Rebecca A. Morrison

From:	Trevor Francis
Sent:	Wednesday, November 15, 2017 11:05 AM
To:	Mark Rushing; Rebecca A. Morrison; Scott Flanagin; Leslie May Yingling
Cc:	Jim Coleman; Charles F. Robinson
Subject:	STEP Selection Process
Attachments:	STEP Financial Need-Based Grant Recipients' Predicted First-Term GPAs.pdf

Please see the attachment and the message below.

Trevor

STEP target groups were selected from current freshmen through the following process.

1. Members of the fall 2017 full-time, degree-seeking, new freshmen (FT DS NF) cohort with AR residence and active enrollment were eligible for STEP's need-based grant component just in case they (i) had completed the FAFSA by 10/2, (ii) had fall free aid and a fall estimated family contribution that failed to meet $2,500 or more of their fall cost of attendance on 10/2, (iii) had a HS GPA of at least 3.0, (iv) were not NCAA athletes, and (v) Engineering Career Awareness Program (ECAP) participants.

Freshmen eligible for STEP's need-based grant component were stratified into pairs by their scores on a measure that projects probability of one-year retention. Candidacy for a treatment group was then randomly assigned to one member of each pair, while candidacy for a control group was assigned to the other. First for the treatment group and again for the control group, an imaginary $650k was then allocated in $2.5k increments to those 150+ candidates for the group and in those amounts (up to a maximum of $10k per recipient) that most improved the group's sum of projected probabilities of retention (i.e., that most improved the full freshman cohort's projected one-year retention rate). The resulting treatment group will be awarded grants in the amounts specified by this process.

2. Initially full-time, degree-seeking, new freshmen (FT DS NF) with AR residence and active enrollment were eligible for STEP's mentoring component just in case they (i) were not included in the need-based grant treatment or control group, (ii) had a HS GPA of at least 3.0, (iii) were not NCAA athletes, (iv) were not ECAP participants, and (v) were not Accelerate Student Achievement Program (ASAP) participants.

Freshmen eligible for STEP's mentoring component were first divided into two categories by parent college completion. Students in the first-generation category and students in the other category were then separately stratified into pairs by their predicted first-term GPAs. For both the 75 pairs of first-generation students and the 75 non-first-generation pairs with the lowest predicted first-term GPAs, random assignments then placed one member of each pair into the intent-to-treat group and the other member of each pair into the control group. If some invited students refuse the invitation, the same process will then be repeated for the pairs with the next-lowest predicted first-term GPAs, until the actually-treated group comprises 75 first-generation and 75 non-first-generation students. (Any subsequent tests should compare the full control group against both the equinumerous intent-to-treat group and the smaller subset of actually treated students.)

Attached is a description of the models initially used to predict first-term GPAs. We can send additional materials if needed about (i) the model ultimately used to predict one-year retention from amount of unmet need, (ii) the models used to predict first-term GPAs for first-generation candidates for the mentoring program, and (iii) the models used to predict first-term GPAs for continuing-generation candidates for the mentoring program.

Five models were constructed to collectively predict each AR-resident new freshman's first-term GPA. The data set used to build these models comprised all 38,710 members of the last ten (i.e., 2007-2016) fall cohorts of full-time, degree-seeking, new freshmen (FT DS NF) who were not NCAA athletes. More than 35 factors were initially considered as possible predictors of first-term GPA, including academic and socio-economic variables.[1] The primary analysis procedure was stepwise linear regression.

Among simple incoming student characteristics, high school GPA was easily the best single predictor of freshman GPA. However, the relationship between HS GPA and first-term GPA, and the distribution of HS GPAs, varies substantially by school and by state. For this reason, an adjusted form of HS GPA was computed that is more strongly and more consistently related to first-term GPA than is HS GPA.[2] This transformed HS GPA was the principal factor in predicting first-term GPA for each large student group.[3]

Students were segmented into several groups, including (i) 81 GED recipients for whom the university has no HS GPAs, (ii) 82 U.S. students for whom the university has no ACT or SAT score, (iii) 357 international students for whom the university has ACT or SAT scores, (iv) 16,522 non-Arkansan U.S. students for whom the university has HS GPAs and ACT or SAT scores, and (v) 21,488 Arkansans for whom the university has HS GPAs and ACT or SAT scores. This segmentation improved the accuracy of predictions and made it possible to account separately for the small groups of freshmen about whom the university lacks predictively important information — small groups of freshmen with relatively high historical attrition rates.

Predictions for some student groups are more accurate than predictions for others. The model constructed to predict most Arkansans' first-term GPAs[4] explained 38.9% of the variation in those GPAs. This compares to 31.2% of the relevant variance explained by the model for most non-Arkansans,[5] 23.1% of

---

[1] Preliminary testing excluded, from one or more models, many factors the inclusion of which would have resulted in excessive collinearity (i.e., in some variable[s] having a variance inflation factor greater than or equal to 2.5). The continuous variables that ultimately contributed to predictions of first-term GPA for one or more groups are (i) a transformation of HS GPA, (ii) the logarithm of number of AP tests completed for UA credit, (iii) a centered form of ACT (or converted SAT) score, (iv) the mean adjusted HS GPA of students who graduated after beginning in a student's initial major, and (v) number of days enrolled before the first term. Continuous variables were centered or similarly adjusted to avoid excessive collinearity. Outlying values on each continuous variable were trimmed. The categorical variables that contributed to predictions of first-term GPA for one or more groups include initial housing type, whether any college-level credit has been transferred, possession of a first-year scholarship, sex, initial college (with each of AFLS, ARCH, ARSC, and ENGR compared against WCOB), parent college completion (with both parents, father alone, and mother alone, each compared against neither parent), and HS state (with Arkansas, Kansas, Missouri, Oklahoma, Texas, Tennessee, Louisiana, and international, each compared against other U.S.). All of these variables, possibly excepting number of AP tests, should be available by a student's 11th day.

[2] The transformed HS GPA expresses each student's HS GPA relative to those of students from the same HS who earned a UA first-term GPA of at least 2.5. Multilevel modelling (MLM) confirmed the desirability of this transformation, indicating that the transformed HS GPA greatly reduces the variability between HSs of HS GPAs relative to the variability within HSs of individual students' HS GPAs. Specifically, MLM showed the intraclass correlation (ICC) of HS GPAs by high school to be 12.9% and the ICC of adjusted HS GPAs by HS to be only 0.3%.

[3] In an initial set of models, adjusted HS GPA accounted for 92% of the explained variance in Arkansas students' first-term GPAs, 82% of the explained variance in other U.S. students' first-term GPAs, and 74% of the explained variance in international students' first-term GPAs.

[4] According to this model, an incoming Arkansas resident freshman's projected first-term GPA equals the following (where 1 is the affirmative value and 0 the negative value on each binary variable): 2.715 + 432*adjusted HS GPA +.003*trimmed average number of days enrolled prior to the student's first-term courses - .188*ENGR is first college + .314*logged number of AP tests + .155*some college credit completed by first fall + .122*both parents completed four-year college degree + .082*father only completed four-year college degree +.093*initial housing is on campus + .091*possesses first-year AR Challenge or AR Governor's Scholarship - .129*mean adjusted HS GPA of UA grads from student's initial major - .055*initially eligible for the Pell Grant - .05*is male - .118*ARCH is first college + .061*AFLS is first college + .041*only mother completed four-year college degree - .162*AR is HS state - .299*TX is HS state + .006*student's ACT score minus mean ACT score.

[5] According to this model, an incoming non-Arkansas resident freshman's projected first-term GPA equals the following: 2.678 + .313*adjusted HS GPA + .021*ACT score over mean - .237*ENGR is first college - .124*is male + .292*logged number of AP tests - .144*TX is HS state - .063*ARSC is first college - .259*ARCH is first college - .117*OK is HS state +.112*both parents completed four-year college degree + .099*possess first-year scholarship(s) + .002* trimmed average number of days enrolled prior to the student's first-term courses + .28*initial housing is on campus + .068*CA is primary ethnicity + .098*KS is HS state + .087*father only completed four-year college degree - .098*mean adjusted HS GPA of UA grads from student's initial major + .037*EDUC is first college + .044*mother only completed four-year college degree.

the relevant variance explained by the model for international students,[6] 20.8% of the relevant variance explained by the model for U.S. students with no ACT scores,[7] and 14.6% of the relevant variance explained by the model for GED students.[8]

[6] According to this model, an incoming international freshman's projected first-term GPA equals the following: 3.319 + .148*adjusted HS GPA + .468* mean adjusted HS GPA of UA grads from student's initial major + .32*some college-level credit transferred by first fall - .272*is male.
[7] According to this model, the projected first-term GPA of an incoming U.S. freshman for whom the university has no ACT or SAT score equals the following: 2.294 + .611*HS GPA is 3.1 or higher + .011*trimmed average number of days enrolled prior to the student's first-term courses - .921*father only completed four-year college degree – 1.262*ARCH is first college.
[8] According to this model, an incoming GED recipient freshman's projected first-term GPA equals the following: 2.138 + .169*student's ACT score minus mean ACT score.