

# Spatial scan statistic: Selecting clusters and generating elliptic clusters

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# Motivation

Some natural phenomena appear in circles  
- but not all!

Hence there is a need for a more  
flexible spatial scan statistic.

Two suggestions

- Using more flexible shapes
- Allowing overlapping clusters

## Elliptic clusters

Set of ellipses is one natural expansion of set of circles.

But which set of ellipses?

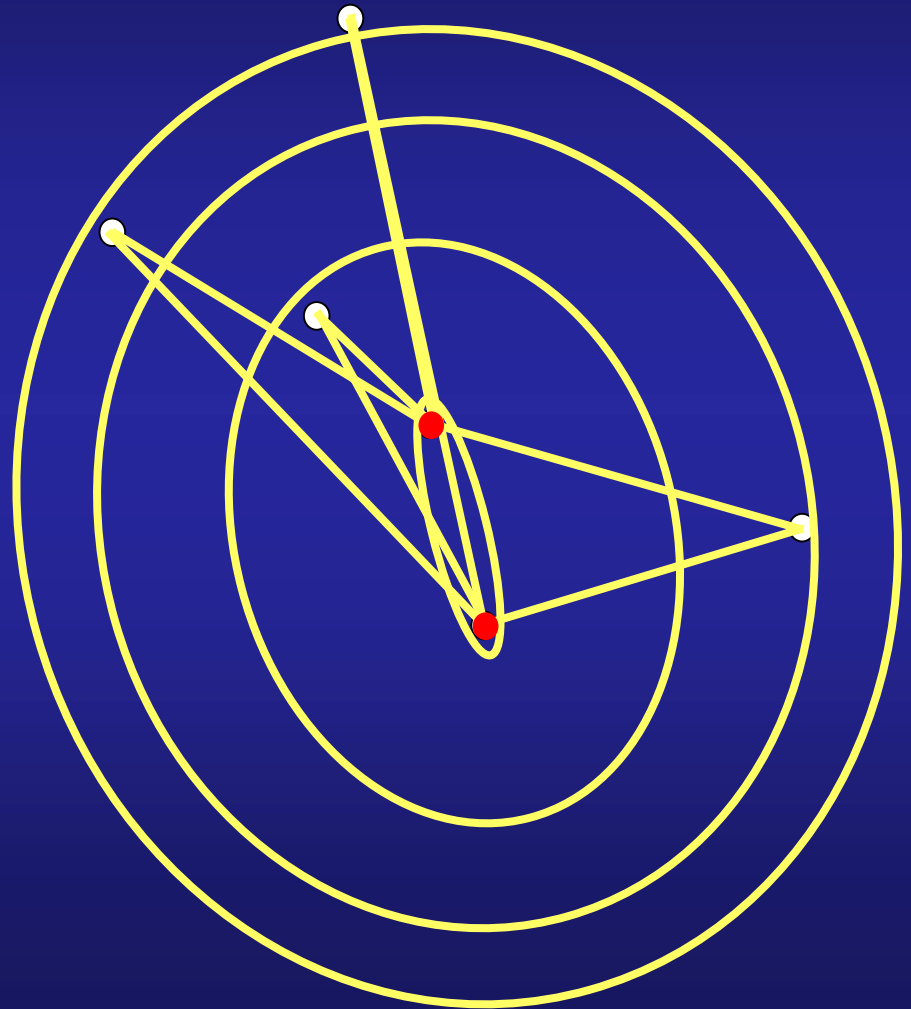
We suggest:

Concentric circles  $\Rightarrow$  Confocal ellipses

Concentric circles  $\subset$  Confocal ellipses

# Constructing set of elliptic clusters

- > Select first focus
- > Select second focus
- > Calculate sum of distances from the foci.
- > Sort distances
- > Include points one by one



# Constructing set of elliptic clusters

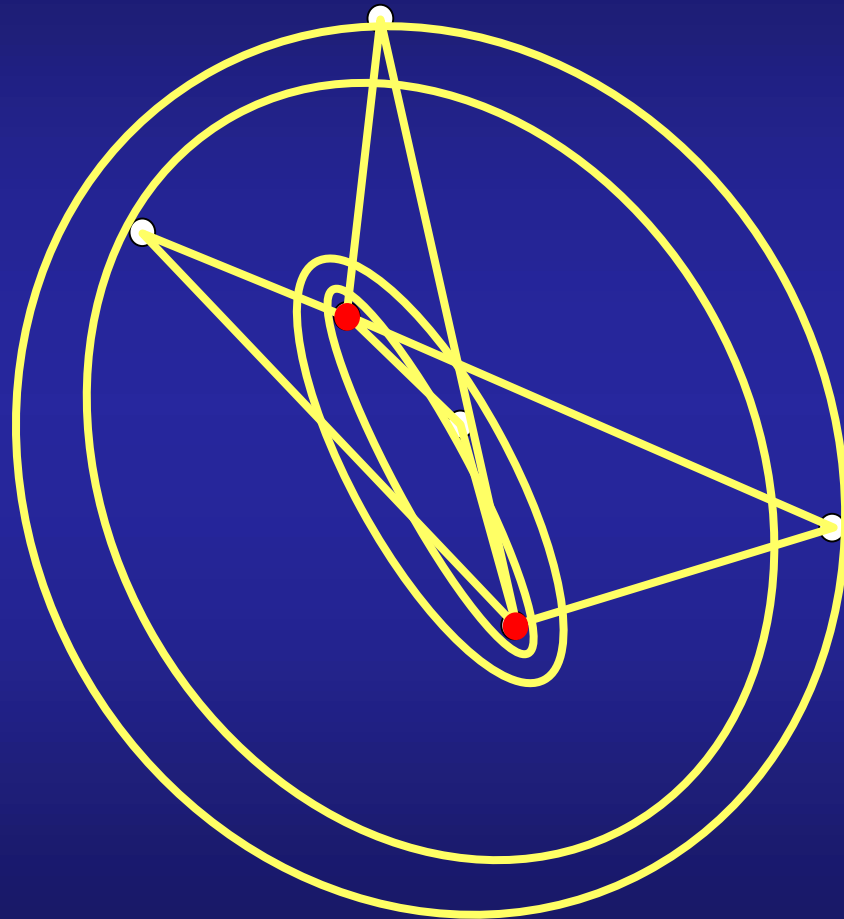
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## Case data

Surveillance of Campylobacter in Danish broiler flocks.

Only first batch was included.

Period: 1998 - 2001

Locations: 794 houses

Incidence: 3080 positive flocks out of 8056 flocks (38%)

## Set of confocal ellipses

$P_s$	$P_m$	# clusters	# clusters no doublets	Relative # clusters
0 %	50 %	315,218	107,953	1
1 %	50 %	1,525,790	223,623	2.07
5 %	50 %	7,662,602	717,338	6.64
10 %	50 %	15,134,726	1,308,741	12.1
20 %	50 %	29,791,478	2,655,066	24.6

# Overlapping clusters

Interested in secondary clusters?

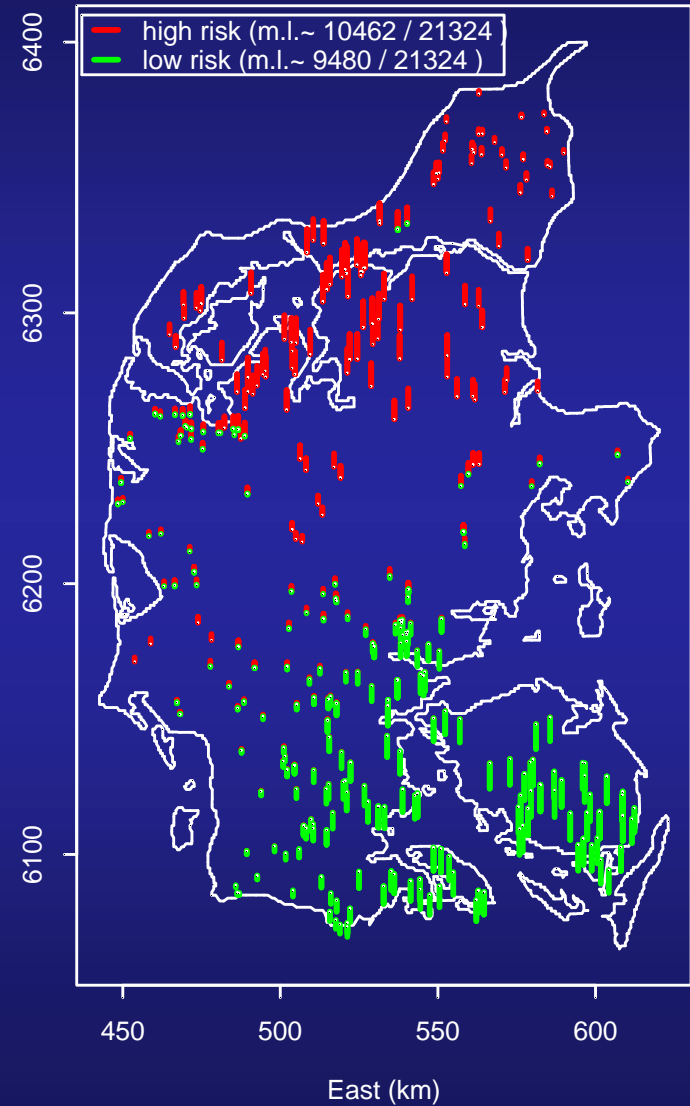
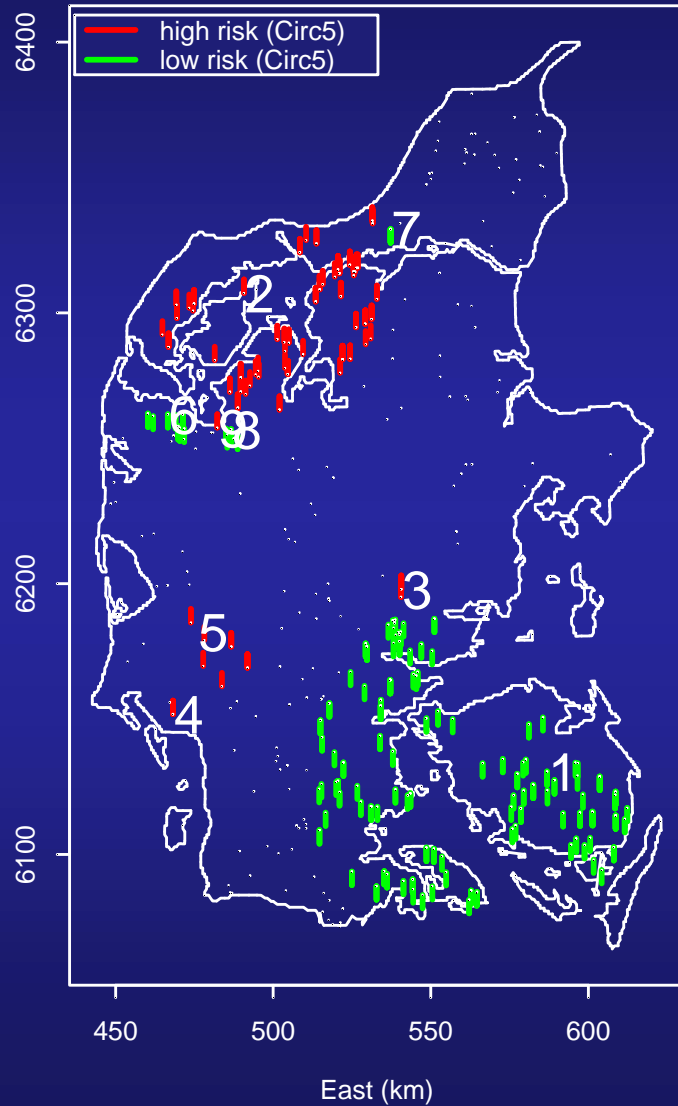
The number is strongly dependent on allowance of overlap.

No overlap at all:	Few clusters.
Some overlap allowed:	Some clusters.
The full set:	Many clusters.

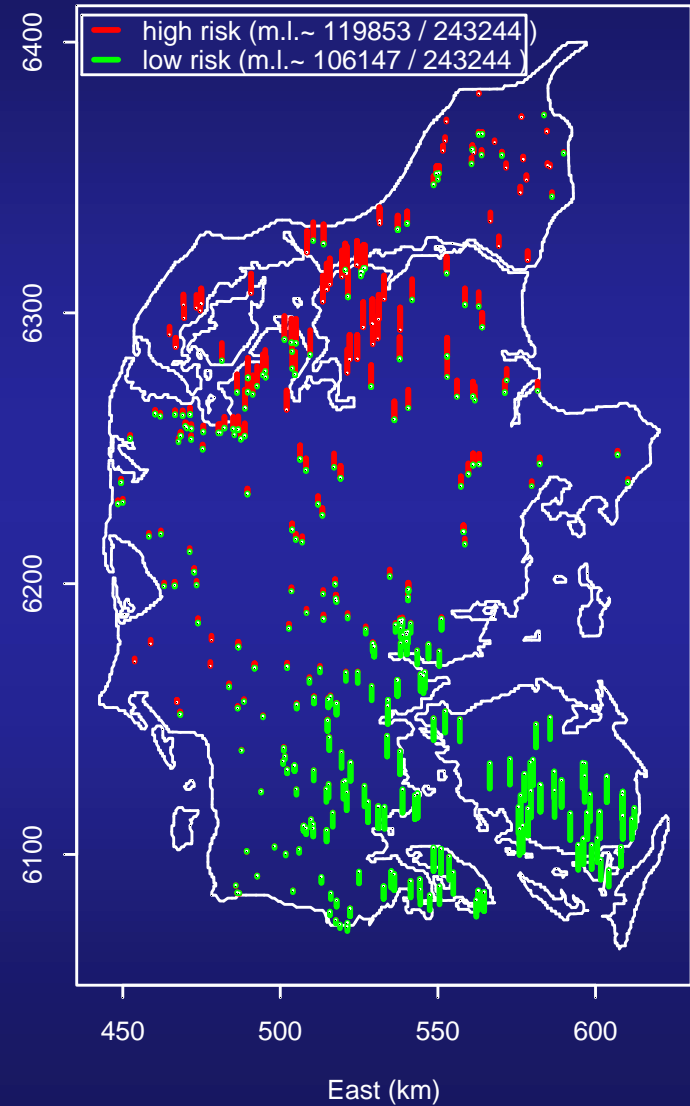
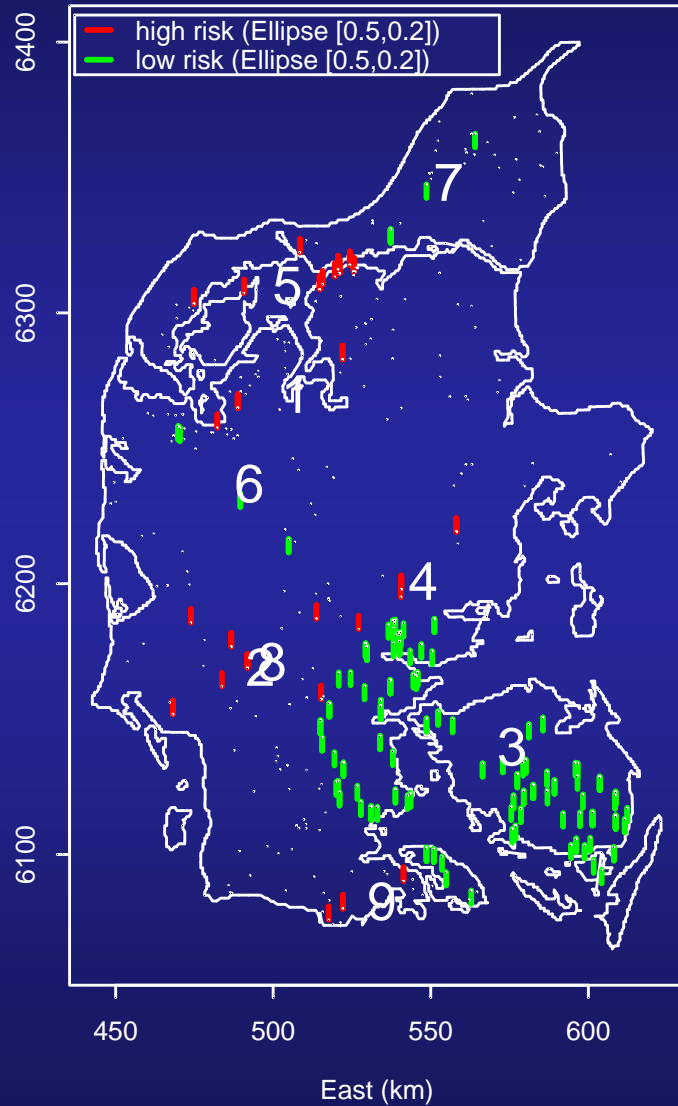
Suggested summary of the full set:

Relative occurrence of points in significant high and low risk clusters.

# Results - circles



# Results - ellipses



# Discussion

Non-overlapping clusters

- are sensitive to transformations.
- give edge effects.

Avoid ellipses with 2 distant foci.

Apply different reductions.

Apply different visualizations.



# Questions ?