ORAL TEMPERATURE AS AN INDICATOR OF FEVER IN PRE-WEANED DAIRY CALVES

Abstract #2497

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INTRODUCTION:

Change in core body temperature can be used for early disease detection and optimizing interventions. Manually assessing individual calf health is limited in commercial farm settings, creating an opportunity to automatically monitor health via body temperature.

Objectives:

1. Explore the potential of oral temperature (OT) in detecting fever and disease in dairy calves.

2. Inform novel health monitoring sensor design.

METHODS:

- 150 neonatal Holstein replacement heifers at 1 NY herd from February - May. Enrolled at birth, followed through 28 days of life.

- Observations on 1, 2, 4, 6, 8, 10, 12, 14, 16, 18, 22, 24, 26 and 28 days of life. OT and Rectal Temperature (RT) were measured via digital probe thermometers [OT: 10cm (4"); RT: 5cm (2")]

- Health scores were collected via the UW Madison Calf Health Scoring App.
  - Scores on 0-3 scale (0 = healthy; 3 = severe)

- ROC Curves were generated to determine optimal cut-points of OT for disease detection.

- Generalized linear models were used to assess the correlation values of OT and RT.

- Multinomial logistic regression models were used to evaluate health outcomes.

Study Limitations:

- Effects of treatment (NSAIDS) on body temperature not yet explored

- Most observations occurred at below thermoneutral conditions.

Oral temperature detects fever in neonatal dairy calves.

# Extreme oral temperatures are associated with disease.

RESULTS: ROC CURVES AND OPTIMAL CUT POINTS

Hyperthermia — AUC = 0.906

Hypothermia — AUC = 0.849
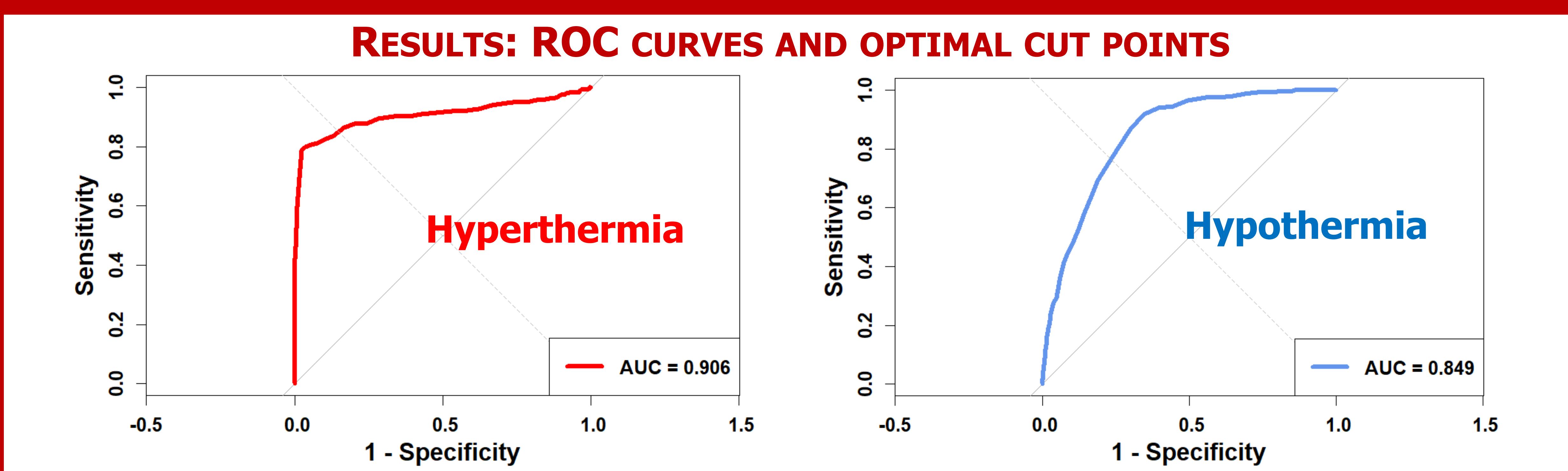
Body Temperature Status	OT Cut-points	N	Se	Sp	PPV	NPV	AUC	AUC 95% CI
Hyperthermia	39.1C (102.4F)	234	0.79	0.98	0.80	0.97	0.906	(0.877, 0.936)
Hypothermia	38.2C (100.7)	467	0.75	0.77	0.49	0.92	0.849	(0.832, 0.867)
Severe Hypothermia	34C (93.2)	3	1	0.99	0.5	1	1	(0.999, 1.001)

Figure: ROC Curves and cut point descriptions of OT detecting Hyperthermia, Hypothermia, and Severe Hypothermia.

RESULTS: HEALTH EVENTS

Fecal Scores by Age

Total Respiratory Scores by Age
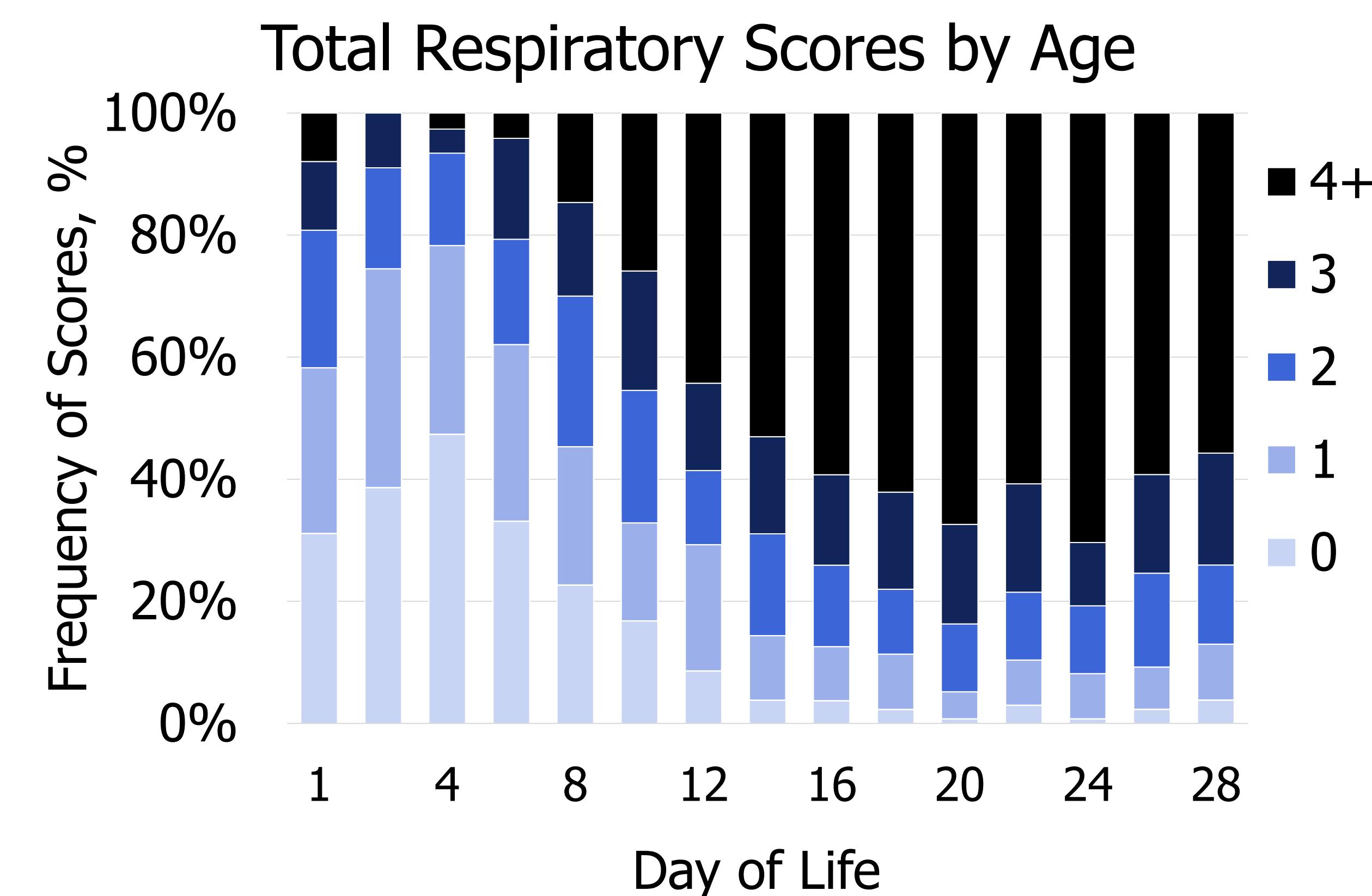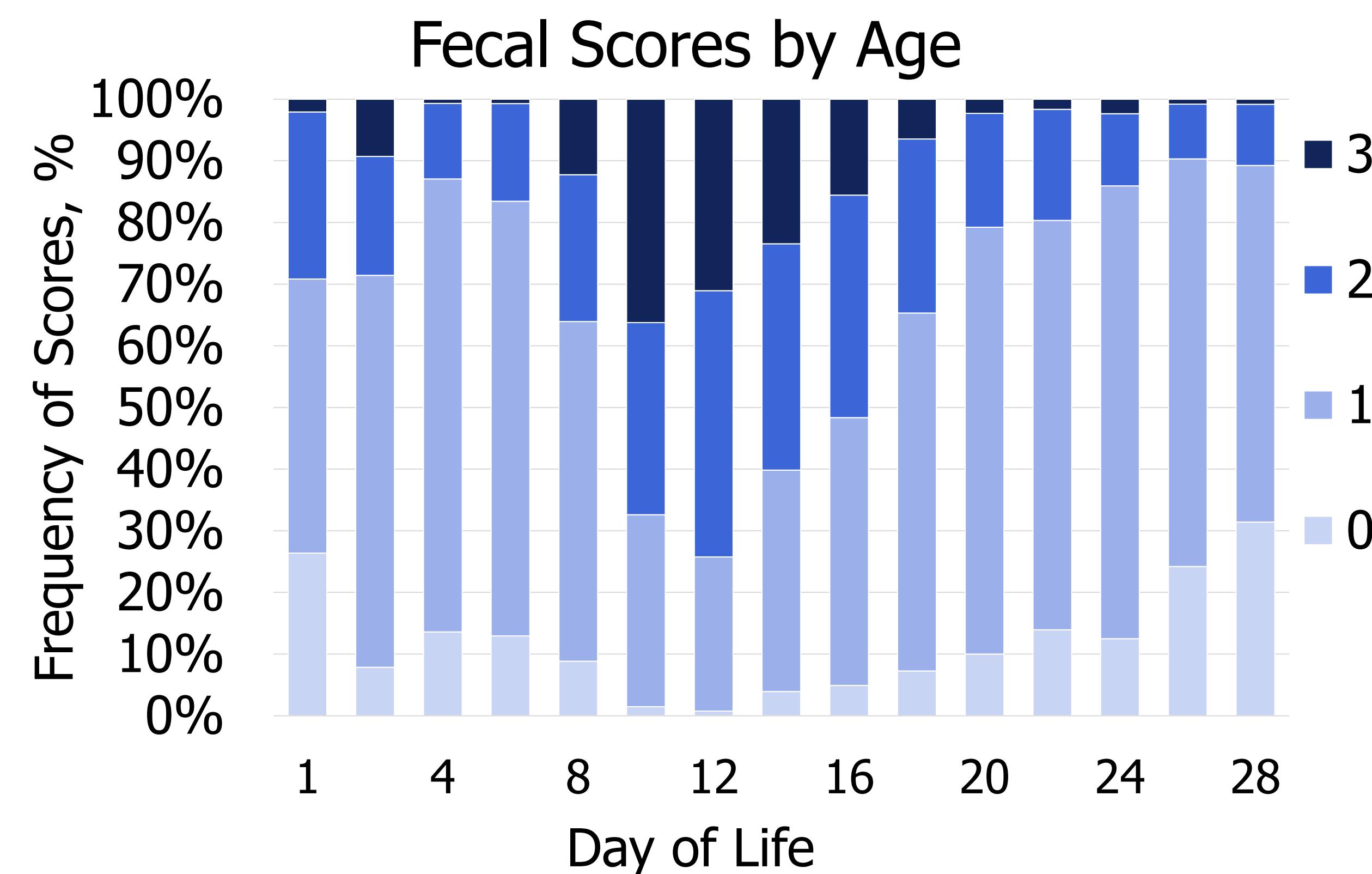
Figure: Major Health Outcome Frequencies by Age

Bovine Respiratory Disease

OT Range	RR	p-value	95 %CI 2.5	97.5
NORMAL	0.34	<0.001	0.29	0.38
LOW	0.71	<0.001	0.56	0.91
HIGH	3.53	0.007	2.62	4.75

Neonatal Calf Diarrhea

OT Range	RR	p-value	95 %CI 2.5	97.5
NORMAL	0.42	<0.001	0.37	0.48
LOW	1.38	<0.001	1.12	1.71
HIGH	1.40	0.03	1.04	1.90

Figure: Multinomial Logistic Regression Models of Health Outcomes based on OT Range