Assessing Fox Mortality in Fox Penning Trials

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What is fox penning?

- Fox hunting is an ancient sport where human trainers and dogs hunt wild foxes.
- For fox penning, the foxes are brought into an enclosure and are then hunted for training or entertainment.
- Fox penning does not adhere to the principle of *fair chase*.

Project Relevance

Fox Penning in Virginia

Laura Donahue | Posted 04.13.2013 | **DC**

Read More: Animal Protection Laws, Dc Impact, Virginia Fox Penning, Fox Penning, Animal Abuse, Animal Protection, DC News

Virginia has some of the best animal protection laws in the country, so most Virginians are shocked to learn that an obscure, extremely cruel practice known as "fox penning" is legal in the Commonwealth.

Read Whole Story

Virginia Could Ban 'Unconscionable Practice'

Richmond Times-Dispatch | Rex Springston | Posted 03.25.2013 | **DC**

Read More: Virginia, Video, Virginia Fox Hunting, Fox Penning, David Marsden Virginia Fox Penning Ban, David Marsden Fox Penning Ban, Hunting, Fox Hunting, Fox Penning Bans, Virginia Foxhound Training Preserve Owners Association, Virginia Fox Penning, David Marsden Fox Penning, Virginia Hunting, David Marsden, DC News

Nearly 5,000 foxes were trapped and placed in large, wooded pens in Virginia over the past four years. There, they were chased by hounds in an activi...

Read Whole Story

Fox-Penning Rules May Change In Virginia

Richmond Times-Dispatch | Rex Springston | Posted 12.18.2012 | **DC**

Read More: Virginia, Virginia Fox Penning Rules, Video, Fox Hunting, Virginia Board of Game and Inland Fisheries, Fox-Penning Rules, Virginia Fox Penning, DC News

Origins of the Project

- In early 2013 the Virginia Department of Game and Inland Fisheries (VDGIF) was considering new regulations on fox penning. They brought this dataset to Virginia Tech's Conservation Management Institute (CMI).
- The focus was on assessing factors contributing to fox mortality in fox-penning enclosures.

Data Overview

- Data consists of two types of days: trial days and non-trial days from a single fox pen in Virginia. For each day the following information is available:
  - Number of dogs (for trial days only)
  - Experience of each fox
  - Survival of each fox
- For non-trial days, we knew when a fox died, but only had vague information about the number of dogs. We handled this limitation by taking a missing data approach to the analysis.

Missing Data

Inferences are made from $P(\Theta|X, Y)$, where $\mathcal{X} = \begin{bmatrix} X \\ X^* \end{bmatrix}$ and X^* denotes missing covariates. Then in a Bayesian paradigm

$$P(\Theta|X, Y), = \int P(\Theta|X, X^*, Y)p(X^*)dX^*$$

Modeling Specification

$$
\begin{aligned}
y_{it} &\sim Bernoulli(p_{it}) && (1)\\
probit(p_{it}) &= \alpha + \mathcal{X}_{it}\beta + \theta_{it} && (2)\\
\theta_{it} &\sim N(0, \phi^{-1}) && (3)
\end{aligned}
$$

where $\mathcal{X}_{it} = [Num.dogs_t \; log.experience_{it} \; (num.dogs * log.experience)_{it}]$, $i = \{1, ...27\}$(fox), and $t = \{1, ..., T\}$ (trials). Let R_{it} be the risk matrix, where

$$
R_{it} = \begin{cases} 1 & \text{if fox i is alive and collared on day t-1} \\ 0 & \text{otherwise} \end{cases}
$$

Modeling Specification

We use data augmentation where

$$Y_{it} = \begin{cases} 1 & Z_{it} > 0 \\ 0 & Z_{it} \leq 0 \end{cases}$$

and then

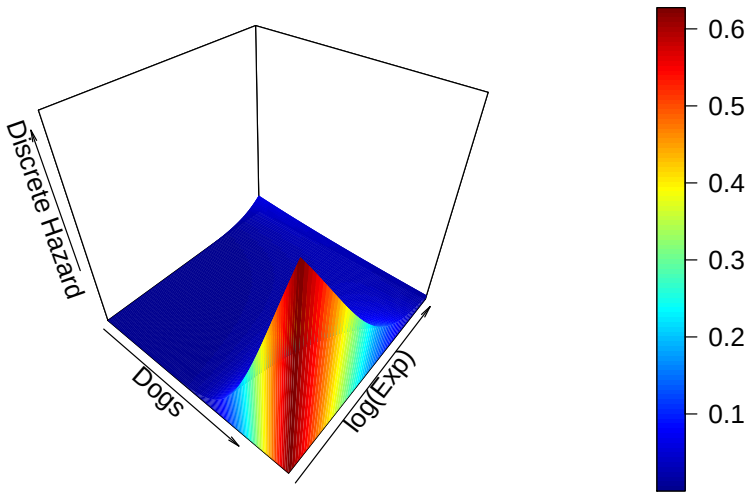
$$Z_{it} \sim N(\alpha + \mathcal{X}_{it}\beta + \theta_{it}, 1). \tag{4}$$

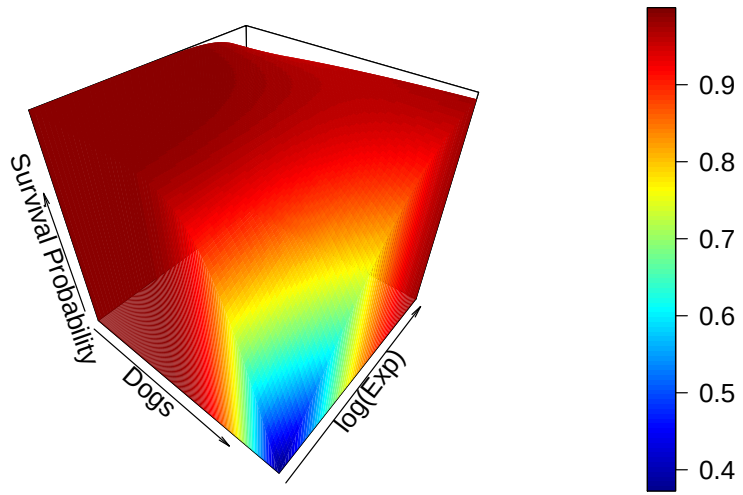
where vague normal priors are placed on α, β. Then $p(\phi) \sim Gamma$ and $X^* \sim N(0, 10)\mathcal{I}(X^* > 0 \ \& \ X^* < 50)$

Posterior Summaries

	mean	CI
α	5.4	(3.0,11.6)
β_{dogs}	-.008	(-.015, -.004)
β_{exp}	-.65	(-2.04,-.10)
$\beta_{dogs*exp}$	.0014	(.0006, .0030)

Response Surface



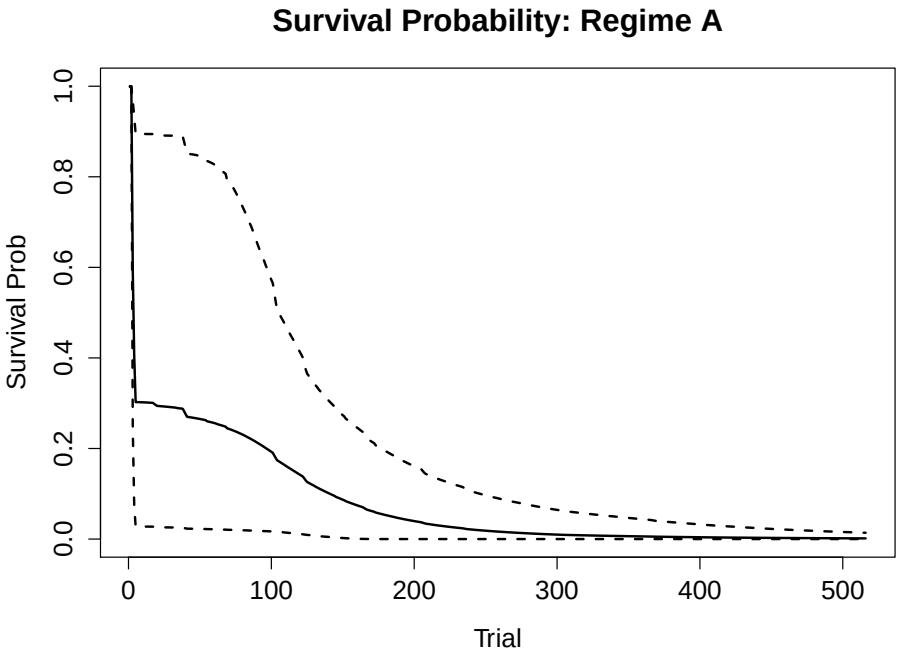


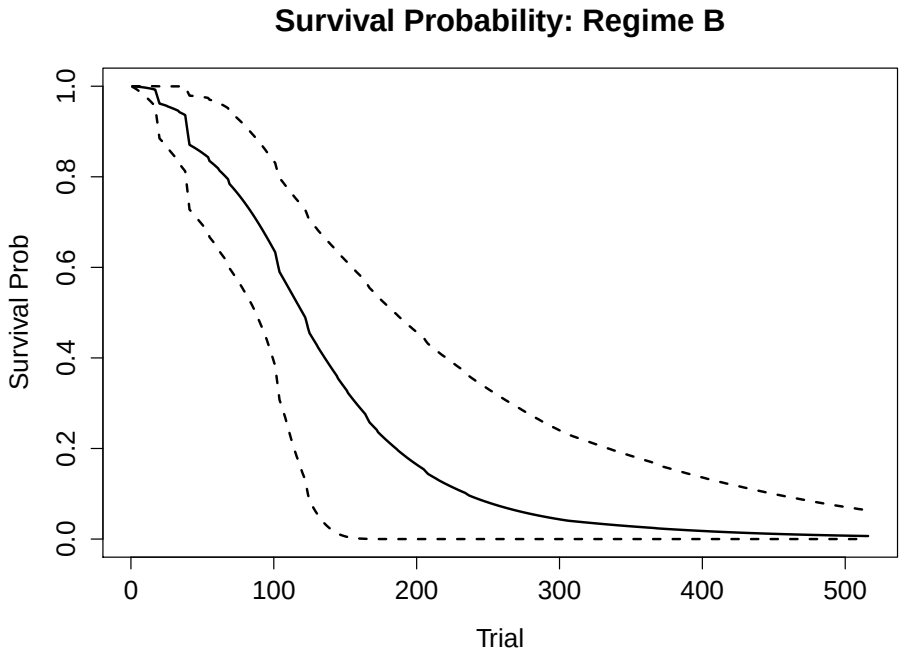
Regime Study

All regimes assume a fox was placed in the pen on the first day of the study.

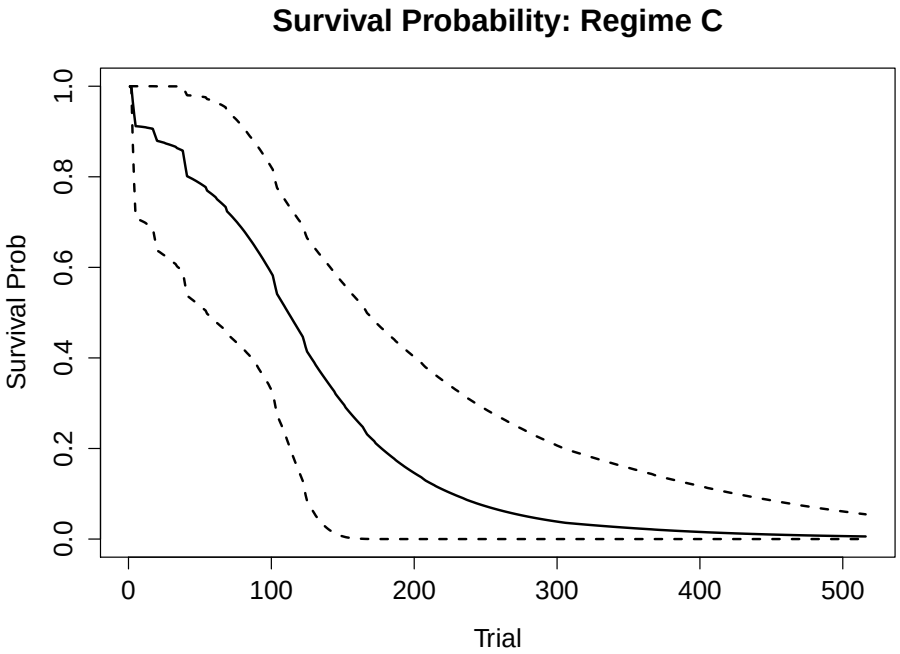
- Regime A: No constraints on number of dogs or allotted acclimation time.
- Regime B: Two weeks acclimation time with no dogs.
- Regime C: No more than 400 dogs allowed in pen at a time.
- Regime D: Two weeks acclimation time and 400 dog limit.

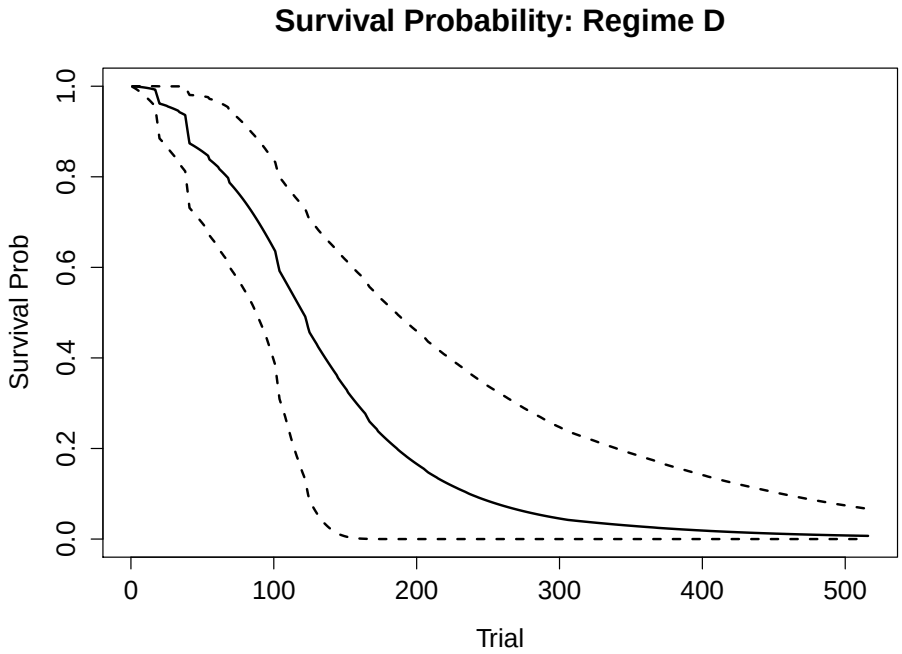
Regime Survival Plots





Regime Survival Plots





Regime Analysis

- Mortality is greatest with many dogs and for inexperienced foxes, but survival greatly improves either with a capped dog count or some time for the foxes to acclimate to the pen.
- Trials are run weekly, so two weeks acclimation is impractical. Thus, we can most practically smooth out fox mortality by capping the number of dogs in the pen.

What's Ahead

While we have addressed fox mortality, it remains to make the connection between mortality and cruelty.