Equine Injury Database Update and Call for More Data

Welfare & Safety of the Racehorse Summit VIII

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How do we get more from the EID?

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Outline

- Equine Injury Database (EID) since 2009
- Summary horse-level risk factors
- Testing the predictive ability of the models
- Evidence for the importance of non-fatal injury
- How could the reporting of non-fatal injuries be improved?

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Annual fatality rates each Spring

- Within 72 hours of race
- Estimates by calendar year
- Point estimates and 95% confidence intervals
- By surface, age and distance

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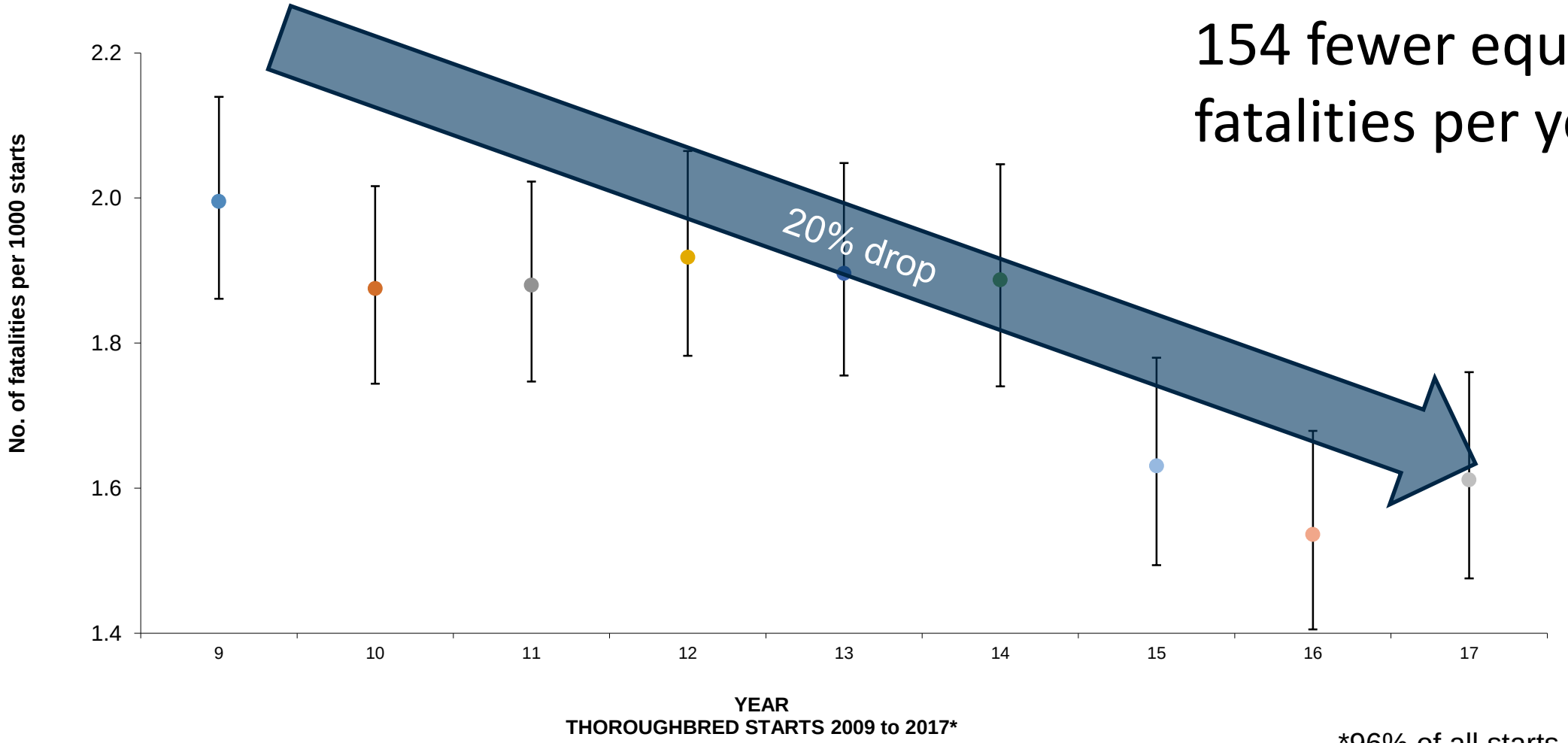
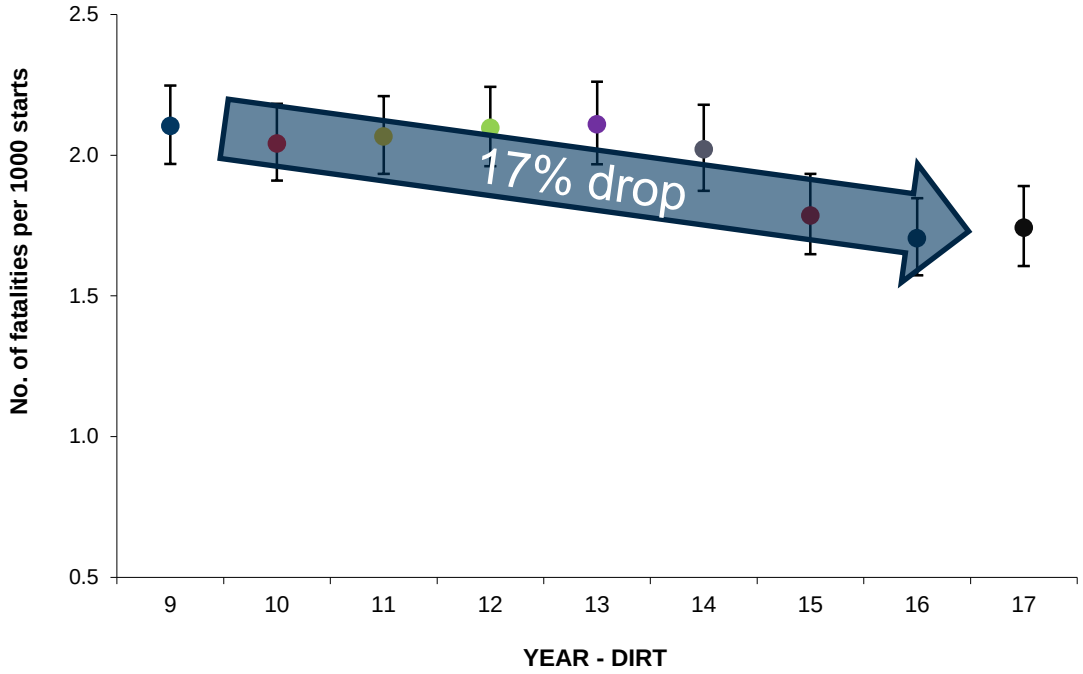
Fatal injury rate since January 2009



154 fewer equine fatalities per year#

*96% of all starts in N. Am.
IF number of starts had remained constant


No. of fatalities per 1000 starts
2.5
2.0
1.5
1.0
0.5
17% drop
9
10
11
12
13
14
15
16
17
YEAR - DIRT

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Summary

- Clear improvement on all surfaces since 2009
- Somethings are working well
- Still room for improvement
- Do not want to see the rate plateau
- What more can be done?

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What has been done so far?

- National and track (state) Specific models
  - Track or state-specific models
    - Dependent on sufficient number of starts at these tracks to provide adequate statistical power
    - Now possible at very many tracks/states
- Models for specific causes of (fatal) injury
  - Fracture
  - Proximal sesamoid bone fracture
  - MCIII fracture
- Models that include information about training schedules

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National and track-specific models

- >3.1 million starts by >150,000 horses
- 96% of all starts in North America (2009 to 2017)
- Some of the more common horse-level risk factors
  - Previous EID injuries
  - Appearance on a vet list
  - Time with same trainer

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Previous injuries

- Note: Only EID reported injuries
  - Actual relationship could be much bigger
- For every extra previous EID reported injury the risk of (fatal) injury during racing increases by:
  - Fatal injury – 61%
  - Fracture – 35%
  - Proximal sesamoid bone fracture – 43%
  - MCIII fracture – 41%

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Vet list

- For horses that have ever been on the vet list the risk of (fatal) injury during racing increases by:
  - Fatal injury – 115%
  - Fracture – 79%
  - Proximal sesamoid bone fracture – Not sig.
  - MCIII fracture – Not sig.

These two models include more workout risk factors, which may explain why being on the vet list was not in final models

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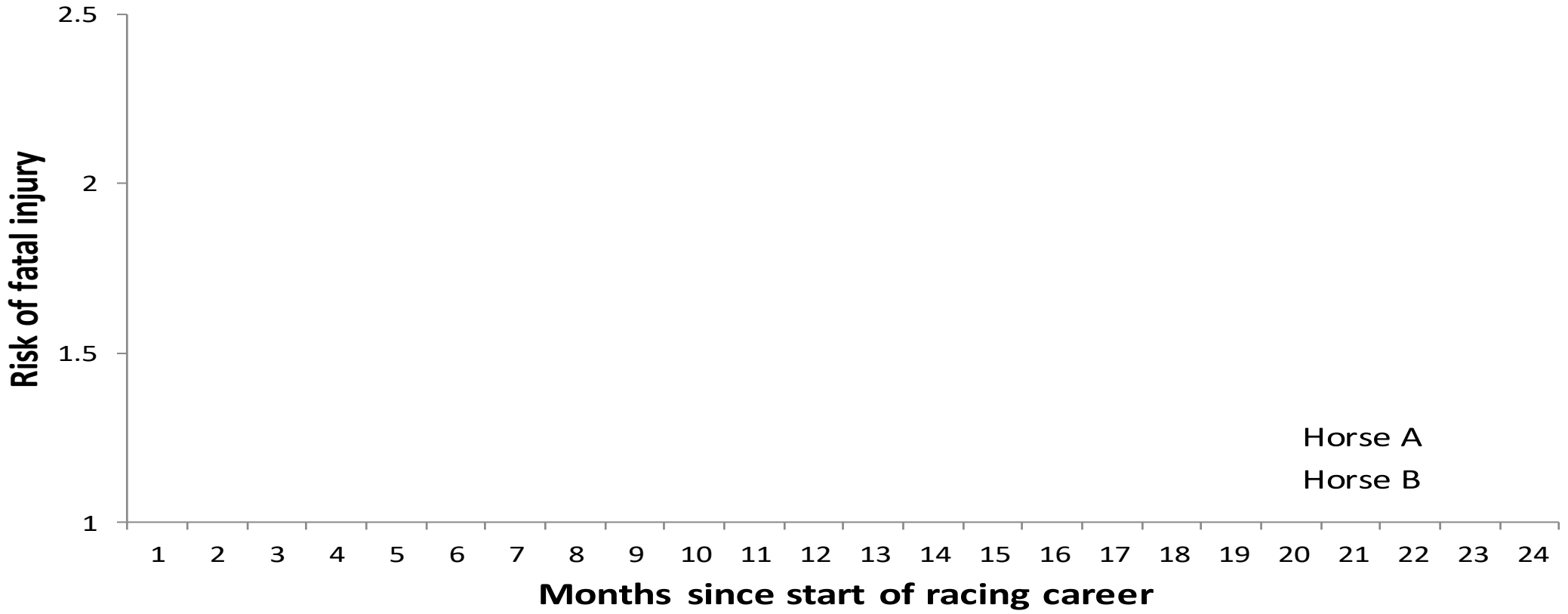
Vet list – national model

- No difference if include when come off the vet list
- Risk does not return to ‘base line’ once been on the vet list



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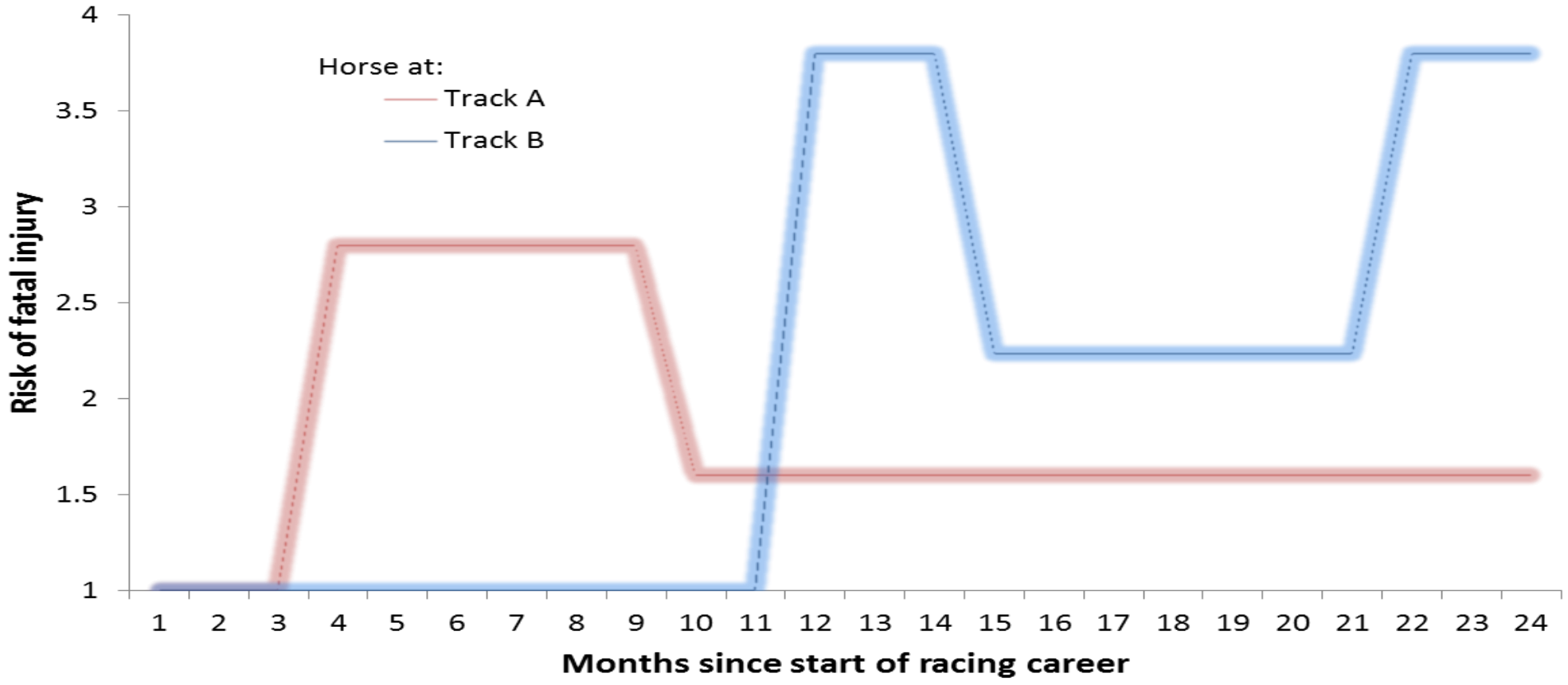
Vet list – track specific models

- Each track is different



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Time with same trainer

- For every extra month spent with the same trainer the risk of (fatal) injury during racing <u>decreases</u> by:

	If with trainer for a year	First start for new trainer
– Fatal injury – 1%		↑ 28%
– Fracture – 1%	13%	↑ 9%
– Proximal sesamoid bone fracture – 1%		
– MCIII fracture – 2%	27%	

Likely at least in some part to be due to lack of familiarity with the new horse.
Some of which will relate to the veterinary history.

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Summary

- Clear evidence of importance previous injury/being on the vet list and racing for a new trainer
  - All increase the risk of (fatal) injury

- Knowledge of health records will improve models and predictive ability and therefore usefulness of models

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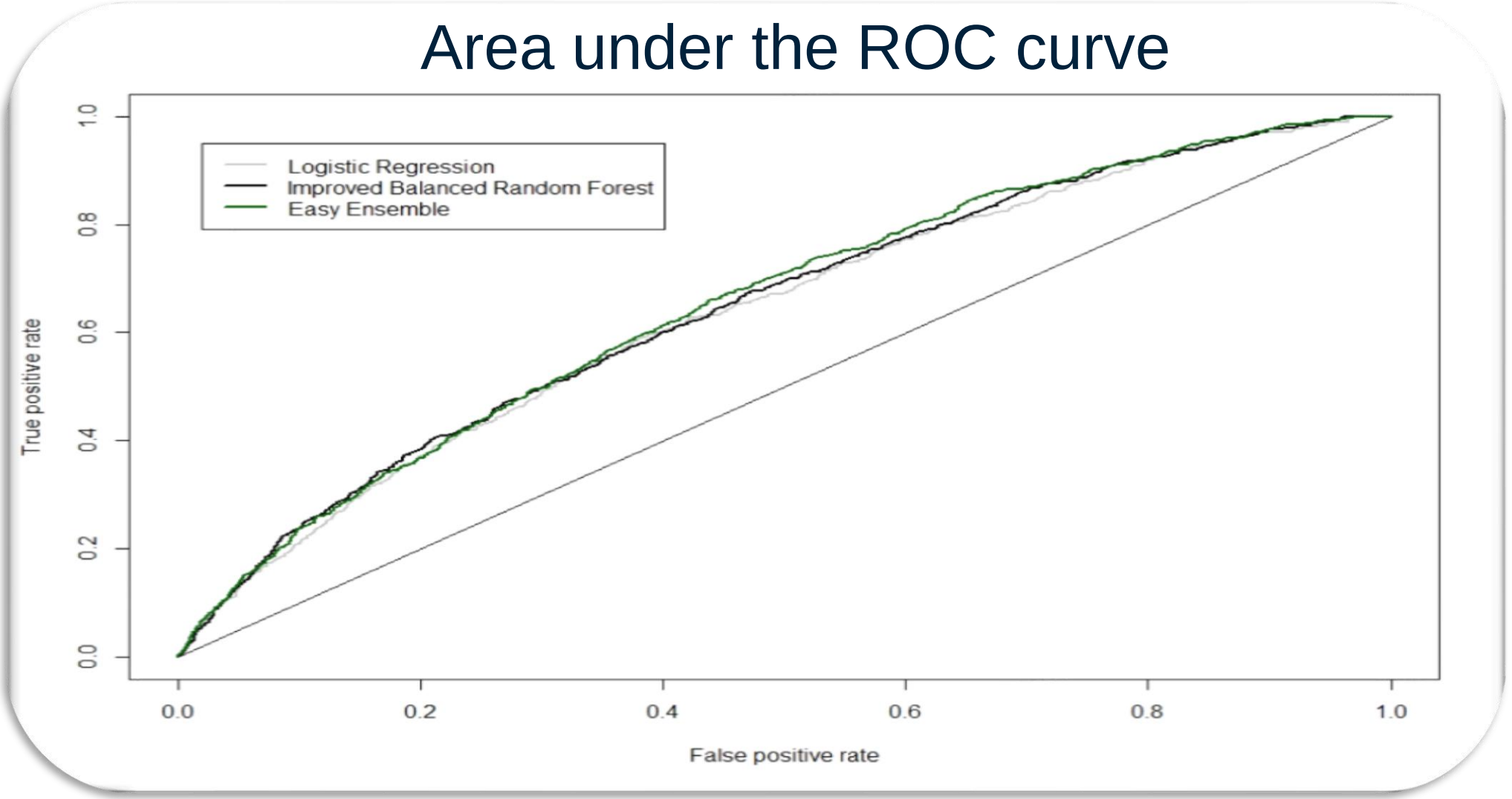
Predictive ability of models ~ 65%

Area under the ROC curve



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What does this mean?

- With two randomly selected starts (one which ends in fatal injury and one which does not) the model will correctly identify the start that ends in fatal injury 65% of the time.

- Better than a coin toss, but not yet good enough to use in practice.

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Variable predictive ability at different tracks

- AUC at different tracks:
- Range from 53% to 68%
  - Most individual track models are slightly less predictive
- A lot of ‘local’ factors that are simply missed in EID or not recorded at all
- Importance of ‘local’ knowledge and working with those on the ground at different tracks
  - Time to build track/state specific models

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Why cannot we be more predictive?

- Frequency of the outcome we are trying to model
- Scope of the data
- NB – amount of data is not an issue!

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Why cannot we be more predictive?: Frequency of outcome

- Risk is approximately 0.18% of starts
- In 10,000 starts - 18 fatal injuries & 9,982 starts not ending in fatal injury
- If you had to guess if a start was going to end in fatal injury you would always say NO
  - And be correct 99.82% of the time!
- Model works in the same way
- How make it a little easier for us
  - Increase the frequency of the outcome we decide to model:
    - Lifetime risk, Season risk, Meet risk
    - Model injury rather than fatal injury

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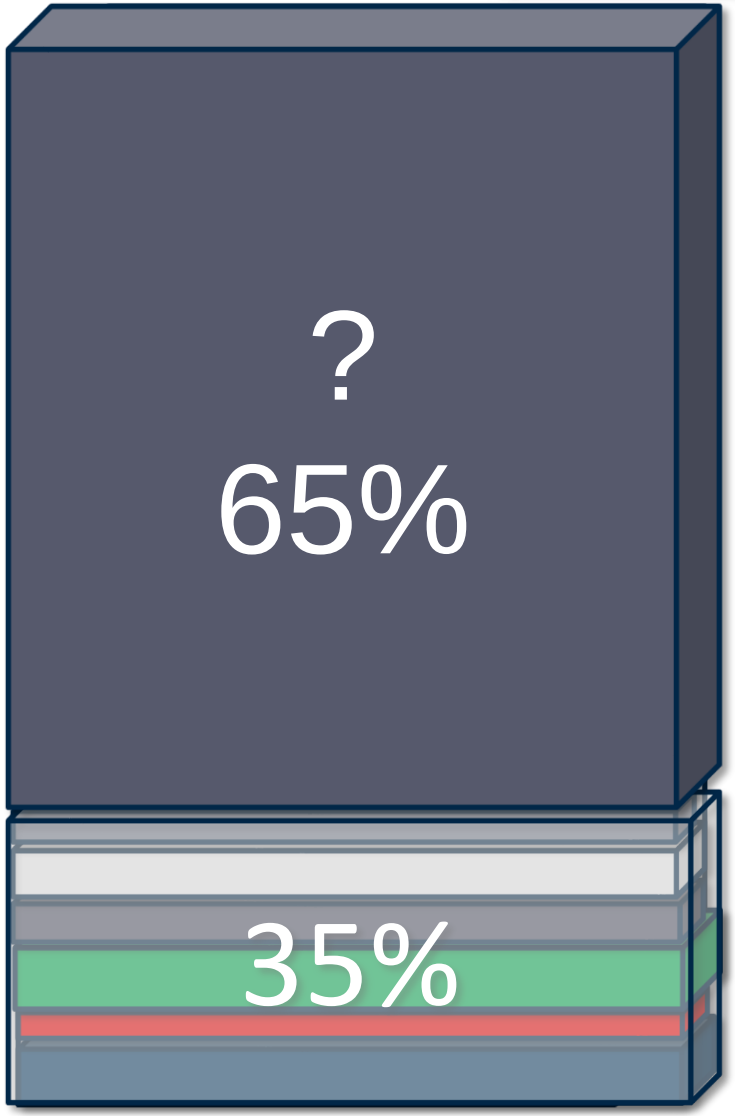
Why cannot we be more predictive?: Scope of data



Race distance ~ 4.2%

Race intensity ~ 6.3%

Same trainer ~ 5.3%

Age at first start ~ 8.4%

Horse gender ~ 4.2%

Surface condition ~ 6.3%

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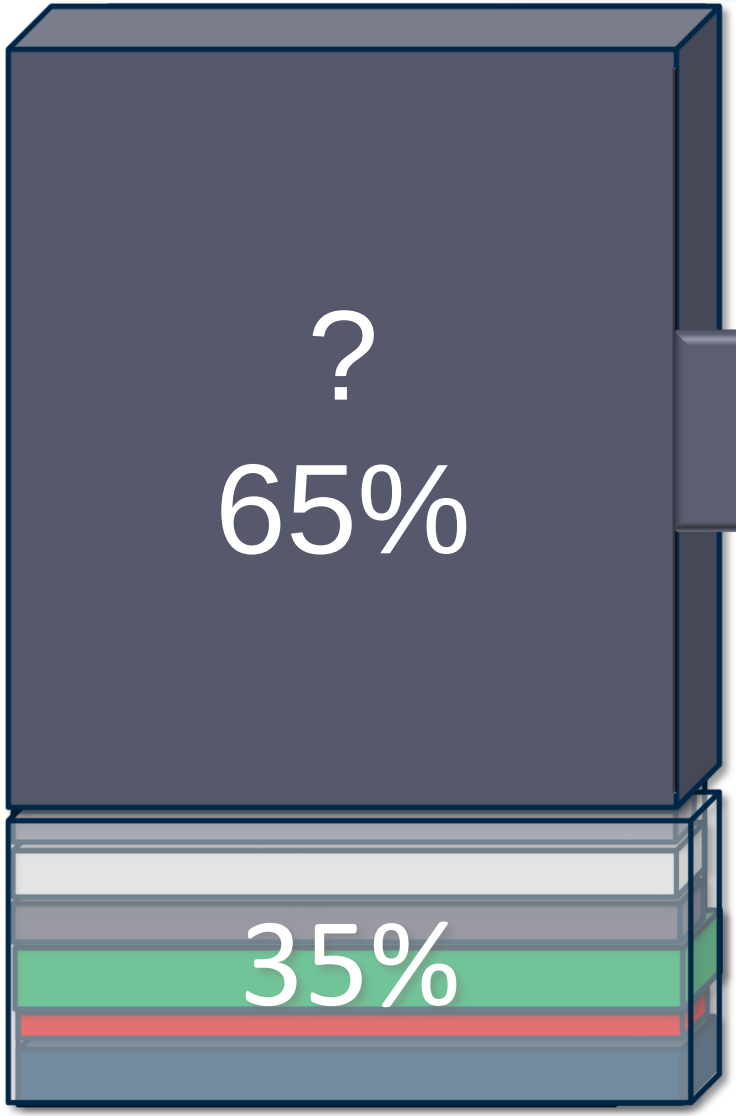
Why cannot we be more predictive?: Scope of data



- Veterinary history
  Complete training records
- Changes to medication regulations
  Local modifications
- Other potential measurable risk factors
- Natural/random variation

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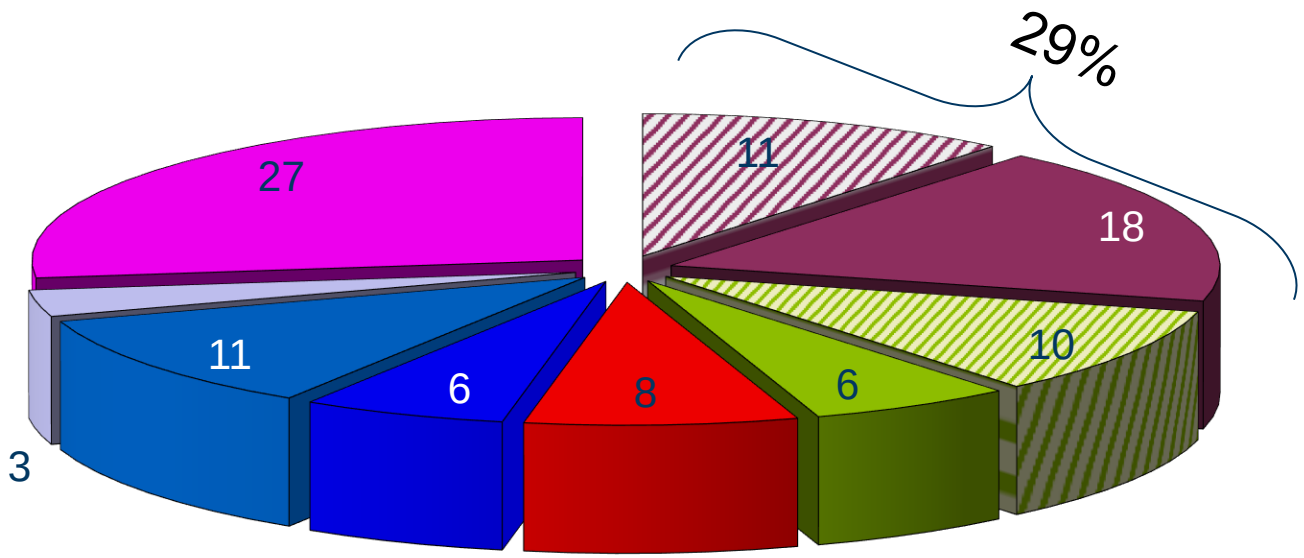
Where are the remaining risk factors?

Variance in the likelihood of a start ending in fatal injury



- Horse (explained)
- Horse (unexplained)
- Race (explained)
- Race (unexplained)
- Trainer (total)
- Racecourse (total)
- Genetics (total)
- Jockey (total)
- ? (total)

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What happens to horses with racing non-fatal injury?

Of 3,107,487 race starts:
12,574 ended in a ‘first occurrence’ non-fatal injury (0.4%)

Compared with the three races prior to injury, the average purse for the three races post injury dropped by 20%: $30k to $24k

5,844 horses made at least one further start (46%)

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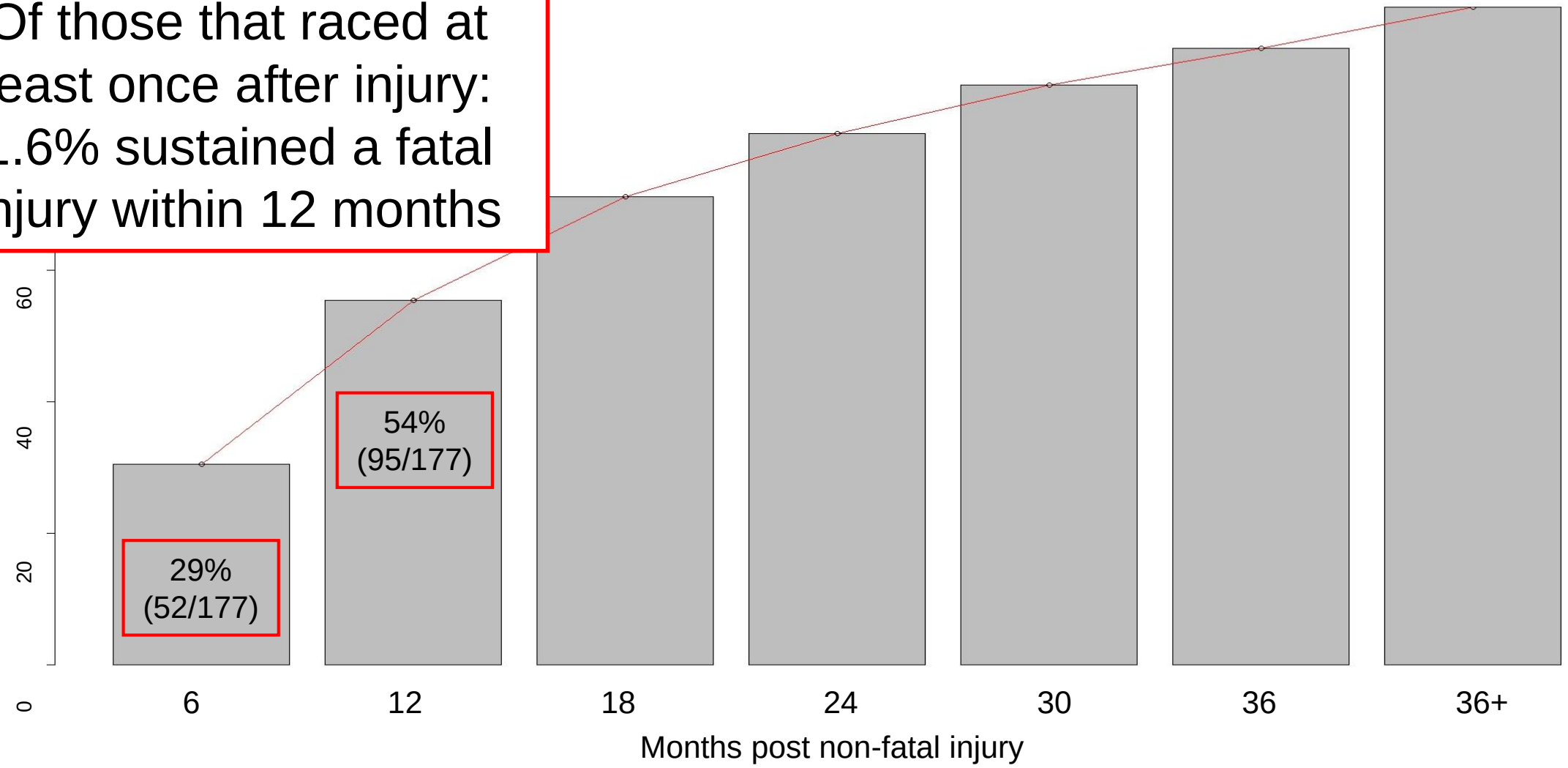
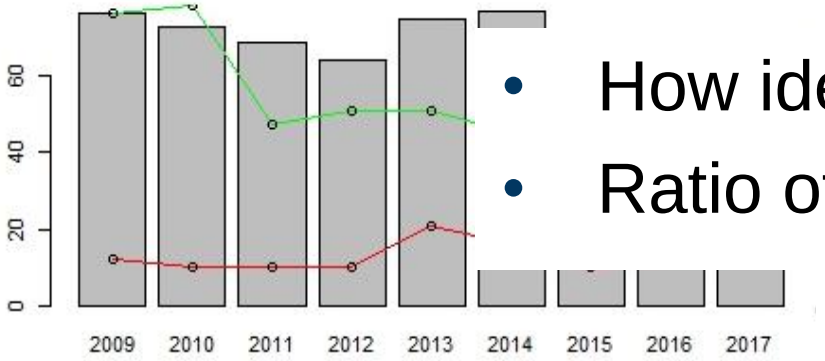
Months until fatal injury

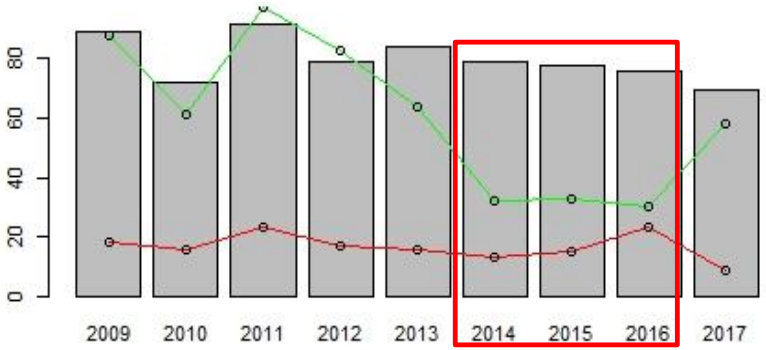
Of those that raced at least once after injury: 1.6% sustained a fatal injury within 12 months

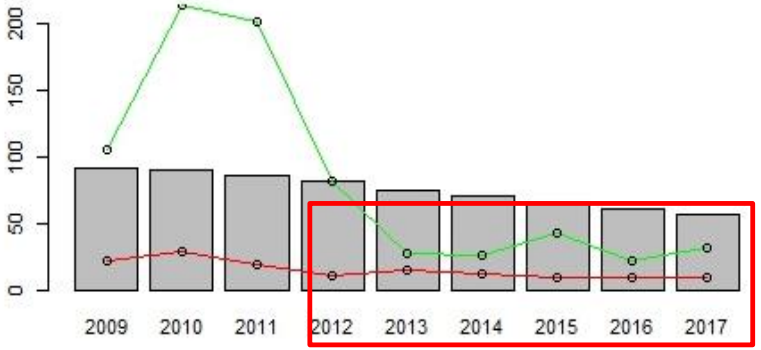


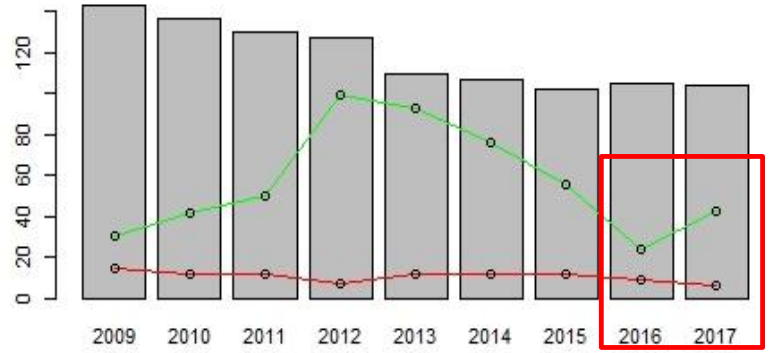
Track by track variation in reporting of non-fatal injuries



- How identify incomplete reporting?
- Ratio of non-fatal to fatal injuries







- Ratio of non-fatal to fatal injuries (national average 2.2 to 1)
  - At some tracks in some years 7 to 1
    - As low as 1.5 to 1 at same track in different year
  - Some tracks consistently closer to 1 to 1

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Summary

- Evidence for importance of non-fatal injuries
  - Risk factors
    - Previous injury, vet list, time with same trainer
  - What are we missing?
    - % of unexplained variance to with the horse
  - Impact of non-fatal injuries on future career
    - >50% never race again, risk of fatal (non-fatal) injury & economic impact
- IF we had more accurate indicator of horses with previous injury would likely make very significant difference to the models and ability to predict injury

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How do we encourage better injury reporting?

- Likely that 1000's of non-fatal injuries go unreported
- Not clear that reporting is improving across all tracks
  - Certainly less good in recent years at some tracks
- Equally (probably more) important is reporting on non-fatal injuries in training
  - Most studies suggest at least as many injuries in training as in racing

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How do we encourage better injury reporting?

- The challenge
- Who should be responsible for ensuring reporting?
- How to incentivise reporting?
- How to ensure accurate reporting?
- Consistent reporting:
  - Across different tracks?
  - At same track by different people?
- Share good practice and make it easy for those who currently find it difficult

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