

# Telehealth Data for Syndromic Surveillance

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*March 30, 2009*

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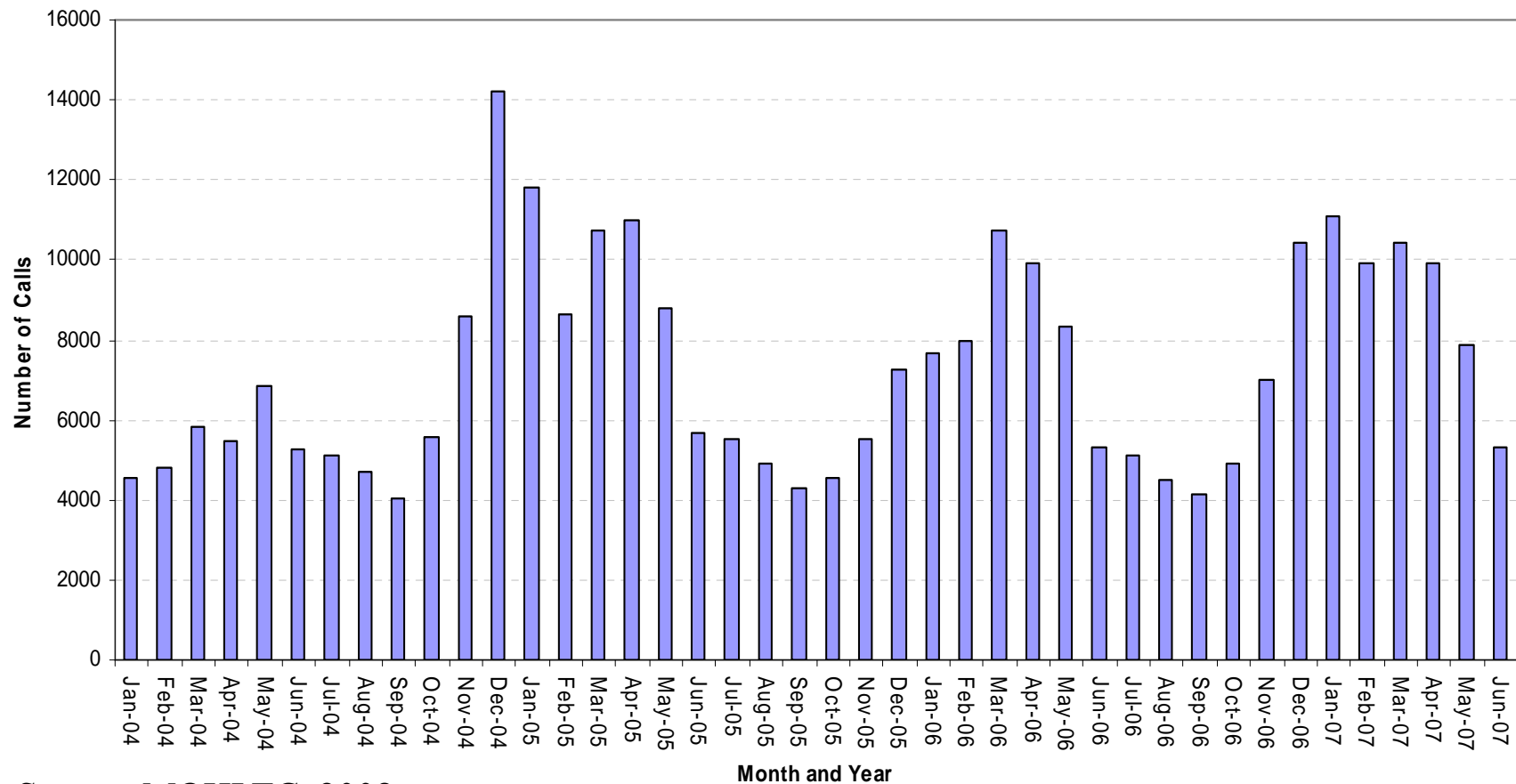
# Syndromic Surveillance Ontario (SSO)

- Syndromic Surveillance Ontario (SSO) is a Ministry initiative developed to support the Ontario Government's action plan to revitalize the public health system in Ontario (Operation Health Protection)
- The SSO strategy has two primary objectives:
  - Improved situational awareness of infectious disease activity in Ontario
  - Earlier detection of outbreaks and clusters of infectious disease
- The SSO community on the [publichealthontario.ca](http://publichealthontario.ca) portal is a web-based knowledge transfer initiative where the Ministry, public health units and other public health practitioners can share information on syndromic surveillance

# Telehealth Ontario

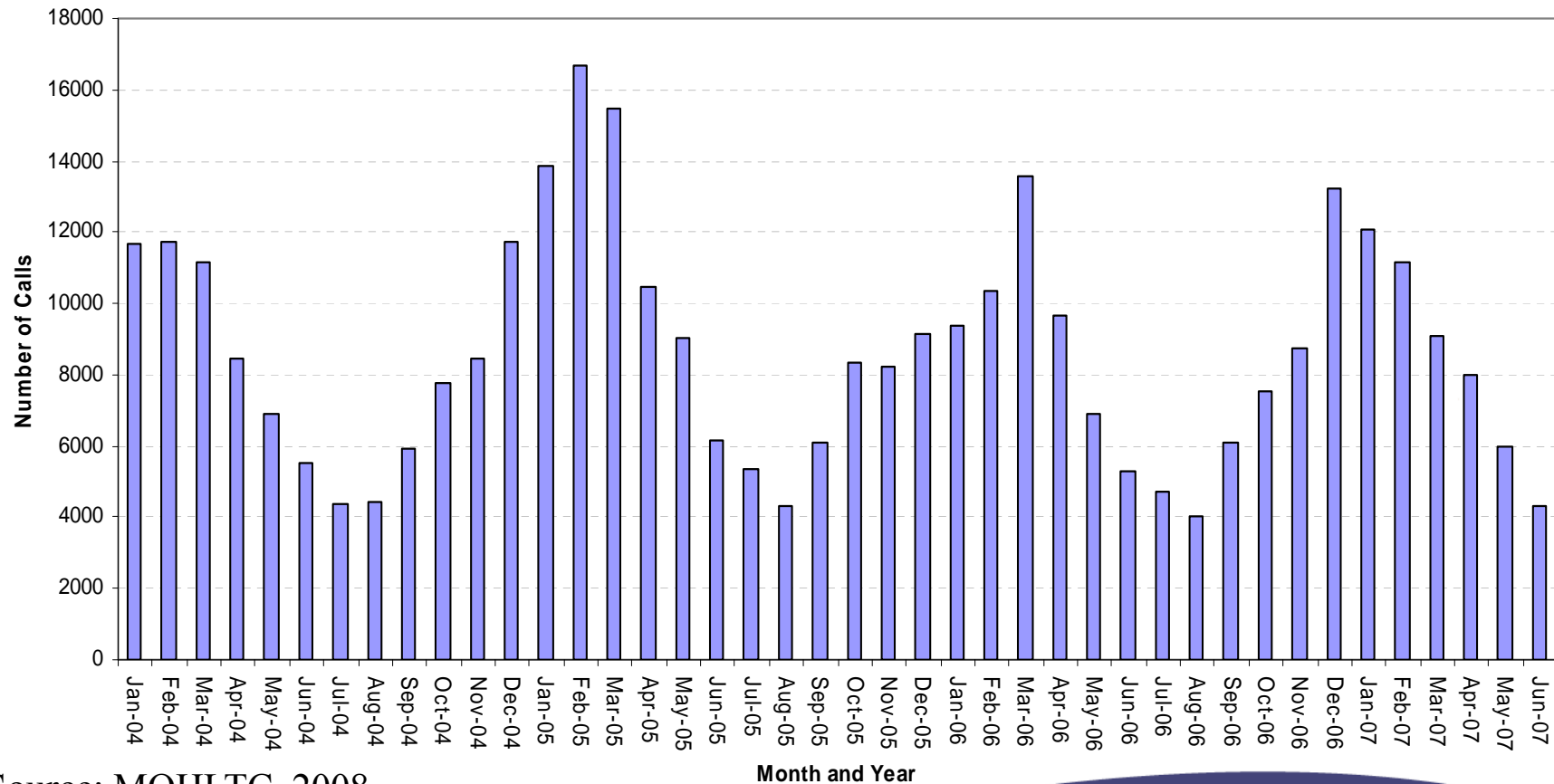
- Telehealth Ontario is a multi-language 24/7 toll-free helpline provided by the MOHLTC for Ontario residents
- 4 call centers in the province use the same algorithms in response to the calls and store all data in one central database.

# Telehealth GI Syndrome Calls: Jan/04 – Jun/07



Source: MOHLTC, 2008

## Telehealth Respiratory Syndrome Calls: Jan/04 – Jun/07



Source: MOHLTC, 2008

# Telehealth Research

Syndromic surveillance using syndrome classification of calls to Telehealth is supported by research

- “Telehealth call volume correlate with increases in NACRS discharge diagnosis data for respiratory illnesses”
- “Telehealth [Ontario] respiratory calls are a timely, useful and representative data stream”
- “Shows promise for integration into a real-time syndromic surveillance system”

— van Dijk A. et al, 2008

## Syndromic Surveillance using Telehealth data

- MOHLTC conducts weekly spatial-temporal analyses of Telehealth data for the detection of syndrome clusters that may be indicative of increased infectious disease activity
- 3 syndromes of interest to public health are analysed: gastrointestinal (GI), fever/influenza-like illness (ILI), and respiratory infections
- Response protocol includes investigation of identified clusters in conjunction with traditional public health surveillance data reported through the integrated Public Health Information System (iPHIS) or the public health laboratory

## Limitations: Syndromic surveillance data

- No data available on information such as potential exposure sources or risk factors
- The analyzed syndrome types do not easily map to specific underlying diseases (low specificity)
- High likelihood of influence by factors unrelated to personal health
- Considerable public health resource implications to investigate signals

# Syndromic Surveillance Analyses of Telehealth Data

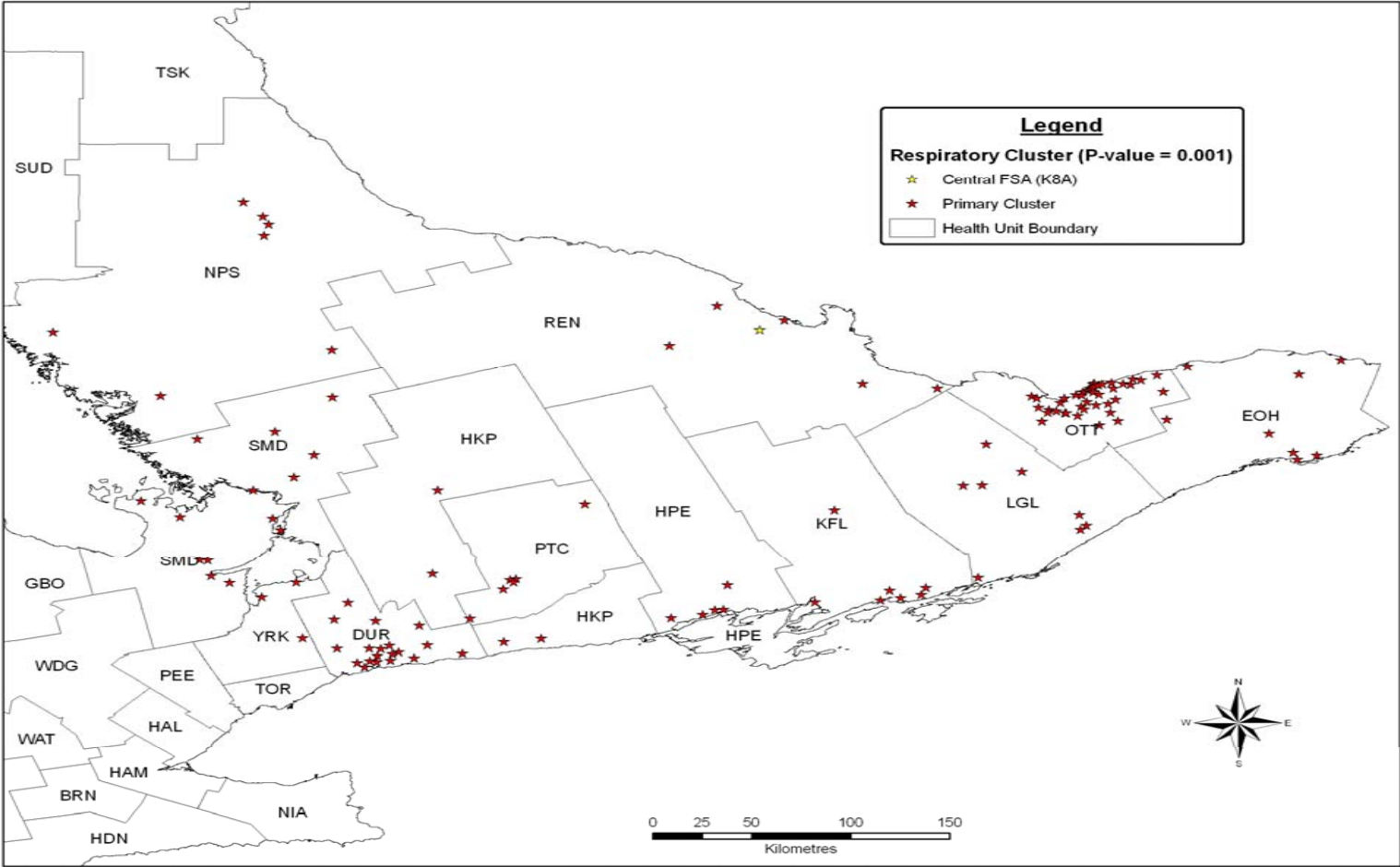
- GI, respiratory, and fever/ILI syndromes are analyzed using 2 statistical methods:
  - **Scan statistics** - SaTScan software for spatial cluster detection (spatio-temporal - maps)
  - **Aberration detection** - CDC Early Aberration Reporting System (EARS) software (temporal - trend graphs)
- Both types of analyses have different strengths and complement each other to provide more comprehensive information

# SaTScan

## SaTScan uses Permutation Probability Modeling to detect syndrome clusters

- Number of primary and secondary clusters and whether they are statistically significant
- Number of calls of a syndrome type during the entire study period and within each cluster
- The ratio of observed to expected number of calls
- The size of the individual clusters (radius in km, the number of FSAs, and number and identity of health units involved)
- The maximum likelihood value for each cluster, the  $t$  statistic and  $p$  value
- The recurrence interval
- The study period (30 days) and the time frame (7 days)

# SaTScan Location Map



Source: MOHLTC Telehealth Syndromic Surveillance Report, Jan/09

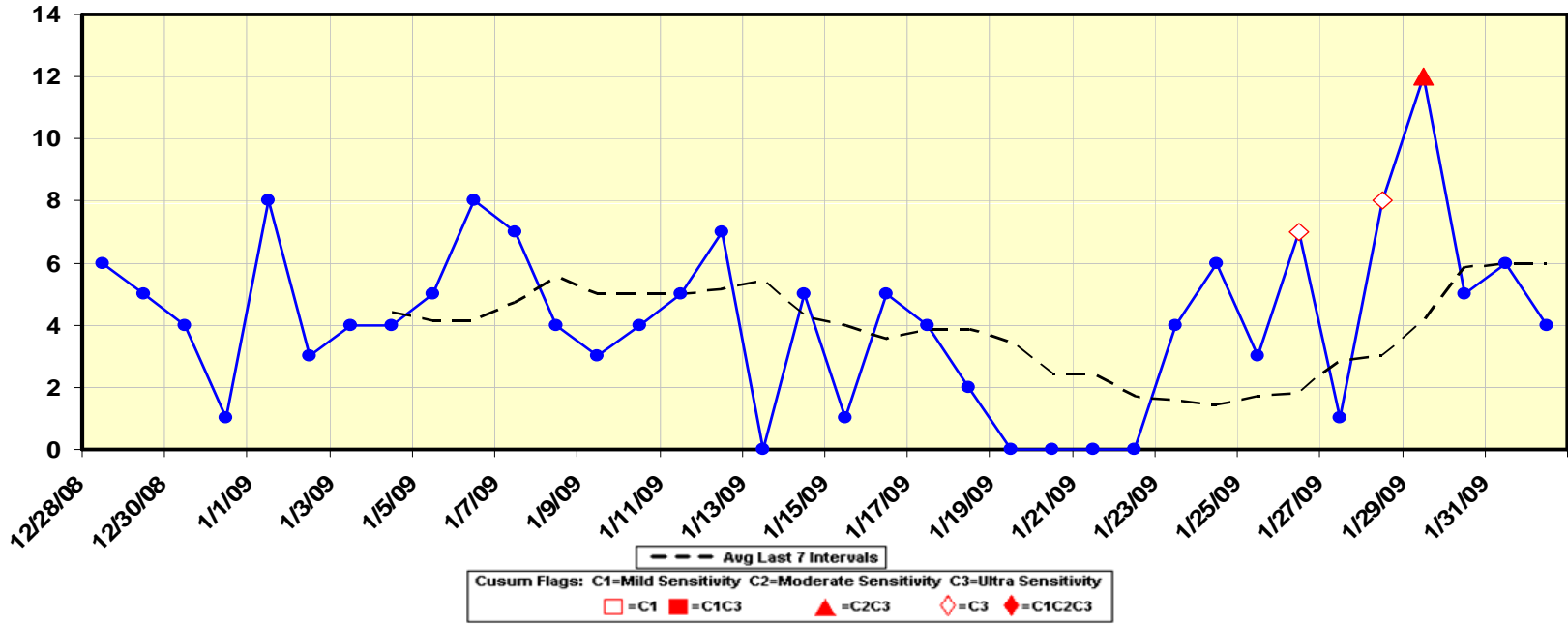
# EARS

## **EARS uses the positive one-sided CUSUM to generate trend graphs**

- Maximum number of calls, the date on which this maximum occurred and whether it represents a new high
- Average number of calls over the baseline period
- A trend graph which shows the type of flag generated (C1, C2 and C3) with the flag type indicating the relative degree of sensitivity
- The number of calls on the date that a flag is generated
- The date of the last C1, C2 and C3 flags

# EARS Trend Graph

FEVER/ILI SYNDROME CALLS DECEMBER 28 - FEBRUARY 1, 2009



## Advantages: EARS

- Allows rapid assessment of changes in frequencies and rates of the 3 syndrome types under surveillance and the characterization of unusual trends or clusters
- Short baseline period of 7-days allows for preservation of specificity and sensitivity compared to historical data
- Provides an additional tool for public health to use in determining when a situation requires further investigation

## Limitations: EARS

- High signal to noise ratio
- Outbreak detection often requires a large number of calls
- User defined parameters affect sensitivity

# Advantages: SATScan

- Uses only call numbers; population-at-risk data not needed
- Makes minimal assumptions about the geographical location, time or size of the outbreak
- Adjusts for natural purely spatial and purely temporal variation
- Avoids arbitrary geographical aggregation of the data
- Effective in detecting localized outbreaks and can detect both rapidly and slowly emerging outbreaks
- Can incorporate covariate information

## Limitations: SATScan

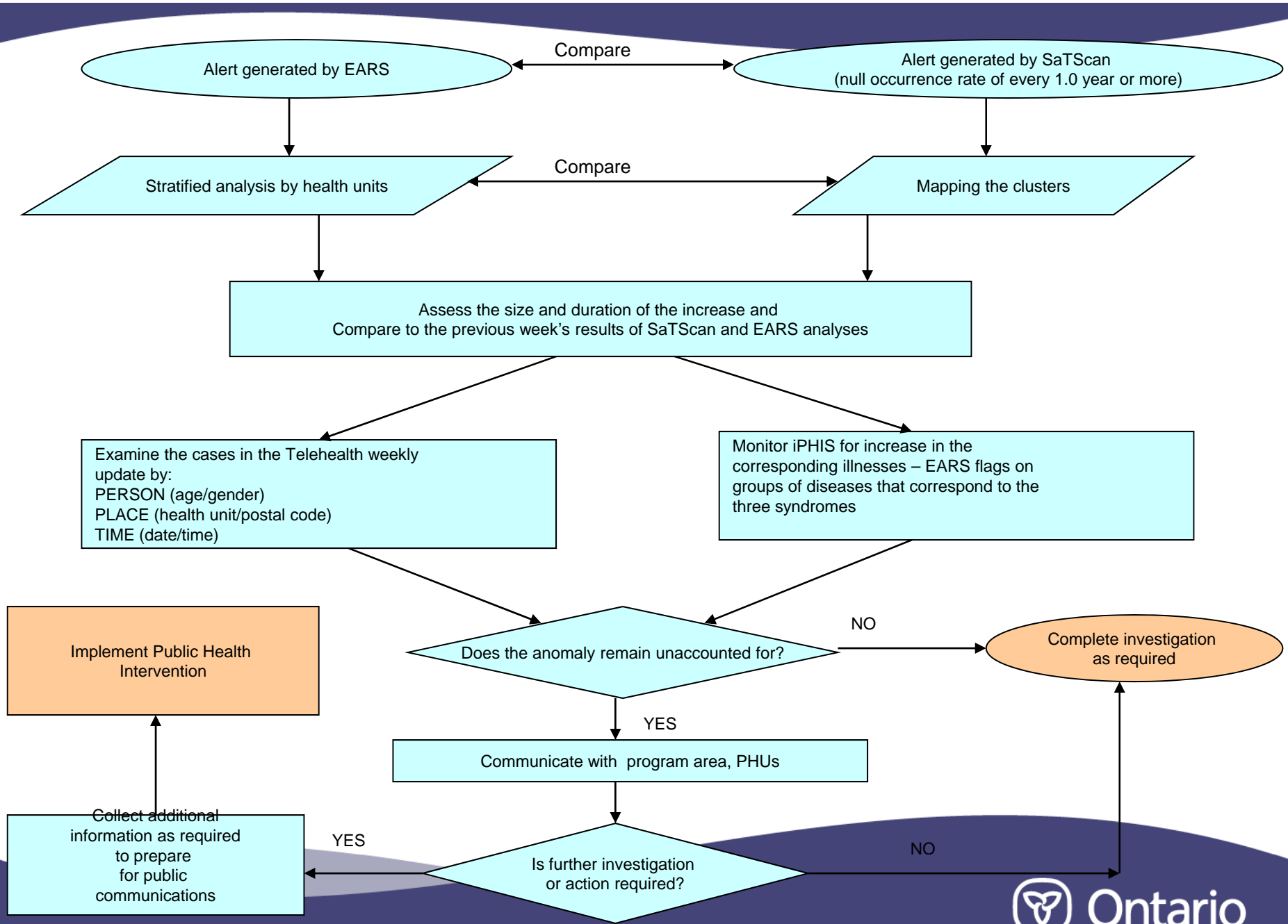
- Detects widespread outbreaks (e.g. province-wide) only if they start locally
- Cannot detect widespread outbreaks that occur simultaneously in many places
- Should supplement but not replace purely temporal analytical methods (e.g., EARS)

## Investigating EARS/SaTScan Alerts

1. Compare EARS and SaTScan outputs for congruency
2. Map clusters identified by SaTScan with a recurrence rate  $\geq 1$  year to visualize the location of the cluster
3. Explore EARS flags further stratifying by health unit to determine the relative contribution of the health units that gave rise to the flag
4. Compare with the previous weeks' results to assess the size and duration of the increase

## Investigating EARS/SaTScan Alerts (con't)

4. Analyze cases by person (age/gender), place (health unit/postal code) and time (date/time) if a false alarm cannot be ruled out
5. Monitor the integrated Public Health Information System (iPHIS) for increases in illnesses corresponding to the three syndrome types
6. If the anomaly cannot be accounted for, initiate communications internally and externally (i.e. health units) to determine if further investigation is required



# Summary

- Evaluation of Telehealth data for syndromic surveillance is required to determine what flags, clusters or combination of signals are sufficiently indicative of an outbreak to warrant further public health response
- Syndromic surveillance analyses should be used as an adjunct to routine monitoring of traditional public health surveillance data to provide more comprehensive information on infectious disease activity in the province

# Questions?

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