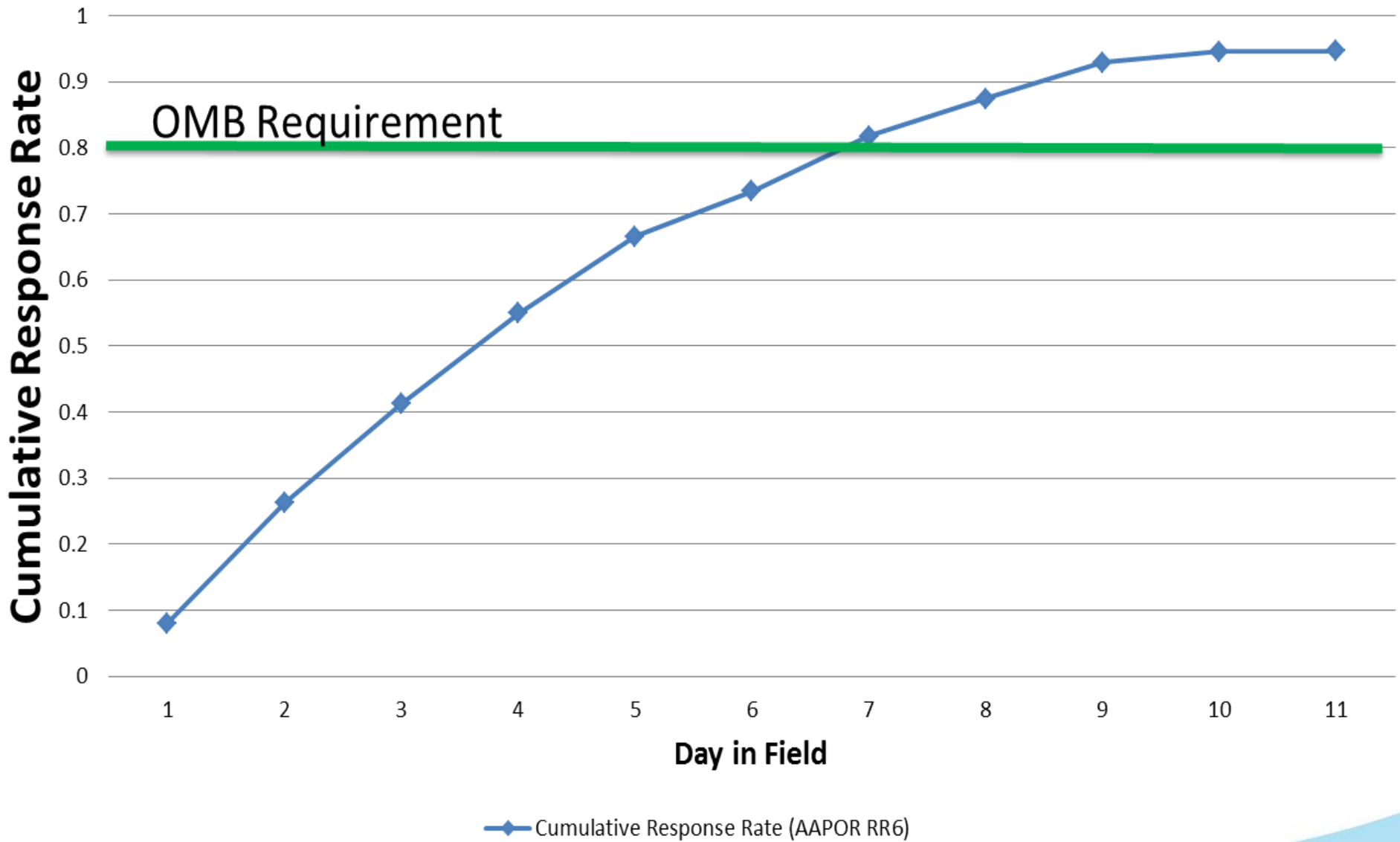
- Plot a KPI over some meaningful time period
  - Day in the field periods (1 to n)
  - Weeks or months in the data collection year
  - Number of contact attempts

# Benchmarking

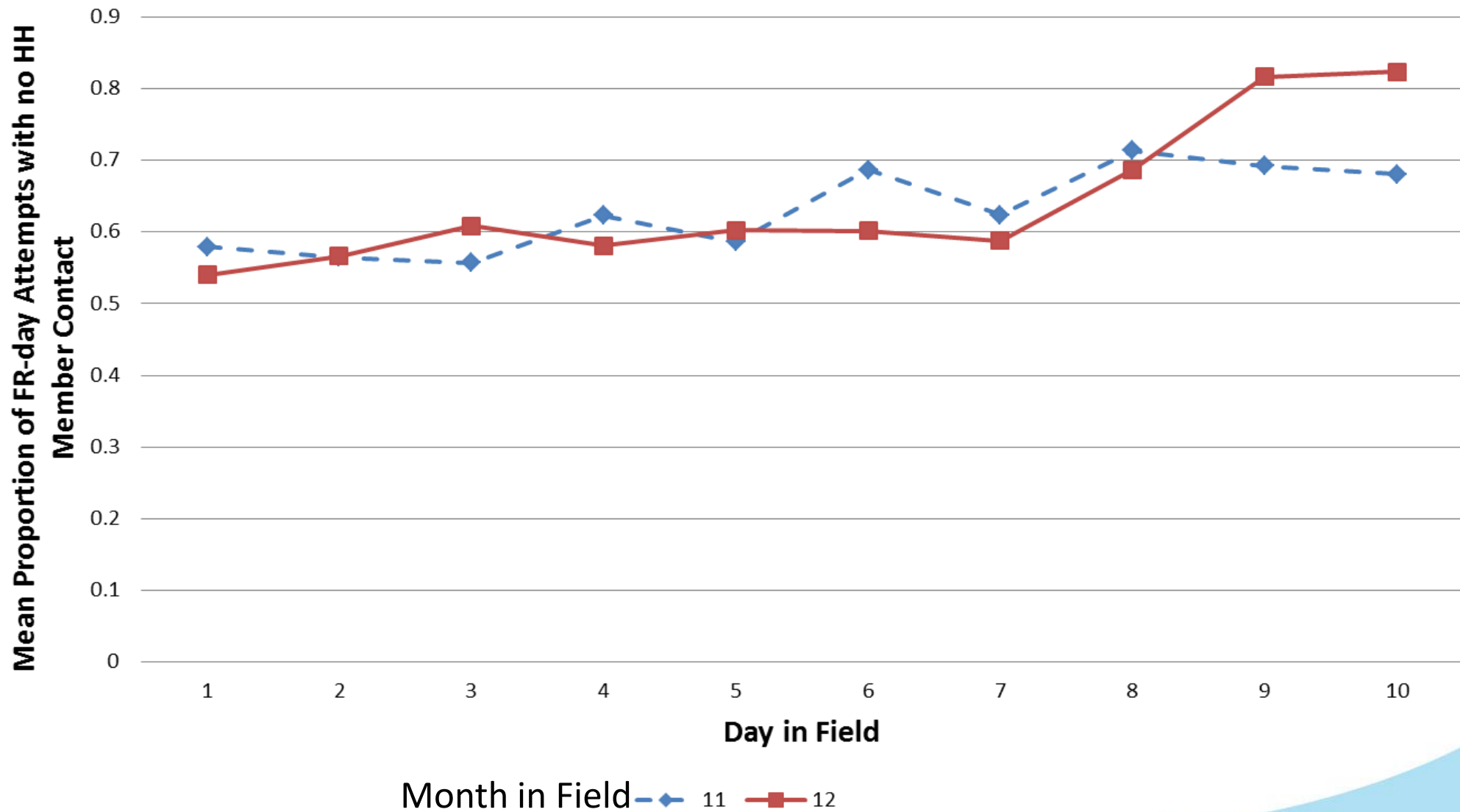
- Arbitrary v. Process-based
  - Similar to voice-of-customer and voice-of-process (Scherkenback, 1986)
- Which process?
  - Last month same survey?
  - Same month last year?
  - Overall survey history?
  - Other survey?
  - Last time we had same design, rider, etc.?



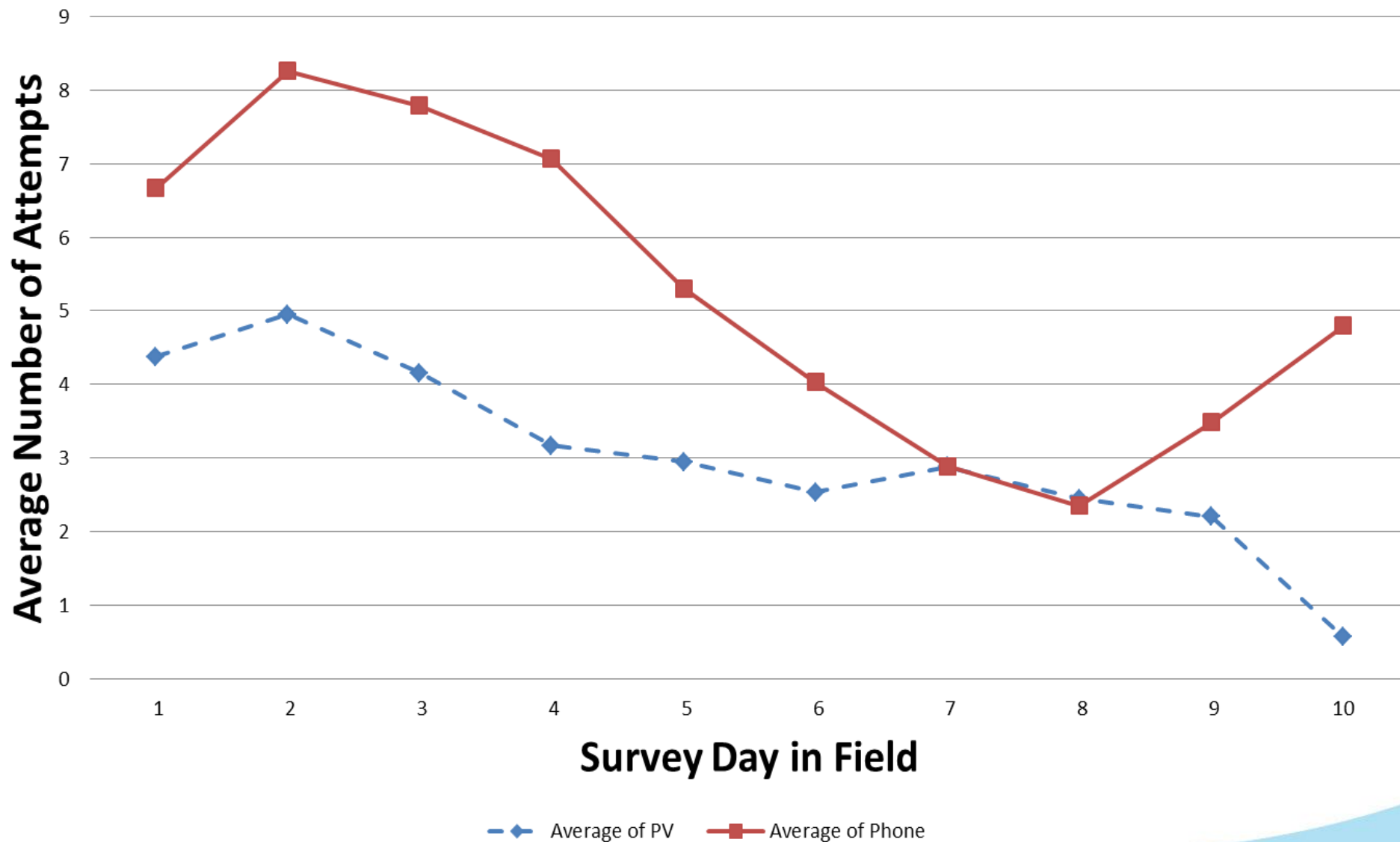
# Cumulative Response Rate (AAPOR RR6) RO D, January



## Mean Proportion of Contact Attempts Resulting in Noncontact RO F, November and December



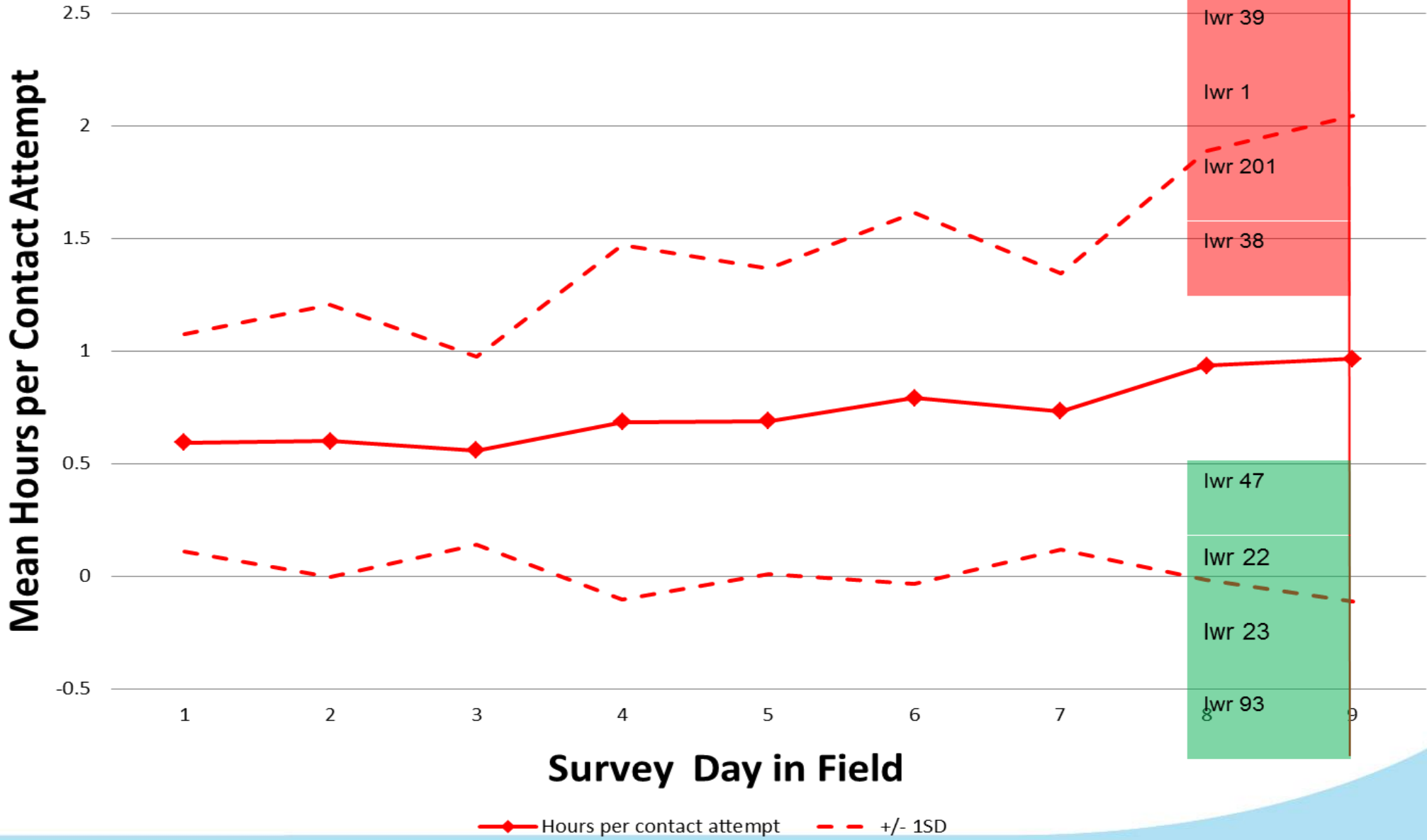
## Average Number of Contact Attempts by Mode of Attempt RO A, Nov 2011



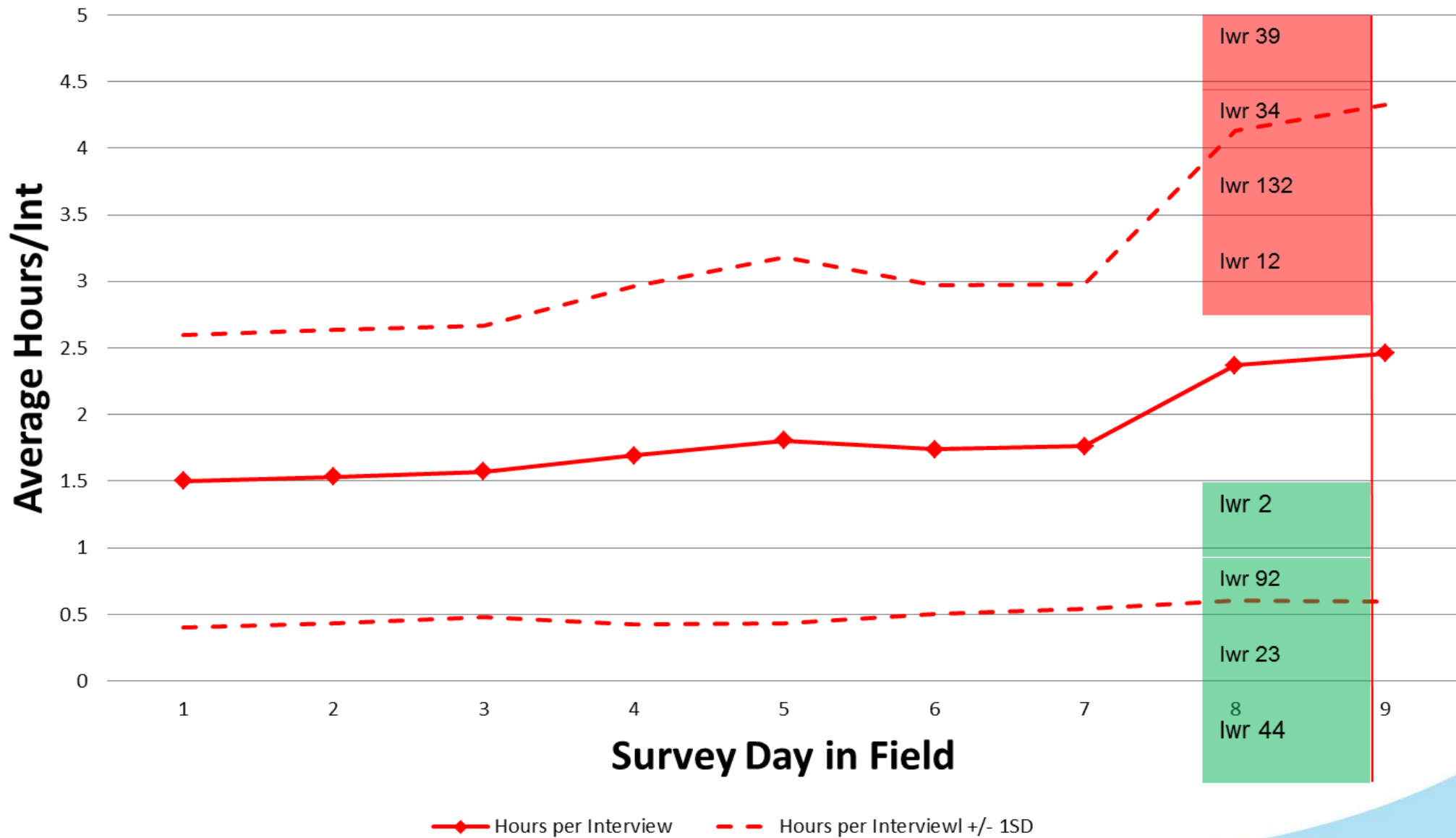
# Variability and Units of Interest

- Variability
  - Range, standard deviation, quartiles
- Identifying extreme values and outliers
  - Ends of the distribution
  - Data points separated from the data mass

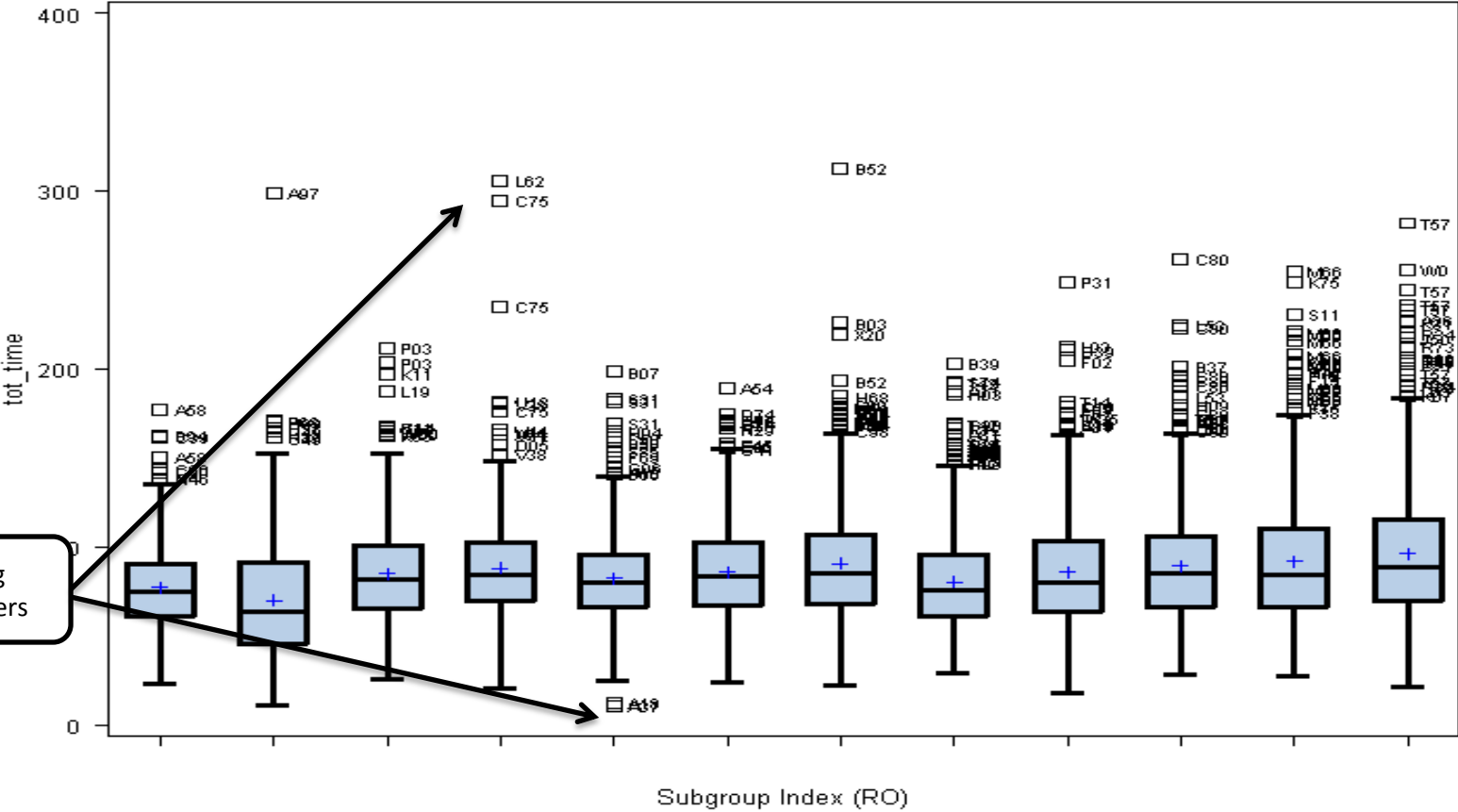
# Mean Hours per Contact Attempt RO A, November



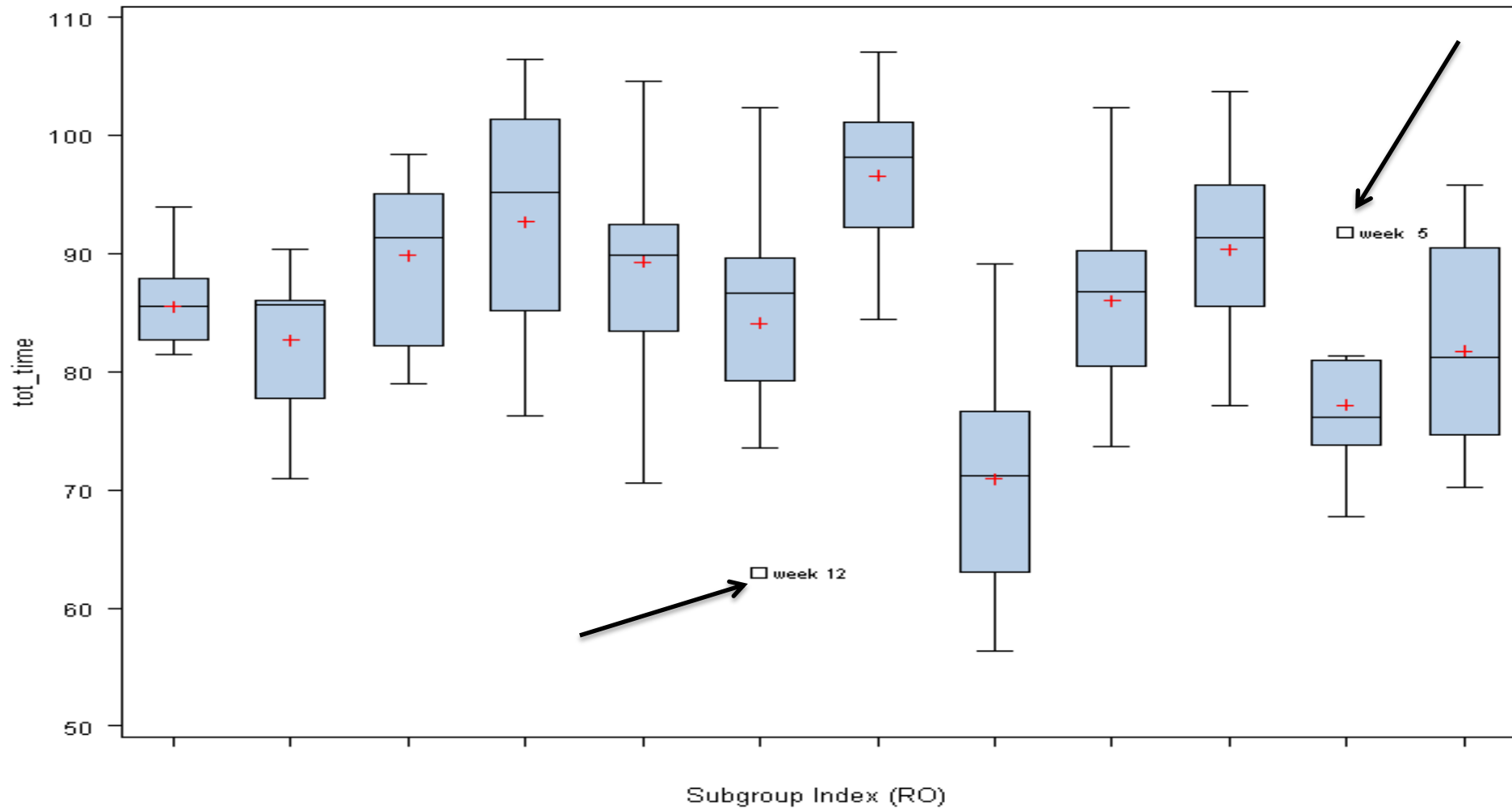
## Average (by Day in Field) of Hours/Interview RO A, November



# Shewhart Boxplots of Case-Level Times by Region



# Shewhart boxplotting of Weekly Timing Averages by Region

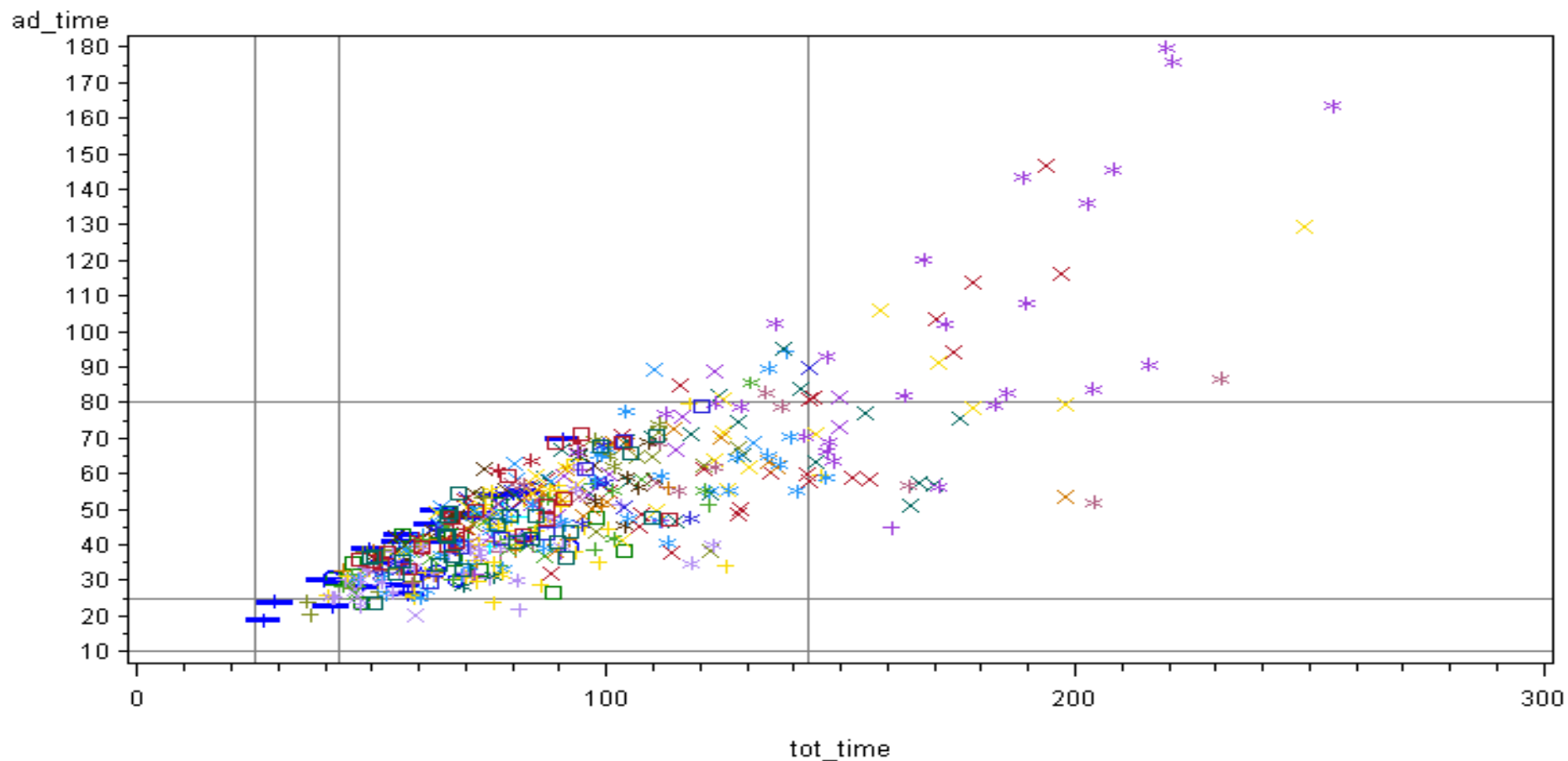


Subgroup Sizes: Min n = 10 Max n = 11



# Scatter Plot of Adult Interview times by Total Interview times

RO F



# Visual Display and Design

- Choice of a chart
  - Depends on the phenomenon of interest
- Data-to-ink ratio
  - More data (e.g., information) for less ink
- White space
  - Embrace it; Keep charts clean
- Gestalt principals of form and placement
  - To highlight key phenomenon in the chart

# Charts Must be Actionable

- Given a management goal, a user can look at the chart and take action
- The chart design points to the potential problem and next step
- ***Actionable within a context...***
- The environment in which they are used

# The Culture of Implementation

- Technical challenges
  - Dispersed and nonintegrated systems
  - Strict chains of command and organizational structure
  - Absence of proper data for KPI's
- **Attitudinal and Behavioral challenges**

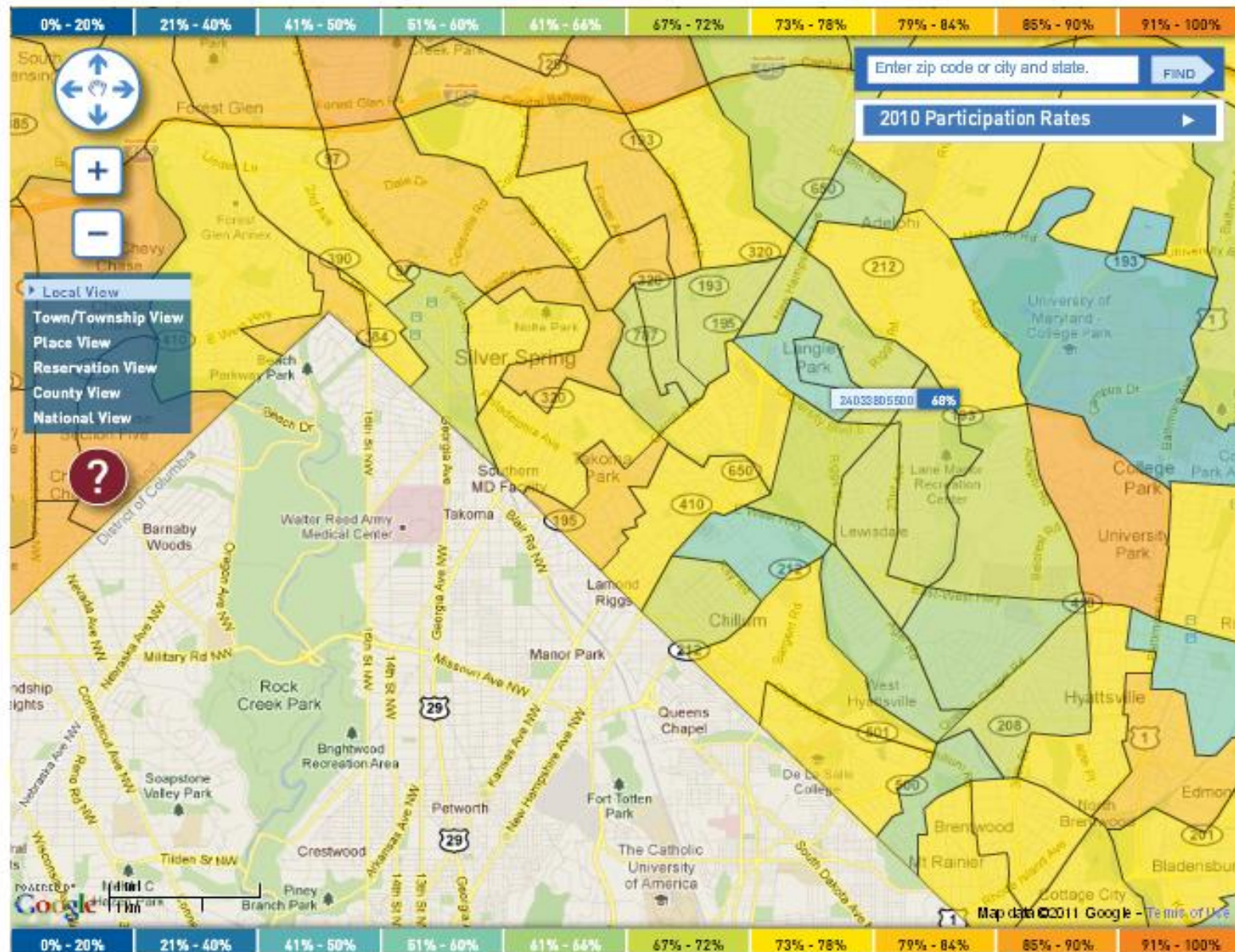
# Avenues for Innovation

- Advanced chart designs
  - Control charts and formal SPC
- Responsive Design
  - Charts to identify phase capacity
- Intuitive tools for managers
  - Customizable dashboards
  - Map-based Interfaces (see Yau, 2011 for some guidance)

## 2010 Census National Participation Rate: 74%

How This Map Works | Are You a Government or Tribal Official? - Download American Indian Reservations Overview [TXT]

Download a Rate Tracker Widget

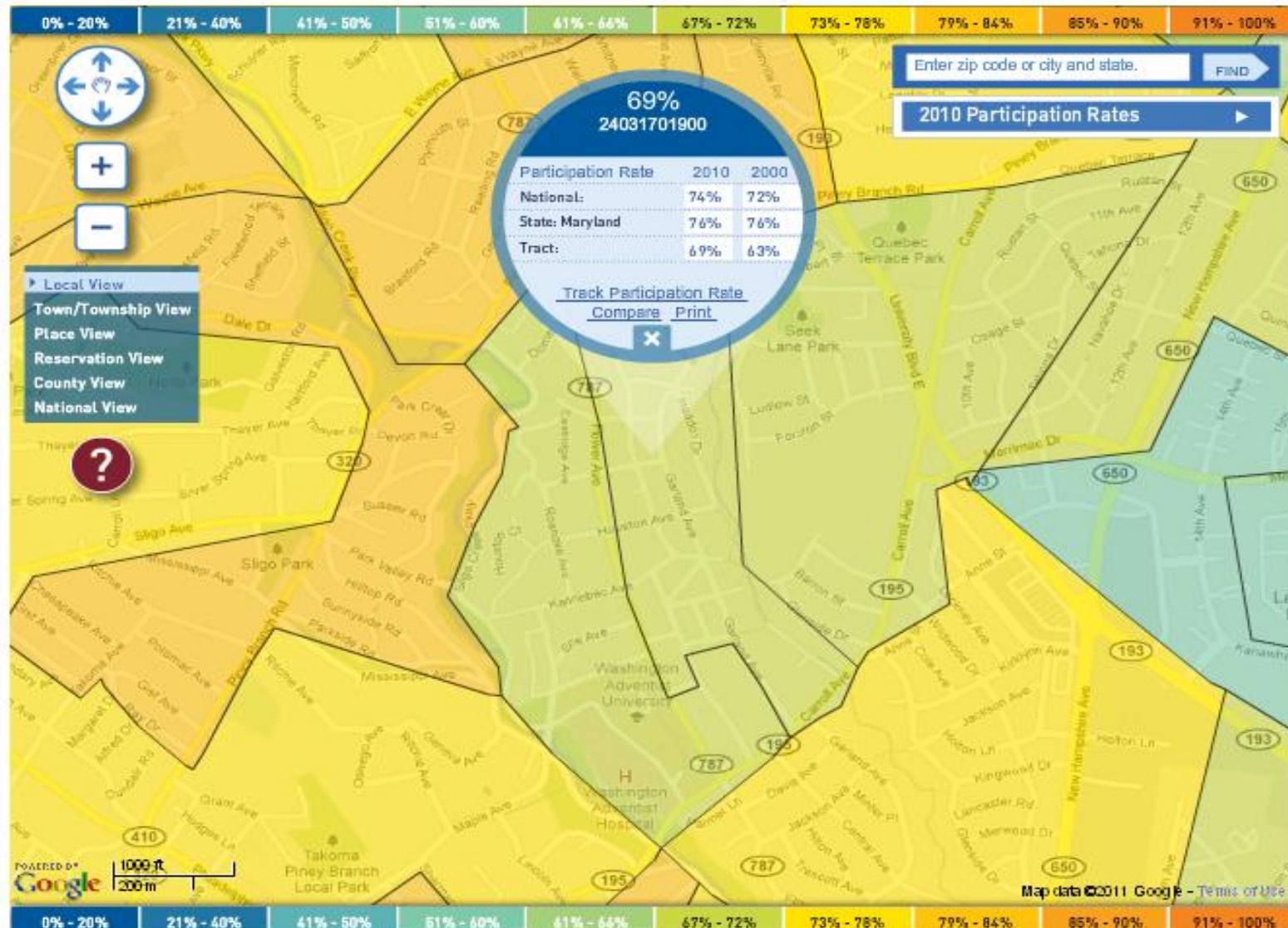


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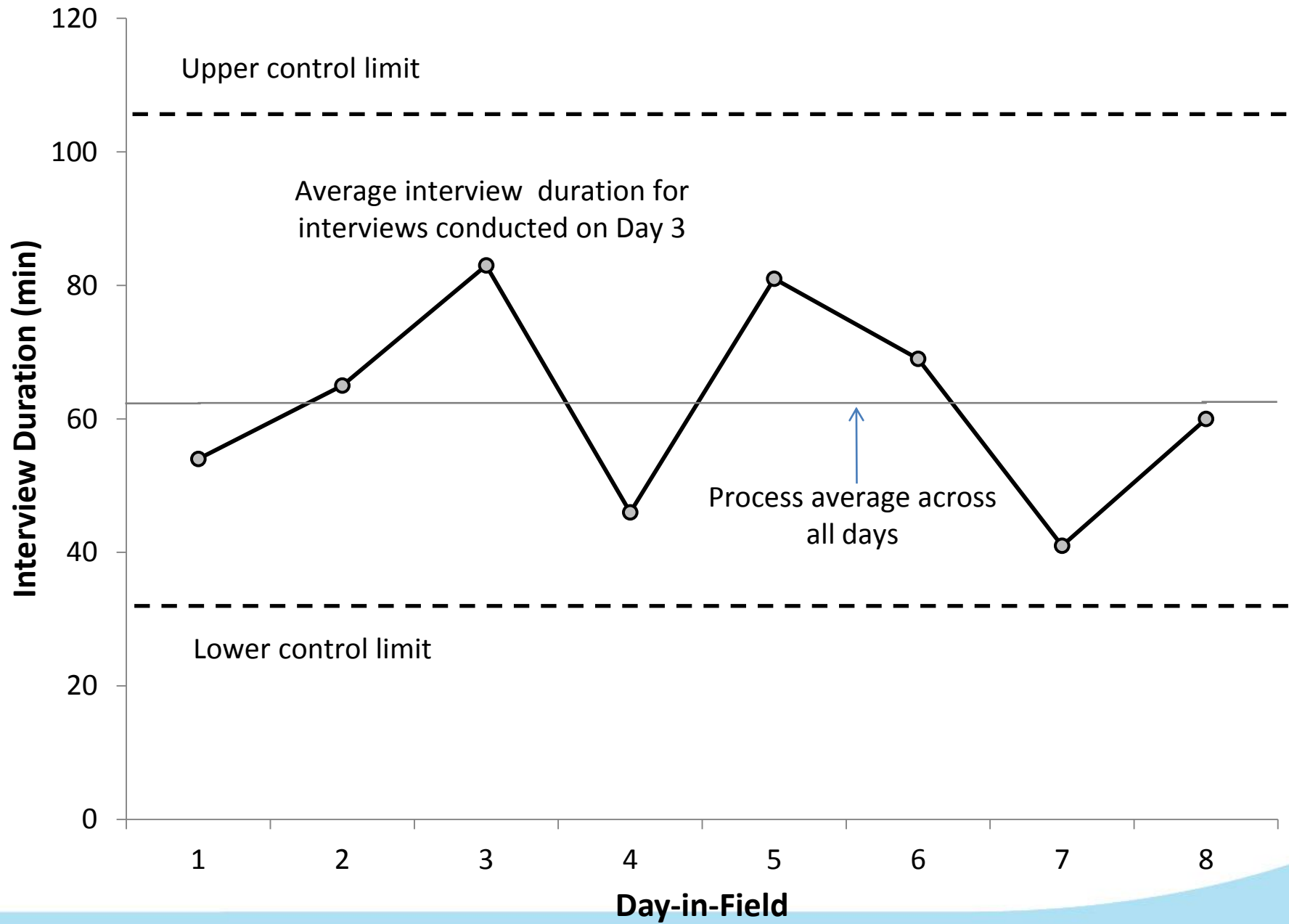


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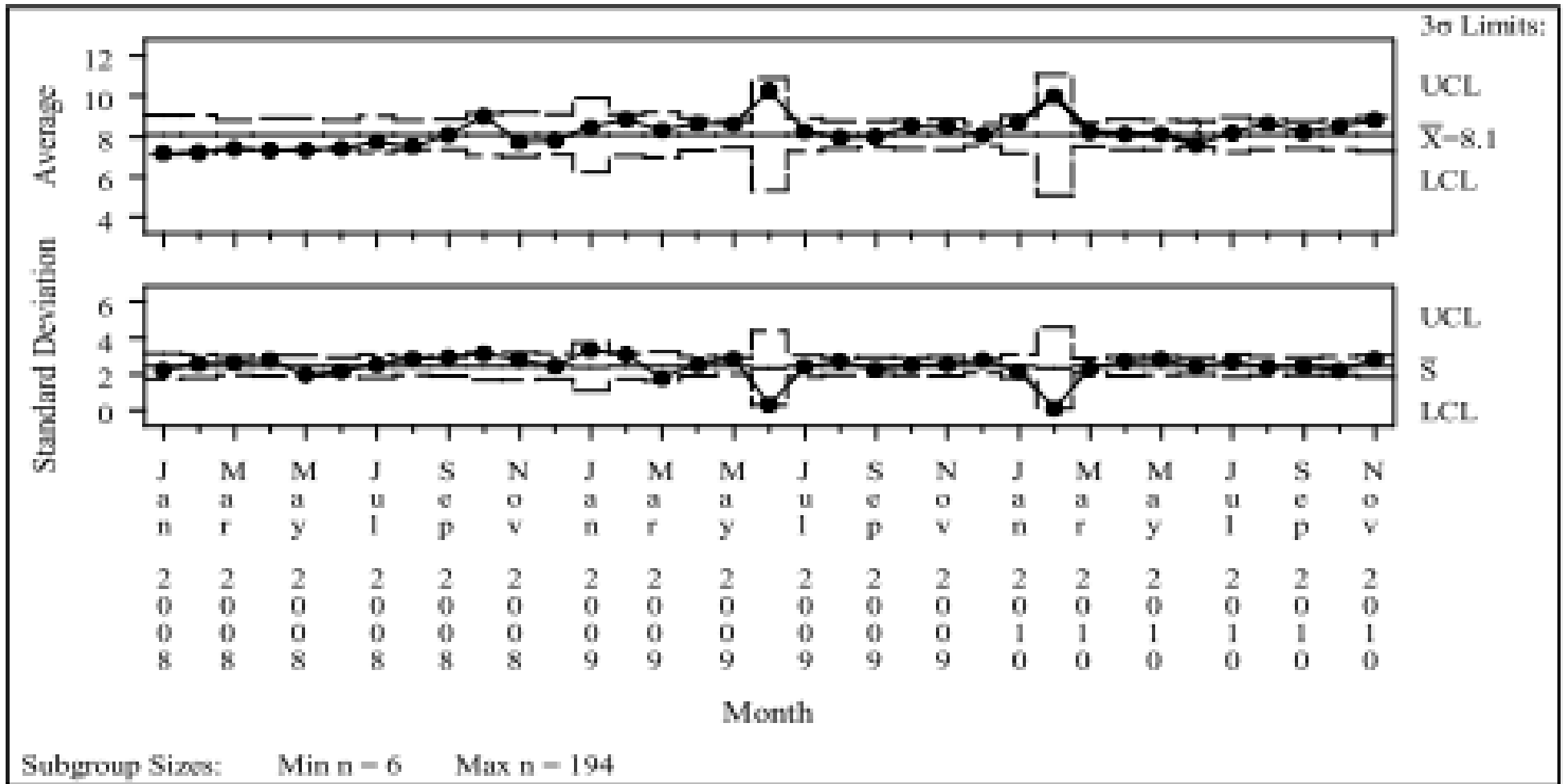
# Thank You

- [matthew.e.jans@census.gov](mailto:matthew.e.jans@census.gov)

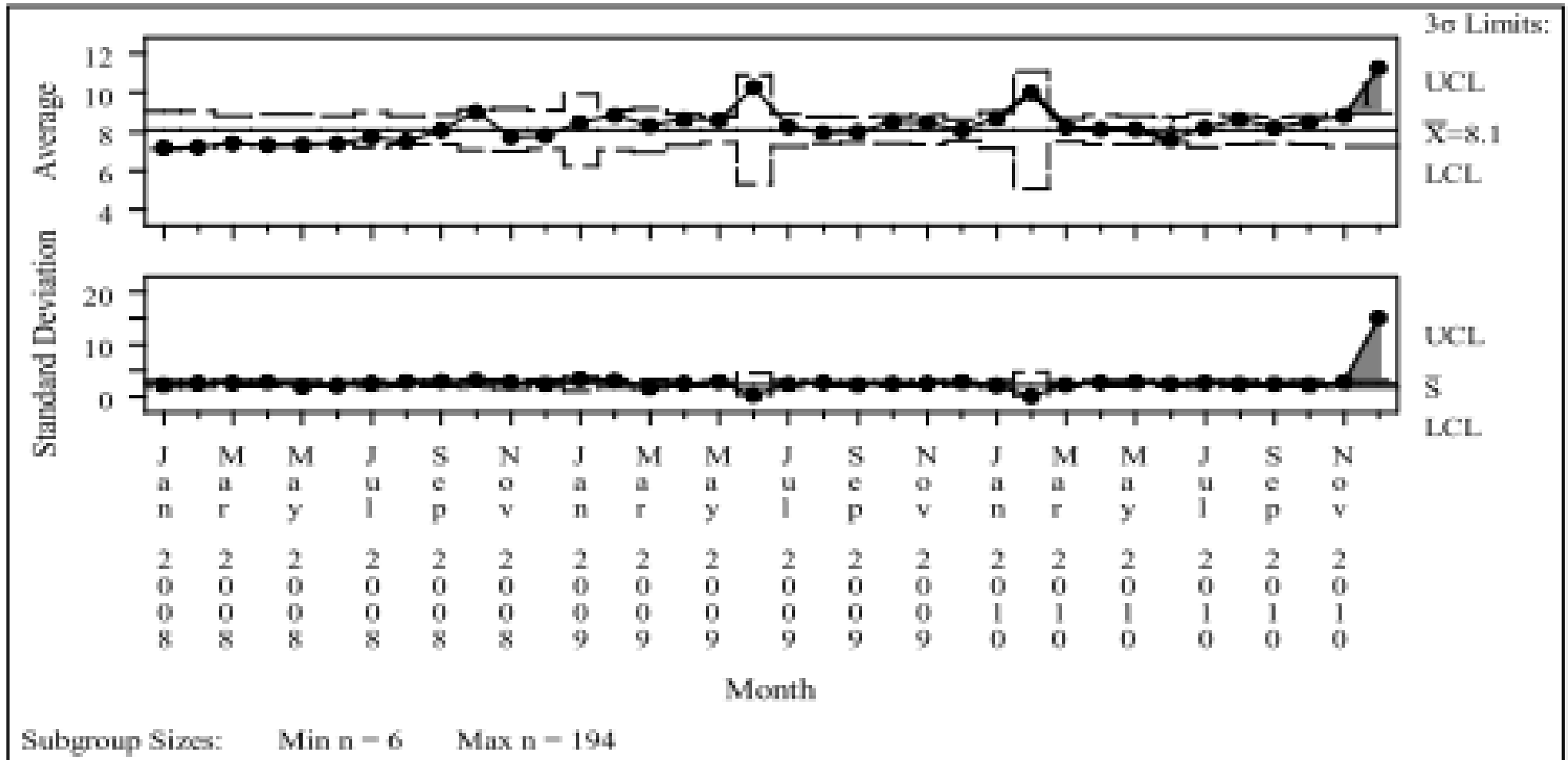




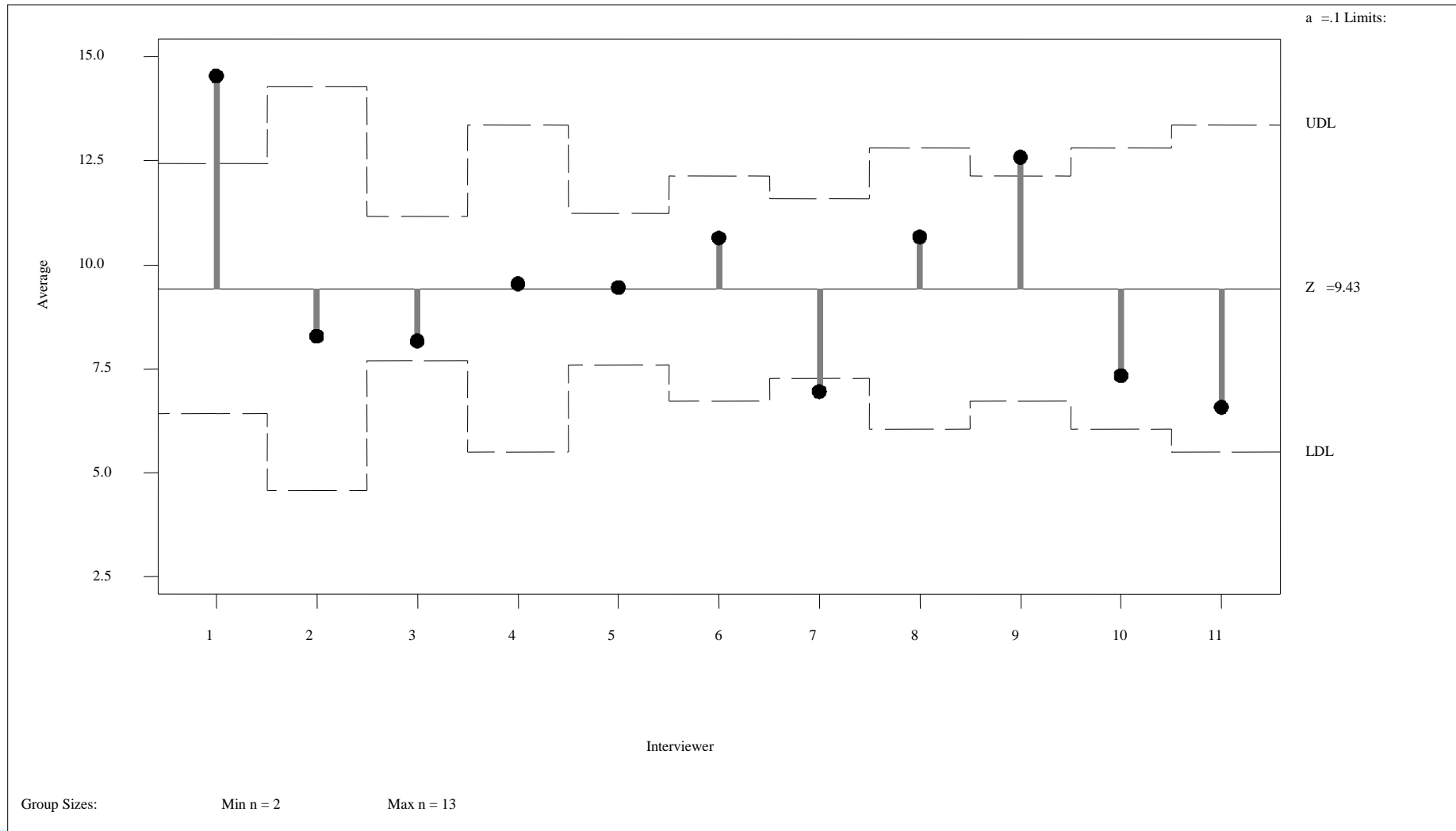
# Process is "In Control"



# December “Out of Control”



# Comparing Interviewers in “Out of Control” Point



# Historical Interviewer Performance

