

Influence of Demographic and Habitat Parameters on Sage-Grouse Chick Survival

Guttery, Dahlgren, Messmer, and Koons
Utah State University



Public Service Statement

Sage-grouse trapping can cause pink eye!!

Hold your bird correctly!!



The Danger Zone



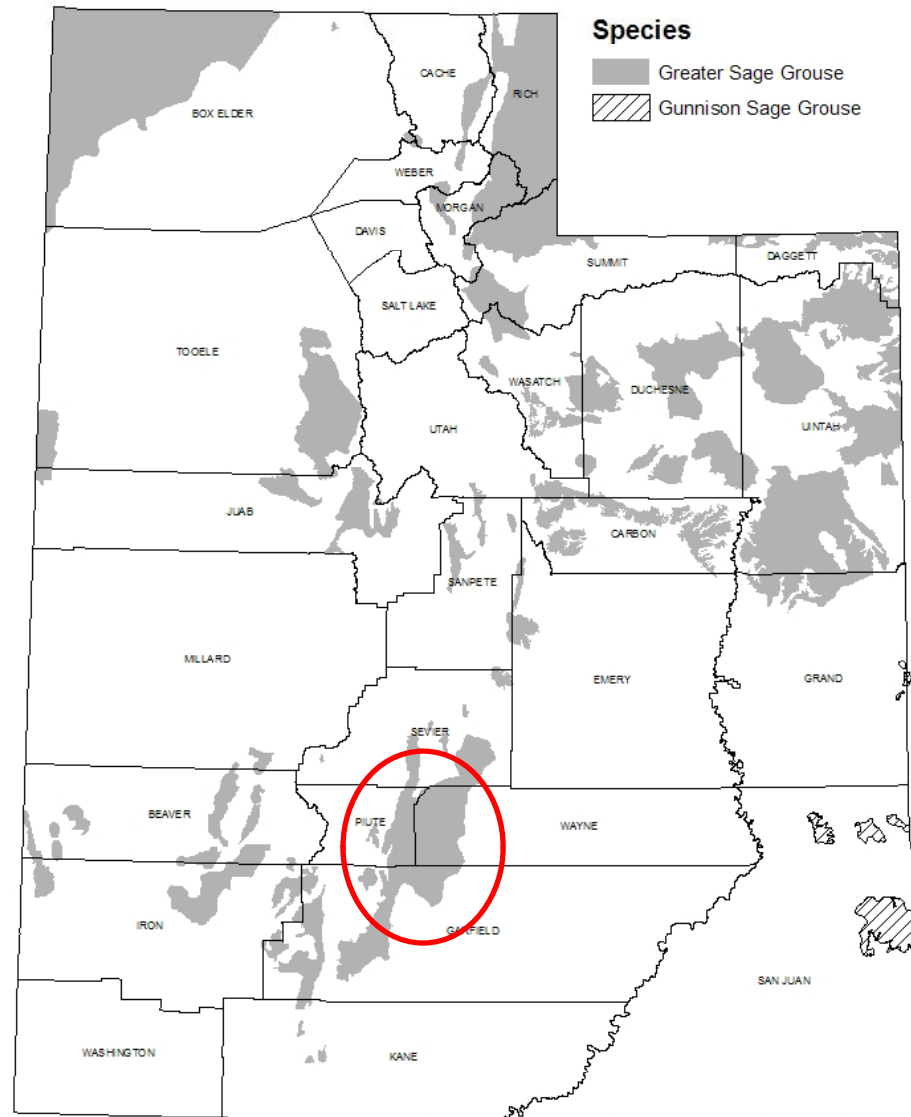
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Study Site

- Parker Mountain, UT
- Approx 100,000 ha
- Primarily grazing land
- Elev = 2,500 to 2,800 m
- Precip = 40 to 50 cm



Utah Greater Sage-Grouse Management Plan 2009

Methods

- Captured hens on/around leks.
- Captured chick soon after hatching.
- 1.5 g suture style transmitter
- Located every other day for 42 days.
- Habitat measurements taken at every other location.



Data and Analysis

- Demographic parameters : Hen Age (Yearling or Adult)
Hatch Date (Standardized Ordinal Date)
Brood Type (Mixed or Normal)

Brood Mixing



Data and Analysis

- **Demographic parameters :** Hen Age (Yearling or Adult)
Hatch Date (Standardized Ordinal Date)
Brood Type (Mixed or Normal)
- **Habitat parameters:** Cover type (Black or Big Sagebrush)
% Shrub Cover (Line Intercept)
Mean Shrub Height
% Forb Cover (Daubenmire Frame)
Mean Forb Height
% Grass Cover (Daubenmire Frame)
Mean Grass Height
PCA

Data and Analysis

- Survival modeled using a known fate max likelihood estimator.
- Allows for variable observation intervals and changes in brood size due to adoption or missing chicks.
- Accounts for lack of independence between brood mates using a quasi-likelihood model.
- See Manly and Schmutz. 2001. Journal of Wildlife Management.



Data and Analysis: Modeling

Intra-Annual Time Effects



Inter-Annual Time Effects



Demographics
(All combinations)

Habitat
(Candidate Set)

Results

- Marked 335 chicks from 76 broods over 5 years.
- 10 chicks died as a result of capture injury / transmitter attachment and were excluded from analyses.
- 95 chicks (29.2%) went missing prior to reaching 42 days.



Results

- Brood-mixing occurred in 25 of 76 broods.
- Mixing occurred in 44% of yearling hen broods but only 29% of adult hen broods.
- Mixing occurred through the survival period with most incidences occurring during weeks 2-4.



Results : Top Models

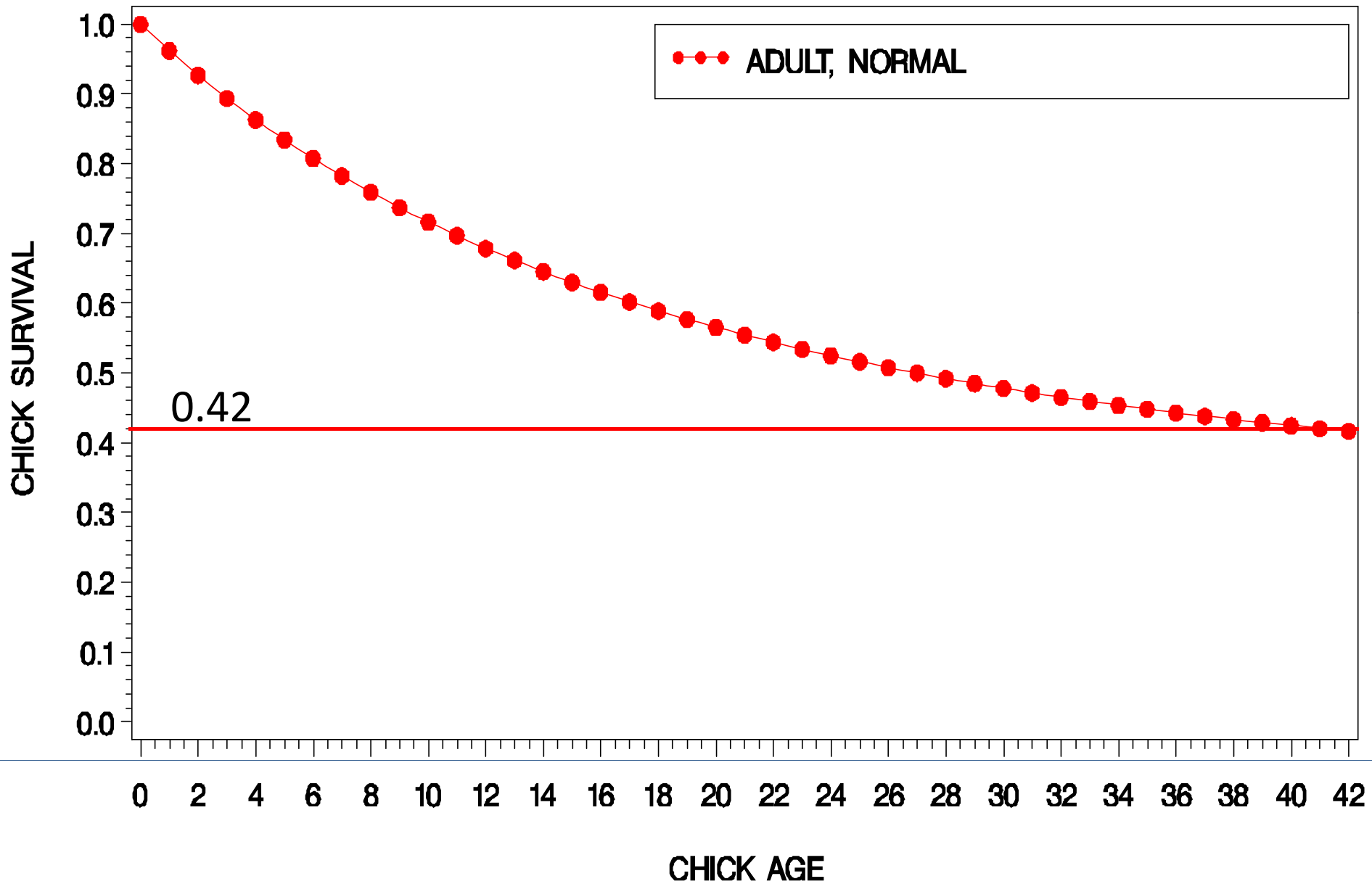
Models	Model Weight	% Reduction in Deviance
Base Model		
Intercept + Linear Time Trend + Year Effect	--	--
Top Demography Model		
** BT + HA + HD + (BT × HA) + (BT × HD)	0.52	61.9
Top Habitat Model		
** DST + GH + (DST × GH)	0.38	63.0

Results : Top Demo Model

Brood Type × Hen Age

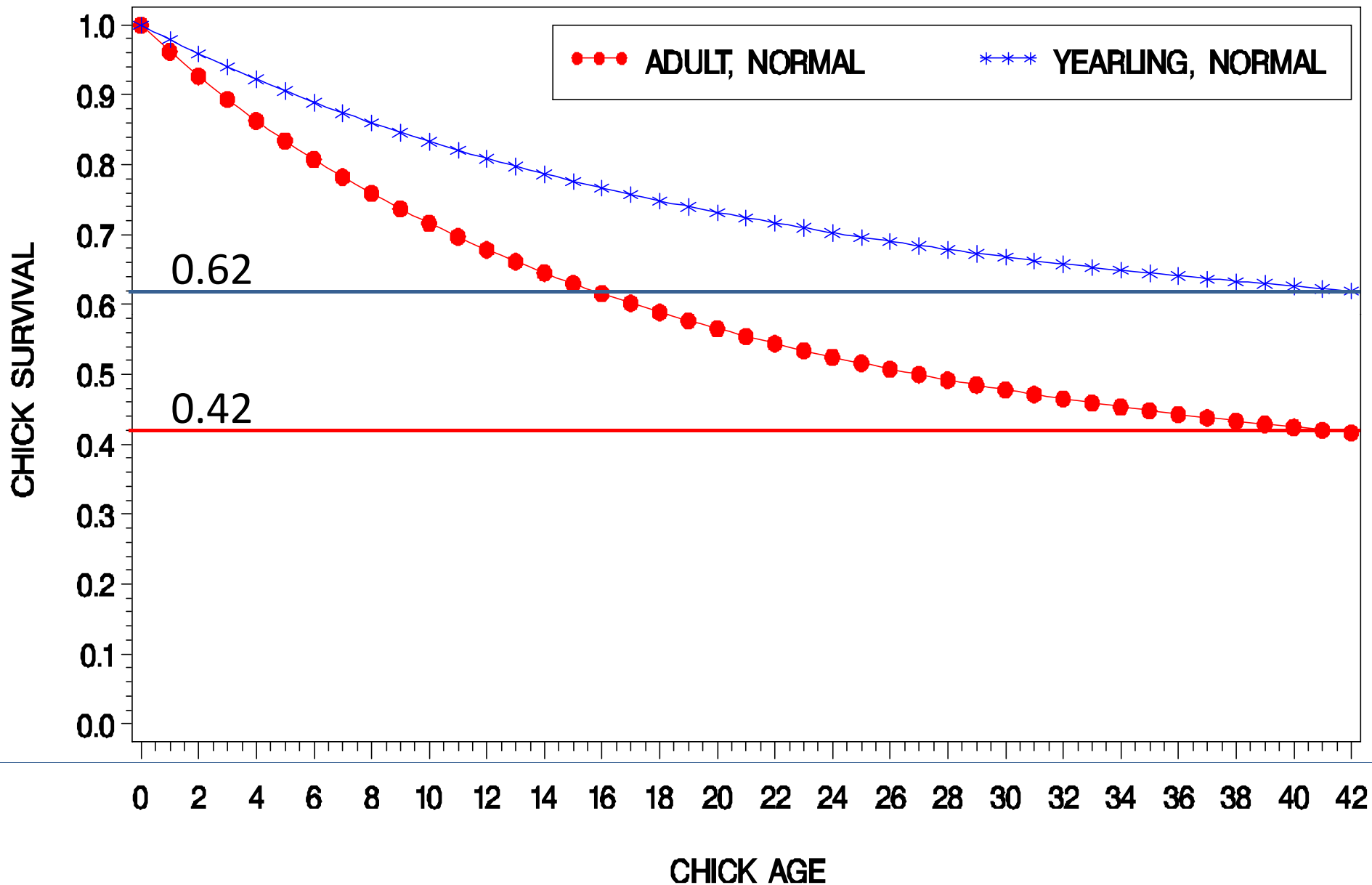
CHICK SURVIVAL IN RELATION TO BROOD TYPE AND HEN AGE

YEAR AND HATCH DATE HELD CONSTANT



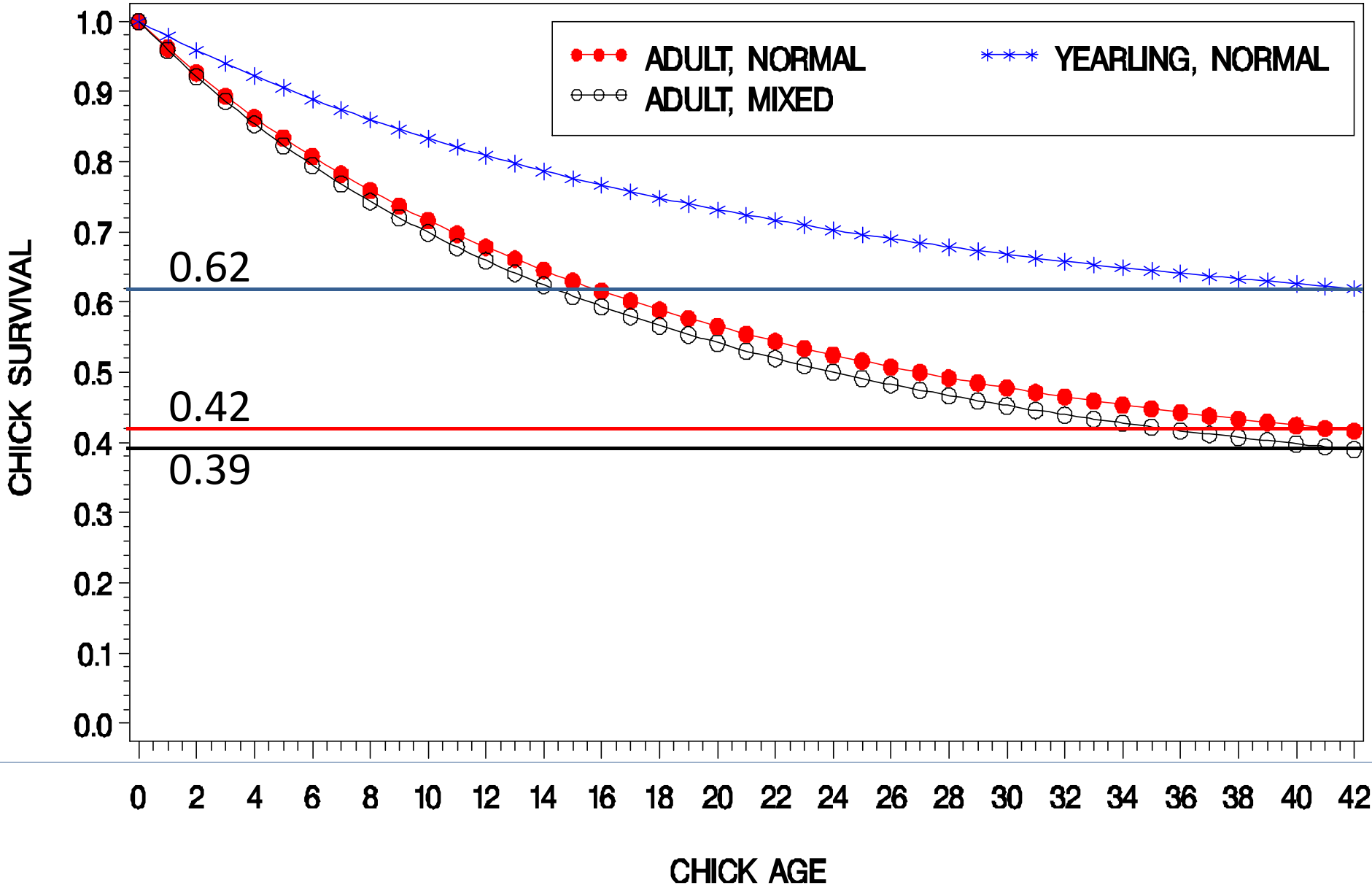
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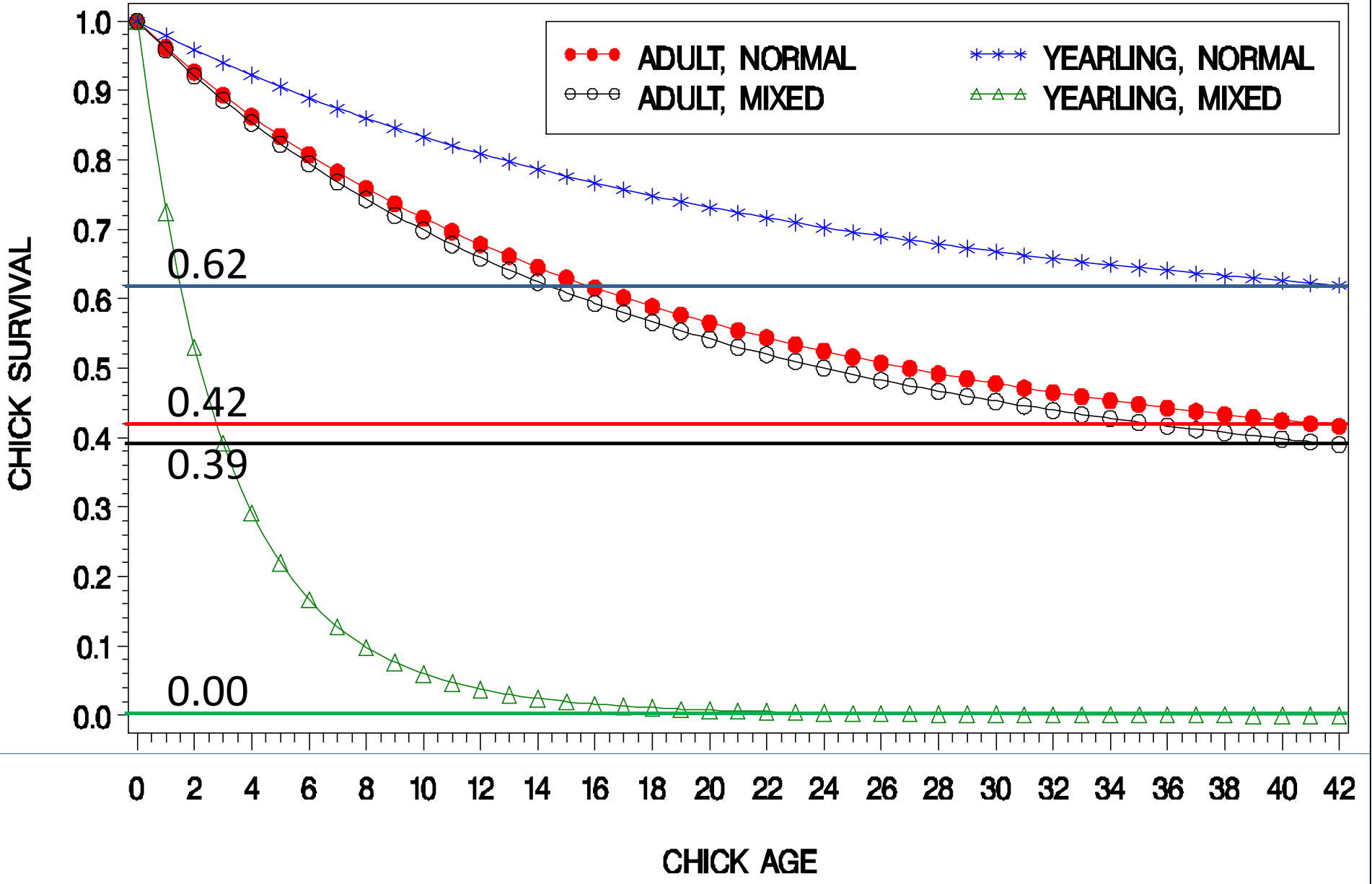
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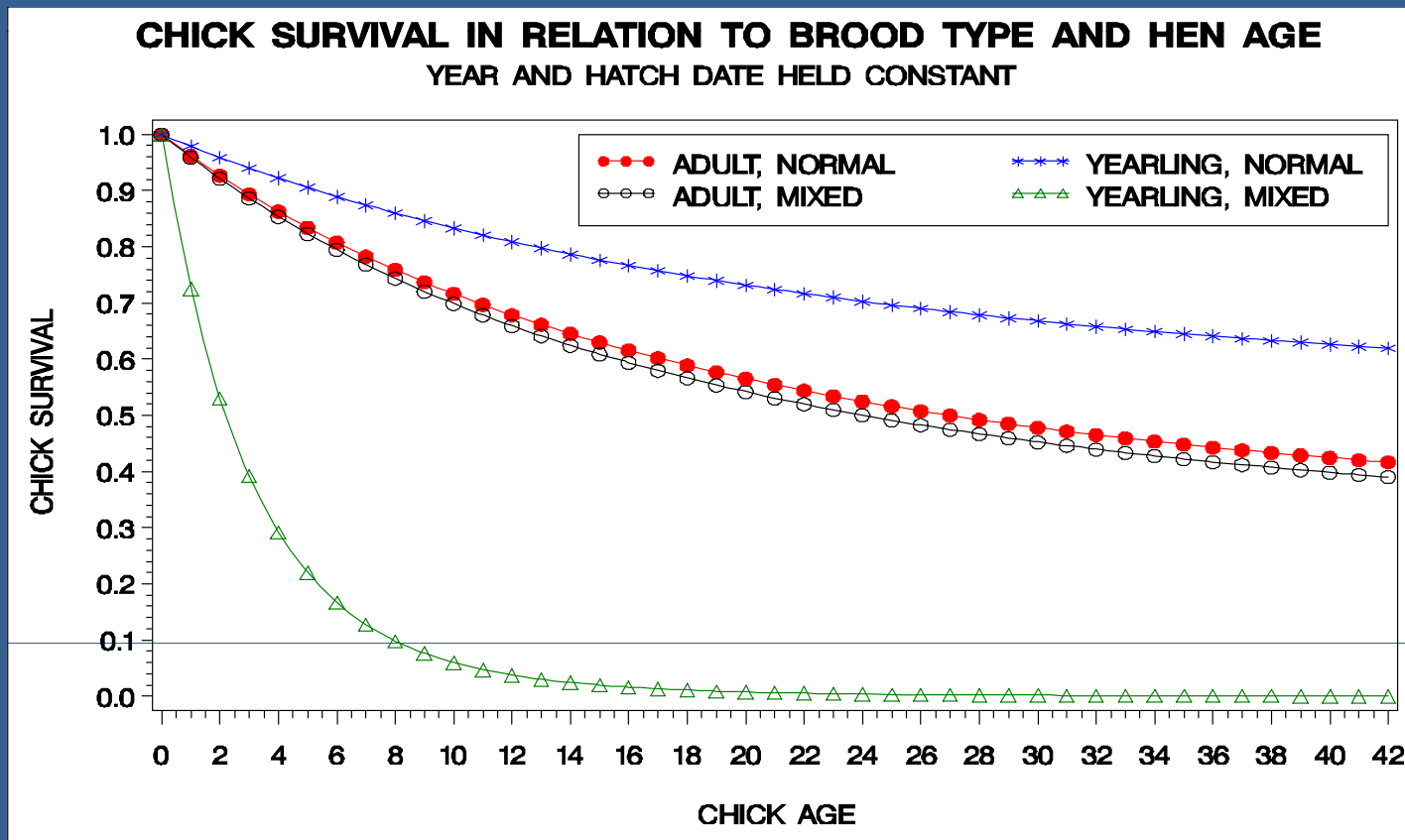
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Discussion: BT*HA

- Survival of chicks hatched to Adult hens is very steady.
- Survival of chicks hatched to Yearling hens is highly variable.



Discussion: BT*HA

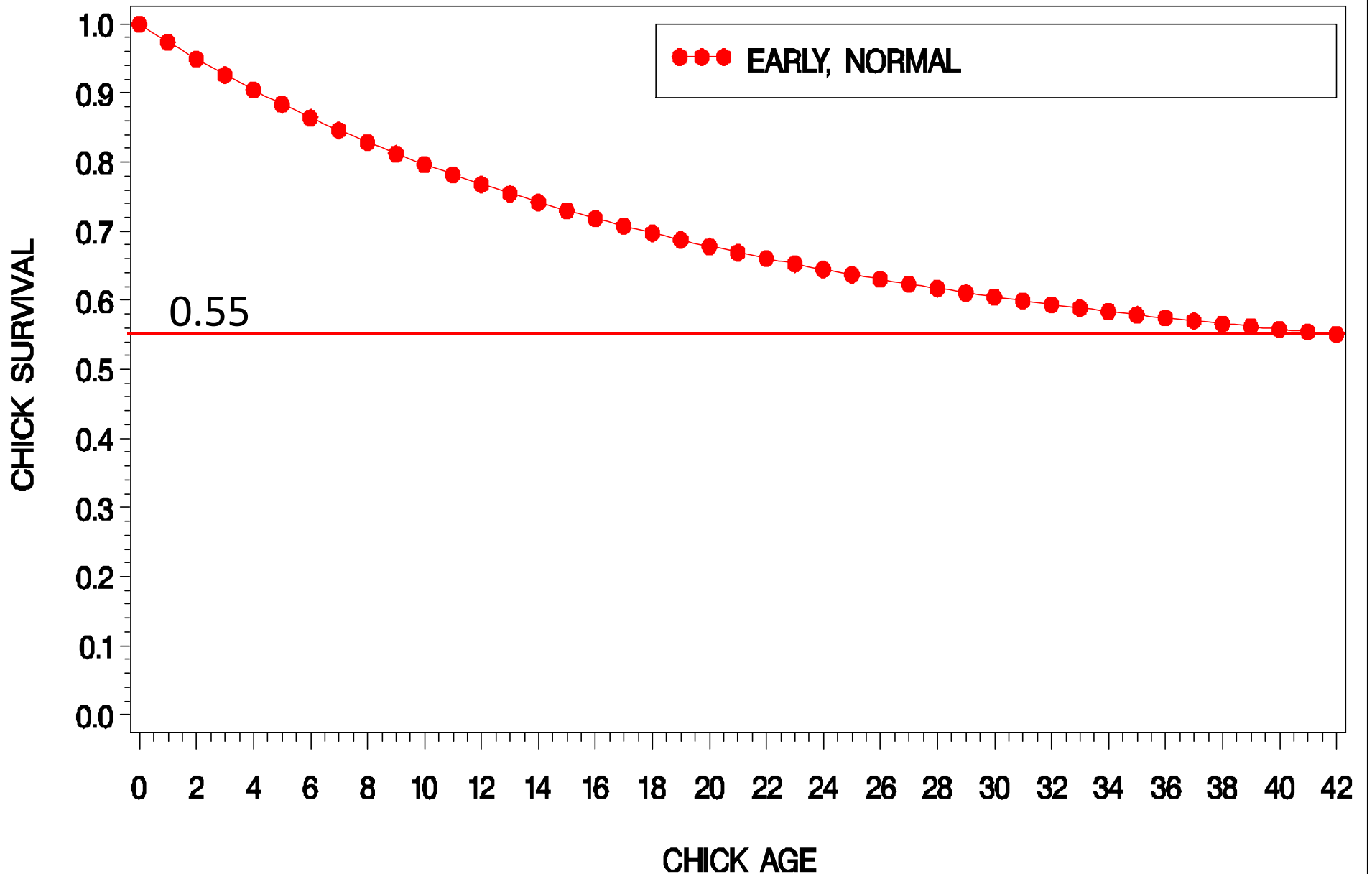
- Why would hatching to a Yearling hen be beneficial?
 - Hen selection
- Why does hatching to an Adult hen result in such stable survival?
 - Higher resource allocation
- Why do chicks hatched to Yearlings hens who engage in brood mixing have 0% survival?
 - These are the stupid chicks

Results : Top Demo Model

Brood Type × Hatch Date

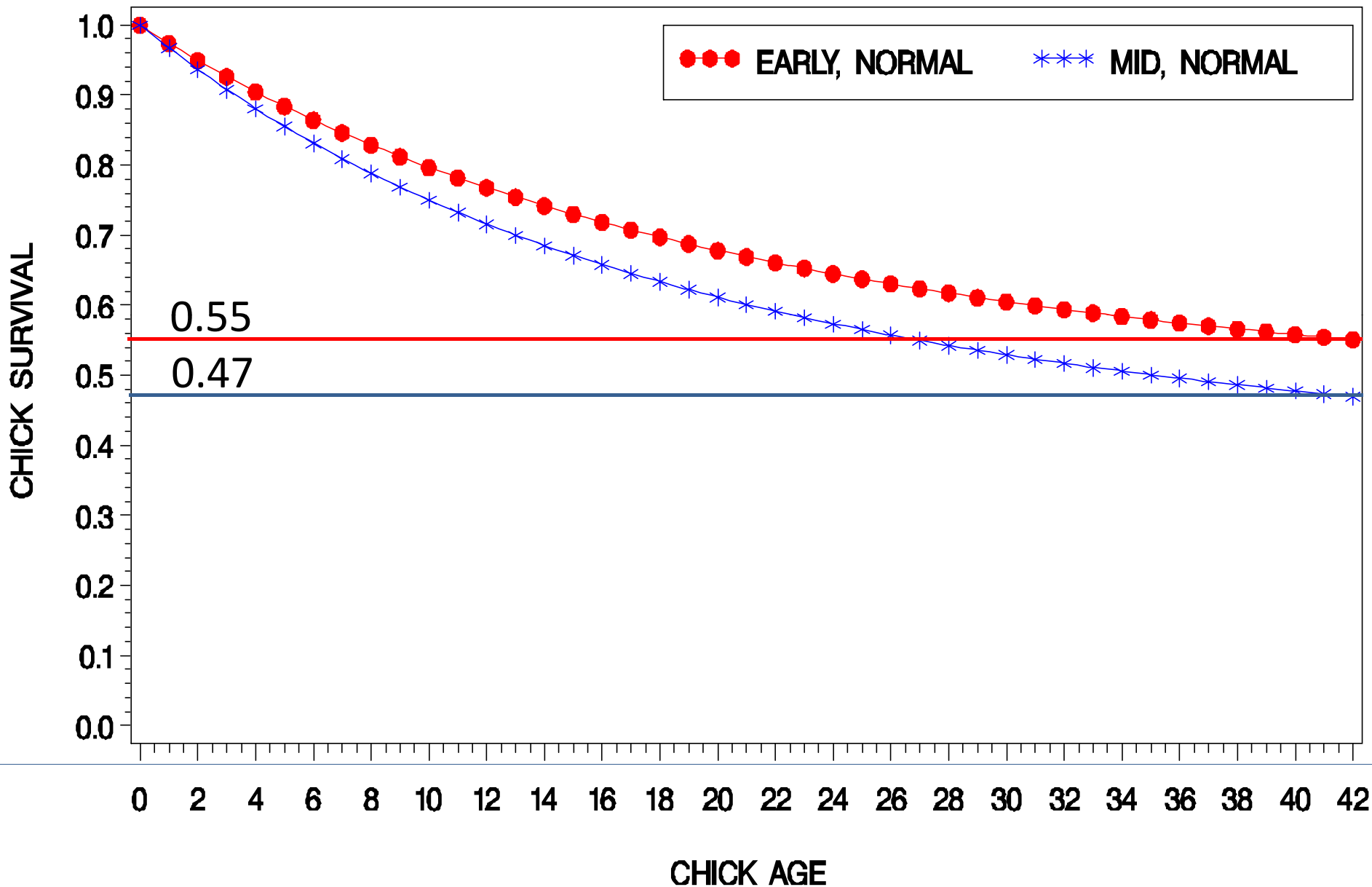
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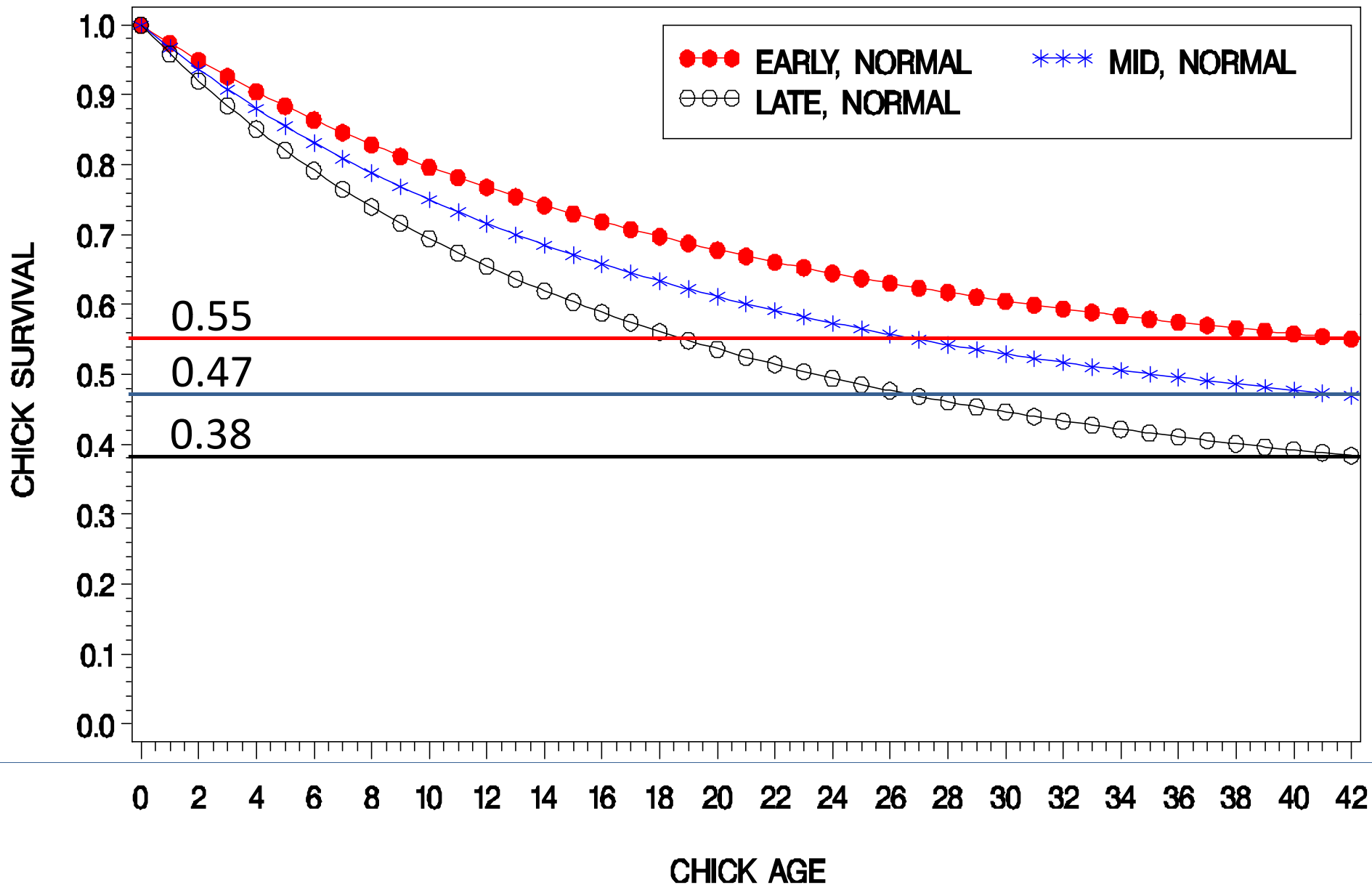
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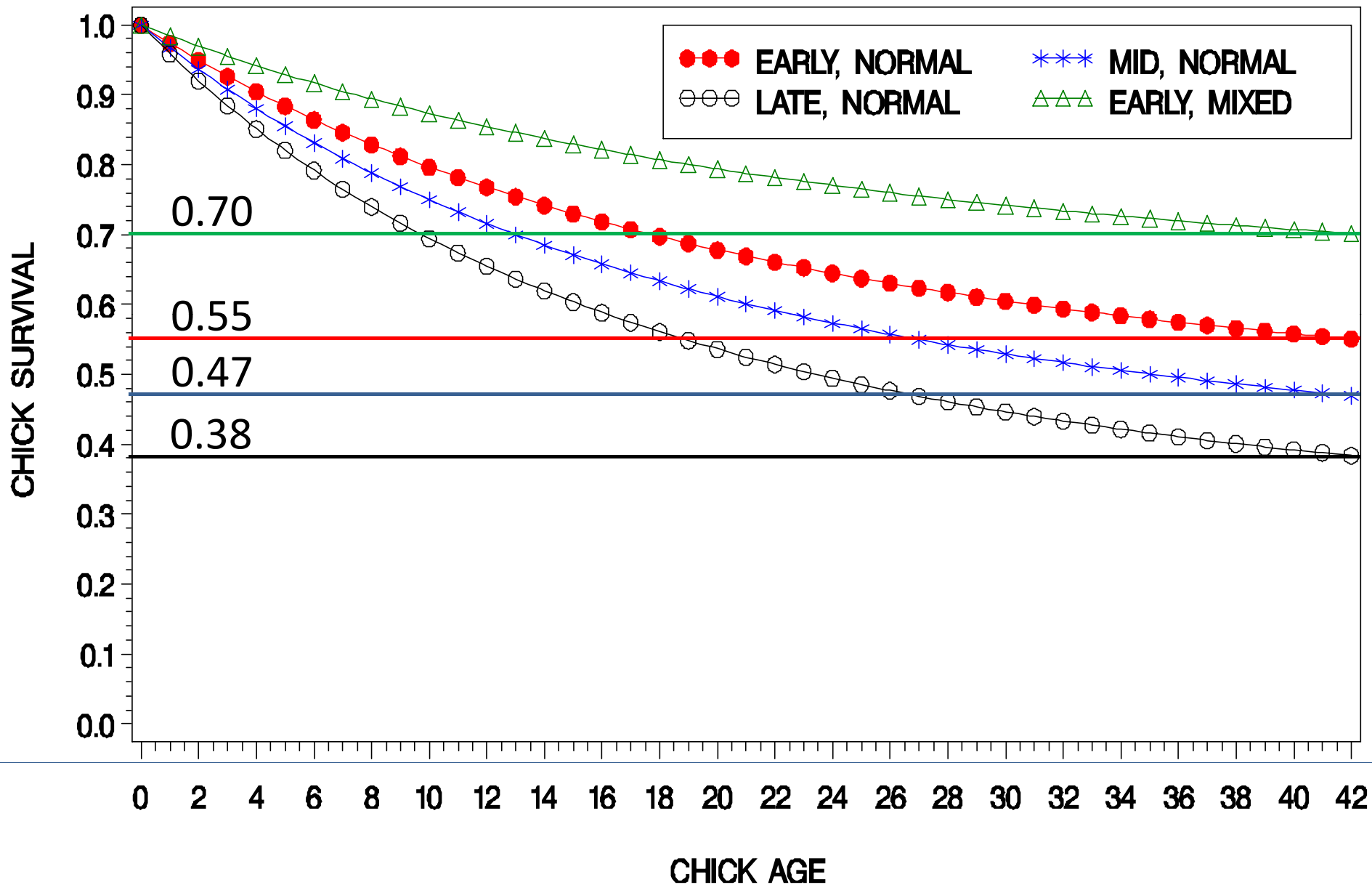
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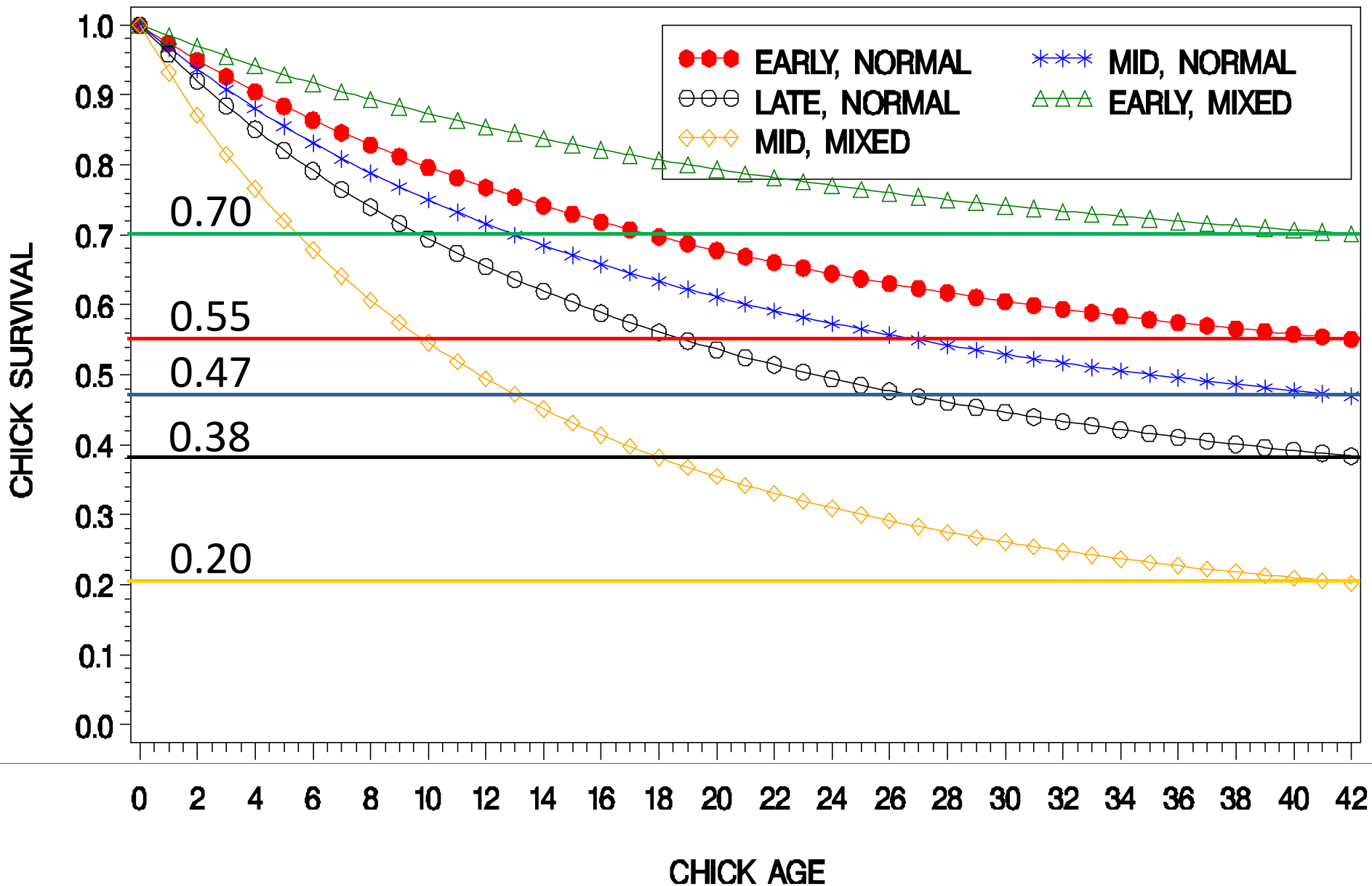
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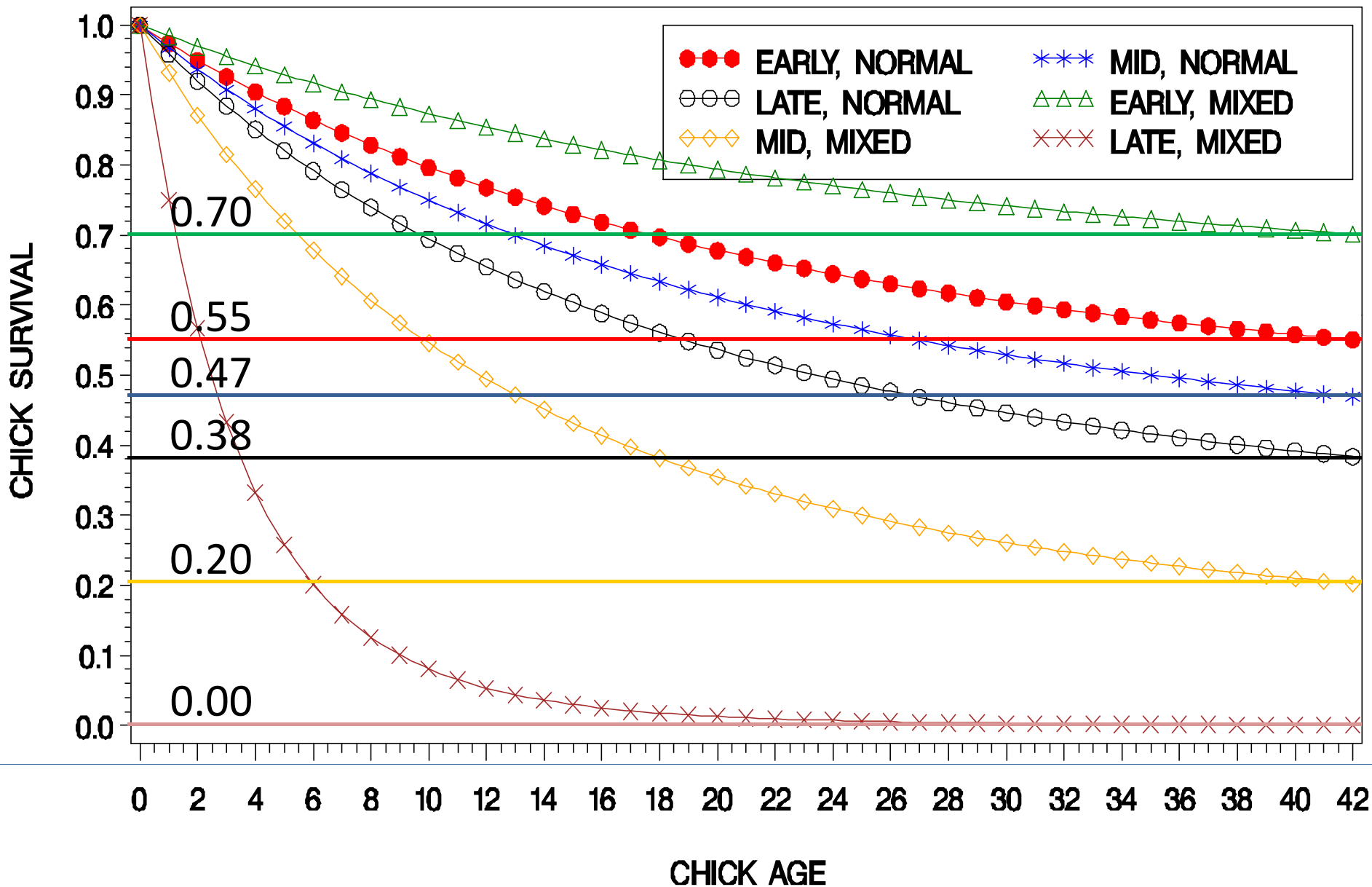
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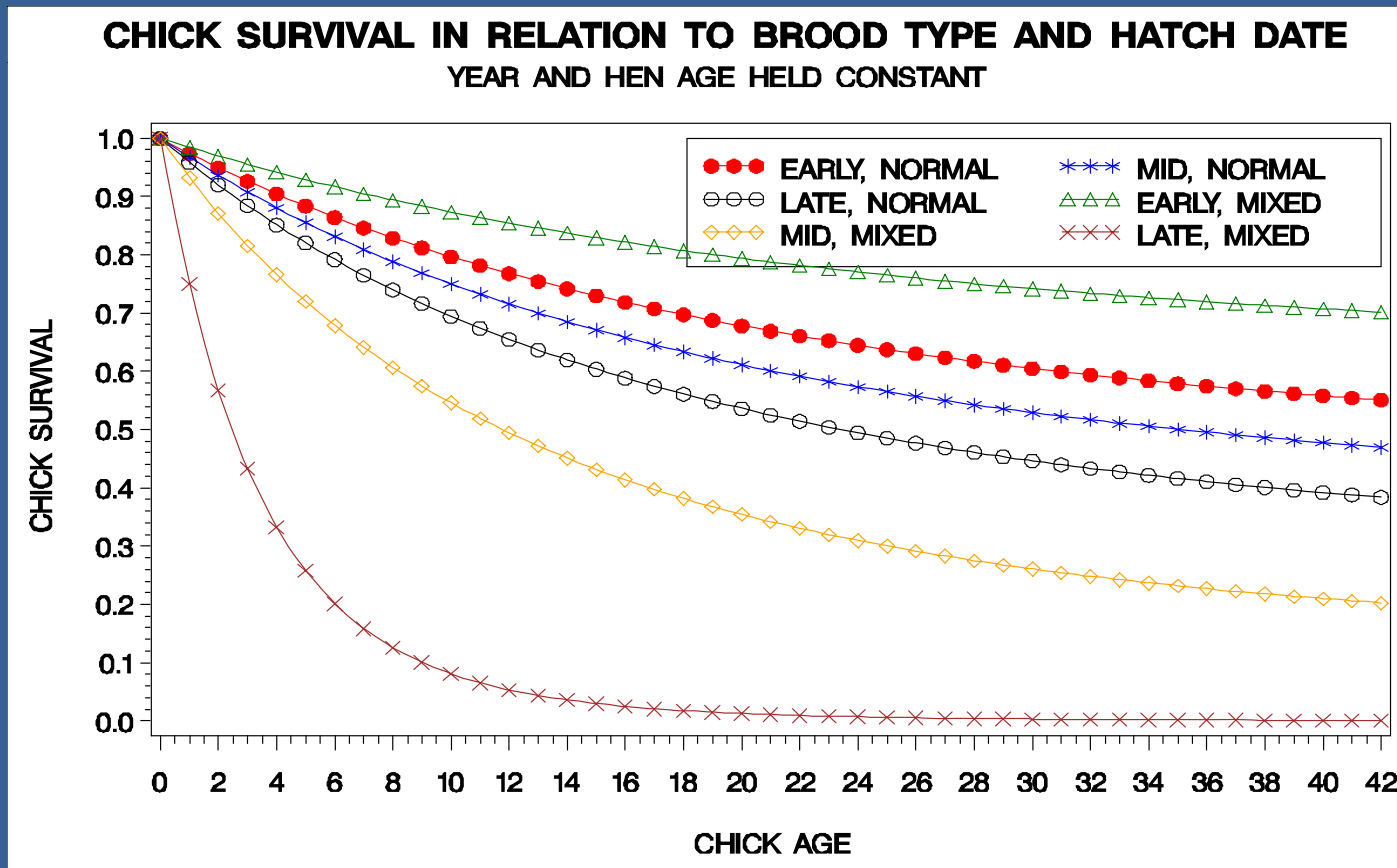
CHICK SURVIVAL IN RELATION TO BROOD TYPE AND HATCH DATE

YEAR AND HEN AGE HELD CONSTANT



Discussion: BT*HD

- Survival is lower for later hatching chicks.
- Huge discrepancy between Mixed and Normal broods.



Discussion: BT*HD

- Normal broods maintain a level playing field.
- Hatching early then brood mixing allows one to take advantage of naïve younger chicks.
- Hatching late and then brood mixing results in being the young naïve brood member.

Discussion: Demography

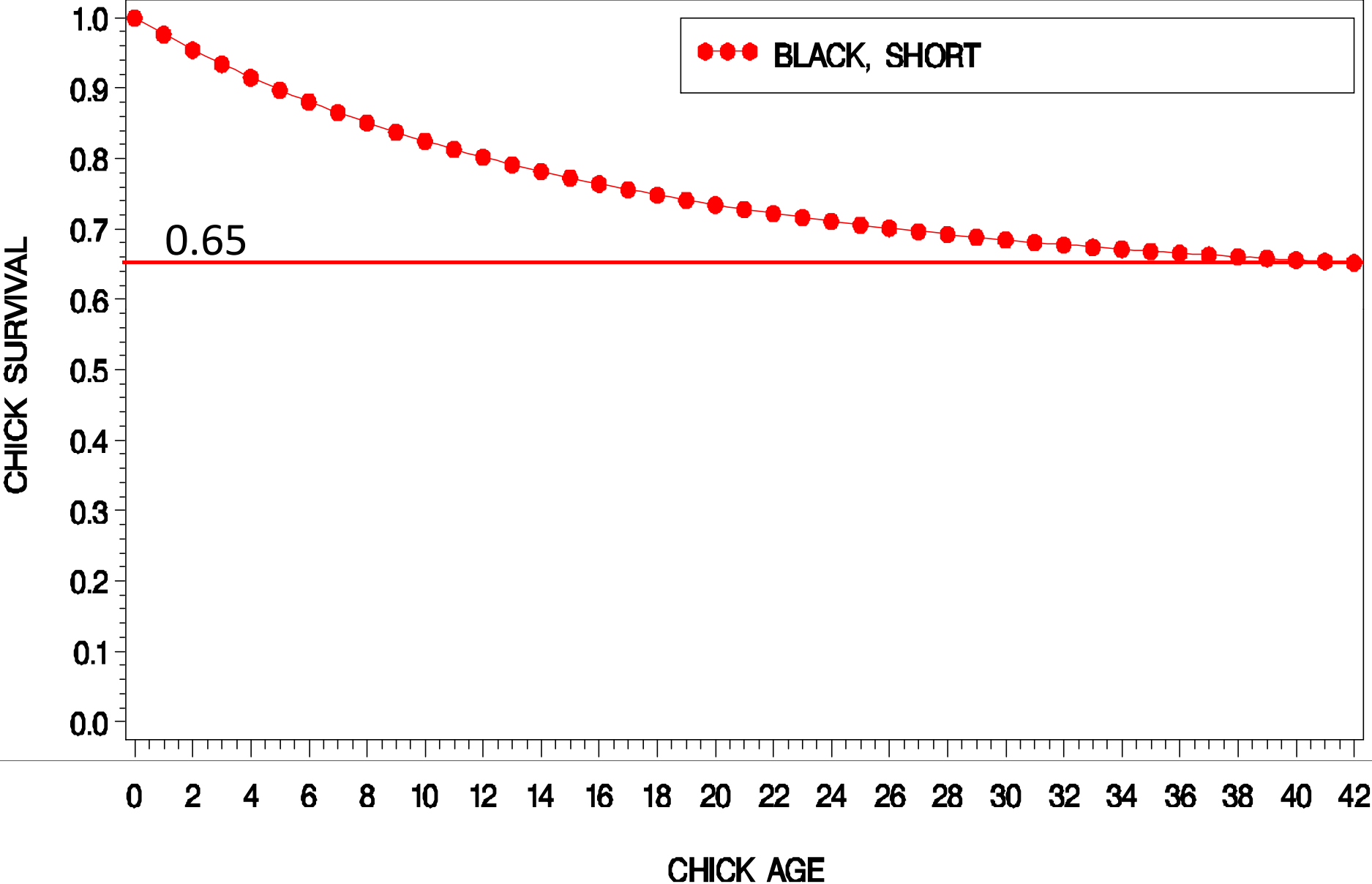
- Protecting adult hens may result in more consistent chick production.
- Brood Mixing appears to be fairly common and important in chick survival.
 - Why does it happen?
 - Hen initiated?
 - Chick initiated?
 - Random?
 - Why is it more common in broods of Yearling hens?
- Is adoption into marked broods occurring?
- Characteristics of adoptive hens.

Results : Top Habitat Model

Shrub Type × Grass Height

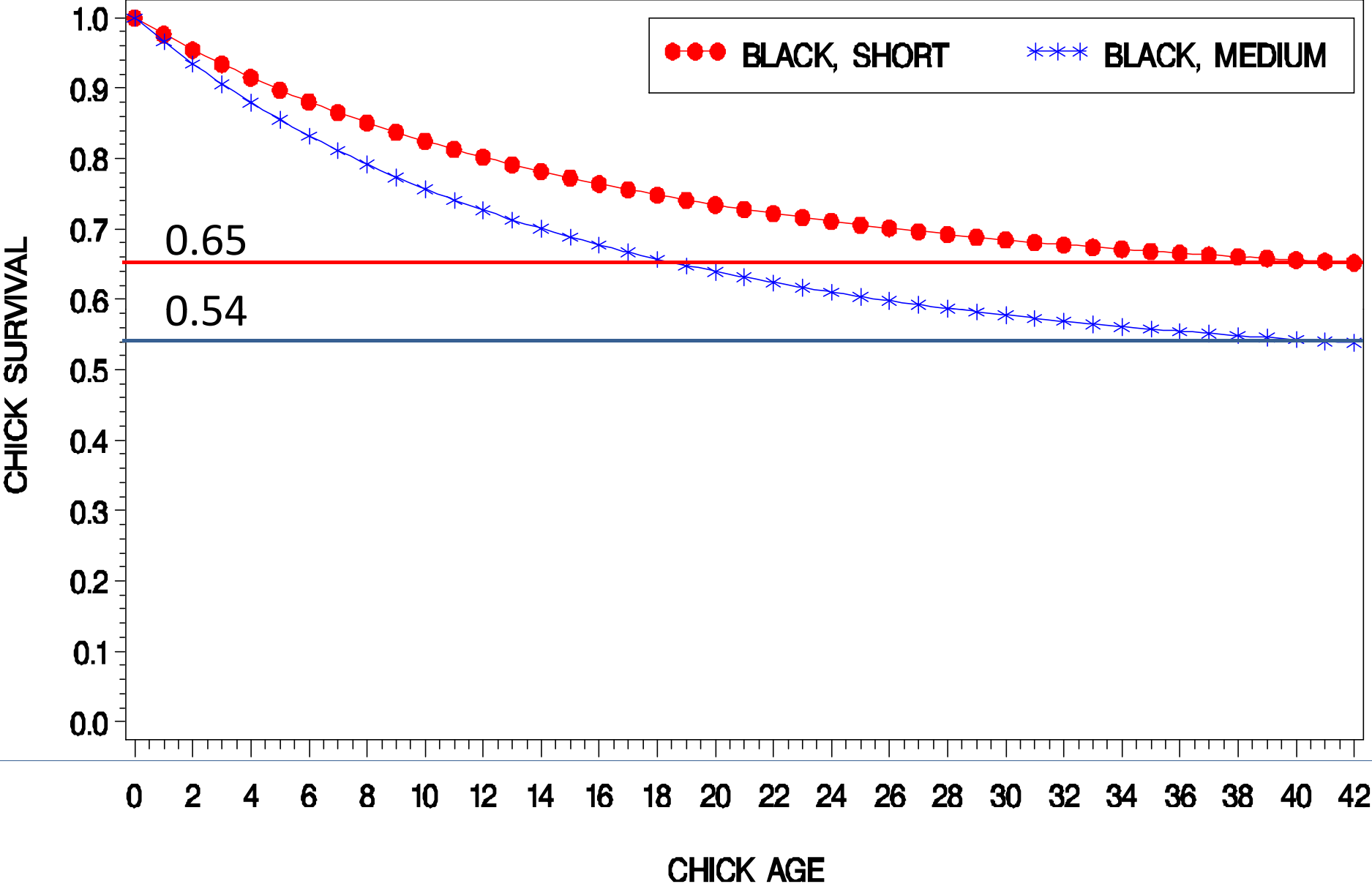
CHICK SURVIVAL IN RELATION TO SHRUB TYPE AND GRASS HEIGHT

YEAR HELD CONSTANT



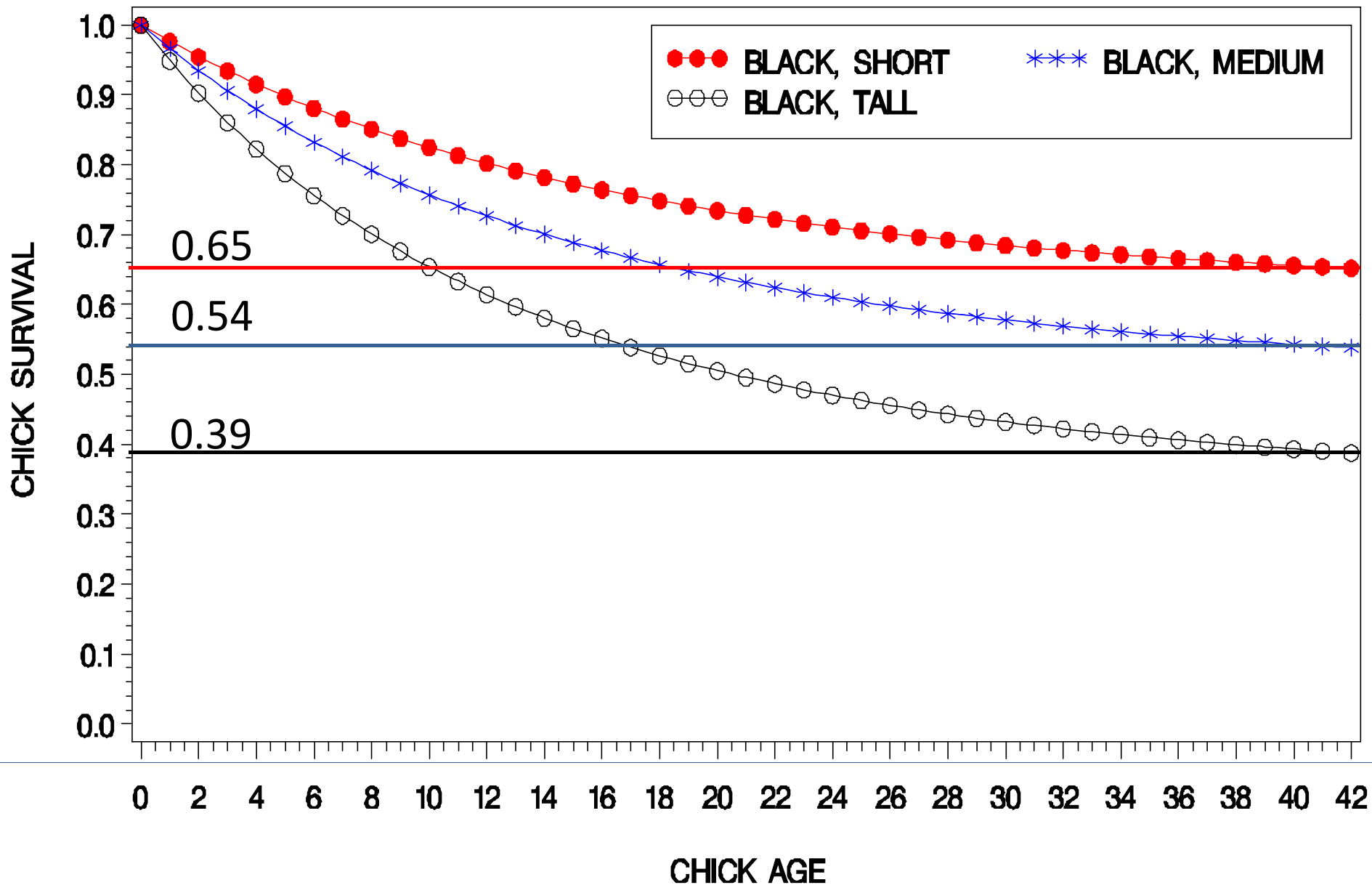
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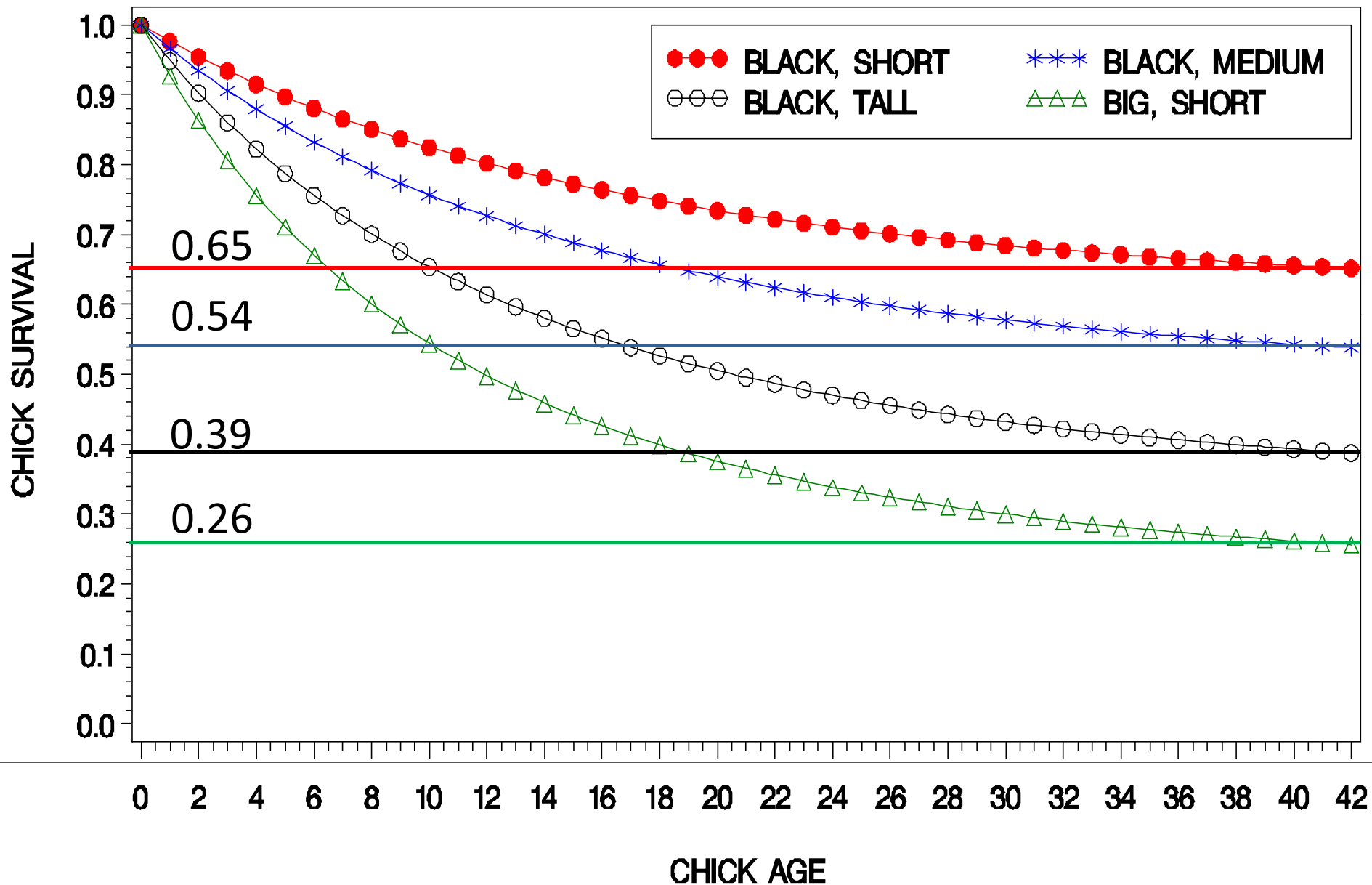
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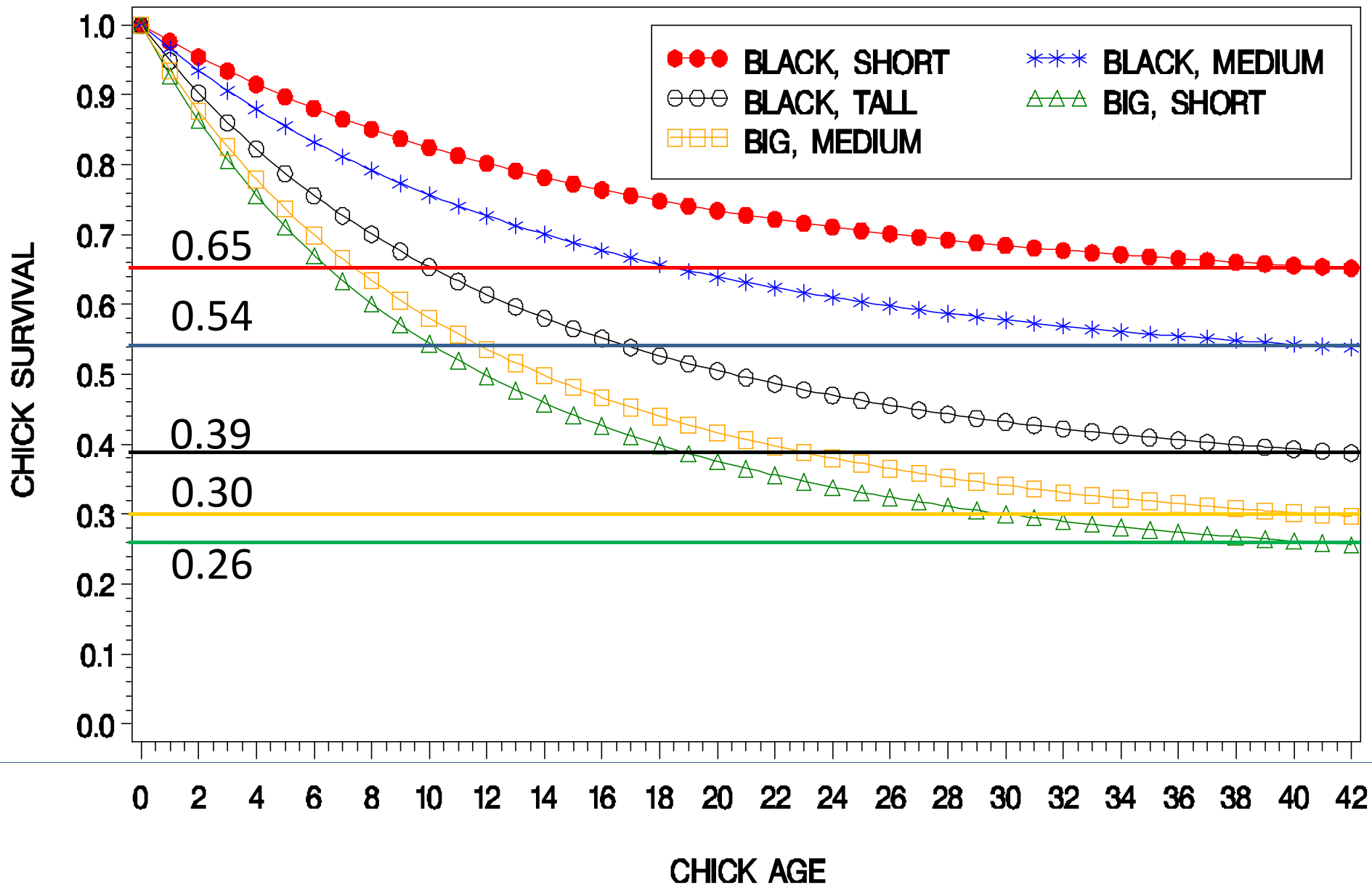
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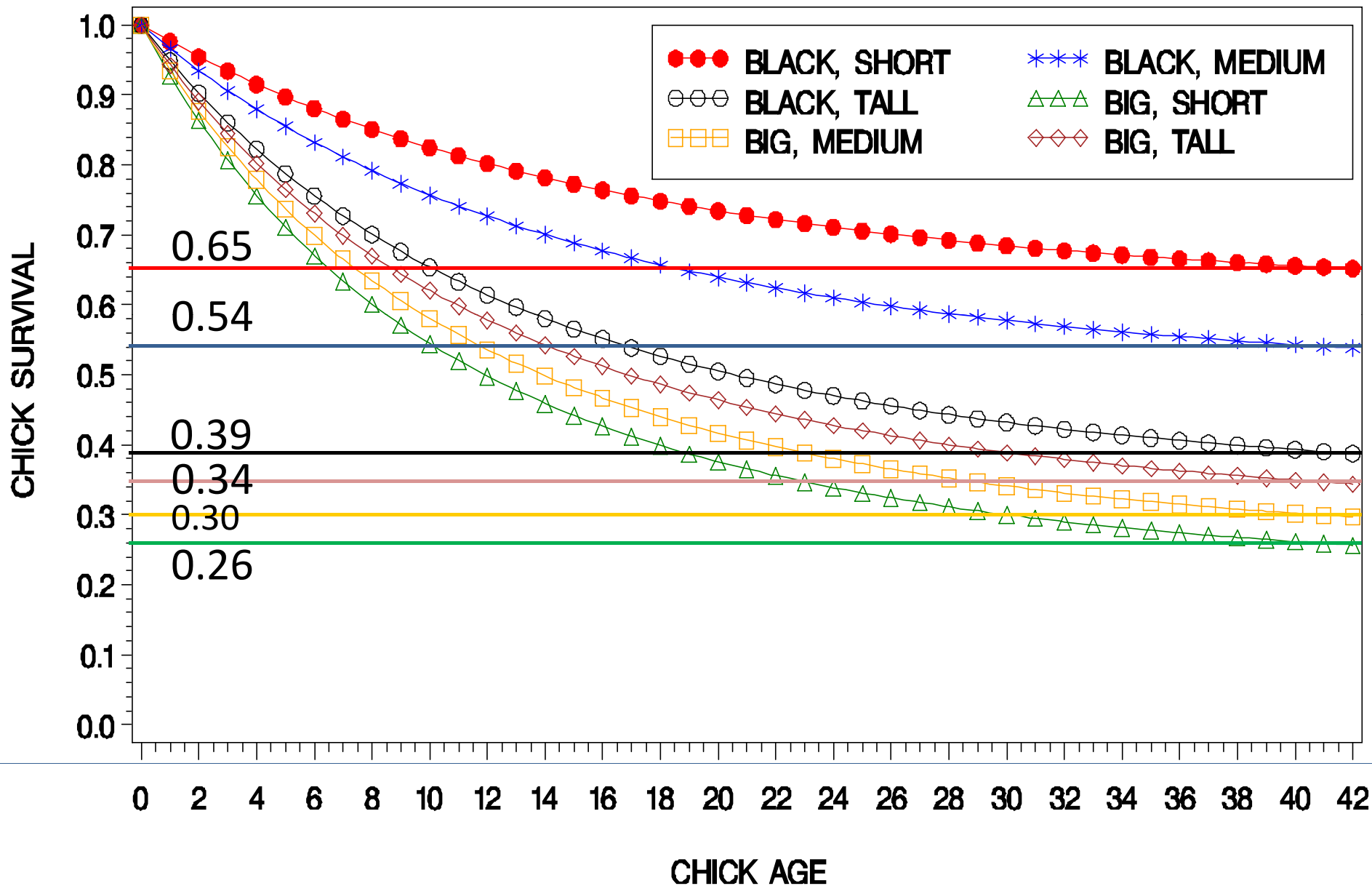
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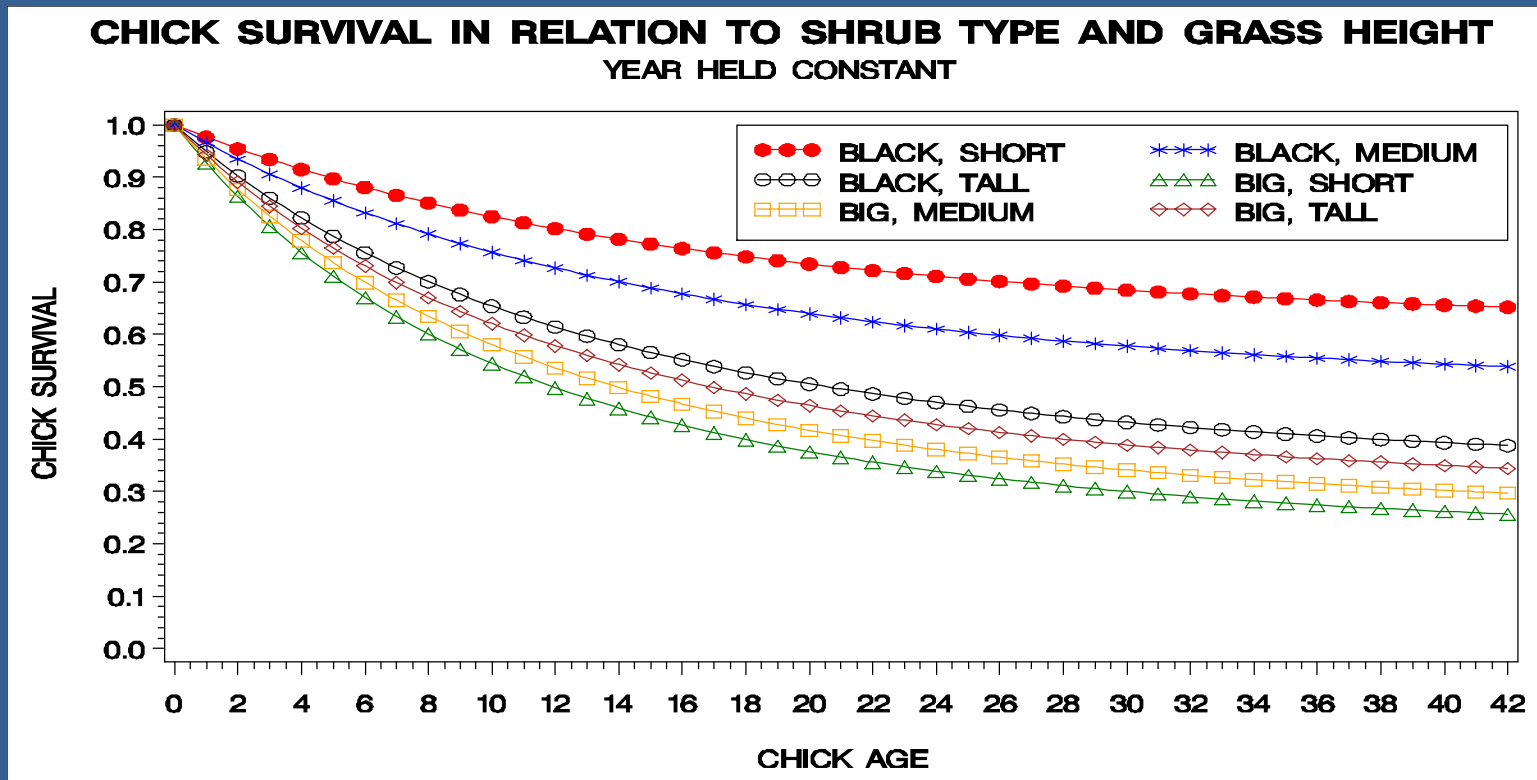
CHICK SURVIVAL IN RELATION TO SHRUB TYPE AND GRASS HEIGHT

YEAR HELD CONSTANT



Discussion: Habitat

- Black sagebrush appears to be very important.
 - Possibly related to food sources.
- Big sagebrush with tall grass may provide good escape cover.
- Surprising, forb cover did not appear in any top models.



Conclusions

- The importance of black sagebrush has been under appreciated.
- Temporal patterns in chick survival exist and are significant.
- The influence of Hen Age and Brood Type on chick survival are surprising and difficult to explain.
- Overall average survival to 42 days was 39%.



Questions

UtahState
University
COLLEGE OF
NATURAL RESOURCES


BERRYMAN INSTITUTE
Resolving Human-Wildlife Conflicts

 **UTAH DIVISION OF**
Wildlife Resources