Demographic Correlates of Temperament and Ability

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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?
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• 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
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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.
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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

$\text{Population Density (log)}$

$\text{Aggregated Openness}$

$b_1 = 1.21$
Example–ZIP code population density and individual Openness

\[ b_1 = 0.15 \]
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.
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**
  - \( \emptyset \) Pop. density
  - \( \emptyset \) Ethnic diversity
  - \( \emptyset \) Median Income
  - + Income disparity

- **Liberalism**
  - + Pop. density
  - \( \emptyset \) Ethnic diversity
  - \( \emptyset \) 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.
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- Do liberals choose these ZIP codes, or do these ZIP codes produce liberals?
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- But, children don’t choose where to live, whereas adults do.
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- We don’t know.
- But, children don’t choose where to live, whereas adults do.

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

<table>
<thead>
<tr>
<th>Age Group</th>
<th>PopDensity</th>
<th>IncDisparity</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School</td>
<td>0.11</td>
<td>0.07</td>
</tr>
<tr>
<td>Undergrad</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Adults</td>
<td>0.17</td>
<td>0.15</td>
</tr>
</tbody>
</table>
**An indication of directionality for cognitive ability**

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

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<th>MedianInc</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School</td>
<td>0.05</td>
<td>0.14</td>
</tr>
<tr>
<td>Undergrad</td>
<td>0.11</td>
<td>0.13</td>
</tr>
<tr>
<td>Adults</td>
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- 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.

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Are the correlations generalizable for men and women?

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<td></td>
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Are the correlations generalizable for men and women?

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

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- Liberalism: Yes.

Table: $R$ of cognitive ability with demographics, by gender

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- Cognitive ability: Yes.
Summary

Individual liberalism

- Positively correlated with ZIP code-level population density and income disparity.
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  • Attenuated in high school students, suggesting directionality; adult liberals choose to live in these neighborhoods.
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- 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.
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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.
- Generalizable for both sexes.
  - More intelligent individuals are more likely to live in more wealthy, but also income-diverse neighborhoods.
Summary

Individual cognitive ability

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

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Item</th>
<th>key</th>
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<tbody>
<tr>
<td>q_345</td>
<td>Believe in one true religion.</td>
<td>–</td>
</tr>
<tr>
<td>q_359</td>
<td>Believe that criminals should receive help rather than punishment.</td>
<td>+</td>
</tr>
<tr>
<td>q_369</td>
<td>Believe laws should be strictly enforced.</td>
<td>–</td>
</tr>
<tr>
<td>q_394</td>
<td>Believe that there is no absolute right and wrong.</td>
<td>+</td>
</tr>
<tr>
<td>q_395</td>
<td>Believe that too much tax money goes to support artists.</td>
<td>–</td>
</tr>
<tr>
<td>q_397</td>
<td>Believe that we coddle criminals too much.</td>
<td>–</td>
</tr>
<tr>
<td>q_398</td>
<td>Believe that we should be tough on crime.</td>
<td>–</td>
</tr>
<tr>
<td>q_1328</td>
<td>Like to stand during the national anthem.</td>
<td>–</td>
</tr>
<tr>
<td>q_1824</td>
<td>Tend to vote for conservative political candidates.</td>
<td>–</td>
</tr>
<tr>
<td>q_1825</td>
<td>Tend to vote for liberal political candidates.</td>
<td>+</td>
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</table>
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:
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[Diagram showing correlations:]

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- 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.
The correlation of median income and cognitive ability is attenuated with the inclusion of parents’ education.
Appendix—Regression time! (population density)

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