# Demographic Correlates of Temperament and Ability

Lorien G. Elleman
Northwestern University
Evanston, Illinois USA


NORTHWESTERN
UNIVERSITY

July 31,2015

# Purpose of study

- To explore whether demographic measures at the neighborhood level are correlated with personality and/or cognitive ability.
  - Can the personality of residents predict the type of neighborhood in which they live?
  - Can the type of neighborhood predict the personality of residents?
- Best available variable for neighborhoods: U.S. ZIP code
  - "Zone Improvement Plan" code.
  - 5-digit postal code designed for efficient mail delivery.
  - A rough approximation of a neighborhood.

# Previous research of personality at different regional levels

- Countries (e.g., Terracciano et al., 2005)
- U.S. regions (e.g., Plaut, Markus, and Lachman, 2002)
- U.S. states (e.g., Rentfrow, Gosling, and Potter, 2008)
- U.S. cities (e.g., Park and Peterson, 2010)
- U.S. ZIP codes (?)

# Hypothesis

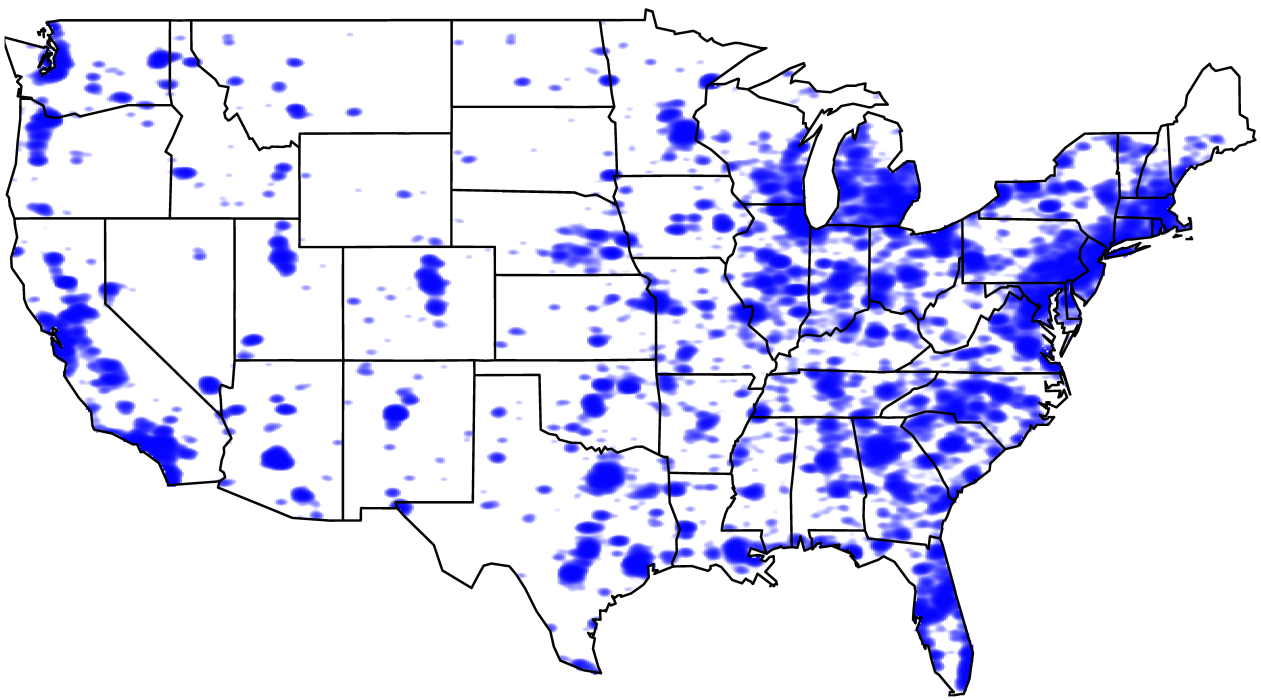
ZIP code population density and ethnic diversity will be positively related to Openness to New Experiences.

- Openness is related to liberalism (McCrae, 1996).
- Big cities tend to be more liberal (Tausanovitch & Warshaw, 2014).
- U.S. liberals self-report that ethnic diversity is an important factor in deciding where to live (Pew, 2014).

## Sample size and geographic diversity

Our sample collected between January 2013 April 2015 had:

- 49,160 U.S. participants from
- 11,273 ZCTAs (about 34% of all ZCTAs)
  - ZIP Code Tabulation Area



NORTHWESTERN UNIVERSITY

## Sample size and geographic diversity

Our sample collected between January 2013 April 2015 had:

- 49,160 U.S. participants from
- 11,273 ZCTAs (about 34% of all ZCTAs)
  - ZIP Code Tabulation Area

NORTHWESTERN UNIVERSITY

## Measurements

- IPIP-NEO (Big Five and 30 facets)
  - International Personality Item Pool
  - 300 items
  - Goldberg, 1999

## Measurements

- IPIP-NEO (Big Five and 30 facets)
  - International Personality Item Pool
  - 300 items
  - Goldberg, 1999
- ICAR 60 (cognitive ability)
  - 60 items
  - Condon and Revelle, 2014

## Measurements

- IPIP-NEO (Big Five and 30 facets)
  - International Personality Item Pool
  - 300 items
  - Goldberg, 1999
- ICAR 60 (cognitive ability)
  - 60 items
  - Condon and Revelle, 2014
- U.S. Census Bureau data

## Measurements

- IPIP-NEO (Big Five and 30 facets)
  - International Personality Item Pool
  - 300 items
  - Goldberg, 1999
- ICAR 60 (cognitive ability)
  - 60 items
  - Condon and Revelle, 2014
- U.S. Census Bureau data
  1. Population density

## Measurements

- IPIP-NEO (Big Five and 30 facets)
  - International Personality Item Pool
  - 300 items
  - Goldberg, 1999
- ICAR 60 (cognitive ability)
  - 60 items
  - Condon and Revelle, 2014
- U.S. Census Bureau data
  1. Population density
  2. Ethnic diversity (index of fractionalization)
     - The probability that two randomly selected individuals from a ZIP code will be different ethnicities.

## Measurements

- IPIP-NEO (Big Five and 30 facets)
  - International Personality Item Pool
  - 300 items
  - Goldberg, 1999
- ICAR 60 (cognitive ability)
  - 60 items
  - Condon and Revelle, 2014
- U.S. Census Bureau data
  1. Population density
  2. Ethnic diversity (index of fractionalization)
     - The probability that two randomly selected individuals from a ZIP code will be different ethnicities.
  3. Median income

## Measurements

- IPIP-NEO (Big Five and 30 facets)
  - International Personality Item Pool
  - 300 items
  - Goldberg, 1999
- ICAR 60 (cognitive ability)
  - 60 items
  - Condon and Revelle, 2014
- U.S. Census Bureau data
  1. Population density
  2. Ethnic diversity (index of fractionalization)
     - The probability that two randomly selected individuals from a ZIP code will be different ethnicities.
  3. Median income
  4. Income disparity (Gini)
     - In the context of ZIP codes, a higher income disparity probably reflects a gentrifying or mixed-income neighborhood, so may be more accurately described as income diversity.

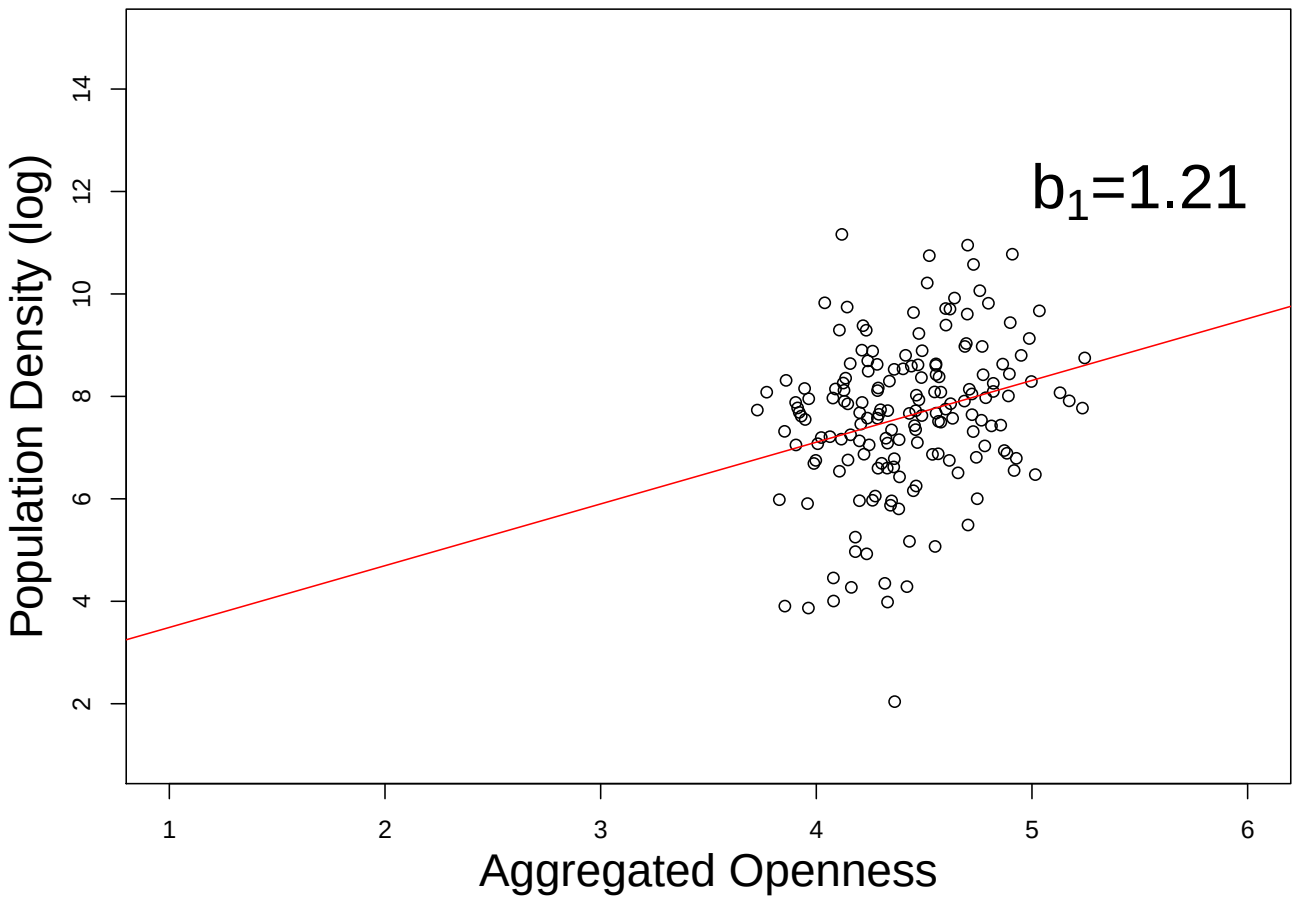
# Method of correlation

- Most studies correlate aggregated personality scores with demographic variables.
  - Correlate two "level 2" variables.

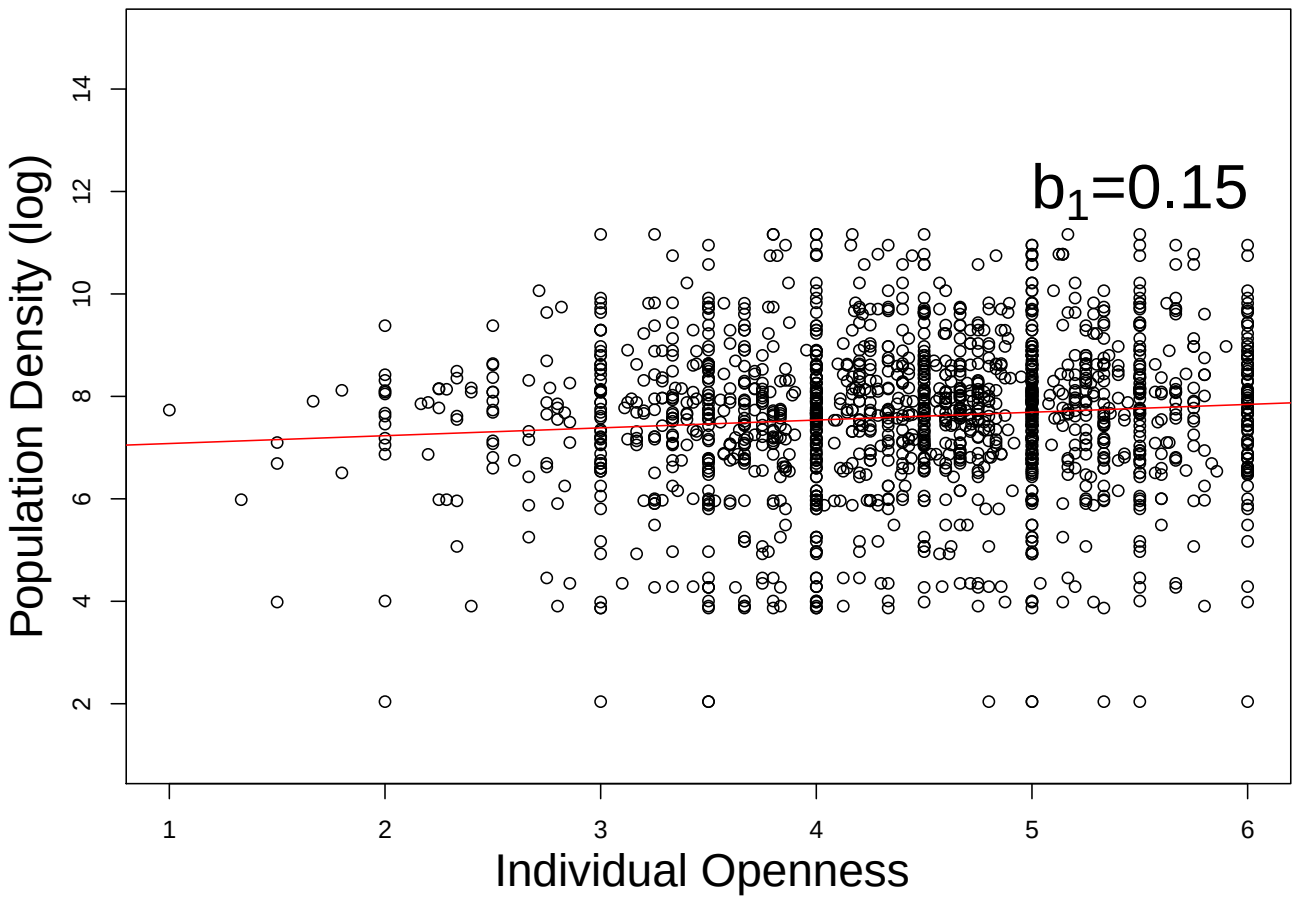
# Method of correlation

- Most studies correlate aggregated personality scores with demographic variables.
  - Correlate two "level 2" variables.
- You can also correlate individual personality scores with demographic variables.
  - Correlate one "level 1" variable and one "level 2" variable.
  - This correlation will be attenuated compared to "two level 2's".

# Example–ZIP code population density and aggregated Openness

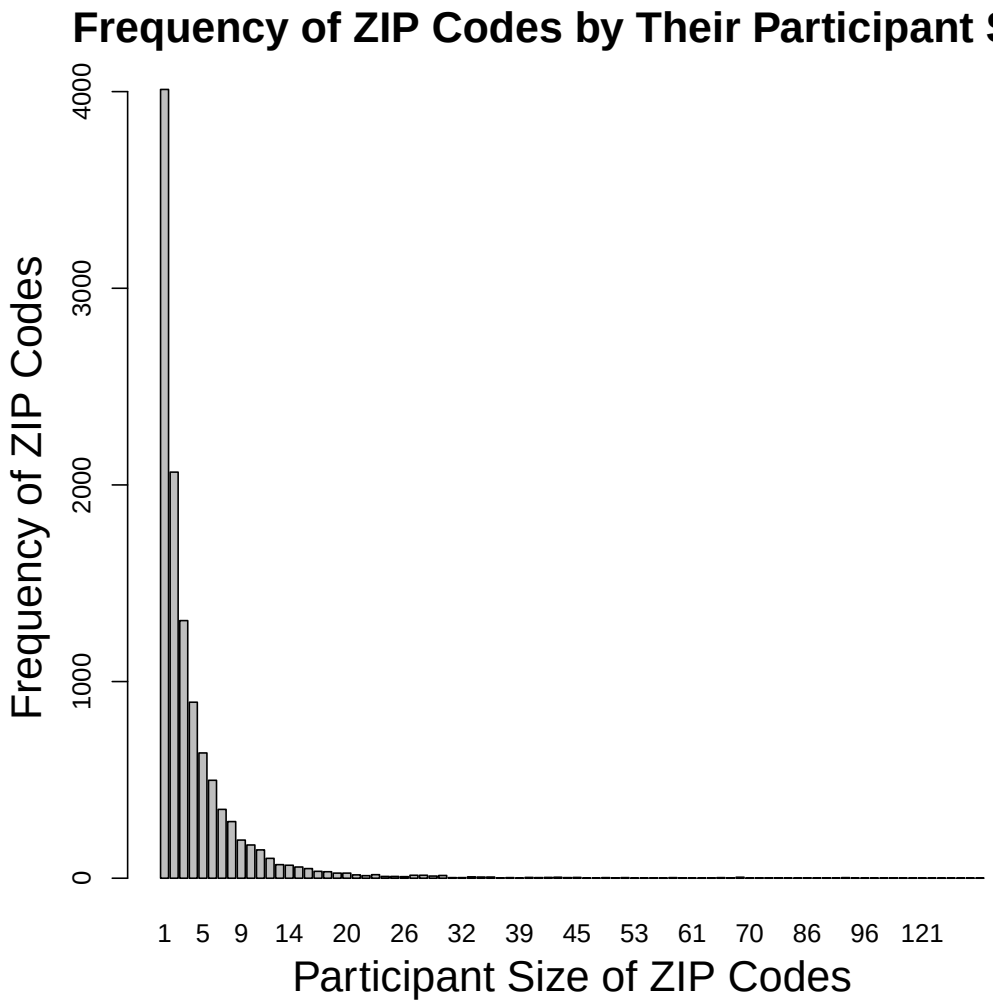


# Example–ZIP code population density and individual Openness



# Method of correlation

- Correlating two "level 2" variables is recommended.
- But we have an average of 4 participants per ZIP code.
- More than 80% of our ZIP codes have 3 or fewer participants.



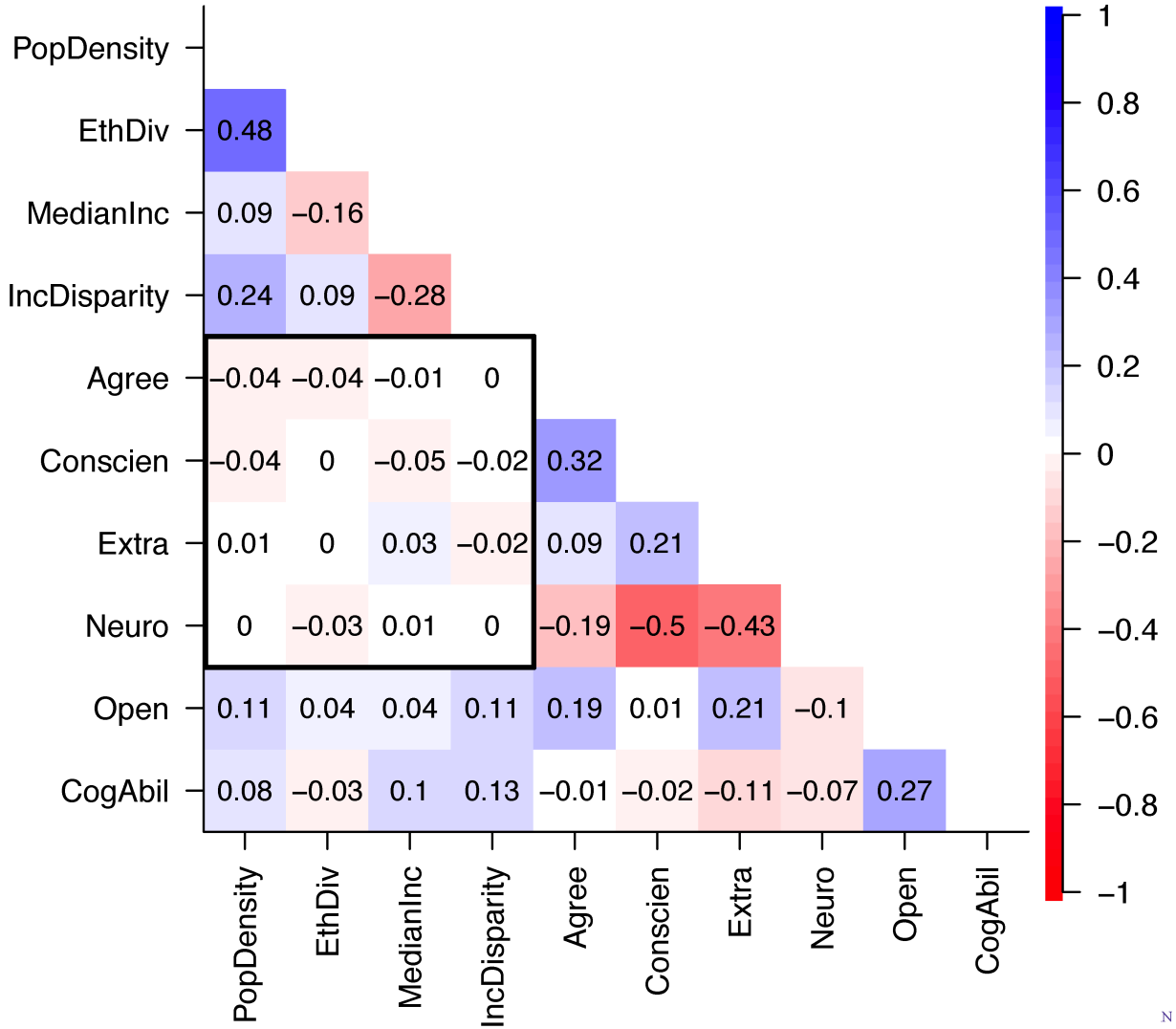

NORTHWESTERN UNIVERSITY

## Let's correlate!

- All correlations use individual personality and aggregated ZIP Code demographic variables.
- Standard errors were very small, such that $|r| \geq .04$ could be significant
- We used $|r| \geq .10$ as a cutoff for a noteworthy effect.

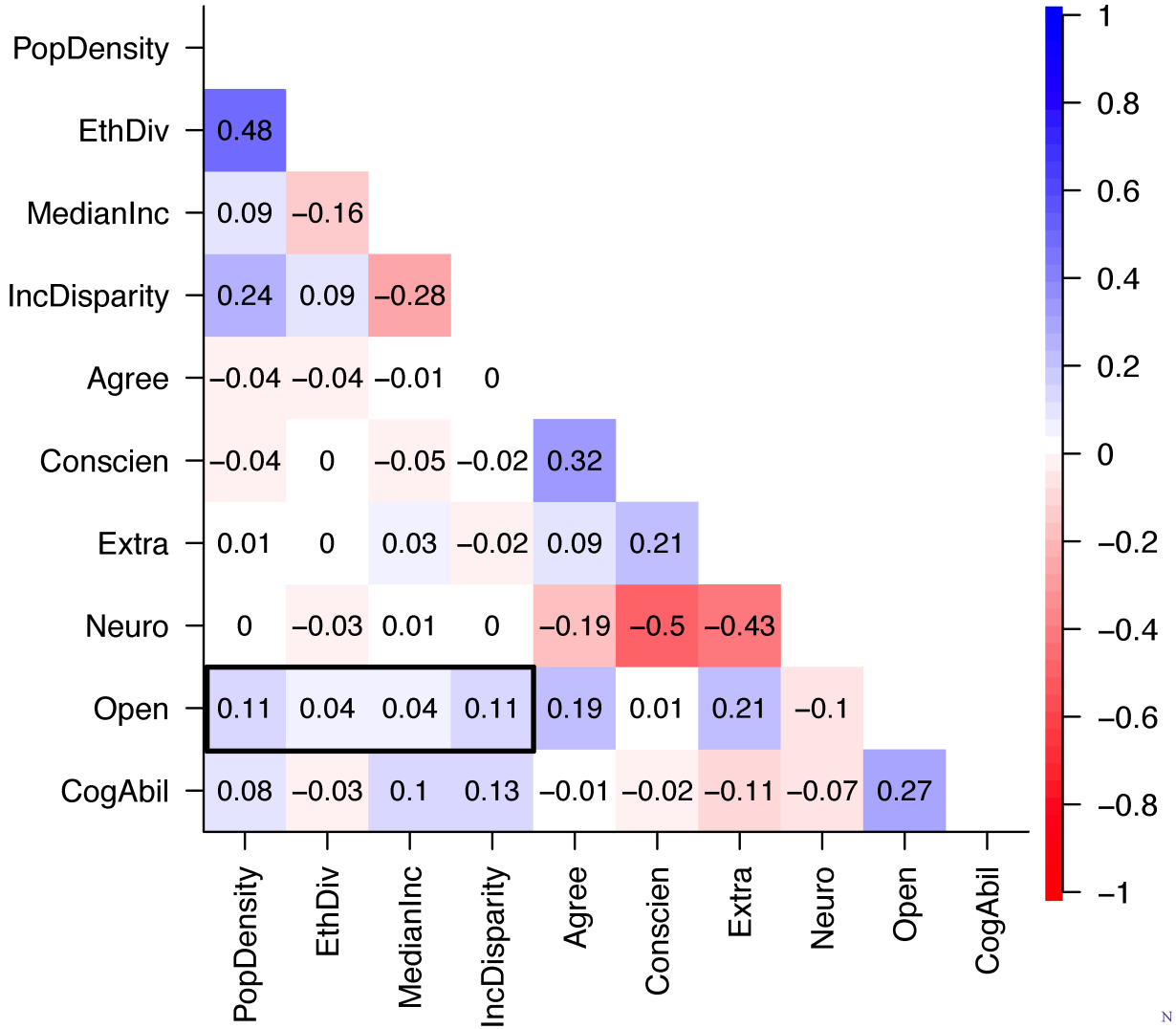
# Let's correlate the Big Five!

- None of the other Big Five were correlated with any of the demographic variables.



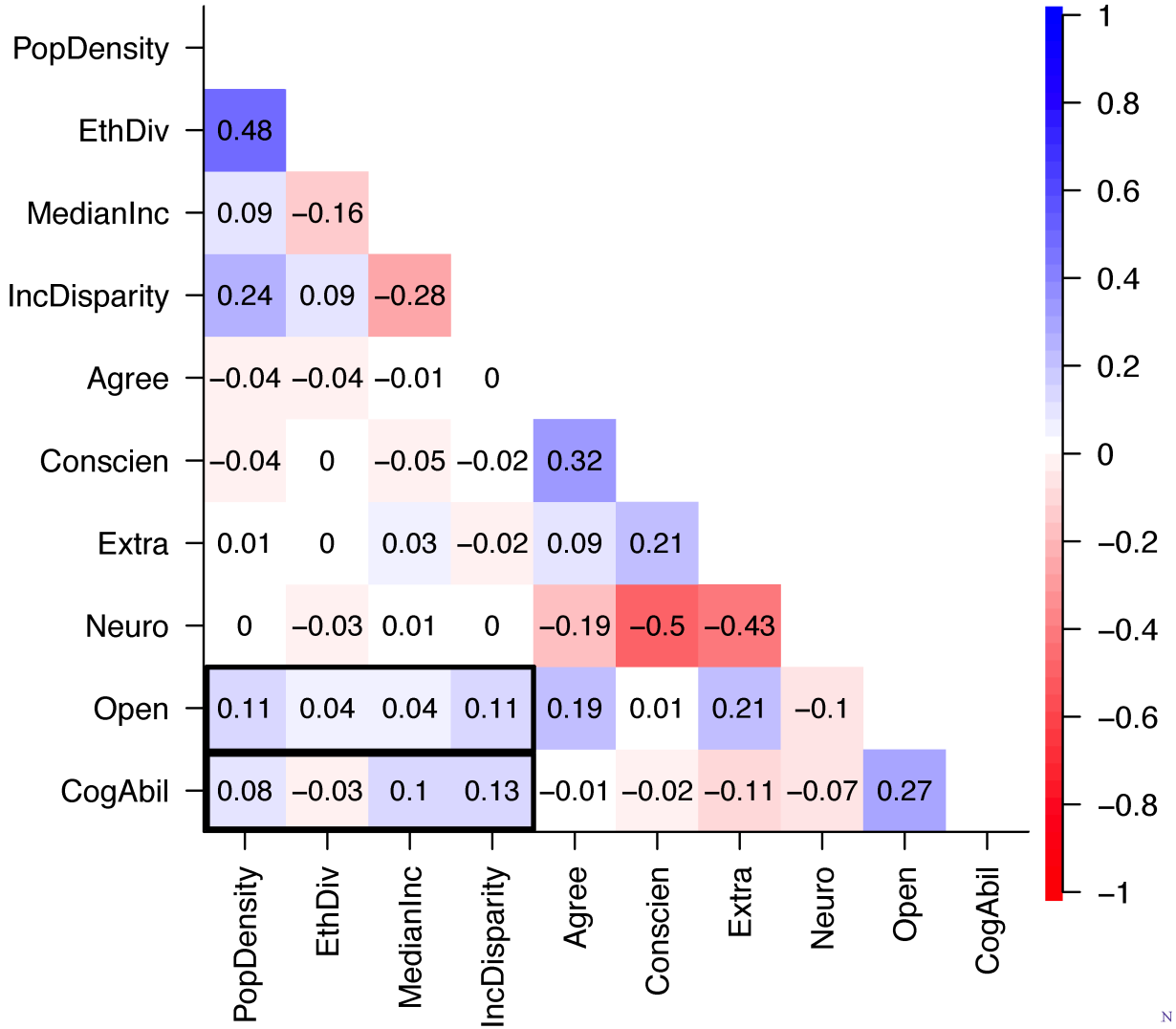
# Let's correlate the Big Five!

- Openness
  - + Pop. density
  - ∅ Ethnic diversity
  - ∅ Median Income
  - + Income disparity



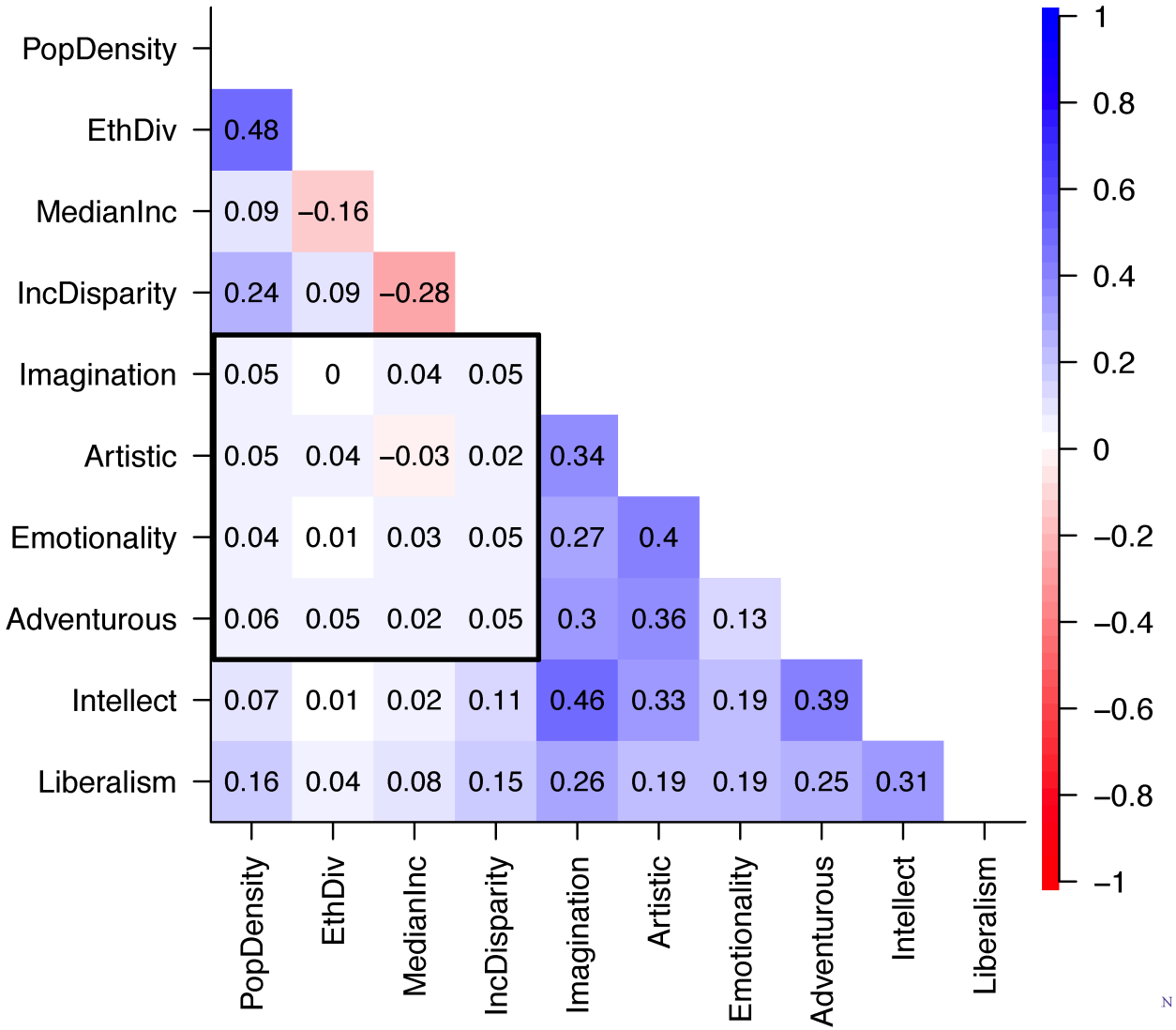
# Let's correlate the Big Five!

- Openness
  - + Pop. density
  - ∅ Ethnic diversity
  - ∅ Median Income
  - + Income disparity
- Cognitive ability
  - ∅ Pop. density
  - ∅ Ethnic diversity
  - + Median Income
  - + Income disparity



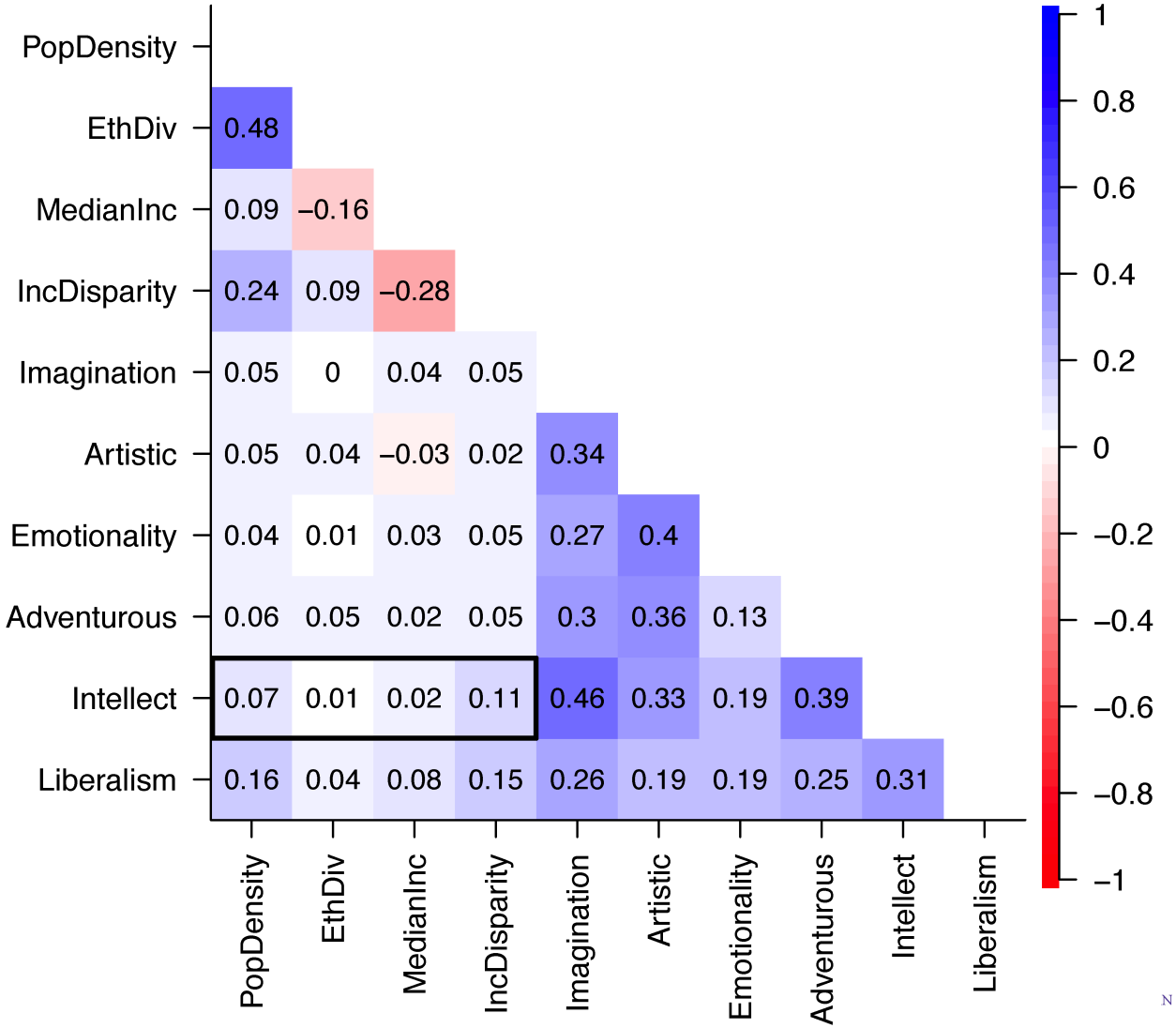
# Let's correlate Openness facets!

- Four of the six Openness facets were not correlated with any of the demographic variables.



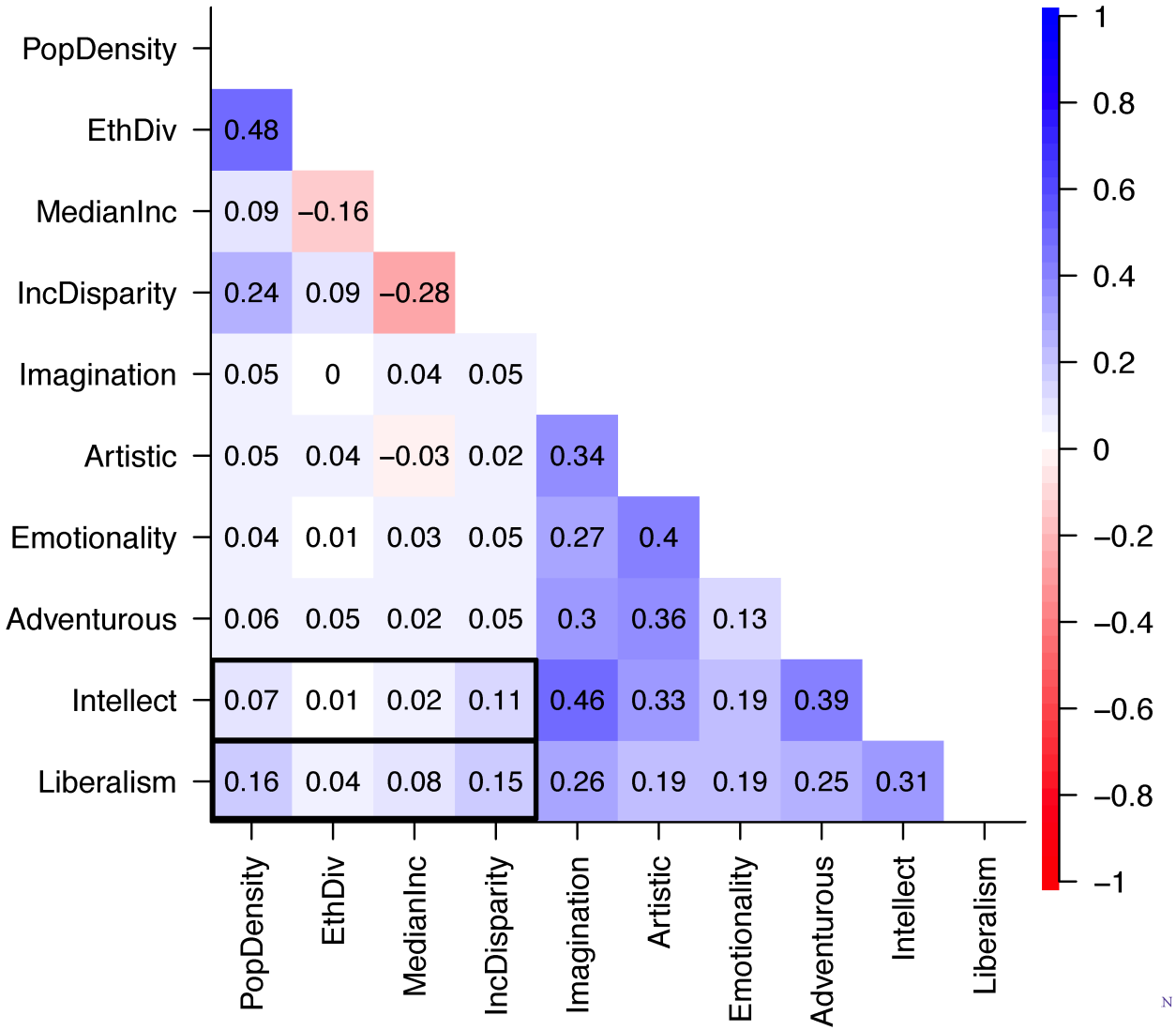
# Let's correlate Openness facets!

- Intellect
  - $\emptyset$ Pop. density
  - $\emptyset$ Ethnic diversity
  - $\emptyset$ Median Income
  - $+$ Income disparity



# Let's correlate Openness facets!

- Intellect
  - ∅ Pop. density
  - ∅ Ethnic diversity
  - ∅ Median Income
  - \+ Income disparity
- Liberalism
  - \+ Pop. density
  - ∅ Ethnic diversity
  - ∅ Median Income
  - \+ Income disparity



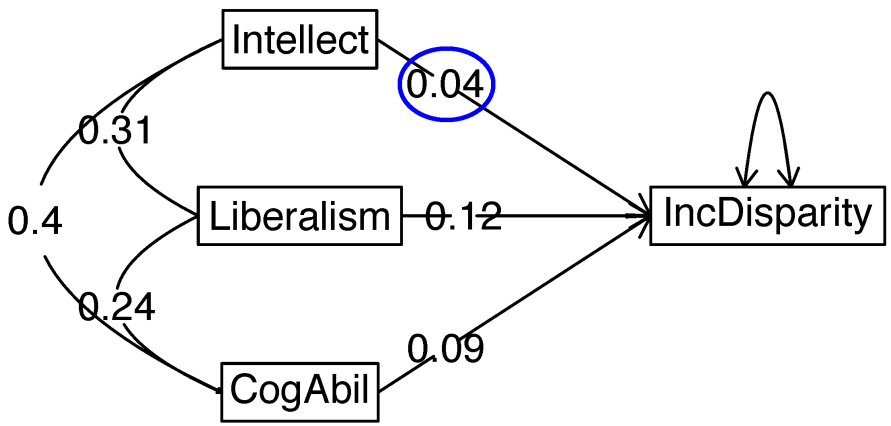
# Regression time! (income disparity)

- Income disparity is positively related to:
  - Intellect
  - Liberalism
  - Cognitive Ability
- What if they're covariates in a multiple regression model?

# Regression time! (income disparity)

- Income disparity is positively related to:
  - Intellect
  - Liberalism
  - Cognitive Ability
- What if they're covariates in a multiple regression model?
- Intellect appears to drop out.

**Income disparity regressed onto personality variables**



# An indication of directionality for liberalism

- Liberalism is correlated with population density and income disparity.

# An indication of directionality for liberalism

- Liberalism is correlated with population density and income disparity.
- Do liberals choose these ZIP codes, or do these ZIP codes produce liberals?

# An indication of directionality for liberalism

- Liberalism is correlated with population density and income disparity.
- Do liberals choose these ZIP codes, or do these ZIP codes produce liberals?
- We don't know.

# An indication of directionality for liberalism

- Liberalism is correlated with population density and income disparity.
- Do liberals choose these ZIP codes, or do these ZIP codes produce liberals?
- We don't know.
- But, children don't choose where to live, whereas adults do.

# An indication of directionality for liberalism

- Liberalism is correlated with population density and income disparity.
- Do liberals choose these ZIP codes, or do these ZIP codes produce liberals?
- We don't know.
- But, children don't choose where to live, whereas adults do.

Table : $R$ of liberalism with demographics, by age

| Age Group | PopDensity | IncDisparity |
|---|---|---|
| High School | 0.11 | 0.07 |
| Undergrad | 0.16 | 0.16 |
| Adults | 0.17 | 0.15 |

# An indication of directionality for cognitive ability

- Cognitive ability's relationship with income disparity is attenuated at the high school age.

Table : $R$ of liberalism with demographics, by age

| Age Group | IncDisparity | MedianInc |
|---|---|---|
| High School | 0.05 | 0.14 |
| Undergrad | 0.11 | 0.13 |
| Adults | 0.14 | 0.10 |

# An indication of directionality for cognitive ability

- Cognitive ability's relationship with income disparity is attenuated at the high school age.
- Its relationship with median income appears to decrease in older age.

Table : $R$ of liberalism with demographics, by age

| Age Group | IncDisparity | MedianInc |
|---|---|---|
| High School | 0.05 | 0.14 |
| Undergrad | 0.11 | 0.13 |
| Adults | 0.14 | 0.10 |

# Are the correlations generalizable for men and women?

# Are the correlations generalizable for men and women?

Table : $R$ of liberalism with demographics, by gender

| Sex | PopDensity | IncDisparity |
|---|---|---|
| Female | 0.16 | 0.14 |
| Male | 0.16 | 0.15 |

- Liberalism: Yes.

- Cognitive ability: Yes. Table : $R$ of cognitive ability with demographics, by gender

| Sex | Income Disparity | MedianInc |
|---|---|---|
| Female | 0.13 | 0.11 |
| Male | 0.14 | 0.08 |

# Summary

Individual liberalism

- Positively correlated with ZIP code-level population density and income disparity.

# Summary

Individual liberalism

- Positively correlated with ZIP code-level population density and income disparity.
  - Attenuated in high school students, suggesting directionality; adult liberals choose to live in these neighborhoods.

# Summary

Individual liberalism

- Positively correlated with ZIP code-level population density and income disparity.
  - Attenuated in high school students, suggesting directionality; adult liberals choose to live in these neighborhoods.
  - Generalizable for both sexes.

# Summary

Individual liberalism

- Positively correlated with ZIP code-level population density and income disparity.
  - Attenuated in high school students, suggesting directionality; adult liberals choose to live in these neighborhoods.
  - Generalizable for both sexes.
- Not correlated with ethnic diversity.

# Summary

Individual liberalism

- Positively correlated with ZIP code-level population density and income disparity.
  - Attenuated in high school students, suggesting directionality; adult liberals choose to live in these neighborhoods.
  - Generalizable for both sexes.
- Not correlated with ethnic diversity.
- U.S. liberals are more likely to live in dense and income-diverse, but not ethnically-diverse, neighborhoods.

# Summary

Individual cognitive ability

- Positively correlated with ZIP code-level income disparity and median income.

# Summary

Individual cognitive ability

- Positively correlated with ZIP code-level income disparity and median income.
  - Relationship with income disparity is attenuated in high school students, suggesting choice.

# Summary

Individual cognitive ability

- Positively correlated with ZIP code-level income disparity and median income.
  - Relationship with income disparity is attenuated in high school students, suggesting choice.
  - Relationship with median income is slightly attenuated in adults, which may indicate the benefits of better schools.

# Summary

Individual cognitive ability

- Positively correlated with ZIP code-level income disparity and median income.
  - Relationship with income disparity is attenuated in high school students, suggesting choice.
  - Relationship with median income is slightly attenuated in adults, which may indicate the benefits of better schools.
  - Generalizable for both sexes.

# Summary

Individual cognitive ability

- Positively correlated with ZIP code-level income disparity and median income.
  - Relationship with income disparity is attenuated in high school students, suggesting choice.
  - Relationship with median income is slightly attenuated in adults, which may indicate the benefits of better schools.
  - Generalizable for both sexes.
- More intelligent individuals are more likely to live in more wealthy, but also income-diverse neighborhoods.

# Conclusions

- Individual-level personality can be correlated with ZIP code level demographic variables.
- However, these correlations are small, but would be larger if we analyzed the data at the aggregate ZIP code level.
- Therefore future research would benefit from analyzing a sample that had a larger number of participants per ZIP code.

# Thank You

- Bill Revelle
- David Condon
- Nick Holtzman and Victoria Allen
- And you!

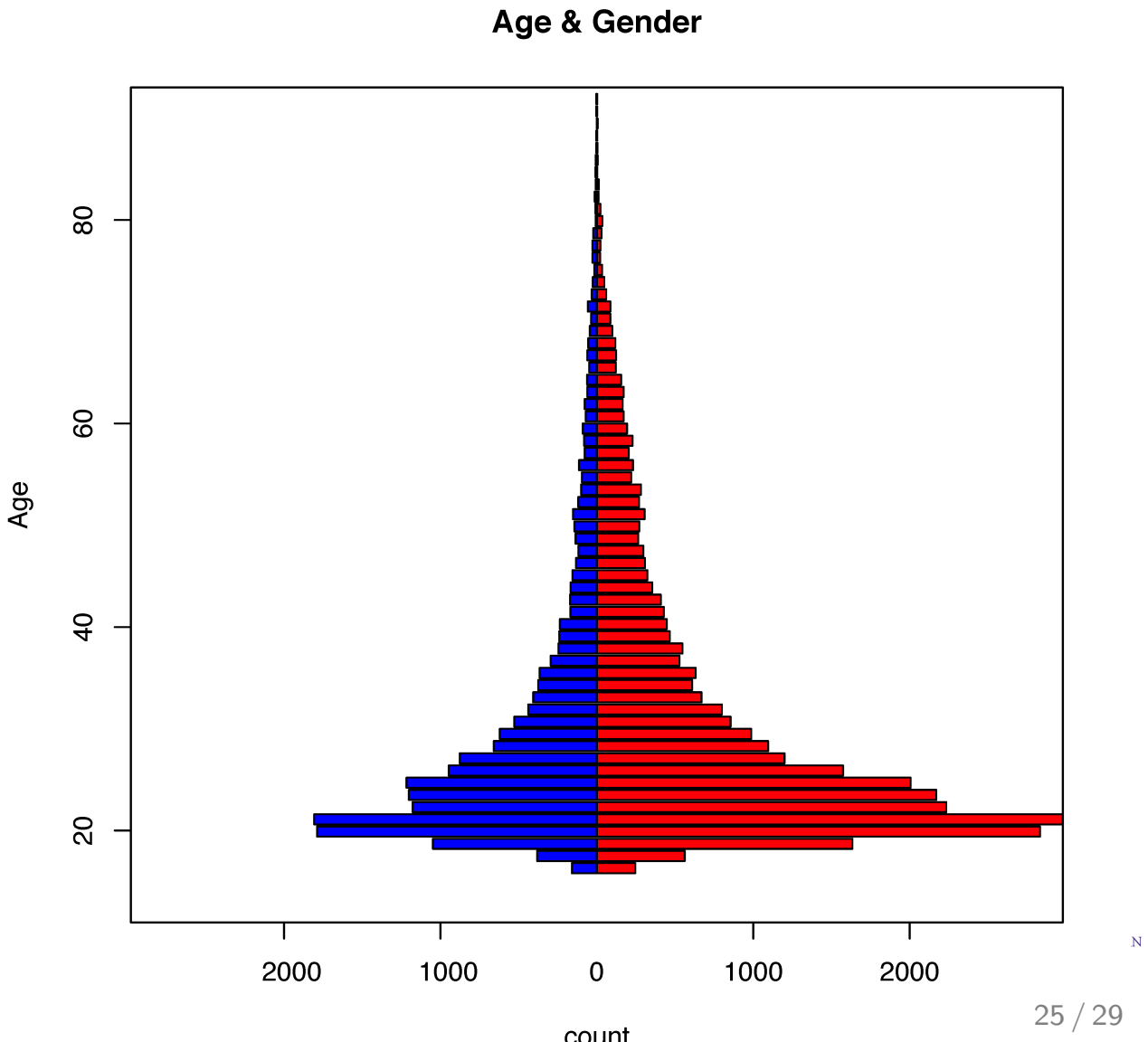
# Appendix–Liberalism Items

Table : IPIP-NEO Liberalism Facet Items

| Item Number | Item | key |
|---|---|---|
| q_345 | Believe in one true religion. | − |
| q_359 | Believe that criminals should receive help rather than punishment. | + |
| q_369 | Believe laws should be strictly enforced. | − |
| q_394 | Believe that there is no absolute right and wrong. | + |
| q_395 | Believe that too much tax money goes to support artists. | − |
| q_397 | Believe that we coddle criminals too much. | − |
| q_398 | Believe that we should be tough on crime. | − |
| q_1328 | Like to stand during the national anthem. | − |
| q_1824 | Tend to vote for conservative political candidates. | − |
| q_1825 | Tend to vote for liberal political candidates. | + |

# Appendix–Sample descriptive stats

- Sex
  - 64% female
- Ethnicity
  - 67% white
  - 10% African American
  - 10% Hispanic
- Age
  - *mean* = 26
  - *sd* = 11
  - *median* = 22
  - *range* = 14 to 90



## Appendix–Measurements

1. IPIP-NEO (Big Five and 30 facets)
   - 300 items
   - 27 items answered per participant (mean)
   - 691 mean pairwise administrations
2. ICAR 60 (cognitive ability)
   - 60 items
   - 15 items answered per participant (mean)
   - 3,176 mean pairwise administrations
3. Population density
4. Ethnic diversity (index of fractionalization)
   - The probability that two randomly selected individuals from a ZIP code will be different ethnicities.
5. Median income
6. Income disparity (Gini)
   - Range of zero to one. A value of zero represents perfect equality (everyone has equal income) and a value of one represents perfect inequality (one person has all income).

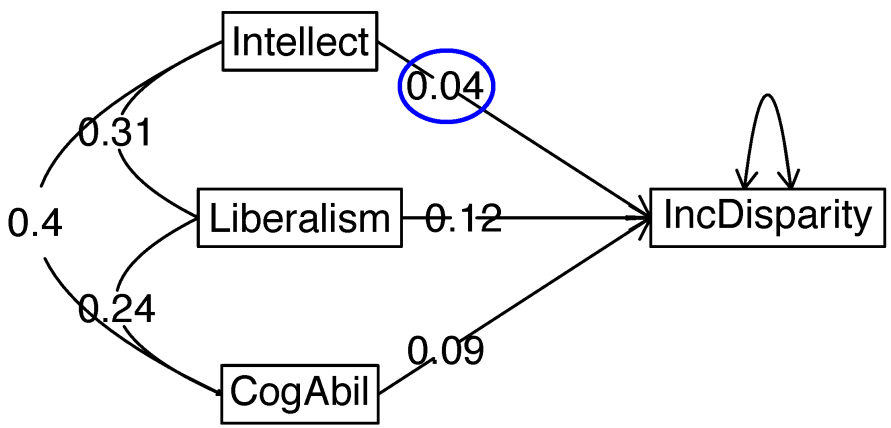
# Appendix–Regression time! (income disparity)

- Income disparity is positively related to:
  - Intellect
  - Liberalism
  - Cognitive Ability
- What if they're covariates in a multiple regression model?

# Appendix–Regression time! (income disparity)

- Income disparity is positively related to:
  - Intellect
  - Liberalism
  - Cognitive Ability
- What if they're covariates in a multiple regression model?
- Intellect appears to drop out.

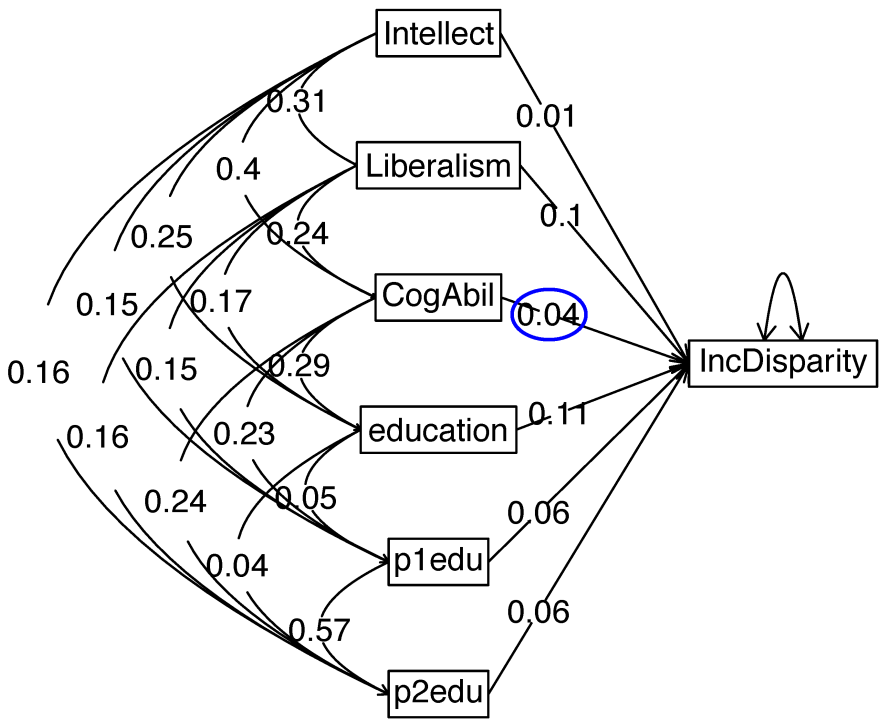
**Income disparity regressed onto personality variables**



# Appendix–Regression time! (income disparity)

- Income disparity is positively related to:
  - Intellect
  - Liberalism
  - Cognitive Ability
- What if they're covariates in a multiple regression model?
- Intellect appears to drop out.
- Cognitive ability also drops out with the inclusion of education in a multiple regression model.

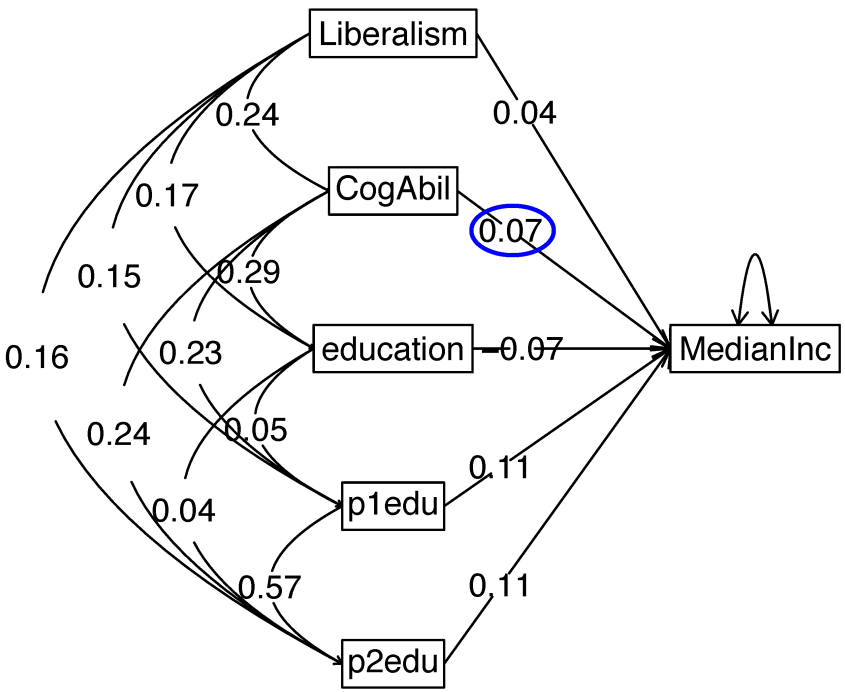
**Income disparity regressed onto personality and education variables**



# Appendix–Regression time! (median income)

- The correlation of median income and cognitive ability is attenuated with the inclusion of parents' education.

**Median Income regressed onto personality and education variables**



# Appendix–Regression time! (population density)

- Only liberalism appears to have unique variance in predicting population density.

**Population density regressed onto personality and education variables**