

# Opioid abuse signal detection and response: 'Signals 101'

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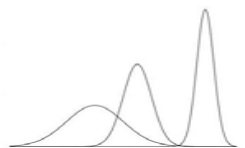
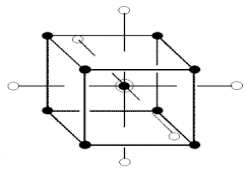
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# Outline

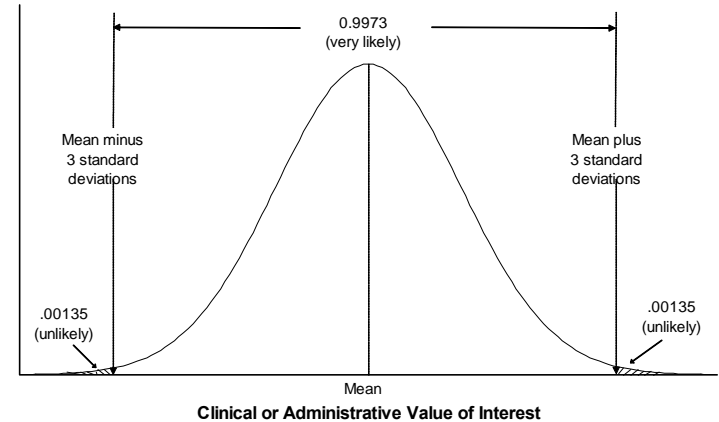
- **What we mean by a signal**
- Temporal and spatial surveillance
- Clear good system could be designed
- **Different types of signals**
- **What would be done in each case?**

# What is a signal?

Working definitions

A *probable* indication of:

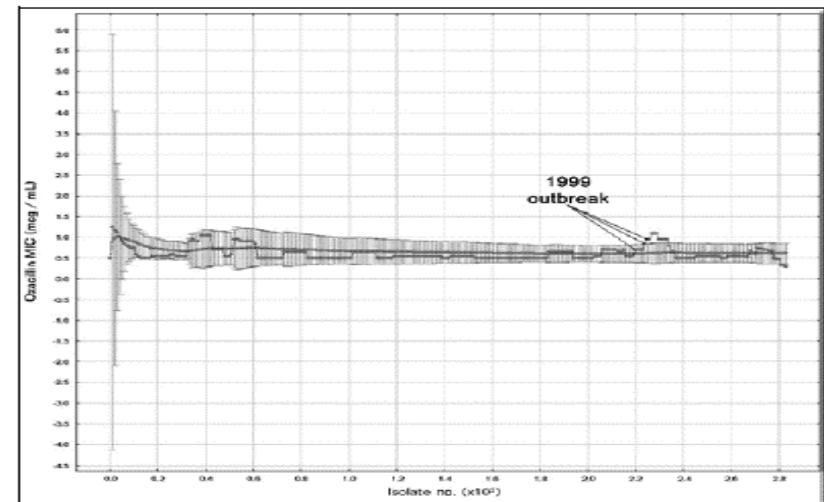
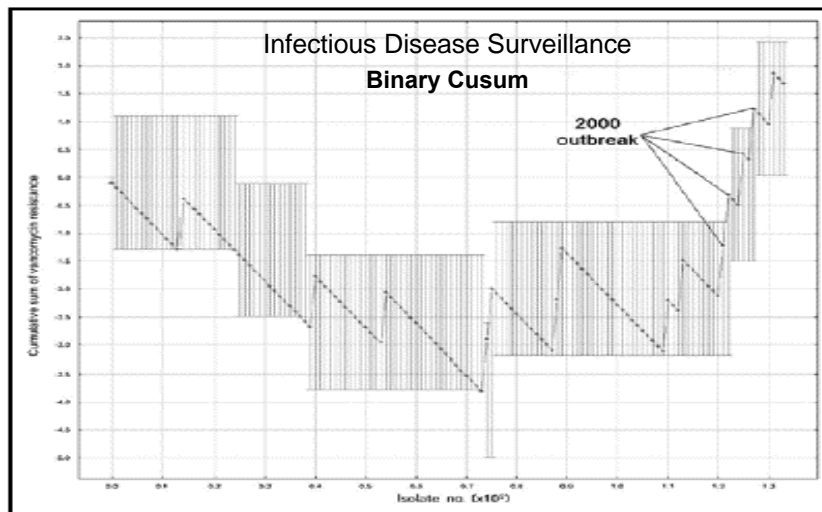
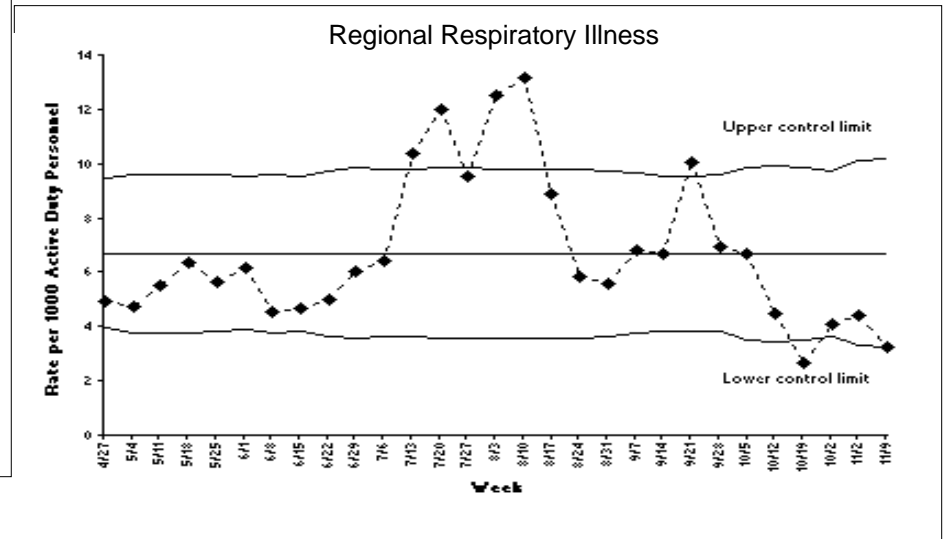
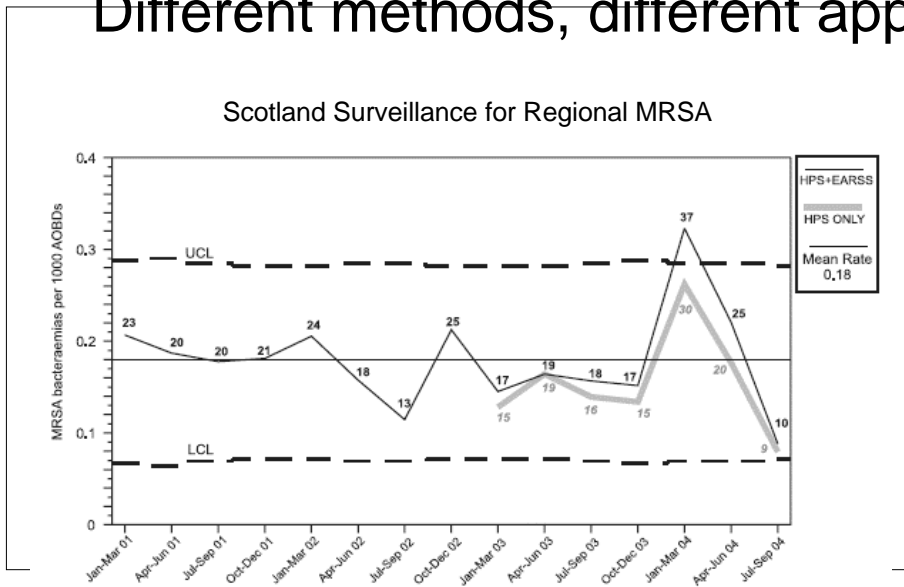
- Something bad
- Something unexpected
- Deviation(s) from baseline expectations or conceptual model of 'normal'
- Null hypothesis is not true
- A statistically significant event



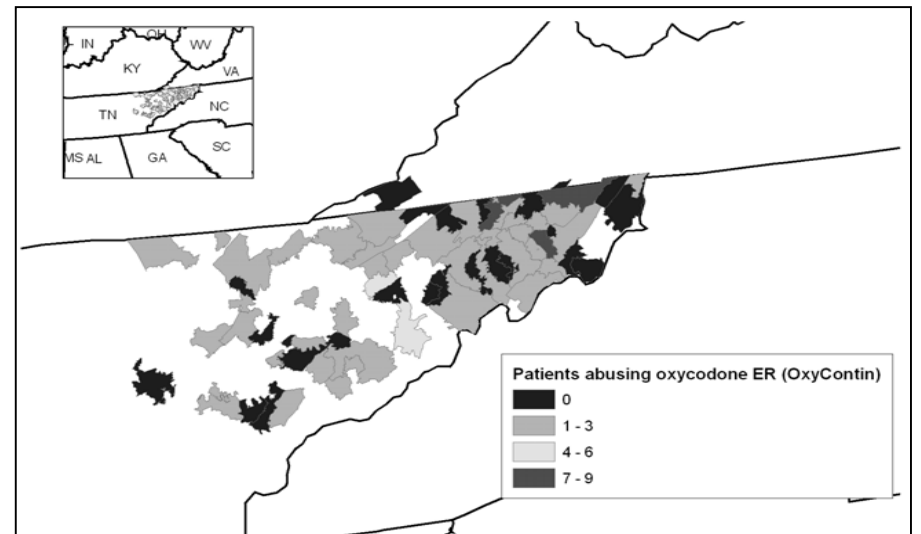
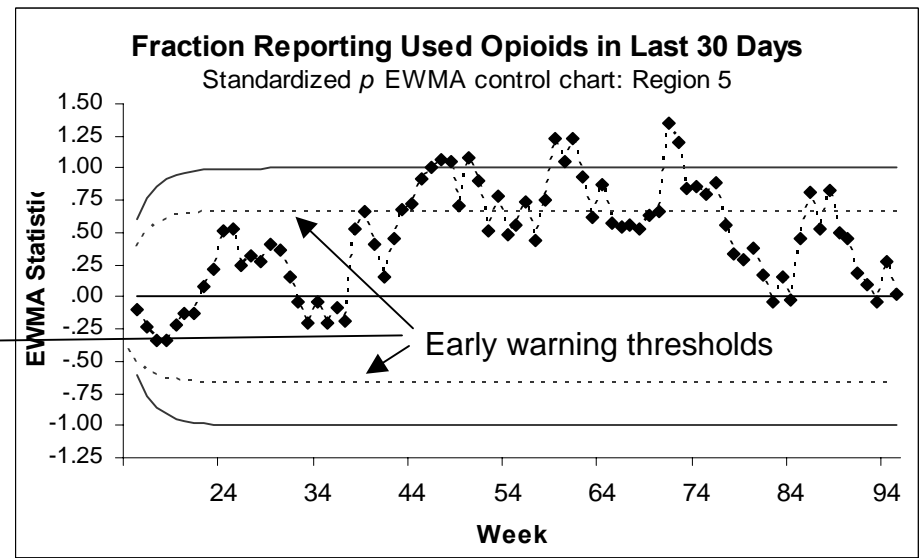
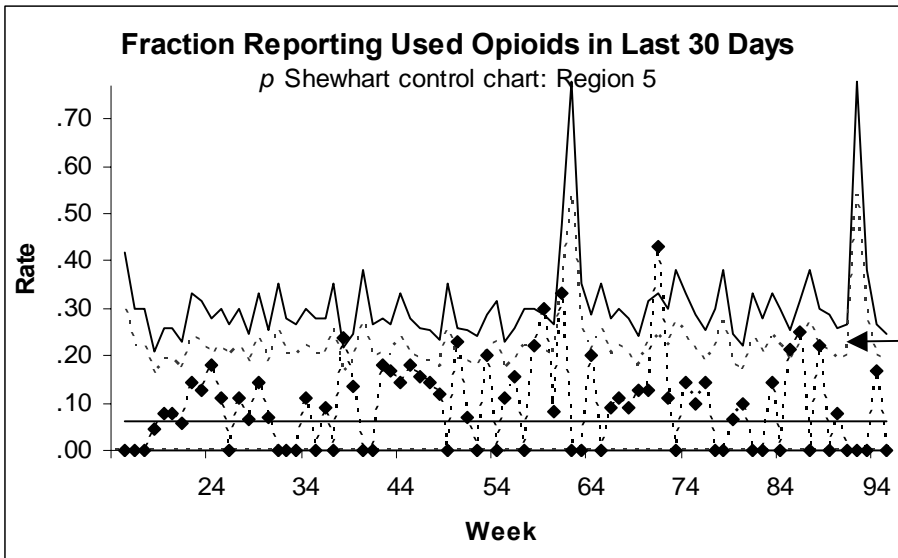
**Different types of signals → Different types (& speeds) of responses**

# Temporal surveillance examples

Different methods, different applications, different performance



# Opioid signal examples (preliminary NAVIPPRO data)



# Types of signals → Types of Reactions

## Possible Taxonomy

### Bad things

- Sentinel event (any occurrence investigated)

### Unexpected things

- Sustained shift (rate increase or decrease)
- Spike (one-time or short-term)
- Trend (linear, nonlinear?)
- Cycle (time series, etc?)

## Possible Classification

### *Type I*

- 1 data source, unsustained
- Low level reaction

### *Type II*

- 2 data sources
- Medium level reaction

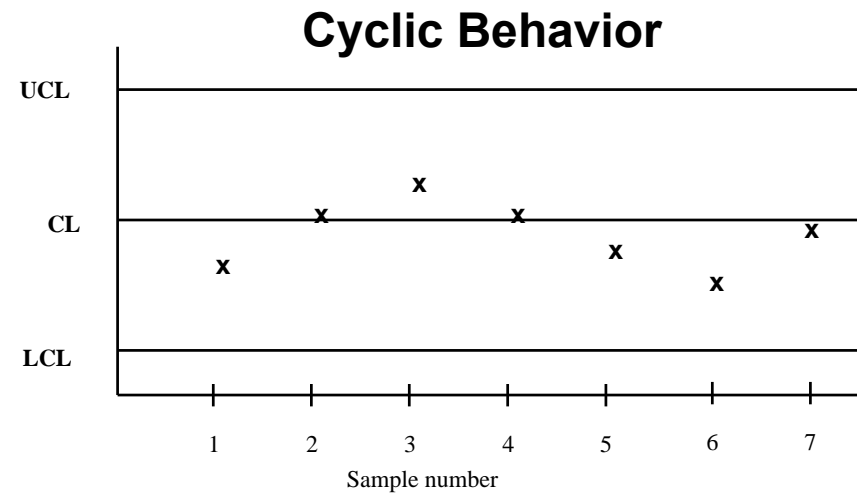
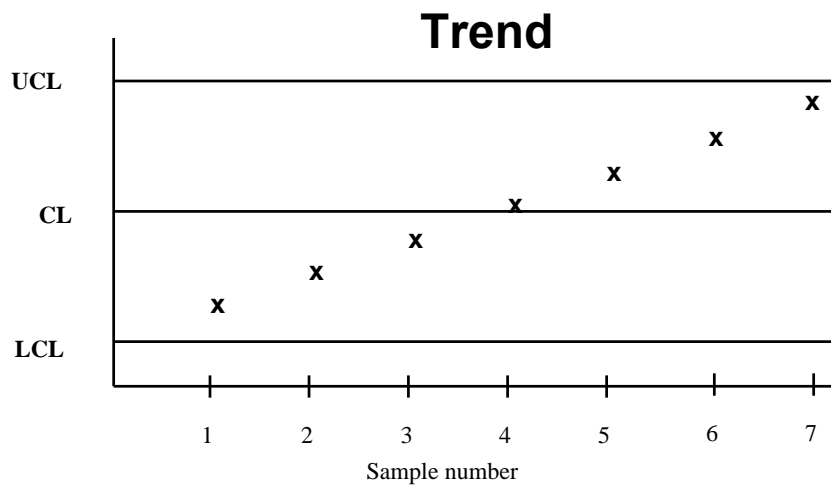
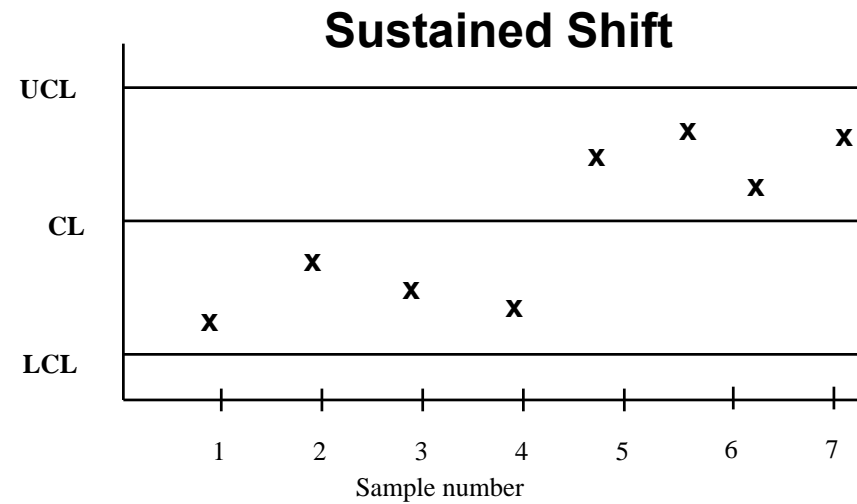
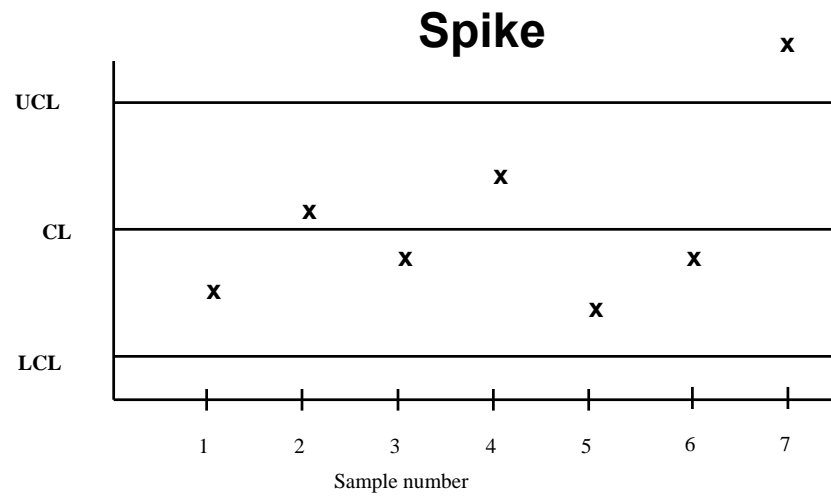
### *Type III*

- 3 data sources, sustained
- High level reaction

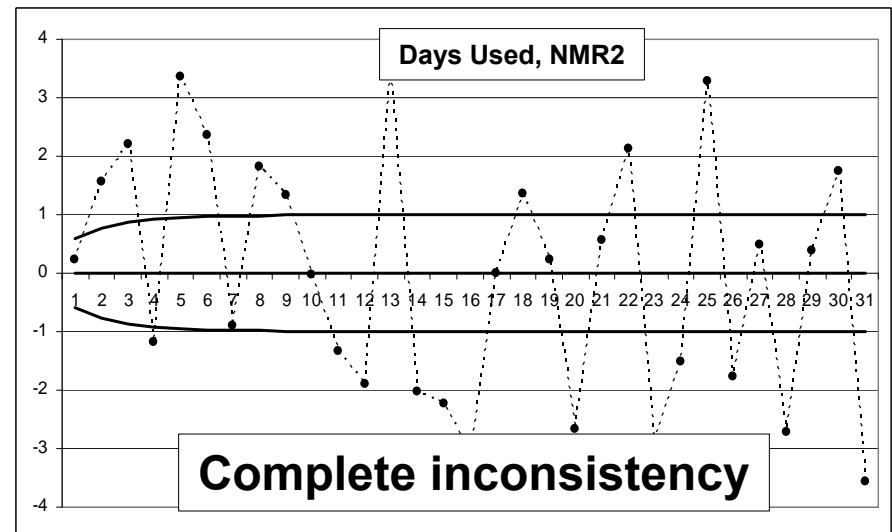
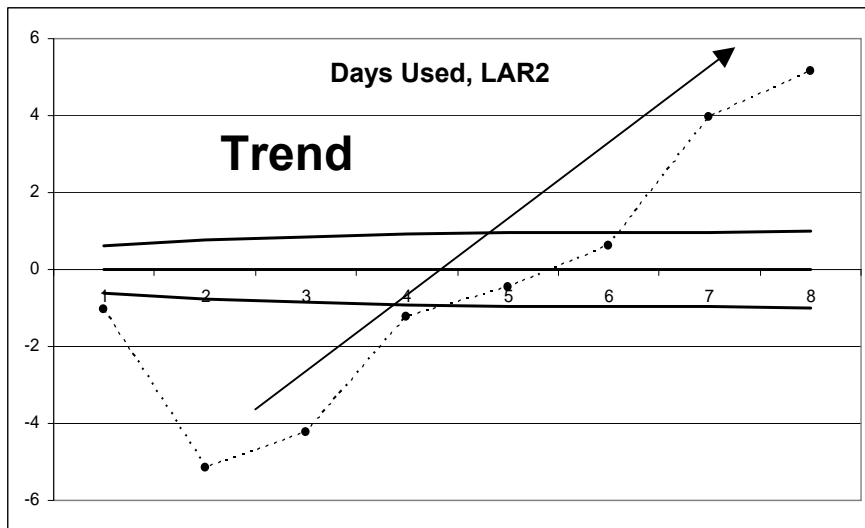
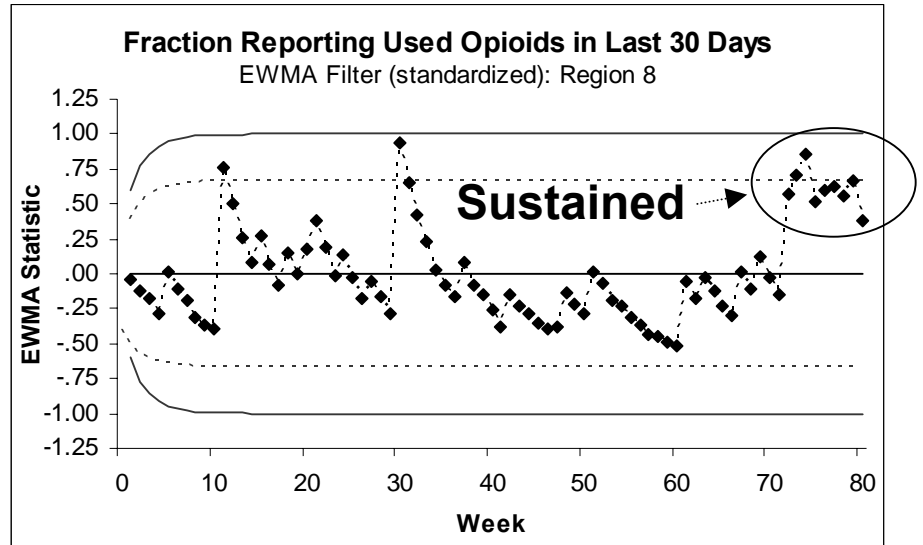
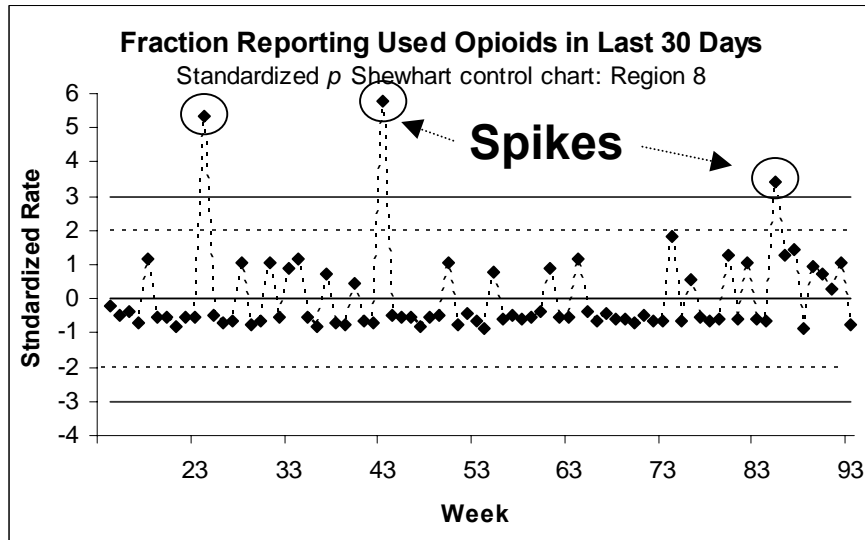
*etc*

(Statistical events)

# Types of signals

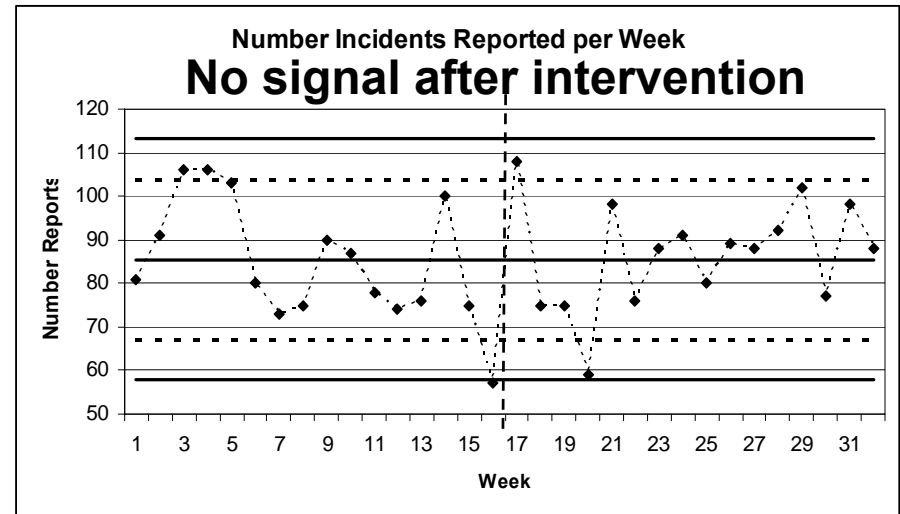
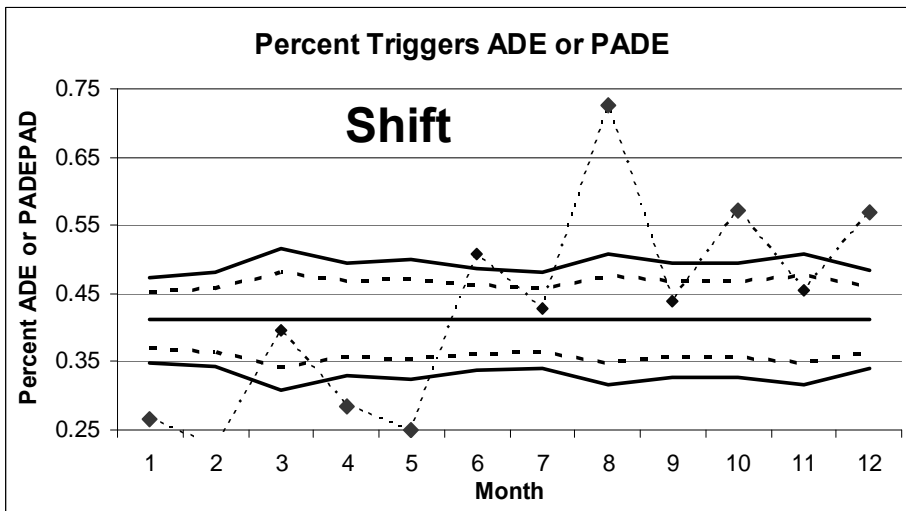
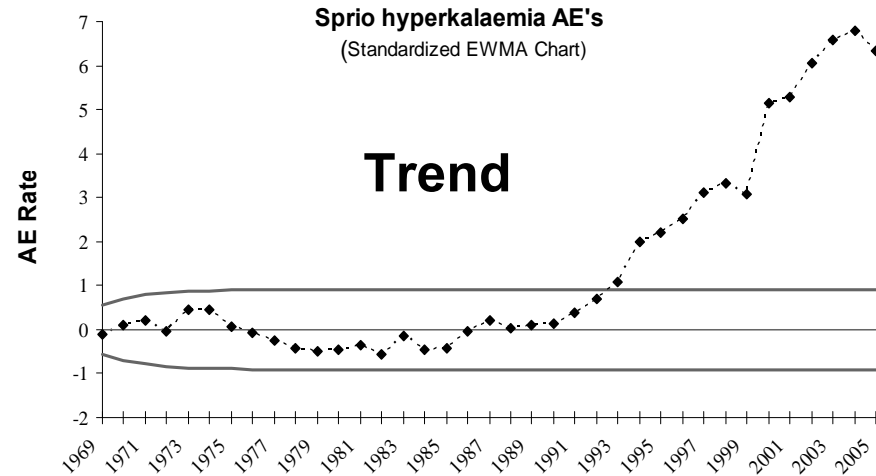
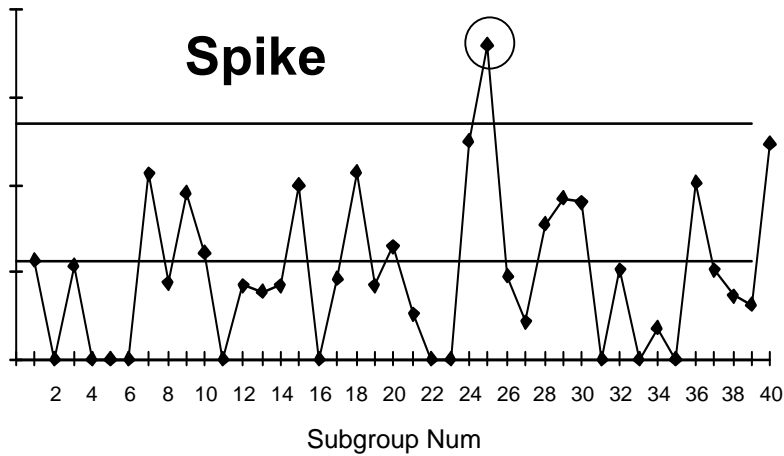


# Opioid signal examples

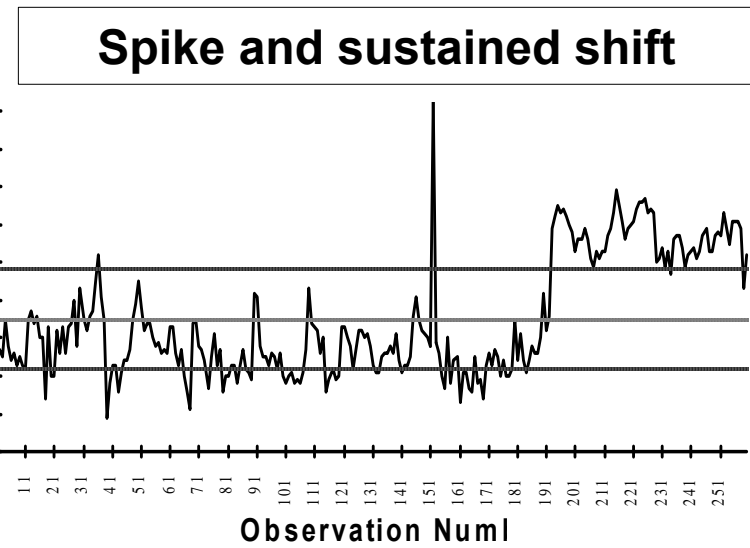
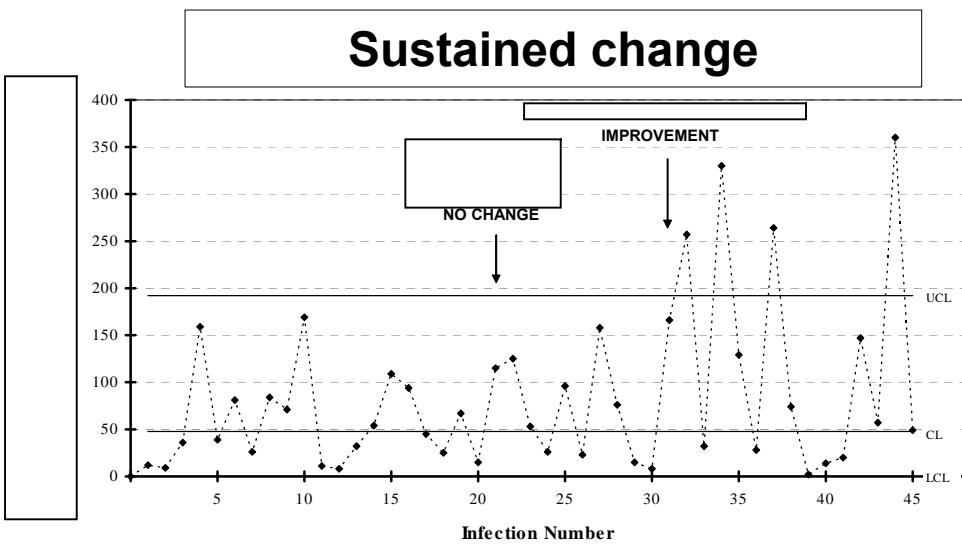
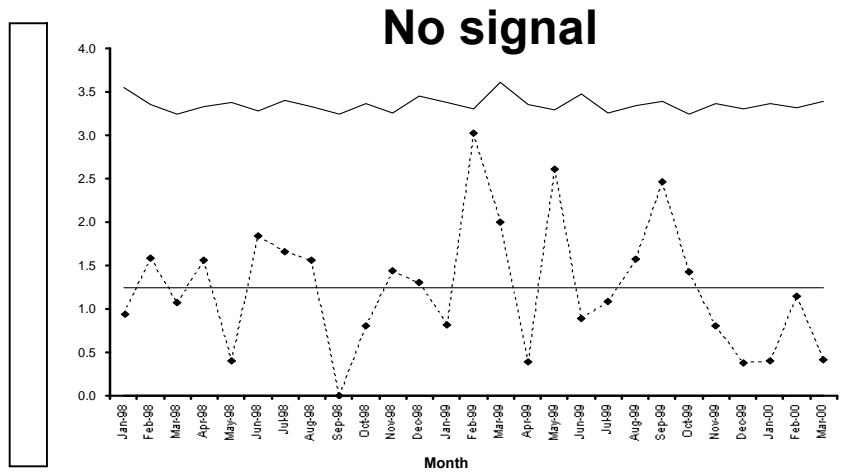
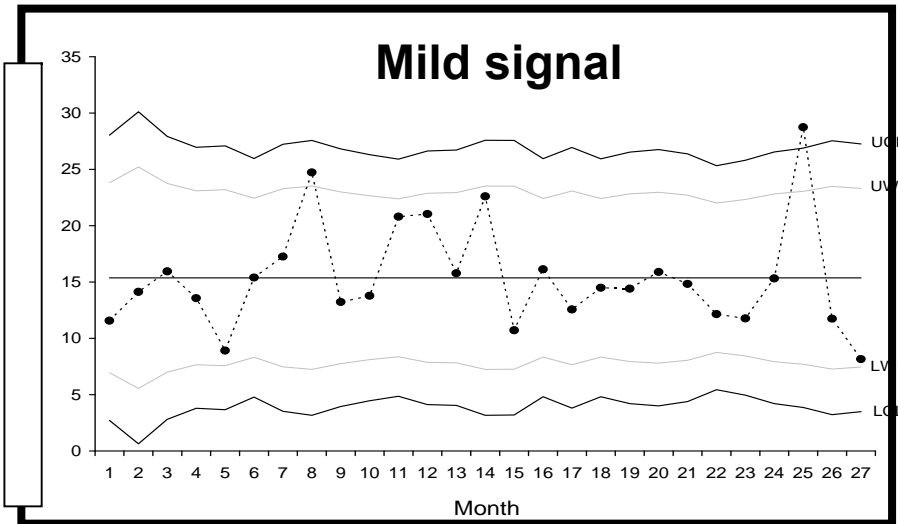




# Other signal examples



# Other signal examples





# Some surveillance technical issues

(The other talk)

- **Methods**
  - What methods exist
  - How would they work here
  - What are technical issues
- **Heterogeneity**
  - Regional rate differences
  - Risk-adjusted populations
- **Clustering**
  - Monitoring for clusters
  - Monitoring *given* clusters
- **New product introduction**
  - Start up trend, sparse data
- **Data aggregation**
  - Local, state, region, national
  - Over-signaling (Bonferroni)
  - Under-signaling (dilution)
- **Other statistical issues**
  - Rare events
  - Multivariate data
  - Incomplete/inaccurate data (under-reporting etc)
- **Performance**
  - Sampling plan
  - Overall system
  - Overall optimization



# Summary & Key questions

- Good detection potential, modest progress
- Different types of signals, data, methods
- Which correlate to field observations and are important to detect?
- Which are actionable by interventions?
- Appropriate interventions for each type of signal?
- What are costs of investigating, false alarms, missed abuse pattern changes?
- Best overall detection, confirmation, intervention system