

Hung-Wei Chang A1

```
# Number of schools = 898
> nrow(g_schools_byCode)
[1] 898
```

```
# Number of programs = 165
> nrow(choice_programs)
[1] 165
```

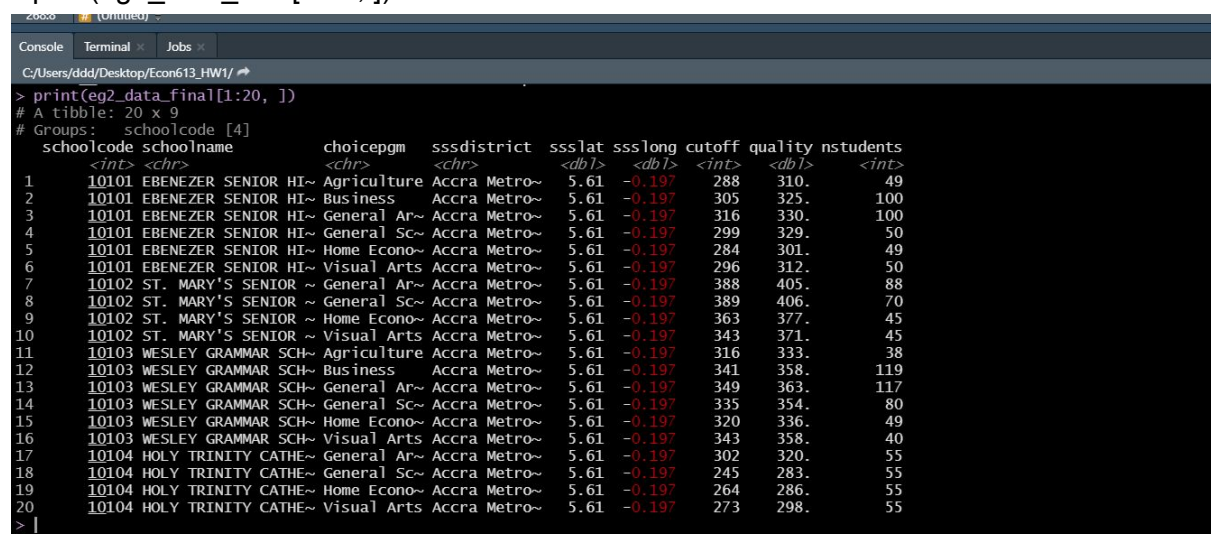
```
# Number of choices (School and Program) = 2773, after dropping the NA values in either
  schoolcodes or choicepgm
> nrow(potential_choices)
[1] 2773
```

```
# How many missing test scores = 179887
> sum(is.na(datstu$score))
[1] 179887
```

```
# numbers of students that apply to the same school = 134122
> length(num_morethan1_school)
[1] 134122
```

```
# Apply to less than 6 choices = 321639
> nrow(lessthan6_program_df)
[1] 321639
```

```
# Exercise 2 Data
> print(eg2_data_final[1:20, ])
```



```
> print(eg2_data_final[1:20, ])
# A tibble: 20 x 9
# Groups:   schoolcode [4]
  schoolcode schoolname choicepgm sssdistrict ssslat ssslong cutoff quality nstudents
  <int> <chr> <chr> <chr> <dbl> <dbl> <int> <dbl> <int>
1 10101 EBENEZER SENIOR HI~ Agriculture Accra Metro~ 5.61 -0.197 288 310. 49
2 10101 EBENEZER SENIOR HI~ Business Accra Metro~ 5.61 -0.197 305 325. 100
3 10101 EBENEZER SENIOR HI~ General Ar~ Accra Metro~ 5.61 -0.197 316 330. 100
4 10101 EBENEZER SENIOR HI~ General Sc~ Accra Metro~ 5.61 -0.197 299 329. 50
5 10101 EBENEZER SENIOR HI~ Home Econo~ Accra Metro~ 5.61 -0.197 284 301. 49
6 10101 EBENEZER SENIOR HI~ Visual Arts Accra Metro~ 5.61 -0.197 296 312. 50
7 10102 ST. MARY'S SENIOR ~ General Ar~ Accra Metro~ 5.61 -0.197 388 405. 88
8 10102 ST. MARY'S SENIOR ~ General Sc~ Accra Metro~ 5.61 -0.197 389 406. 70
9 10102 ST. MARY'S SENIOR ~ Home Econo~ Accra Metro~ 5.61 -0.197 363 377. 45
10 10102 ST. MARY'S SENIOR ~ Visual Arts Accra Metro~ 5.61 -0.197 343 371. 45
11 10103 WESLEY GRAMMAR SCH~ Agriculture Accra Metro~ 5.61 -0.197 316 333. 38
12 10103 WESLEY GRAMMAR SCH~ Business Accra Metro~ 5.61 -0.197 341 358. 119
13 10103 WESLEY GRAMMAR SCH~ General Ar~ Accra Metro~ 5.61 -0.197 349 363. 117
14 10103 WESLEY GRAMMAR SCH~ General Sc~ Accra Metro~ 5.61 -0.197 335 354. 80
15 10103 WESLEY GRAMMAR SCH~ Home Econo~ Accra Metro~ 5.61 -0.197 320 336. 49
16 10103 WESLEY GRAMMAR SCH~ Visual Arts Accra Metro~ 5.61 -0.197 343 358. 40
17 10104 HOLY TRINITY CATHE~ General Ar~ Accra Metro~ 5.61 -0.197 302 320. 55
18 10104 HOLY TRINITY CATHE~ General Sc~ Accra Metro~ 5.61 -0.197 245 283. 55
19 10104 HOLY TRINITY CATHE~ Home Econo~ Accra Metro~ 5.61 -0.197 264 286. 55
20 10104 HOLY TRINITY CATHE~ Visual Arts Accra Metro~ 5.61 -0.197 273 298. 55
> |
```

Hung-Wei Chang A1

Exercise 3 Data

```
> print(eg3_for_printing[1:20,])
# A tibble: 20 x 8
# Groups:   schoolcode [1]
  schoolcode sssdistrict ssslong ssslat jssdistrict point_x point_y distance
  <int> <chr> <dbl> <dbl> <chr> <dbl> <dbl> <dbl>
1 10101 Accra Metropolitan -0.197 5.61 Accra Metropolitan -0.197 5.61 0
2 10101 Accra Metropolitan -0.197 5.61 Aowin Suaman (Enchi) -2.79 5.79 31988.
3 10101 Accra Metropolitan -0.197 5.61 Ga East (Abokobi) -0.241 5.72 71.1
4 10101 Accra Metropolitan -0.197 5.61 Ga West (Amasaman) -0.398 5.66 206.
5 10101 Accra Metropolitan -0.197 5.61 Kumasi Metro -1.60 6.68 14778.
6 10101 Accra Metropolitan -0.197 5.61 Accra Metropolitan -0.197 5.61 0
7 10101 Accra Metropolitan -0.197 5.61 Awutu/Efutu/Senya (Winneba) -0.509 5.54 479.
8 10101 Accra Metropolitan -0.197 5.61 Ga West (Amasaman) -0.398 5.66 206.
9 10101 Accra Metropolitan -0.197 5.61 Mfantseman (Saltpond) -1.01 5.20 3897.
10 10101 Accra Metropolitan -0.197 5.61 Accra Metropolitan -0.197 5.61 0
11 10101 Accra Metropolitan -0.197 5.61 Ga West (Amasaman) -0.398 5.66 206.
12 10101 Accra Metropolitan -0.197 5.61 Wassa West (Tarkwa) -1.99 5.28 15756.
13 10101 Accra Metropolitan -0.197 5.61 Accra Metropolitan -0.197 5.61 0
14 10101 Accra Metropolitan -0.197 5.61 Awutu/Efutu/Senya (Winneba) -0.509 5.54 479.
15 10101 Accra Metropolitan -0.197 5.61 Ga West (Amasaman) -0.398 5.66 206.
16 10101 Accra Metropolitan -0.197 5.61 Kumasi Metro -1.60 6.68 14778.
17 10101 Accra Metropolitan -0.197 5.61 Tema -0.0501 5.69 135.
18 10101 Accra Metropolitan -0.197 5.61 Accra Metropolitan -0.197 5.61 0
19 10101 Accra Metropolitan -0.197 5.61 Awutu/Efutu/Senya (Winneba) -0.509 5.54 479.
20 10101 Accra Metropolitan -0.197 5.61 Dangme East (Ada) 0.107 5.91 889.
```

Exercise 4 Data

```
> g_datstu_school_program_jssdistrict_final
# A tibble: 6 x 7
  rank avg_cutoff sd_cutoff avg_quality sd_quality avg_distance sd_distance
  <int> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
1 1 300. 51.9 307. 50.4 8581. 20728.
2 2 293. 48.6 299. 47.3 6849. 17256.
3 3 283. 44.2 289. 42.5 5698. 15484.
4 4 271. 40.6 278. 38.4 4809. 14464.
5 5 243. 26.7 250. 26.7 2157. 4442.
6 6 244. 27.0 250. 26.2 2115. 5520.
```

> datstu_school_program_jssdistrict_quantile_final

```
# A tibble: 4 x 7
  quantilegroup avg_cutoff sd_cutoff avg_quality sd_quality avg_distance sd_distance
  <int> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
1 1 232. 12.7 235. 10.8 4320. 14202.
2 2 265. 9.13 267. 8.22 5446. 16738.
3 3 299. 11.8 302. 10.9 5559. 16028.
4 4 350. 22.7 354. 23.3 5828. 14425.
```

Exercise 6

- $\text{cor}(x1, y) = 0.216015$
- `>est_eg6`

```
> est_eg6
True parameter R: GLM : est R: GLM :se R: own : est R: own :se
(Intercept) 0.5 2.4907098 0.040620200 2.4907098 0.040620200
x1 1.2 1.1976226 0.017358550 1.1976226 0.017358550
x2 -0.9 -0.8970514 0.002876599 -0.8970514 0.002876599
x3 0.1 0.0875850 0.021694530 0.0875850 0.021694530
```

Exercise 7

Probit

```
> est_probit
      True parameter R: GLM : est R: GLM :se R: own : est R: own :se
(Intercept)      0.5   3.04273897 0.09980833   3.04291992 0.10007901
x1                1.2   1.17235282 0.04287054   1.17226371 0.04292037
x2               -0.9  -0.90546040 0.01856071  -0.90545759 0.01858976
x3                0.1  -0.01124978 0.04651168  -0.01128529 0.04647593
```

Logit

```
> est_logit
      True parameter R: GLM : est R: GLM :se R: own : est R: own :se
(Intercept)      0.5   5.42654014 0.18557270   5.42655751 0.18557823
x1                1.2   2.10059417 0.07936026   2.10060264 0.07936256
x2               -0.9  -1.61850702 0.03670791  -1.61851304 0.03670969
x3                0.1  -0.01963017 0.08323153  -0.01962943 0.08323301
```

Linear

```
> est_linear
      True parameter R: GLM : est R: GLM :se R: own : est R: own :se
(Intercept)      0.5   0.885823611 0.013655728   0.885823611 0.013655728
x1                1.2   0.146193985 0.005835610   0.146193985 0.005835610
x2               -0.9  -0.102832042 0.000967057  -0.102832042 0.000967057
x3                0.1  -0.008053057 0.007293283  -0.008053057 0.007293283
```

In all 3 models, intercept, x1, x2 are very significant, but x3 is not.

Exercise 8

- Marginal effect (Probit)

```
> est_ME_probit
      BT: mean_ME  BT: sd_ME
x0  0.373236342  0.010838540
x1  0.143661849  0.004792798
x2 -0.111062310  0.001366401
x3 -0.001502377  0.005461645
```

- Marginal effect (Logit)

```
> est_ME_logit
      BT: mean_ME  BT: sd_ME
x0  0.381122225  0.012167275
x1  0.147429134  0.005471467
x2 -0.113682432  0.002121301
x3 -0.001514196  0.005574479
```