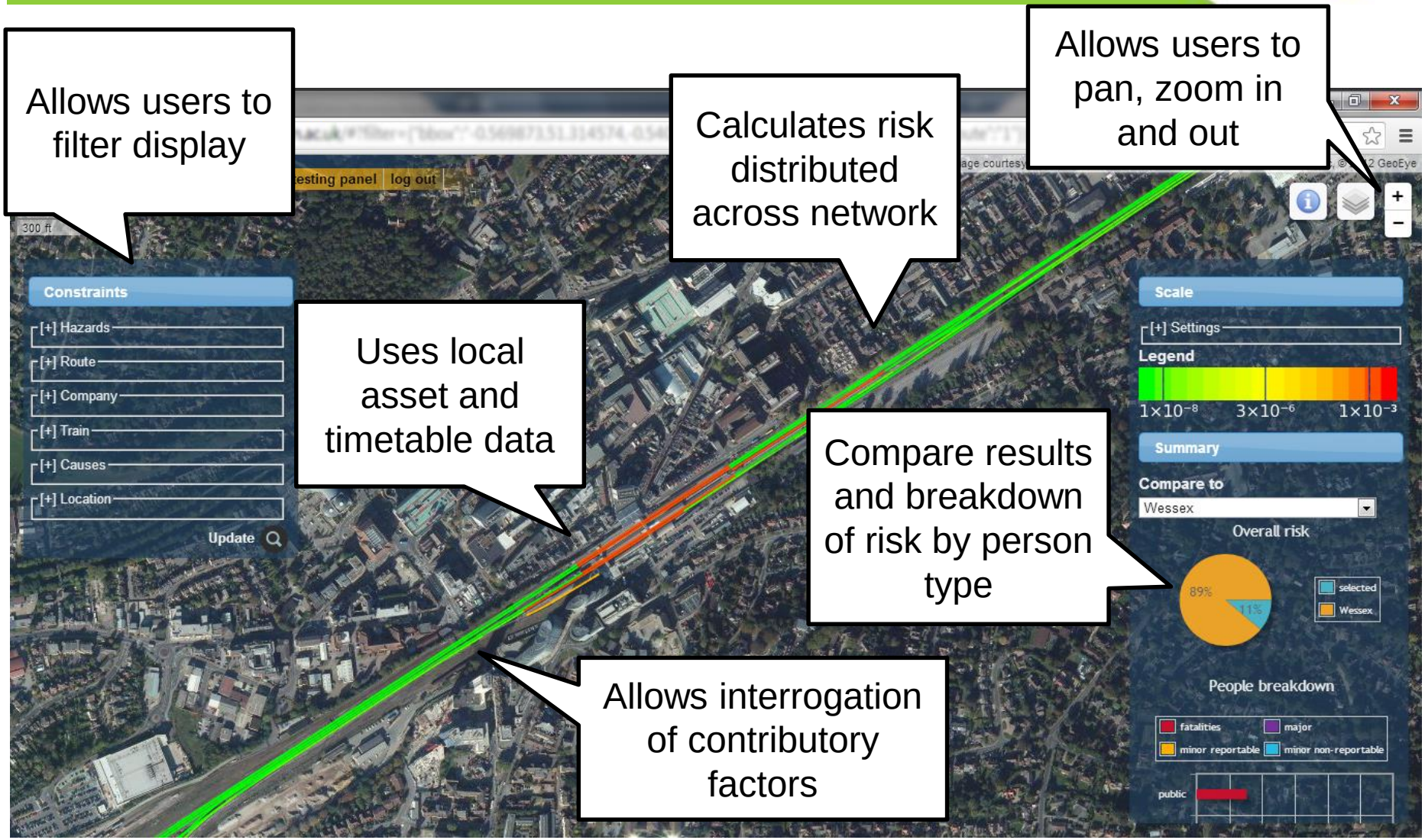
A geospatial approach to understanding factors for suicides at stations and level crossings

Jay Heavisides

What is the GeoSRM?

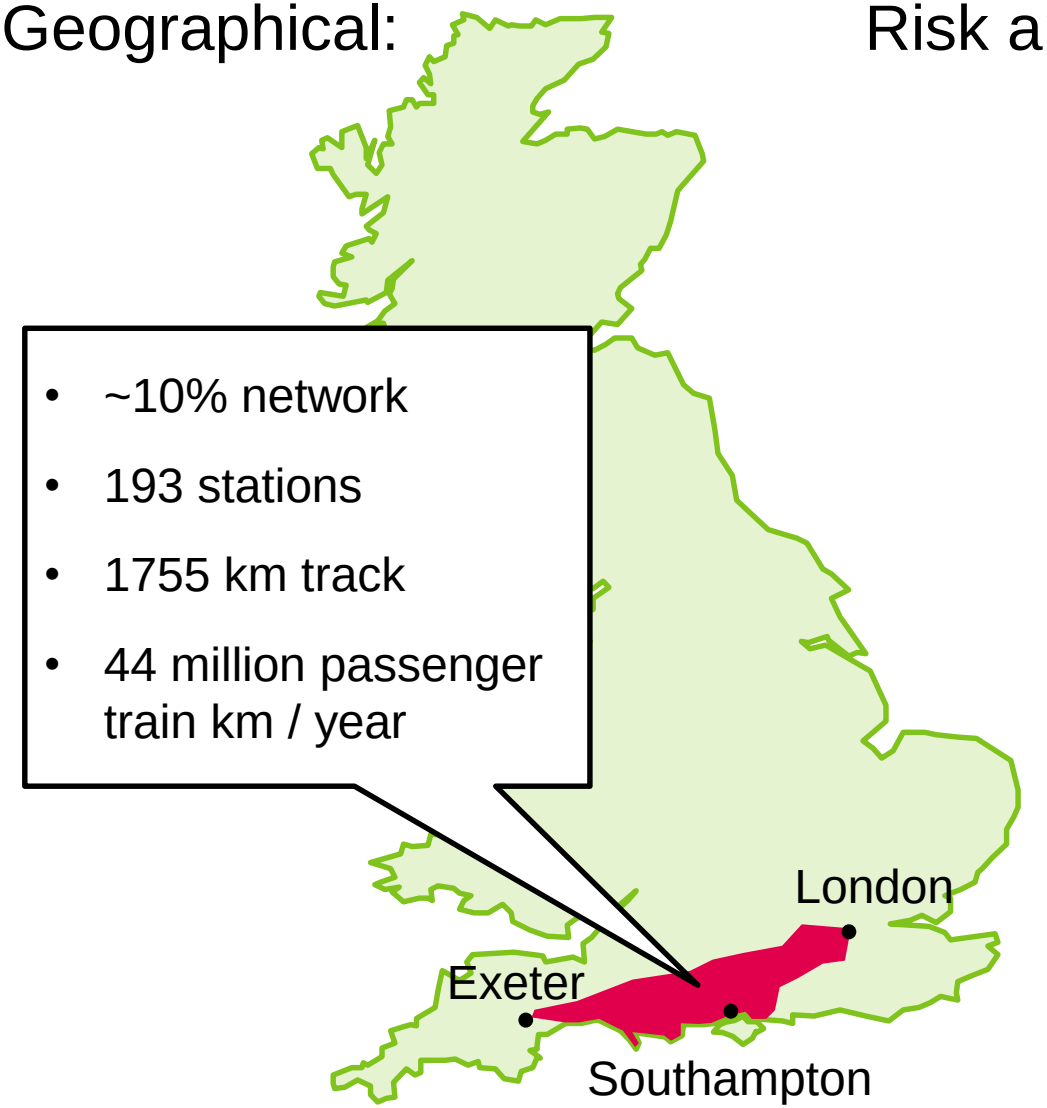
- Output from *T972: Piloting a geo-referenced safety risk model for the rail network in Great Britain.*
- Making network-wide safety improvements is not reasonably practicable.
- Now need to understand localised risk profiles.
- Identify areas where safety measures are disproportionate to the risk they are mitigating.
- Identify areas where safety measures could be improved and justified on a location specific basis.

GeoSRM web based tool



Scope of the pilot

Geographical:

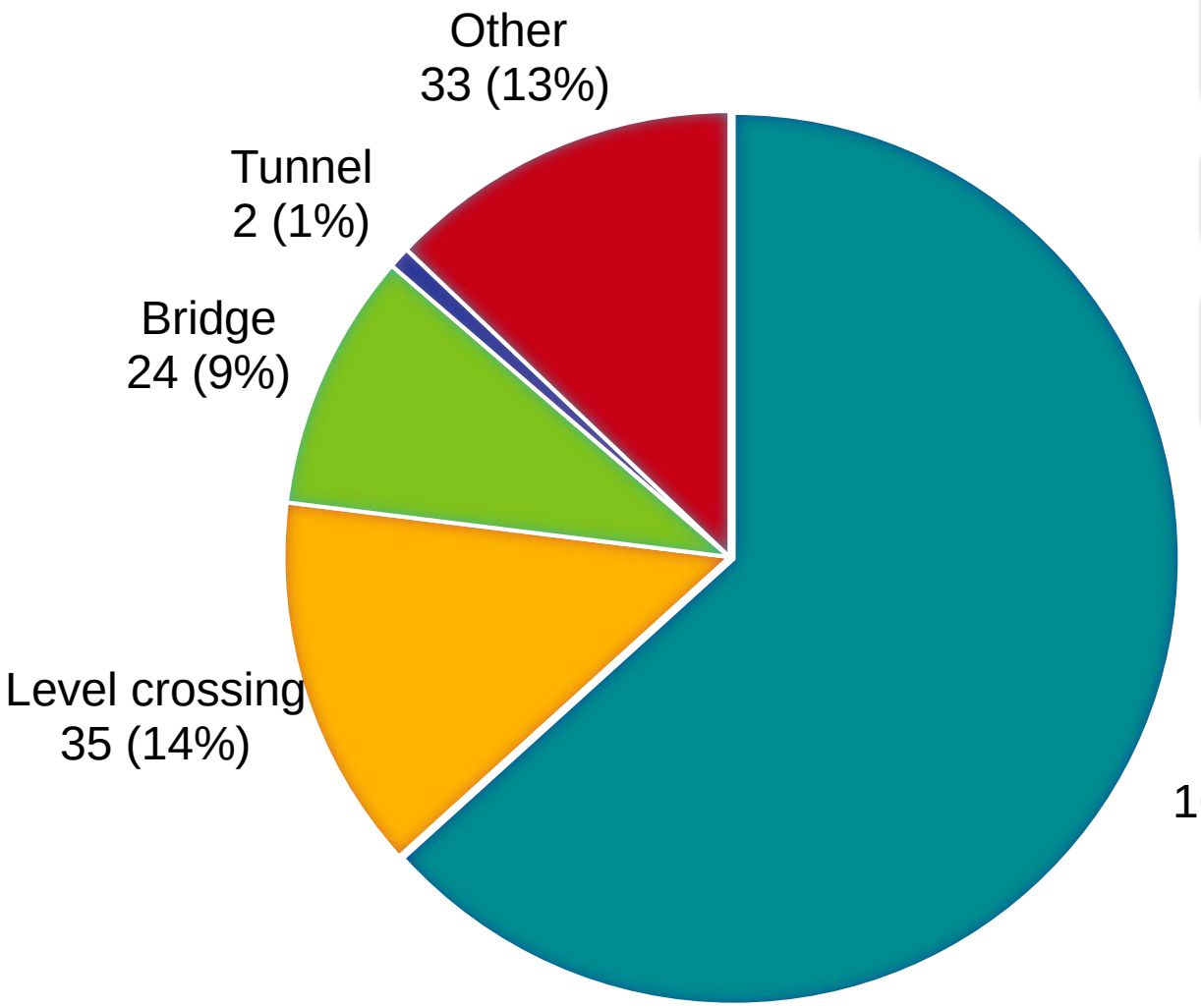


- ~10% network
- 193 stations
- 1755 km track
- 44 million passenger train km / year

Risk areas:

- Suicides
- Slips, trips and falls at stations
- Derailments

The data



Suicides

2003-2013

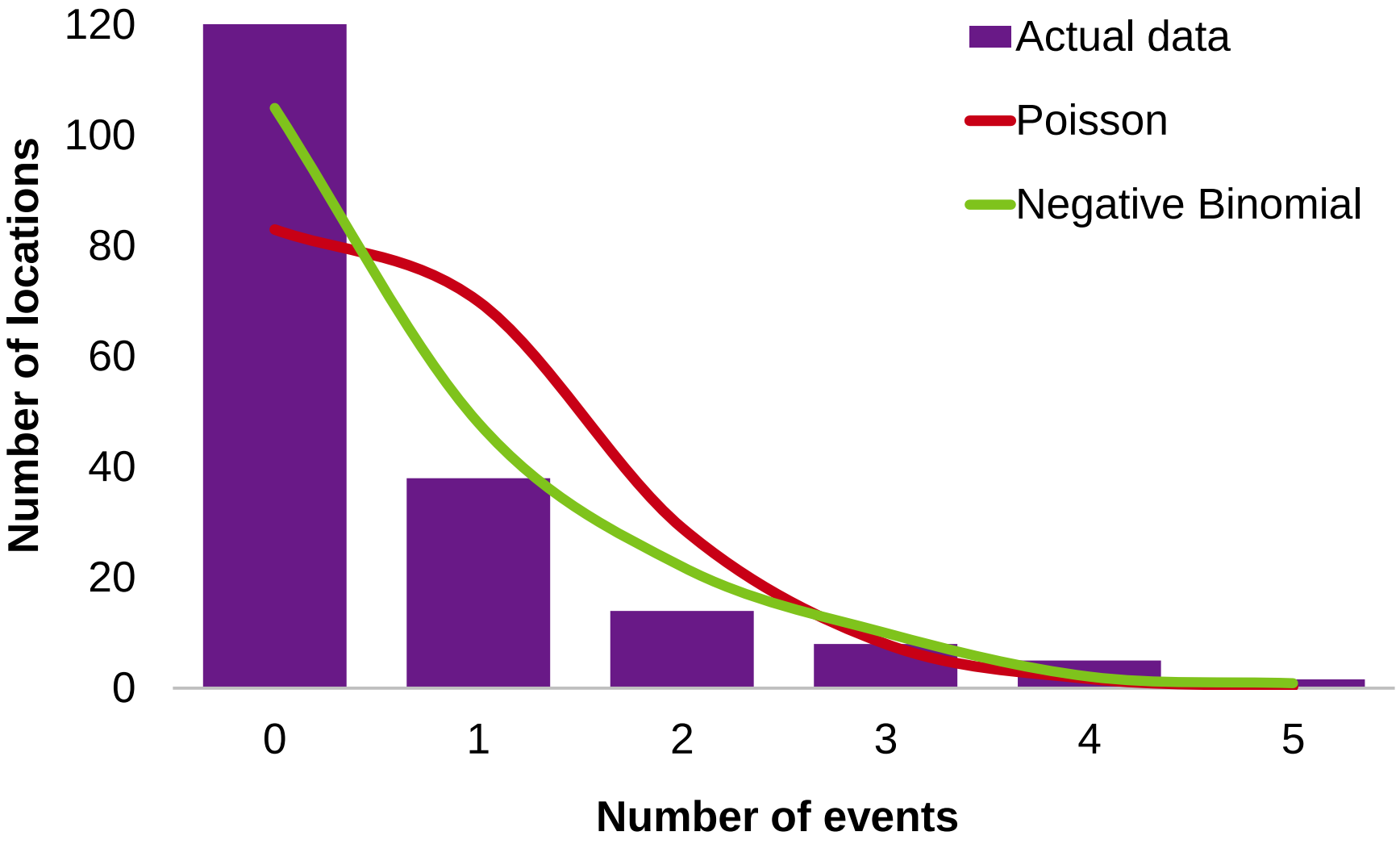
Attempted & completed

The data

Location type	Event count	Site count	Events:Sites	
Stations	162	193	1 : 1.2	✓
Level crossings	35	211 (346)*	1 : 6	✓
Bridges	24	3204	1 : 134	✗
Tunnels	2	96	1 : 46	✗
Other	33	10000s	> 1 : 300	✗

* Crossings at stations excluded as site type not distinguishable from station, hybrid crossings count as one site

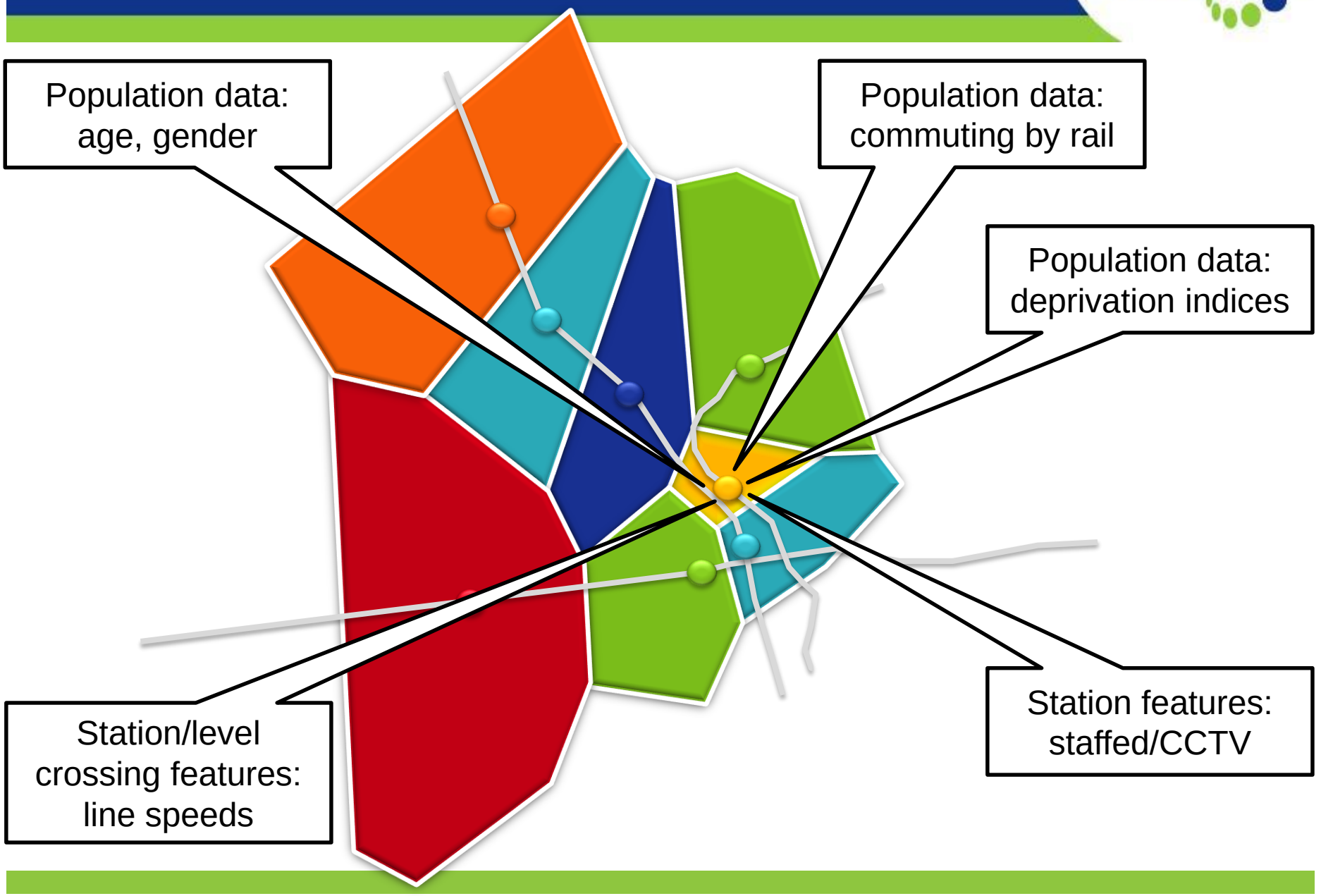
The modelling



The modelling

- Generalised linear model (GLM) can be used to estimate the number of events at a location.
- The GLM is made up of:
  - A base rate
  - A number of explanatory factors that influence the rate
- Fitted against the Negative Binomial distribution
- Factors are tested for significance (5%) for incorporation into the GLM

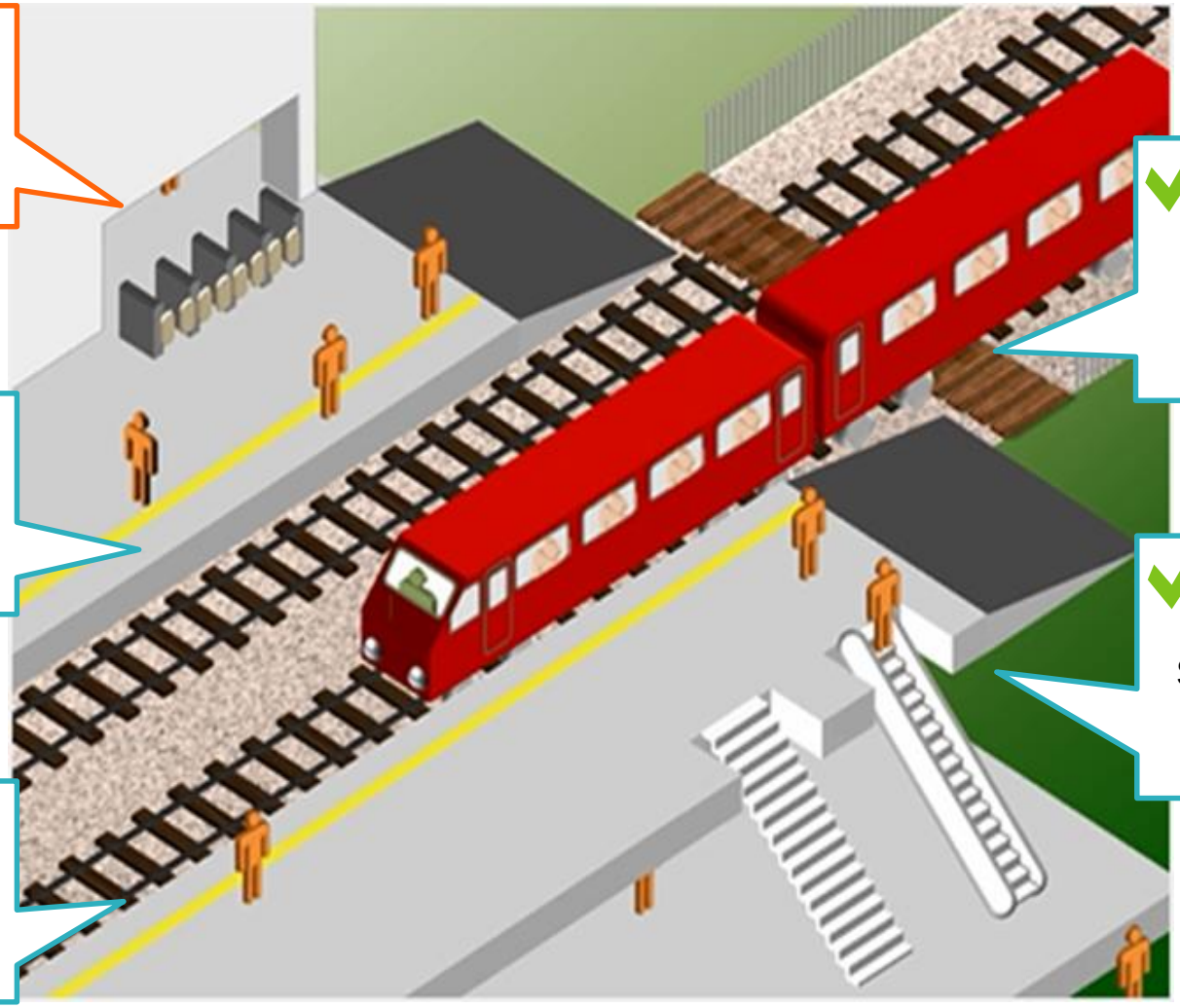
Processing the data



Suicides at stations

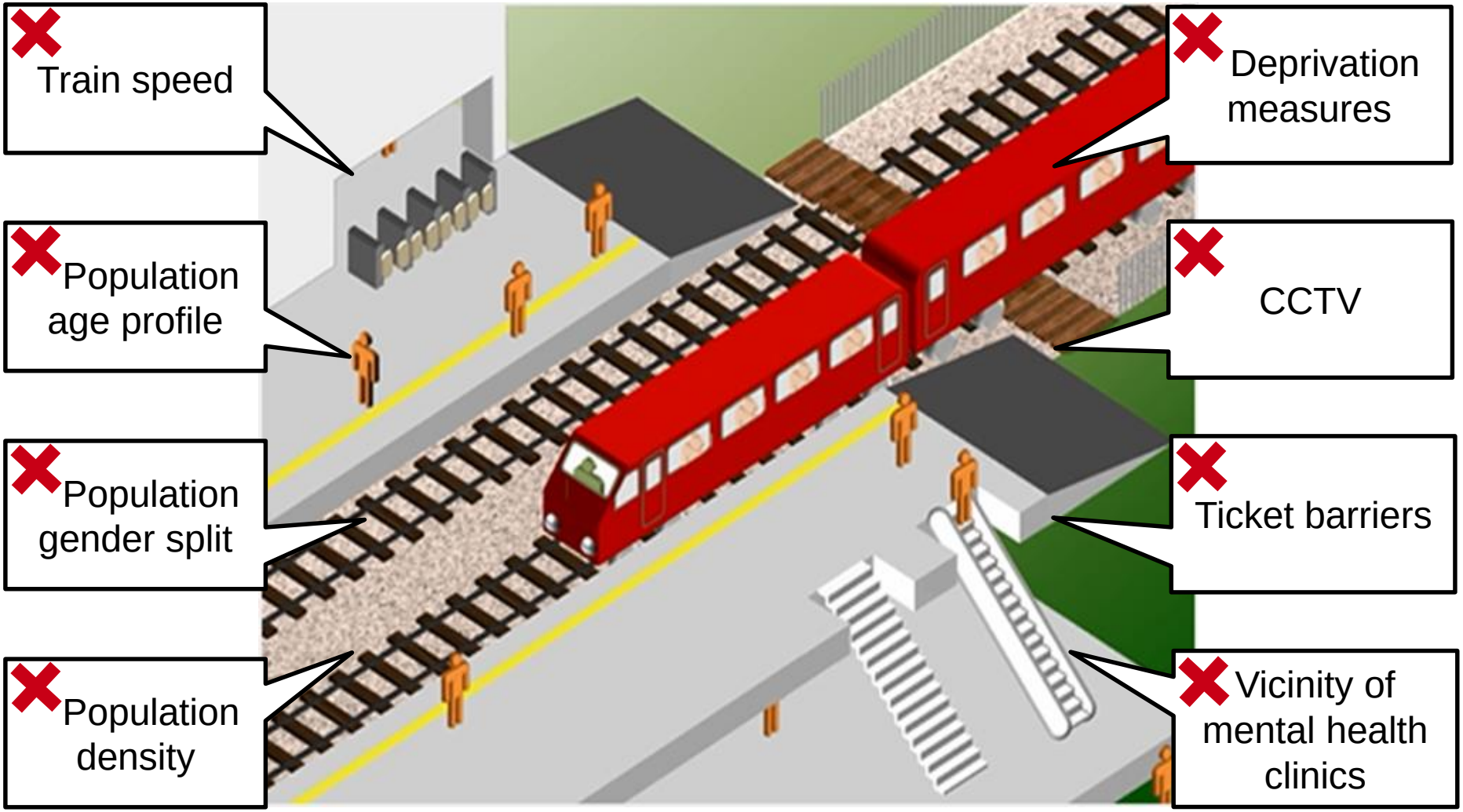
Generalised linear model: base rate and explanatory factors

- ✓ Number of entrances and exits
- ✓ Percentage non-stopping trains
- ✓ Station type
- ✓ Percentage tracks with adjacent platforms
- ✓ Percentage season ticket holders

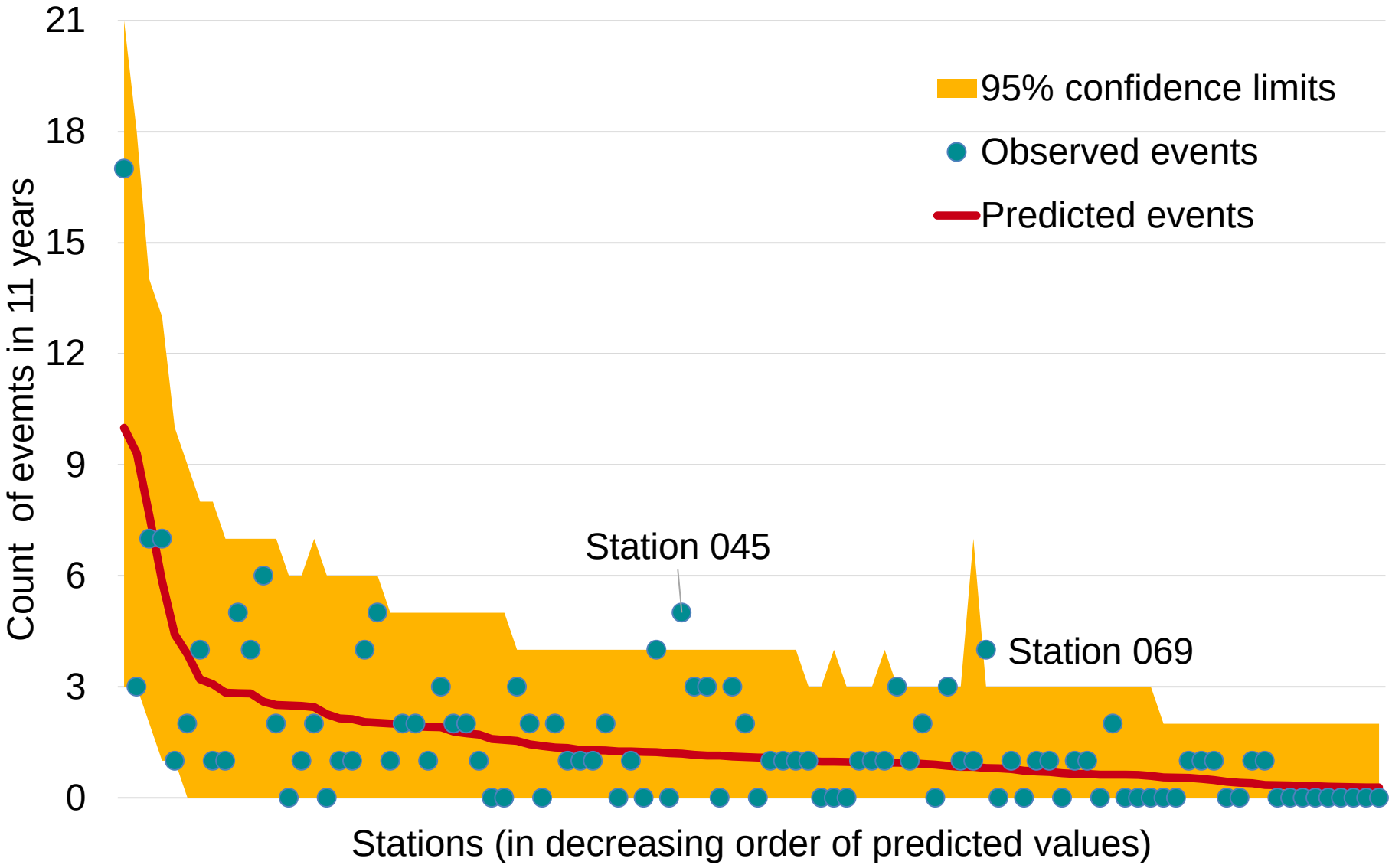


Suicides at stations

Generalised linear model: discounted factors

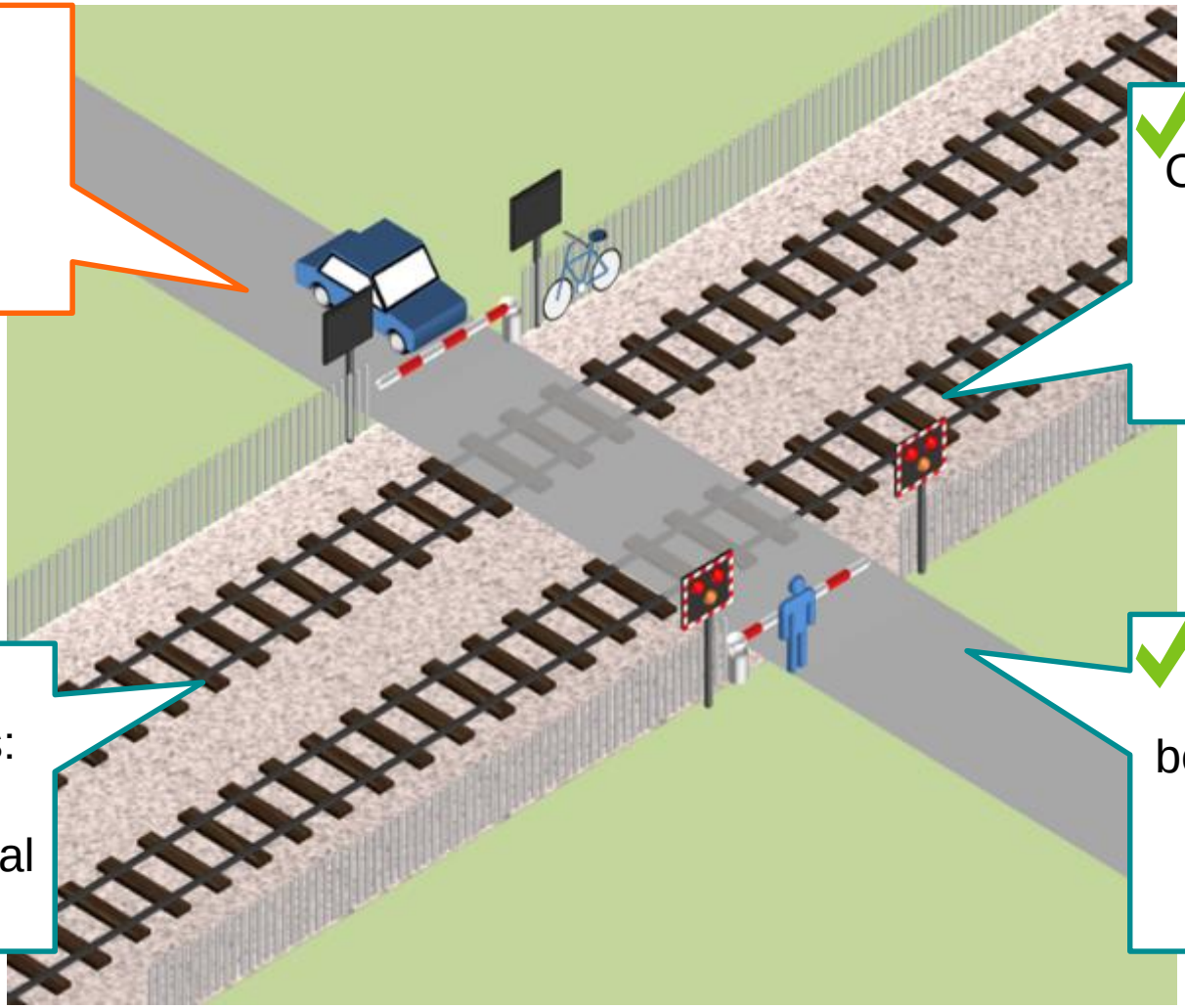


Suicides at stations results – top 100



Suicides at level crossings

Generalised linear model: base rate and explanatory factors



Number of trains

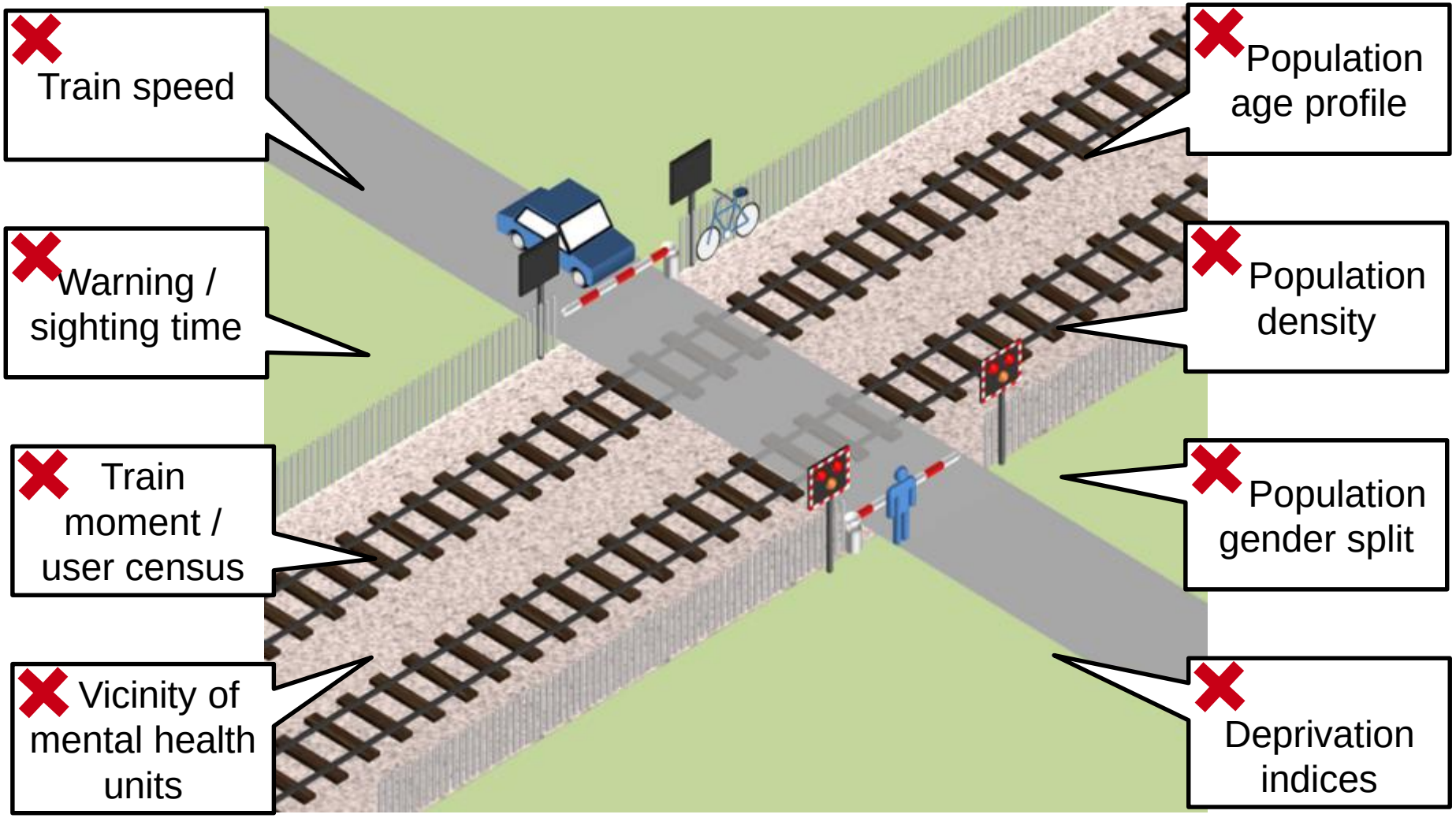
Crossing type: full barrier / automatic / passive

Surroundings: urban / suburban / rural

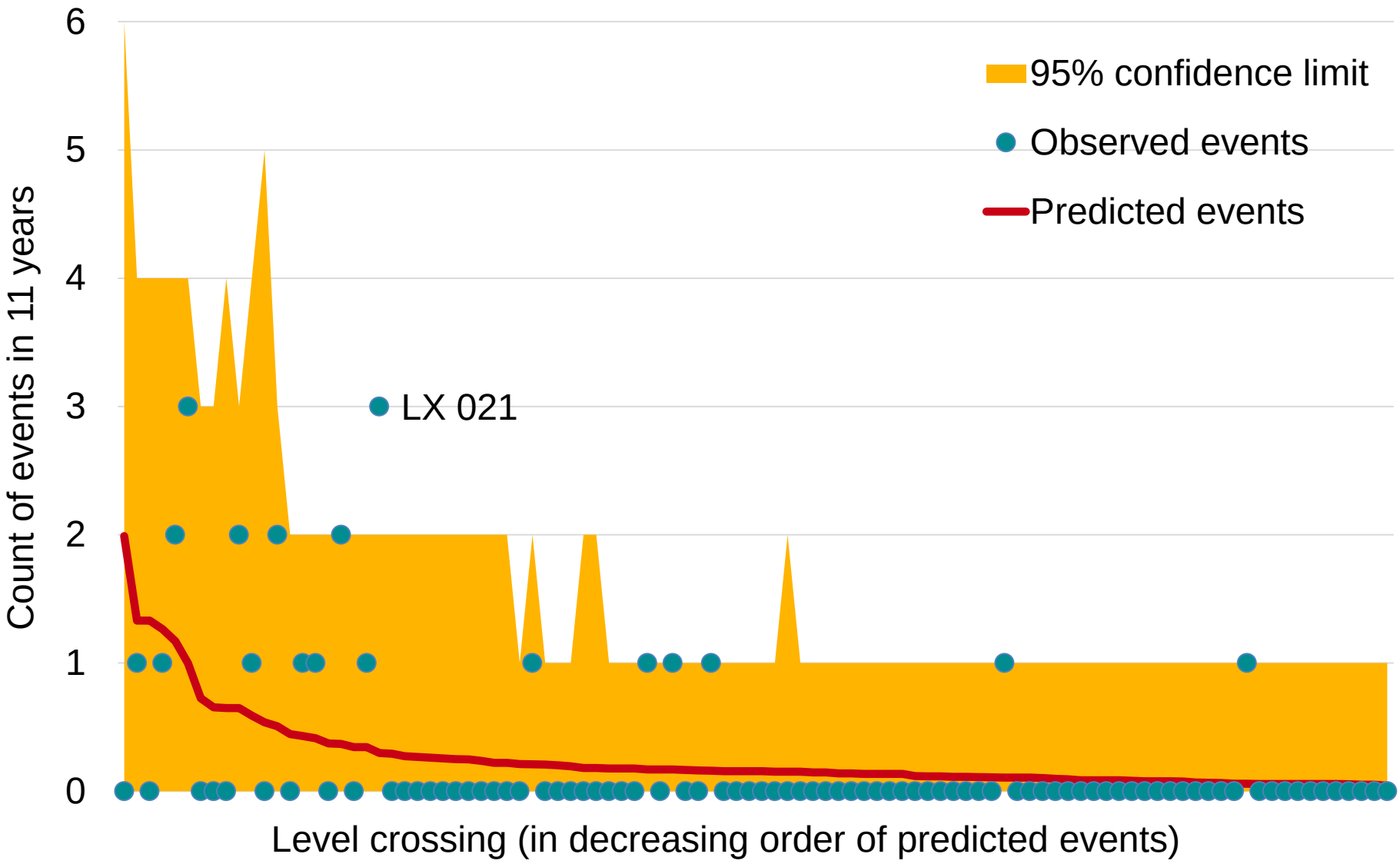
Interval between trains: frequent / infrequent

Suicides at level crossings

Generalised linear model: discounted factors



Level crossings results – top 100



Conclusions

- GLMs show promise, although with limited data it is tricky to identify the explanatory factors.
- Lengthening the data analysis period:
  - + more data points
  - – features change
- The results of the model provide a different insight into suicide locations.
- Match pair analysis may lead to identify
  - further explanatory factors
  - mitigations

Next steps

- We are in the process of briefing this out to our industry partners for user testing.
- We envisage the suicide modelling within the GeoSRM to be used inform decisions and understanding of risk:
  - Do they agree with the risk predictions, if not why?
  - Help facilitate with driver route learning, through identification of hotspots
  - Help support driver rostering
- Feedback from the user testing will be used to decide the future of the GeoSRM.

Acknowledgements

Thank you for listening

Thanks to SOUTH WEST TRAINS and NetworkRail for their support

www.rssb.co.uk

T972 Piloting a geo-referenced safety risk model for the rail network in Great Britain