Effect of Management Practices on Economic and Animal Welfare Outcomes for Beef Cattle

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Background and Significance

What is the relationship between pre-slaughter management and quality outcomes (Hot Weight) at commercial cattle slaughter facilities in the US?

Study Design/Methods/Techniques

This was an observational study that included:
- 501 Lots of cattle
- 71,053 total cattle
- Multiple states
- 4 different plants/companies
- Data was collected from March 2021 to April 2022.

Variables Included:
- **Outcome (Response):**
  Hot weight (Yield in lbs)
- **Pre-slaughter Management (Predictors):**
  Arrival Humidity(%)
  Arrival Temperature(°F)
  Arrival to Unload Time(minutes)
  Pen Density(animals/ft^2)
  Shift(A,B, Both)
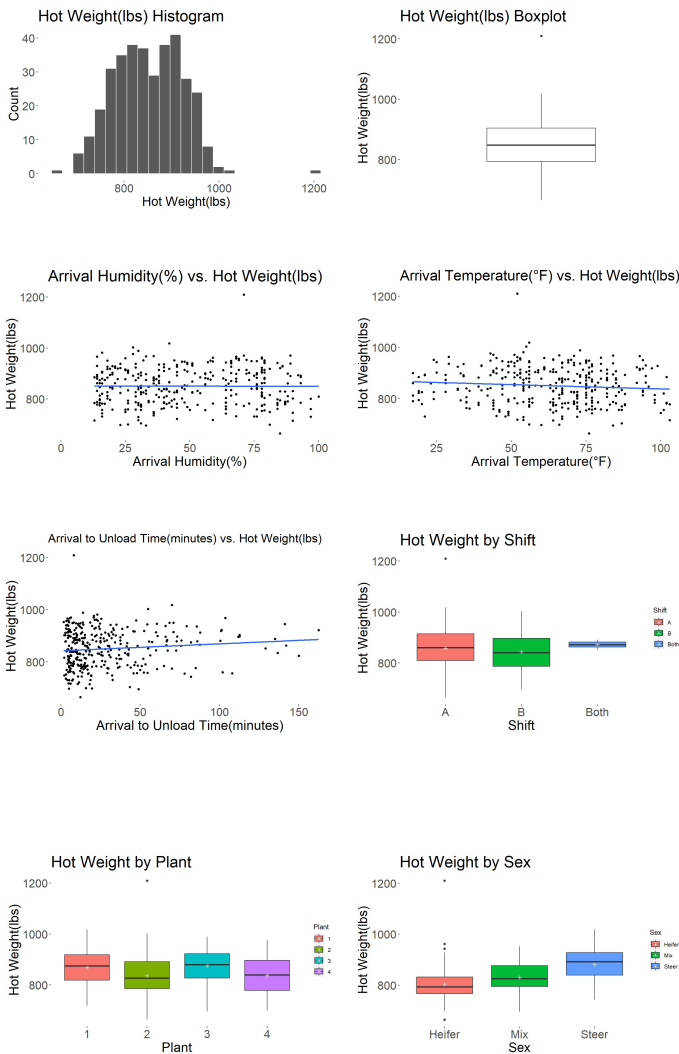 Plant(1-4)
  Sex(Steer, Heifer, Mix)

Challenges:
- Lot is the unit of interest, but observational units varied (multiple trucks, pens, etc per lot) depending on variable.
- Merging data
- Missing data

Methods:
- Multiple regression for economic outcome (Yield in lbs)
- Multiple logistic regression for welfare outcome (limp), which is not shown
- AIC for model selection

Main Findings

Results and Conclusions

Hot Weight Model

Predictor	Estimate	Std Error
Intercept	880.023	17.509
Arrival Humidity	-0.300	0.139
Arrival Temperature	-0.433	0.163
Arrival to Unload Time	0.222	0.112

Shift	emmean	SE	df	CI lower bound	CI upper bound
A	853.235	5.543	330	838.523	867.948
B	827.648	4.939	330	814.539	840.757
Both	837.342	38.190	330	735.976	938.709

Plant	emmean	SE	df	CI lower bound	CI upper bound
1	860.499	13.561	330	822.175	898.823
2	816.285	13.981	330	776.774	855.795
3	866.930	14.754	330	825.233	908.627
4	813.920	14.242	330	773.671	854.170

Sex	emmean	SE	df	CI lower bound	CI upper bound
Heifer	808.921	13.794	330	772.308	845.533
Mix	821.925	14.975	330	782.177	861.673
Steer	887.380	13.142	330	852.499	922.261

Conclusions

- Higher **Arrival Humidity** and **Arrival Temperature** are associated with lower average **Hot Weight**.
- Longer **Arrival to Unload Time** is associated with higher average **Hot Weight**.