STAT 225 - Prelim Project Look Group D

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What is the True Value of a College Education?

Perhaps the most prevalent rationale for the pursuance of a college degree is the promise of economic mobility upon graduation. However, our project aims to investigate whether this opportunity is equally available for all students. Specifically, our group will analyze whether the racial and socio-demographic composition of a college affects the proportion of students who go on to earn higher wages after enrolling in the institution.

Read in the data

```
data <- read.csv("https://awagaman.people.amherst.edu/stat225/datasetsS2018/groupDdata.csv")
data2<-data[,c(-6, -18, -19, -(27:34), -(42:89))]
data2<-data2[,c(-2,-3,-5)] %>%
  as.data.frame() # Must start with a data-read in command from Prof. Wagaman
data2[,3:27]<-sapply(data2[,3:27], as.character)
data2[,3:27]<-sapply(data2[,3:27], as.numeric)
data3 <-data2 %>%
  group_by(INSTNM) %>%
  mutate(rank=min(UNITID), n=n()) %>%
  filter(n<2) %>%
  as.data.frame()
data4<-data3[,c(-1, -28, -29)]
```

Summary command on data set

```
summary(data4)
```

```
##                                       INSTNM       PCT_WHITE
##  A & W Healthcare Educators              :   1   Min.   : 5.34
##  A T Still University of Health Sciences:   1   1st Qu.:67.09
##  Aaniiih Nakoda College                  :   1   Median :78.66
##  Aaron's Academy of Beauty               :   1   Mean   :75.48
##  ABC Beauty Academy                      :   1   3rd Qu.:87.83
##  ABC Beauty College Inc                  :   1   Max.   :98.92
##  (Other)                                 :7306   NA's   :2136
##    PCT_BLACK        PCT_ASIAN       PCT_HISPANIC        PCT_BA
##  Min.   : 0.020   Min.   : 0.060   Min.   : 0.410   Min.   : 3.00
##  1st Qu.: 4.150   1st Qu.: 0.900   1st Qu.: 2.700   1st Qu.:11.41
##  Median : 8.345   Median : 1.785   Median : 5.865   Median :14.08
##  Mean   :12.947   Mean   : 3.028   Mean   :12.957   Mean   :14.34
##  3rd Qu.:17.720   3rd Qu.: 3.470   3rd Qu.:15.120   3rd Qu.:16.96
##  Max.   :85.820   Max.   :51.720   Max.   :99.350   Max.   :30.70
##  NA's   :2136     NA's   :2136     NA's   :2136     NA's   :2173
##  PCT_GRAD_PROF     PCT_BORN_US     MEDIAN_HH_INC     POVERTY_RATE
##  Min.   : 0.600   Min.   : 28.92   Min.   : 15429   Min.   : 3.010
##  1st Qu.: 5.880   1st Qu.: 85.11   1st Qu.: 49663   1st Qu.: 6.987
##  Median : 7.340   Median : 92.54   Median : 57740   Median : 8.950
##  Mean   : 7.863   Mean   : 88.87   Mean   : 57912   Mean   :10.763
##  3rd Qu.: 9.330   3rd Qu.: 96.14   3rd Qu.: 65851   3rd Qu.:12.180
##  Max.   :24.360   Max.   :100.00   Max.   :100871   Max.   :55.280
```

```
##  NA's   :2173     NA's   :2173     NA's   :2136     NA's   :2136
##    UNEMP_RATE     LN_MEDIAN_HH_INC MN_EARN_WNE_P10  MD_EARN_WNE_P10
##  Min.   : 1.850   Min.   : 9.64    Min.   : 12200   Min.   :  9100
##  1st Qu.: 3.100   1st Qu.:10.78    1st Qu.: 27000   1st Qu.: 24100
##  Median : 3.550   Median :10.92    Median : 35100   Median : 31200
##  Mean   : 3.847   Mean   :10.90    Mean   : 37854   Mean   : 33626
##  3rd Qu.: 4.240   3rd Qu.:11.05    3rd Qu.: 44000   3rd Qu.: 39750
##  Max.   :15.360   Max.   :11.49    Max.   :250000   Max.   :250000
##  NA's   :2136     NA's   :2136     NA's   :1813     NA's   :1813
##  PCT10_EARN_WNE_P10 PCT25_EARN_WNE_P10 PCT75_EARN_WNE_P10
##  Min.   :  800      Min.   :  4600     Min.   : 18700
##  1st Qu.: 4800      1st Qu.: 13300     1st Qu.: 37750
##  Median : 7000      Median : 17400     Median : 47600
##  Mean   : 8247      Mean   : 19798     Mean   : 50487
##  3rd Qu.:10600      3rd Qu.: 24600     3rd Qu.: 57600
##  Max.   :61200      Max.   :173300     Max.   :250000
##  NA's   :2743       NA's   :2301       NA's   :2301
##  PCT90_EARN_WNE_P10 SD_EARN_WNE_P10    GT_25K_P10     MN_EARN_WNE_INC1_P10
##  Min.   : 25100     Min.   :  9600   Min.   :0.0900   Min.   : 14100
##  1st Qu.: 54500     1st Qu.: 19500   1st Qu.:0.4840   1st Qu.: 26400
##  Median : 66300     Median : 25200   Median :0.6160   Median : 32200
##  Mean   : 69828     Mean   : 27826   Mean   :0.6029   Mean   : 35185
##  3rd Qu.: 79000     3rd Qu.: 31600   3rd Qu.:0.7420   3rd Qu.: 40475
##  Max.   :250000     Max.   :172700   Max.   :0.9770   Max.   :182900
##  NA's   :2743       NA's   :1813     NA's   :1813     NA's   :2806
##  MN_EARN_WNE_INC2_P10 MN_EARN_WNE_INC3_P10 MN_EARN_WNE_INDEP0_INC1_P10
##  Min.   : 19900       Min.   : 18800       Min.   : 17400
##  1st Qu.: 35900       1st Qu.: 39200       1st Qu.: 29100
##  Median : 41600       Median : 45900       Median : 34000
##  Mean   : 43007       Mean   : 47298       Mean   : 35368
##  3rd Qu.: 47875       3rd Qu.: 52575       3rd Qu.: 39400
##  Max.   :135900       Max.   :155500       Max.   :120900
##  NA's   :3994         NA's   :3982         NA's   :4800
##  MN_EARN_WNE_INDEP0_P10 MN_EARN_WNE_INDEP1_P10
##  Min.   : 13300         Min.   : 14900
##  1st Qu.: 29300         1st Qu.: 28200
##  Median : 35900         Median : 35600
##  Mean   : 37237         Mean   : 38627
##  3rd Qu.: 42800         3rd Qu.: 45100
##  Max.   :130300         Max.   :193200
##  NA's   :3167           NA's   :3167
```

Data Codebook

`PCT_WHITE`: Percent of the population from students' zip codes that is White, via Census data; quantitative

`MEDIAN_HH_INC`: Median Household Income of Students' Parents; quantitative.

`GT_25K_P10`: Percentage of students earning at least 25k 10 years after entry; quantitative

`MD_EARN_WNE_P10`: Median income 10 years after entry of students working and not enrolled in school; quantitative.

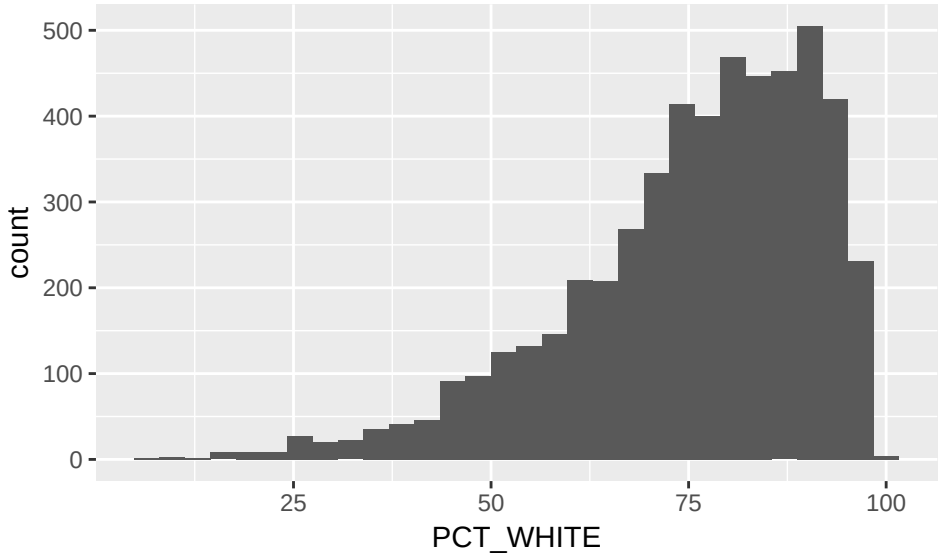
Analysis Plan

We plan to focus our project on explanation the relationships between `MD_EARN_WNE_P10` and various predictor variables. Below, we have highlighted a few potential predictors, their distributions, and their relationships with our primary response variable.

Prelim Univariate Analysis

Percentage White

```
#Univariate Analysis
#favstats(data4$PCT_WHITE)
#histogram(data4$PCT_WHITE)
ggplot(data4, aes(PCT_WHITE))+geom_histogram()
```




```
#densityplot(data4$PCT_WHITE)
```

Conducting Univariate Analysis on the distribution of the percentage of students that are white, it is clear that this distribution is quite skewed left. The mean percentage is 75.509 while the median is 78.685. The data ranges from from 5.34 to 98.98 with a standard deviation of 15.879.

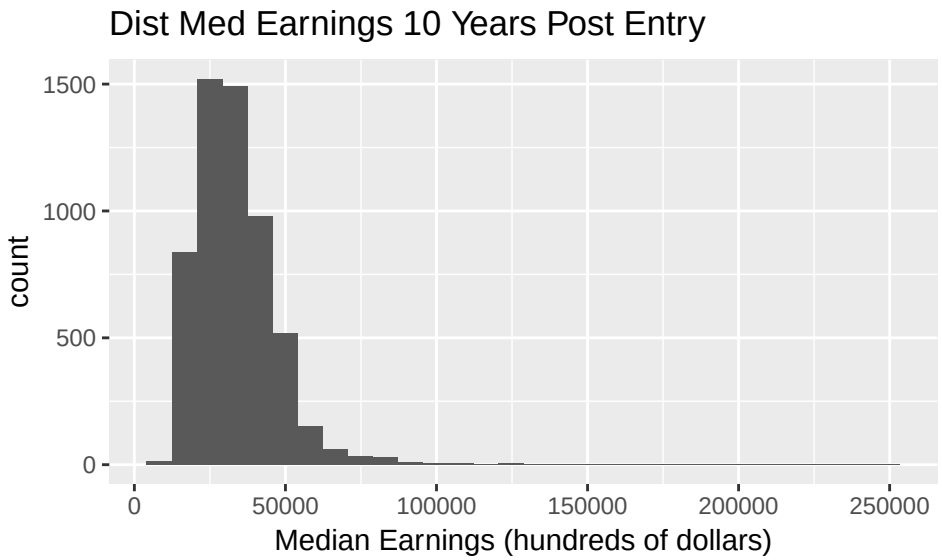
Intuitively, this distribution makes sense. White people have a traditionally stronger representation in the American college system, and this distribution supports that claim as there is more density around colleges with a proportionately high white student body.

Median Earnings 10 Years Post College

```
favstats(data2$MD_EARN_WNE_P10)
```

```
##   min    Q1 median    Q3    max     mean       sd    n missing
##  9100 24100  31100 39500 250000 33500.42 15444.58 5682    1911
```

```
ggplot(data2,aes(as.numeric(MD_EARN_WNE_P10)))+geom_histogram()+
  ggtitle("Dist Med Earnings 10 Years Post Entry")+
  xlab("Median Earnings (hundreds of dollars)")
```



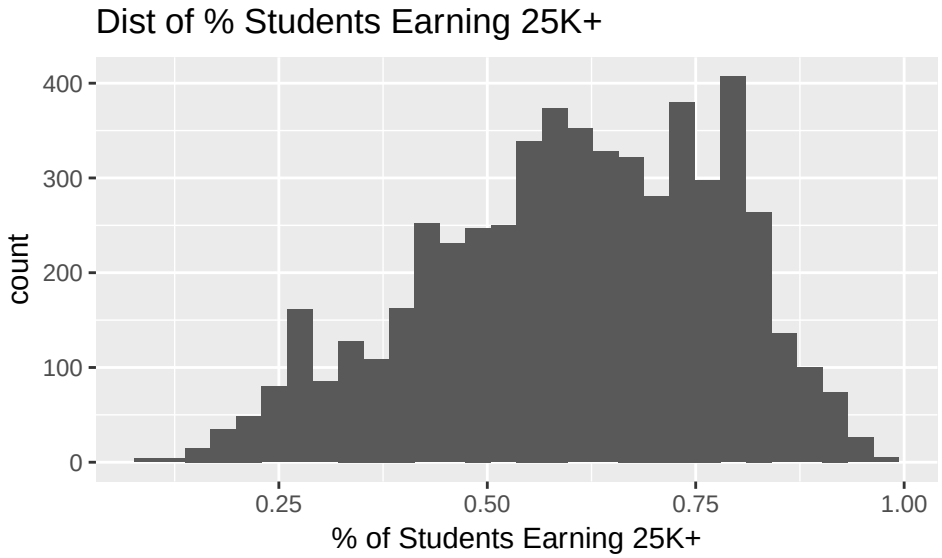
The distribution of median earnings of students working and not enrolled 10 years after entry has a median of 31100dollars and a mean of 33500.42 dollars, and so we see the distribution is skewed right. The range of the distribution is 9100 to 250000 dollars, and the standard deviation is 15444.58 dollars which indicates a relatively large spread.

% of Students Earning At Least 25K

```
favstats(data4$GT_25K_P10)
```

```
##   min    Q1 median    Q3   max      mean        sd    n missing
##  0.09 0.484  0.616 0.742 0.977 0.6029171 0.1748034 5499    1813
```

```
ggplot(data4,aes((GT_25K_P10)))+
  geom_histogram()+ggtitle("Dist of % Students Earning 25K+")+
  xlab("% of Students Earning 25K+")
```

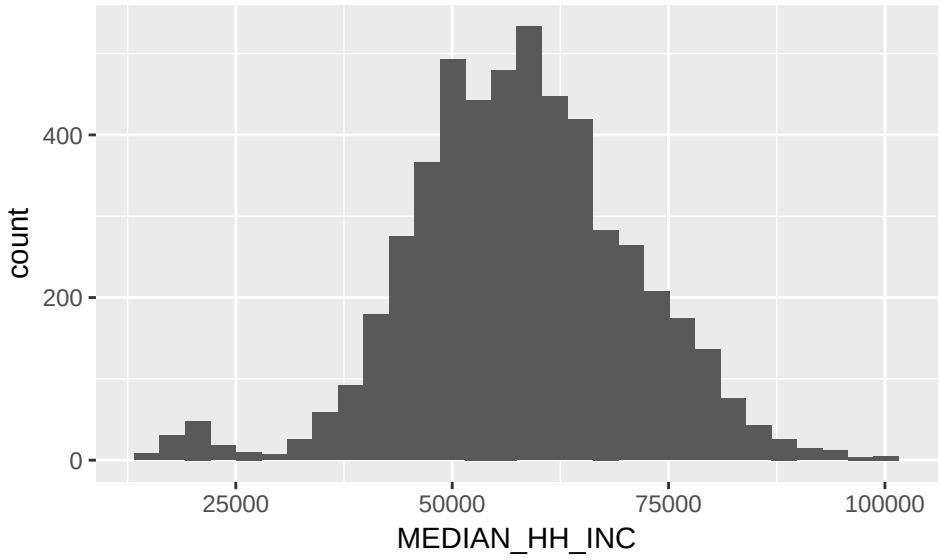


The distribution share of students earning over $25,000/year (threshold earnings) 10 years after entry has a median of 0.616 and a mean of 0.602, and we see the distribution is skewed left. The standard deviation is 0.175 which indicates a fairly large spread.

Median Household Income

As expected, the distribution of this variable is primarily bell-shaped. While there are a couple of spikes, there is one primary peak and it is relatively symmetric around a median of 57,739.61. The values for this variable range from 15,429.01 to 100,870.80.

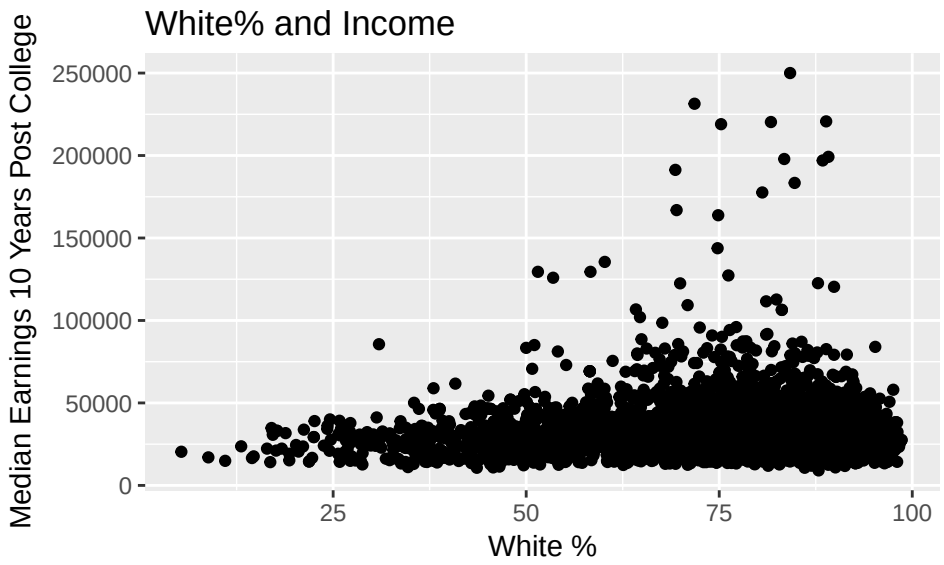
```
ggplot(data4, aes(MEDIAN_HH_INC)) +geom_histogram()
```



Prelim Bivariate Analysis

Percentage White and Median Earnings 10 Years Post College

```
ggplot(data4, aes(PCT_WHITE, MD_EARN_WNE_P10)) + geom_point() + xlab("White %") +
  ylab("Median Earnings 10 Years Post College") + ggtitle("White% and Income")
```



There appears to be a weak positive linear correlation between percentage of student body that is white and median earnings 10 years after college.

```
summary(rfit(MD_EARN_WNE_P10~PCT_WHITE, data=data4),overall.test="drop")
```

```
## Call:
## rfit.default(formula = MD_EARN_WNE_P10 ~ PCT_WHITE, data = data4)
##
## Coefficients:
##              Estimate Std. Error t.value   p.value
## (Intercept) 23257.840    795.038  29.254 < 2.2e-16 ***
## PCT_WHITE     116.008     10.319  11.242 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Multiple R-squared (Robust): 0.02728063
## Reduction in Dispersion Test: 130.4127 p-value: 0
```

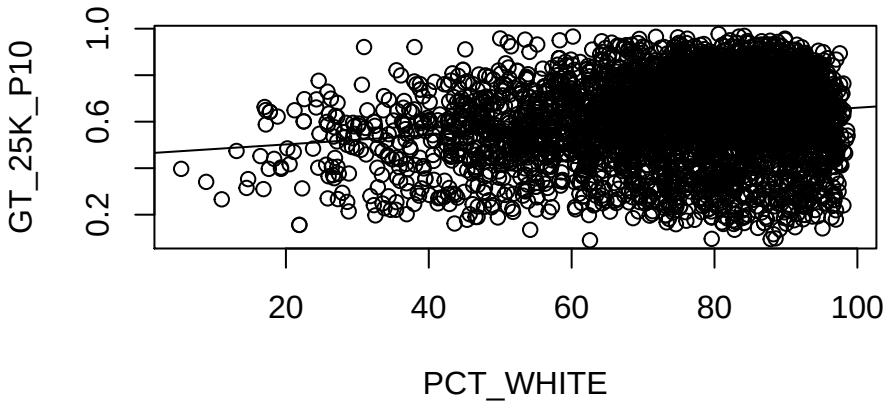
Above, we have fit a simple linear model using percent white to predict median earnings. Most notably, the p-value for model utility is very close to 0, indicating that there is a significant linear relationship between these two variables. This relationship is one we will continue to investigate as our project progresses.

Percentage White and % Student Body Earning >25k

```
mod<-lm(GT_25K_P10~PCT_WHITE, data = data4)
summary(mod)
```

```
##
## Call:
## lm(formula = GT_25K_P10 ~ PCT_WHITE, data = data4)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.54106 -0.10740  0.01677  0.13102  0.39726
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.4626911  0.0122237   37.85   <2e-16 ***
## PCT_WHITE   0.0019731  0.0001591   12.40   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1719 on 4650 degrees of freedom
##   (2660 observations deleted due to missingness)
## Multiple R-squared:  0.03202,    Adjusted R-squared:  0.03181
## F-statistic: 153.8 on 1 and 4650 DF,  p-value: < 2.2e-16
```

```
with(data4,plot(PCT_WHITE,GT_25K_P10))
abline(mod)
```



There seems to be a weak to moderate positive relationship between `PCT_WHITE` and the proportion of students earning over 25K within 10 years of graduating.