Greek Life for First Generation College Students: Virtue or Vice?

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Problem Statement

- The Harvard College Alcohol Study provides important opportunity to study the experience of different types of students on college campuses.
- Study data ranges over 1993, 1997, 1999, 2001 consisting of extensive survey response data of college students across the United States, with over 50,000 total observations with $\sim$ 100 questions per survey
- First Generation College often face challenges (Choy 2001; Ishitani 2006; Pascarella et al. 2004)
- Risky alcohol behavior in Fraternities/Sororities extensively documented (e.g. Borsari & Carey 2010)
- What is the first generation college student experience with risky alcohol-related behaviors? Is it modulated by Greek life participation? Is there a similar effect for GPA?

Data Formatting/EDA

Response variables of interest are whether a student has an alcohol problem and a student's grades.
As a general alcohol problem is unobserved we use as proxies problems such as having a hangover, missing class, and damaging property.
Second response of interest (GPA) is directly observed ordered categorical.
Predictors of interest

- Member of Greek Community
- First Generation: Neither parent finished college
- Interaction effect of the above

Example covariates we adjust for

- Age/Year in School (Pederson et al., 2009)
- Sex (Wilsnack et al., 2018)
- High School Drinking Behavior (Arria et al., 2008)

EDA Plot

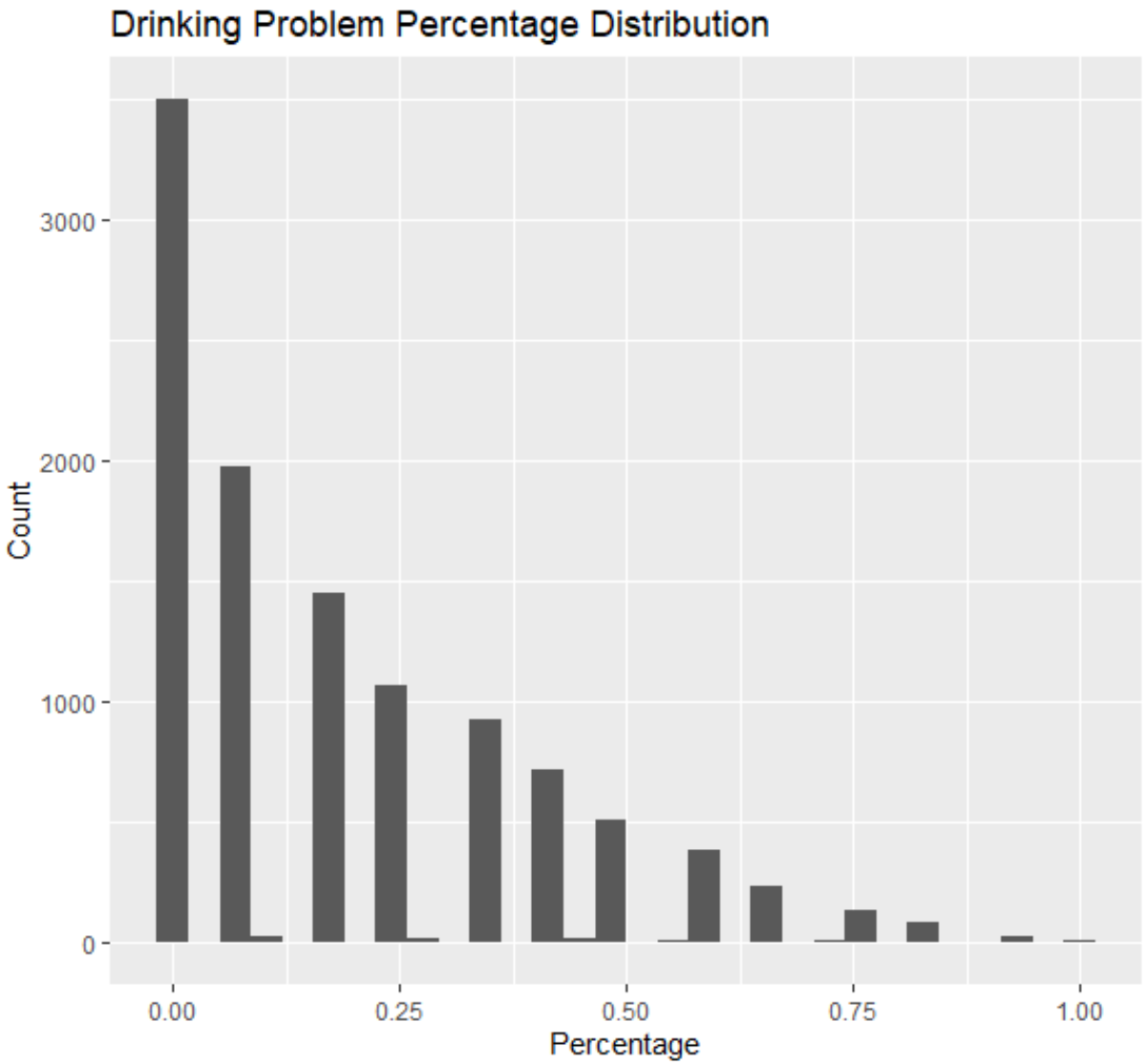


Figure: Drinking Problems Distribution

EDA Plot

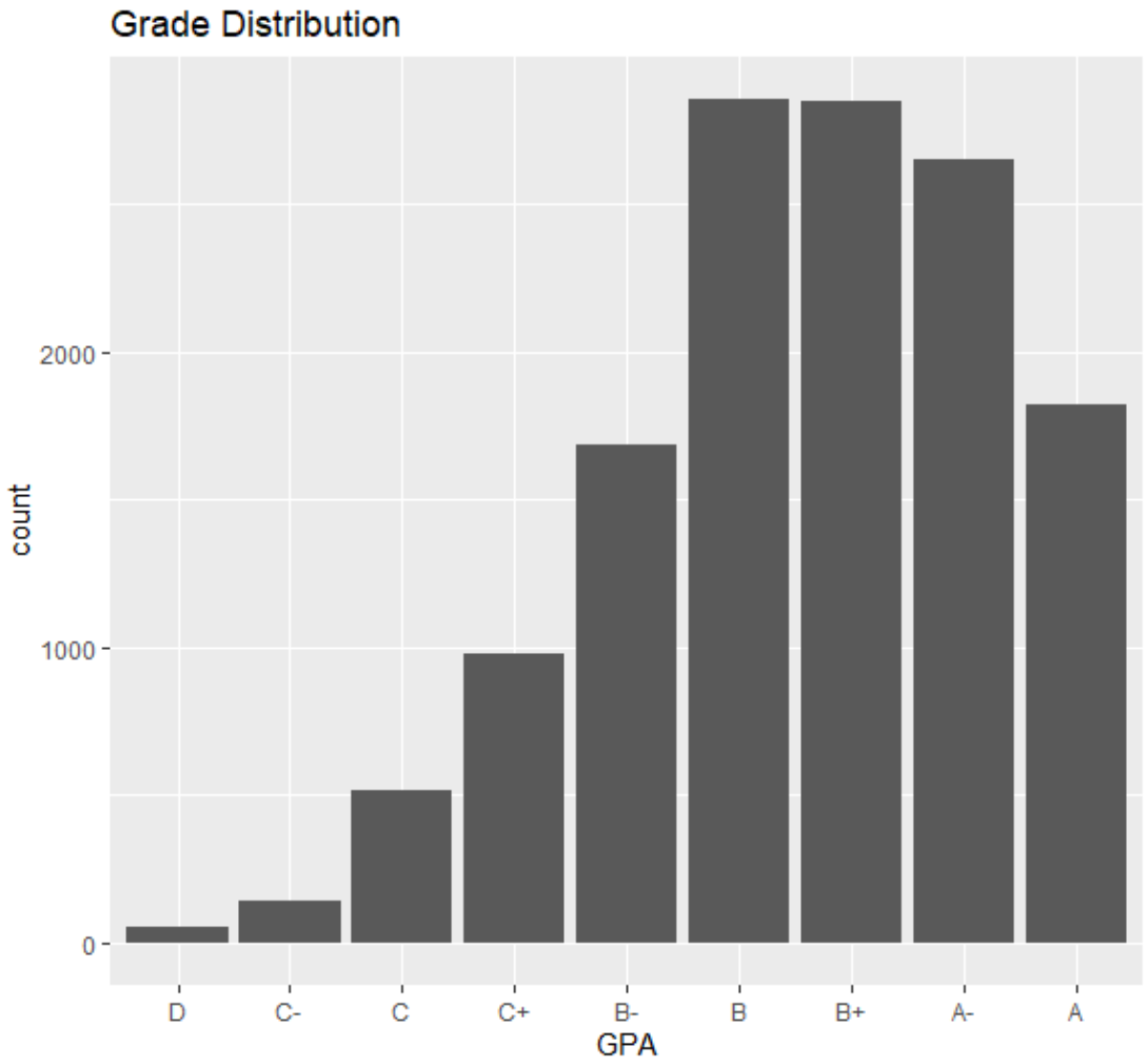


Figure: Distribution of College Grades

EDA Plot

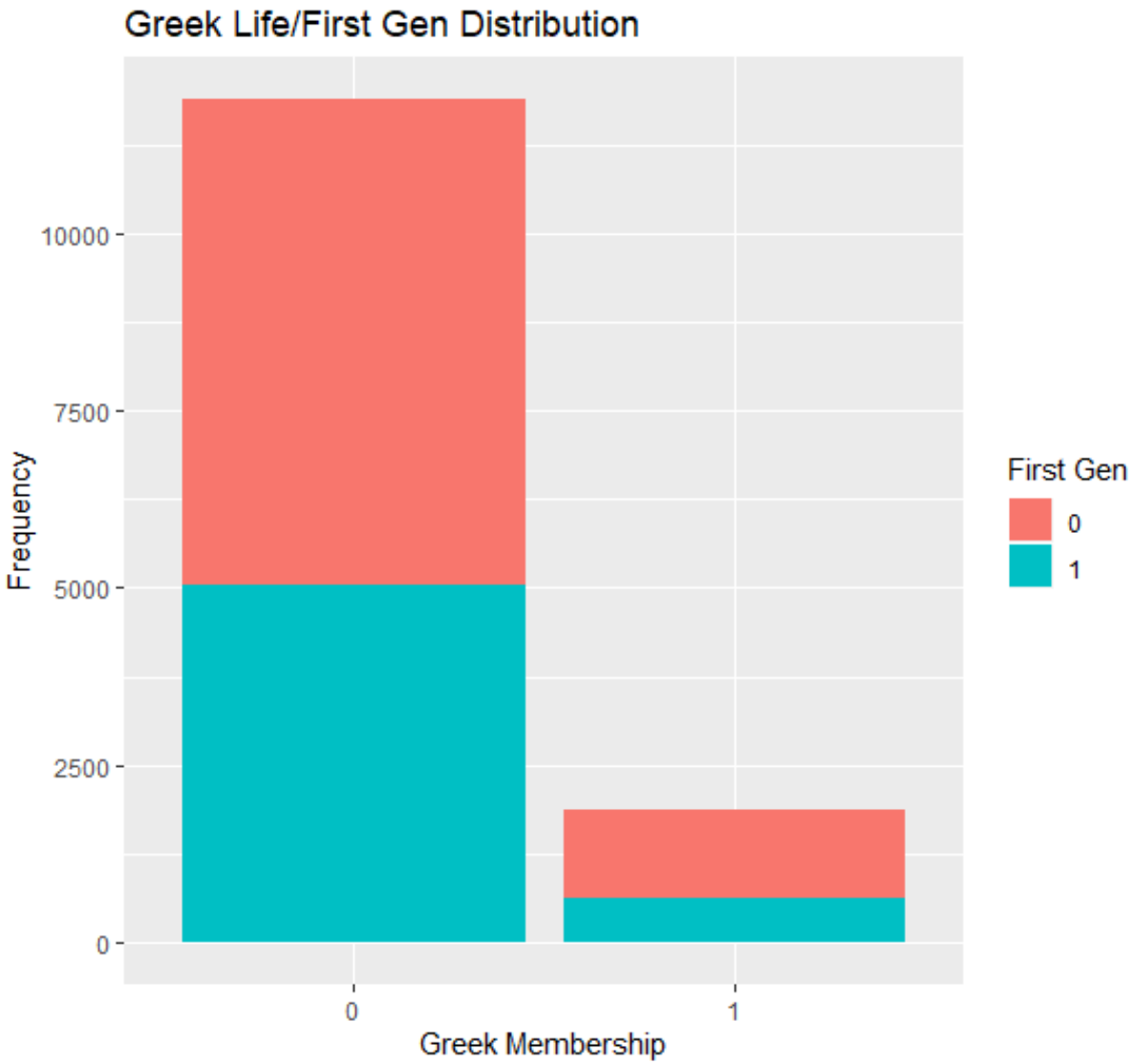


Figure: Distribution of First Gen and Greek Life

EDA Plot

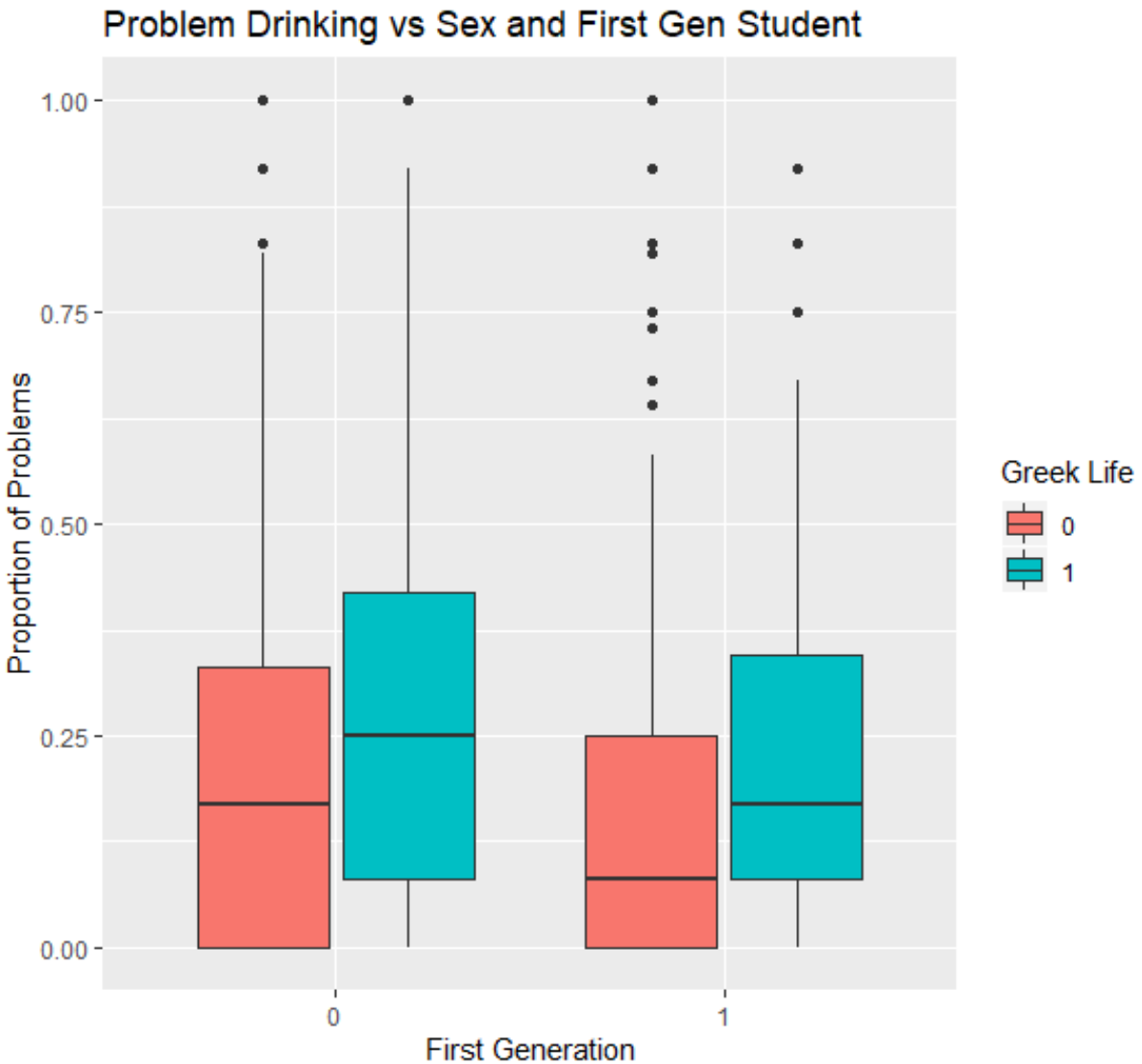


Figure: Drinking Problems vs Greek Participation and First Gen

EDA Plot

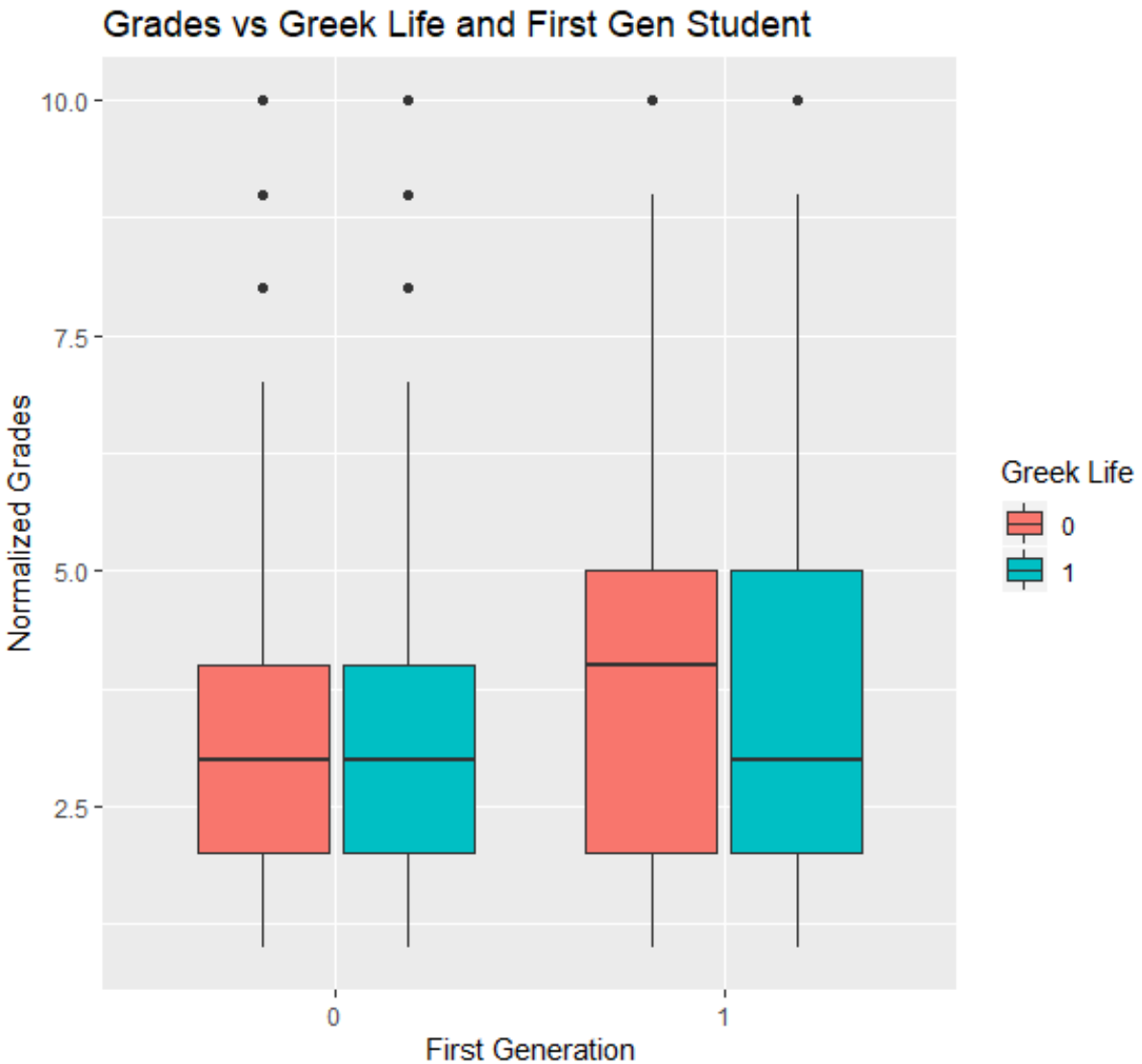


Figure: Grades vs Greek Participation and First Gen

EDA Plot

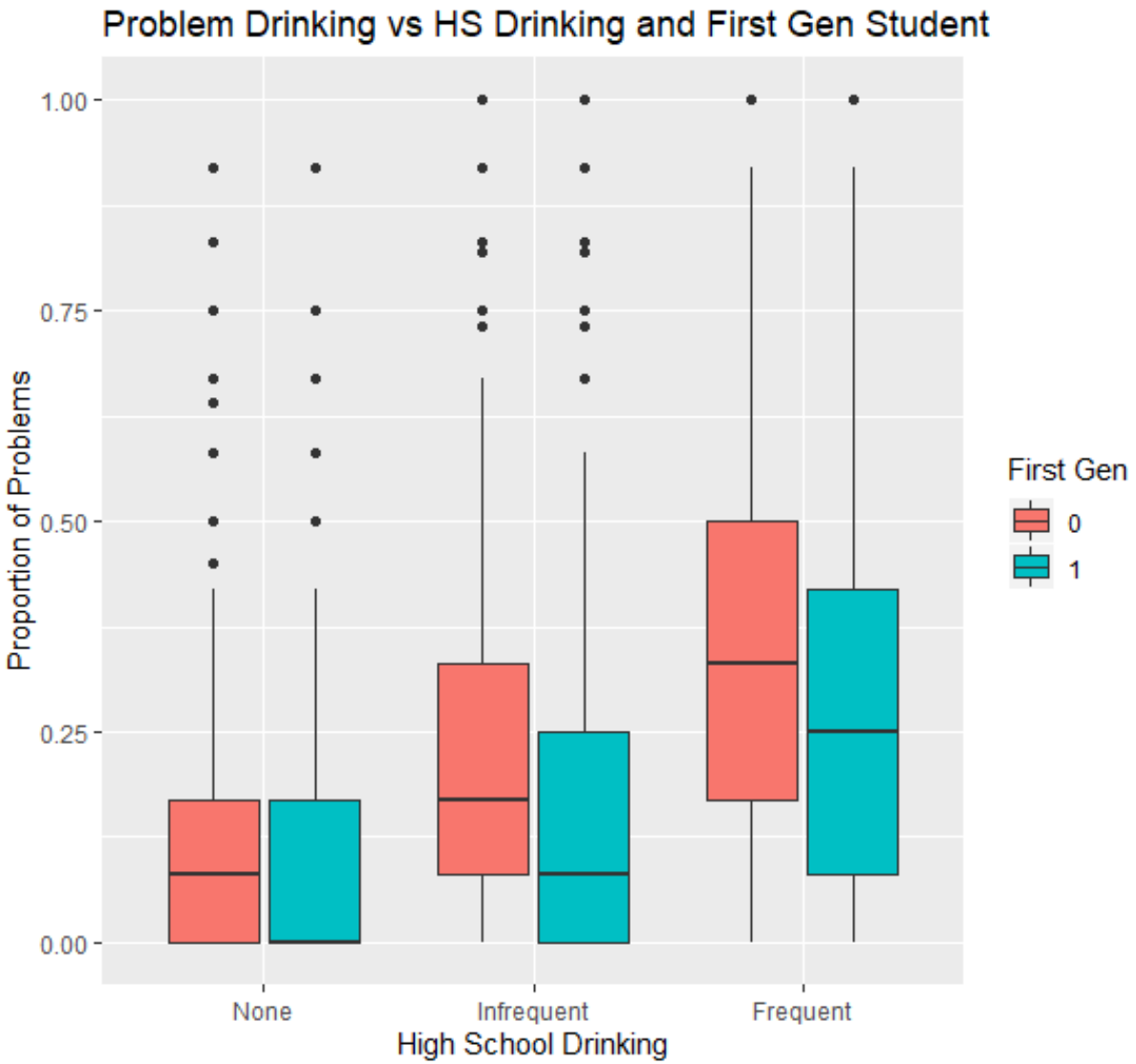


Figure: College Drinking Problems vs HS Drinking

EDA Plot

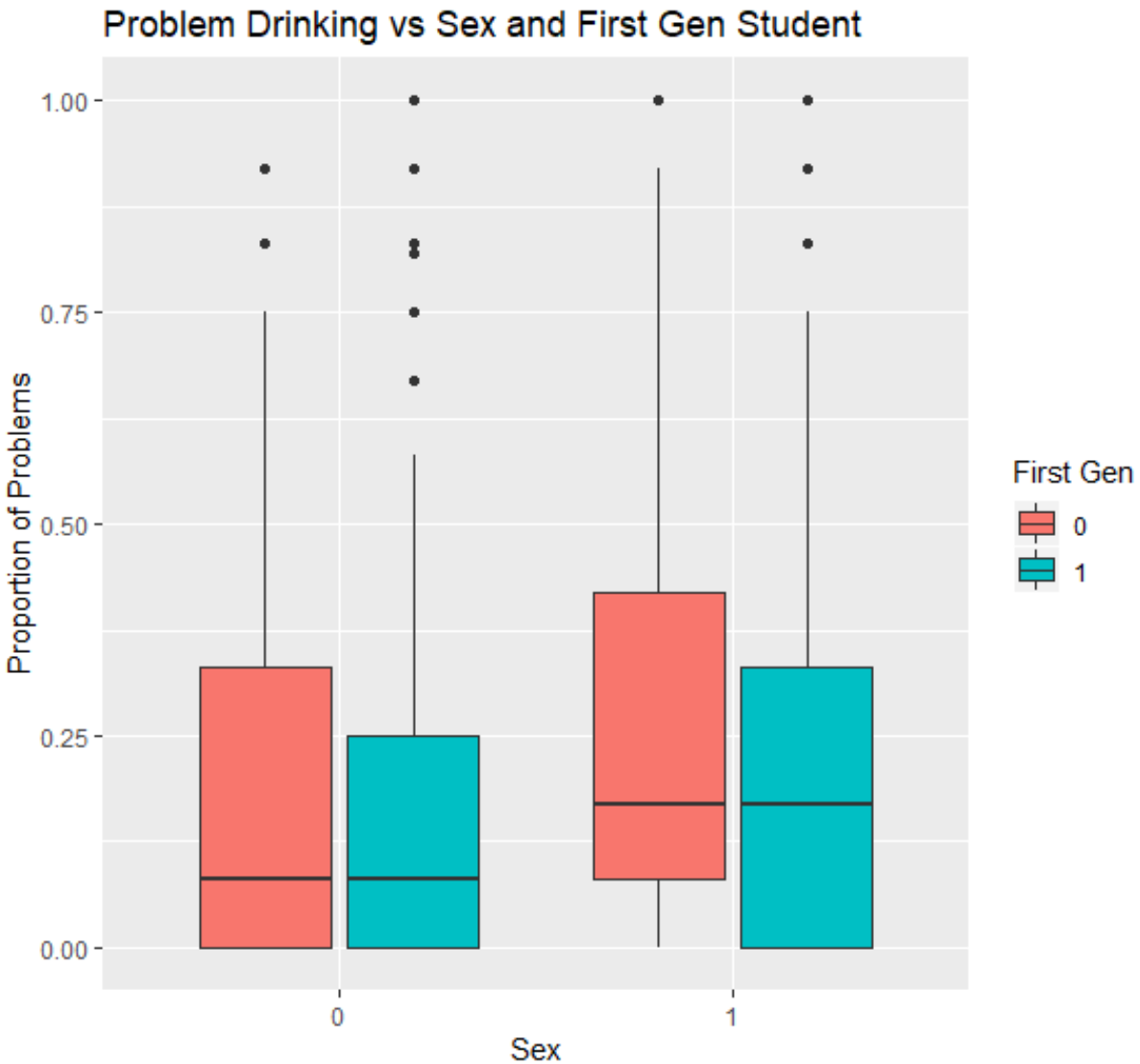


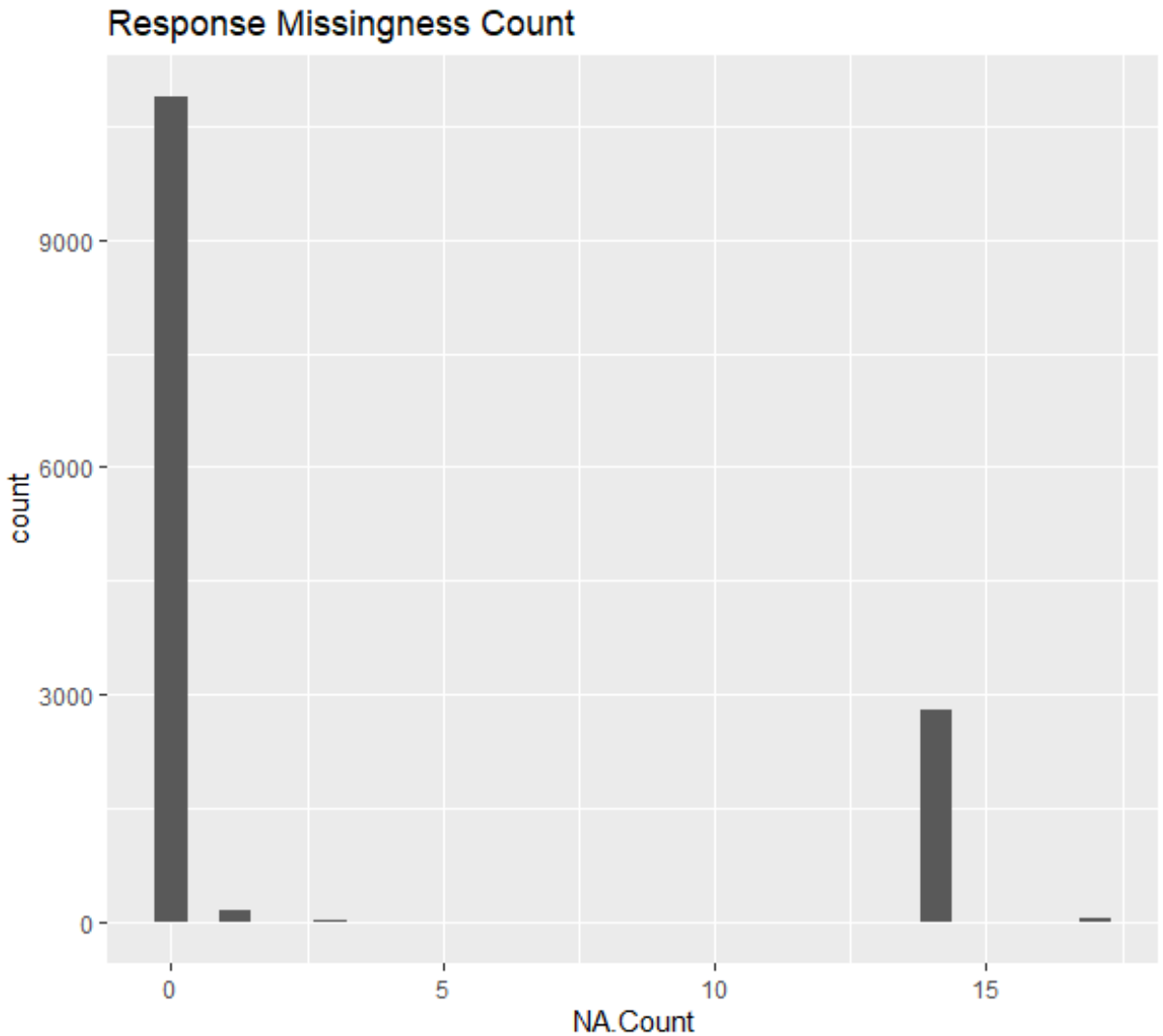
Figure: College Drinking Problems vs Sex

Missing Data

Problems with the Data:

- Missingness in Covariates
- Missingness in Response
- $\sim 2\%$ Missingness in Predictors
- 22% Response Missingness
- $> 90\%$ of Missing Response Observations have all Problem Behaviors Missing (see next slide chart)
- Likely acceptable to drop observations with missingness.

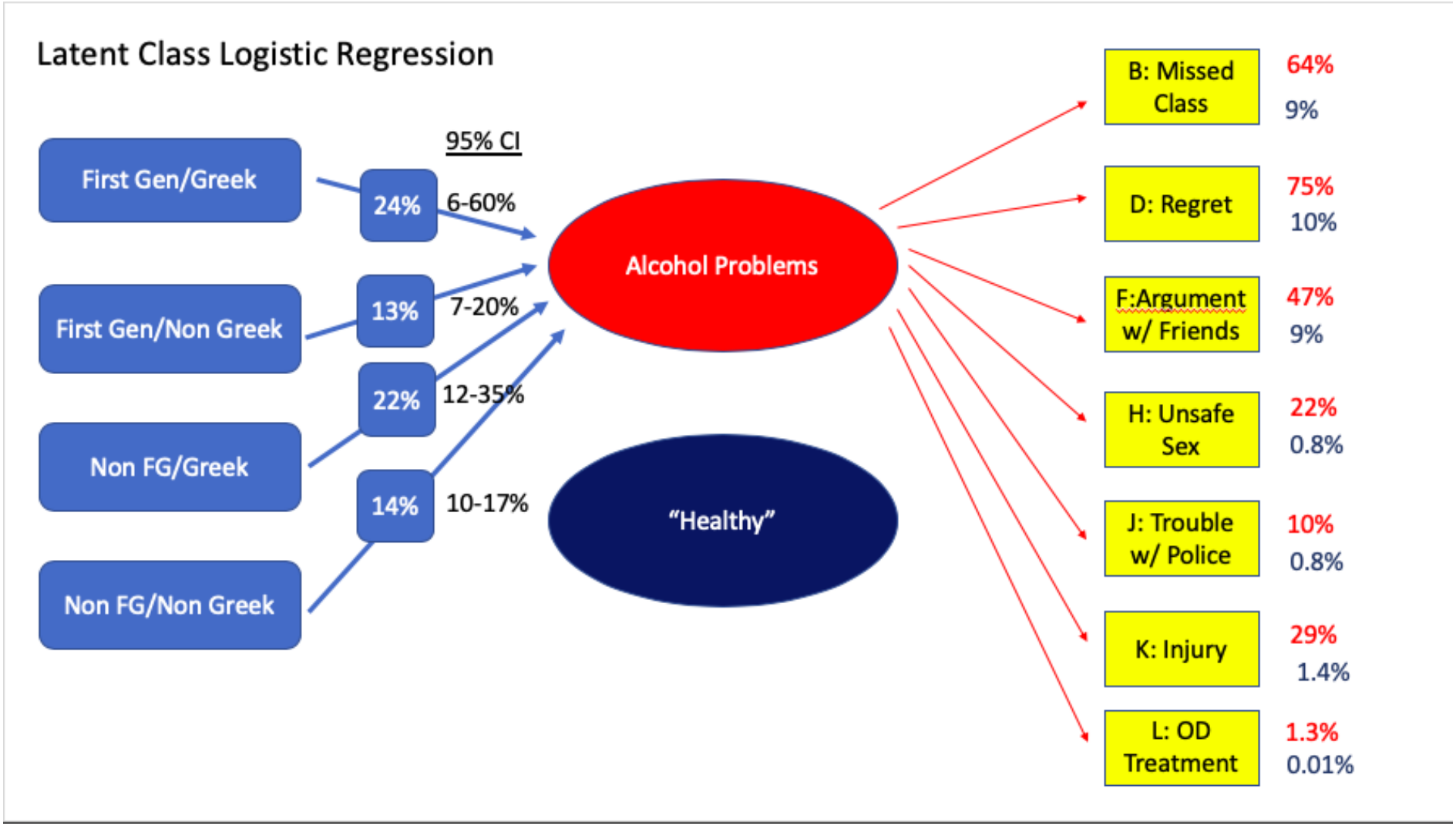
Missing Response Plot



Latent Logistic Regression Model

$$\text{Consequences} \mid \text{Bad Drinker} \sim \textit{ind}\ \text{Bernoulli}(p_{cons,BD})$$
$$\textit{logit}(E[\textit{BadDrinker}]) = X\beta$$

- Model treats the drinking consequences experienced by each individual as a draw from a mixture of product Bernoulli trials. Mixture indexed by latent class membership.
- Traits determine each person's probability of drawing "consequence" vector from one latent class or the other.
- β adjusts for High School Drinking History, Sex, and Grade


Latent Class Logistic Regression
95% CI
First Gen/Greek
24%
6-60%
First Gen/Non Greek
13%
7-20%
Non FG/Greek
22%
12-35%
Non FG/Non Greek
14%
10-17%
Alcohol Problems
"Healthy"
B: Missed Class
64%
9%
D: Regret
75%
10%
F:Argument w/ Friends
47%
9%
H: Unsafe Sex
22%
0.8%
J: Trouble w/ Police
10%
0.8%
K: Injury
29%
1.4%
L: OD Treatment
1.3%
0.01%

Ordered Probit Regression for GPA

- The ordinal response Y is related to predictors X via a regression in terms of a latent variable Z.

$$Z|X \sim N(\beta^T X, I)$$
$$Y_i = g(Z_i), i = 1, \cdots, n,$$

  where $g(z) = j$ if $g_{j-1} < z < g_j$, a monotone piecewise constant function.

- The rank likelihood allows estimating β without specifying g.
  Rank likelihood: $Pr(Z_i < Z_j \text{ if } y_i < y_j \text{ for all } i, j|\beta)$.
  Full conditionals $p(\beta|z)$ and $p(z_k|\beta, z_{-k}, z_i < z_j \text{ if } y_i < y_j \text{ for all } i, j)$ are all truncated normal.

Interaction of FG and Greek Effects on GPA

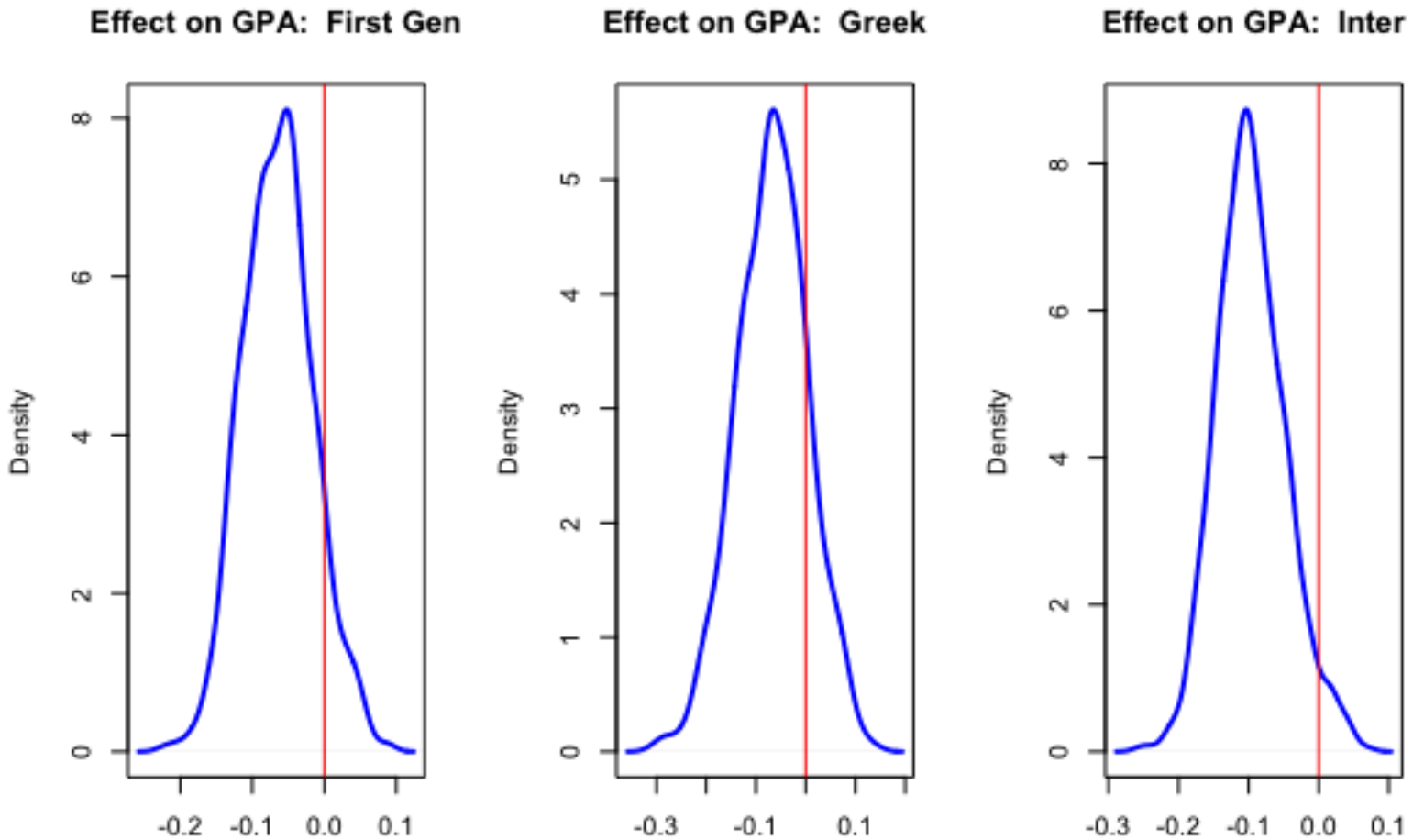


Figure: Monte Carlo Estimates of Coefficient Posterior Distributions

Summary

- **Problem Alcohol Use:** Fraternity/Sorority membership strongly associated with problem alcohol use, but relationship is not necessarily stronger for First Generation Students
- **GPA:** Fraternity/Sorority Membership appears to be associated with lower grade point averages for FG students in particular.
- **Future Work:**
  - Computational Resources: Fit on full data across years, check for drifting effects
  - Investigate goodness of fit. Conditional independence failures? More than two latent classes?
  - Given more detailed educational outcomes data, could infer scale of academic performance effects