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Race, discrimination, cognitive ability and income: an analysis of the Add Health dataset

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Abstract

Self-reported discriminatory experiences differ slightly by US social racial groups, but why? Using the public-use Add Health dataset, the matter was investigated. It was found that when accounting for cognitive ability (IQ) that differs by social race group, there no longer seemed to be any detectable differences in self-reported discrimination, nor any differences related to skin tone. This seemed to be due to a slight correlation between self-reported discrimination and cognitive ability ($r = -.14$).

Furthermore, the validity of social racial groups were examined for the prediction of self-reported income. It was found that other-perceived social race and skin tone did not predict income when IQ was included in the model, but self-perceived social race did. Results were overall congruent with meritocracy and incongruent with racial discrimination models.

Key words: discrimination, Add Health, race, ethnicity, intelligence, cognitive ability, g, income

1. Introduction

In a recent study, Boutwell et al (2017) found only fairly small differences in self-perceived discrimination between identified race/ethnicity groups in the USA, incongruent with narrative reports of the United States as a particular racialized country with rampant pro-White/Anti-nonWhite racial discrimination (Hunter, 2007; Kaplan, 2015; Nazroo, 2003). However, Boutwell et al relied on self-perceived discrimination opening the possibility that differences in reported discrimination by group were in the eyes of the beholder, not in reality. In particular, the relative ordering of self-reported discrimination found by Boutwell et al were nearly identical to the relative ordering of the same

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groups' average levels of cognitive ability ($r = -.91$), as seen in Table 1.

Group	% answering “often” or “sometimes” to discrimination question	Mean IQ
Asian	19%	104
White	24%	100
Hispanic	27%	89
American Indian	27%	86
Black	32%	85

Table 1: Self-perceived discrimination by racial group and average cognitive ability. Discrimination values from Boutwell et al (2017), IQ means from Lynn (2015) based on medians of recent US samples.

This study had two goals. First, to examine whether other variables, in particular cognitive ability, can account for the observed differences in self-perceived discrimination by racial groups found by Boutwell et al. Second, to examine the importance of alleged causes of discrimination, in particular skin tone, in the prediction of (self-reported) income in regression analysis.

2. Data and coding

All analyses were done in R. A notebook with complete code and output is available at http://rpubs.com/EmilOWK/add_health_discrimination.

The public dataset from Add Health (The National Longitudinal Study of Adolescent to Adult Health) was used. This is a subset of the restricted dataset used by Boutwell et al. The author did not have access to the complete dataset nor any feasible way to get access due to the very restricted access policy (see <http://www.cpc.unc.edu/projects/addhealth/contracts>).

For discrimination, the same variable as used by Boutwell et al was used (H4MH28) and it was coded in the same fashion, i.e. by collapsing people who answer “often” or “sometimes” to the question “In your day-to-day life, how often do you feel you have been treated with less respect or courtesy than other people?”.

Social race. Add Health has measures of both social race/ethnicity and genomic ancestry. Unfortunately, the genomic ancestry data is only available in the restricted dataset and could not be used here. For social race, both self-perceived and interviewer-perceived data were available and both were used (self: H3OD4 + H3OD2, interviewer: H4IR4). The self-perceived data were available for multiple years and the latest version were used (Wave 3). The interviewer-perceived were only available from Wave 4. Both sets were coded per the US standard coding practice, i.e. by giving preferential treatment to Hispanic status, but otherwise coding cases as their selected choice. In case of multiple choices, cases were coded as multi-racial. Other and self-perceived social race were strongly congruent, as shown in Table 2. Note that there was no variable for other-perceived Hispanic status.

Self-perceived / other-perceived racial group	<i>White</i>	<i>Black</i>	<i>Hispanic</i>	<i>Asian</i>	<i>American Indian</i>	<i>Multi-racial</i>
<i>White</i>	0.84	0.00	0.12	0.01	0.00	0.03
<i>Black</i>	0.01	0.91	0.03	0.00	0.01	0.05
<i>Asian</i>	0.01	0.01	0.06	0.79	0.01	0.11
<i>American Indian</i>	0.06	0.00	0.33	0.08	0.47	0.06

Table 2: Agreement between self and other-perceived racial group. Row marginalized.

Additionally, skin tone/color/brightness was also reported by the interviewer on a 5-point scale ranging from Black to White (H3IR17).

For cognitive ability, the pre-computed longitudinal scores from the Peabody Picture Vocabulary Test (PPVT) were used (PVTSTD3L).

For income, self-reported income was available from wave 4 in the form of the question “Now think about your personal earnings. In {2006/2007/2008}, how much income did you receive from personal earnings before taxes, that is, wages or salaries, including tips, bonuses, and overtime pay, and income from self-employment?” (H4EC2). Because income was very skewed, the $\log_{10}(x+1)$ value was used. A large number of respondents reported no earnings. Two alternative codings were tried to deal with this. First, by excluding anyone with below $2 \log_{10}(\text{income}+1)$. Second, by winsorizing incomes below $2 \log_{10}(\text{income}+1)$ to 2.

Finally, as control variables, age and sex were included. Sex was already coded in a useful fashion (BIO_SEX3), while age had to be calculated from the supplied year and month of birth (H4OD1Y, H4OD1M).

All numerical variables were standardized (mean = 0, sd = 1) based on the entire sample before the analyses.

3. Analyses

3.1. Correlations

The correlations between the primary variables of interest are shown in Table 4.

	Skin brightness	Sex	IQ	Income	Income log	Income log alt1	Income log alt2	Age	Discrimination
Skin brightness	1.00	0.02	0.33	0.07	0.04	0.10	0.06	0.00	-0.10
Sex	0.02	1.00	-0.05	-0.21	-0.22	-0.23	-0.24	-0.07	-0.07
IQ	0.33	-0.05	1.00	0.15	0.14	0.17	0.16	0.04	-0.14
Income	0.07	-0.21	0.15	1.00	0.42	0.62	0.51	0.08	-0.15
Income log	0.04	-0.22	0.14	0.42	1.00	0.97	0.98	0.02	-0.09
Income log alt1	0.10	-0.23	0.17	0.62	0.97	1.00	0.99	0.09	-0.15
Income log alt2	0.06	-0.24	0.16	0.51	0.98	0.99	1.00	0.03	-0.11
Age	0.00	-0.07	0.04	0.08	0.02	0.09	0.03	1.00	0.01
Discrimination	-0.10	-0.07	-0.14	-0.15	-0.09	-0.15	-0.11	0.01	1.00

Table 3: Correlation matrix for primary variables. Latent correlations used for non-numeric variables (Uebersax, 2015). Sex = female.

With regards to income, it can be seen that the first alternative (income log alt1) coding had the highest validities with other variables and was thus chosen for all further modeling.

The hypothesized relationship between cognitive ability and self-reported discrimination was observed in the bivariate results, $r = -.14$. However, this might just reflect the fact that the less discriminated against groups tend to be smarter on average (i.e. population stratification).

Skin brightness and IQ showed a large correlation of .33, larger than the value of .17 reported by Lynn (2002). This, however, reflects the fact that Lynn's sample included only Blacks, while the correlation reported in Table 3 included the entire sample and is inflated by population stratification. The skin brightness x IQ correlations for the Black and Hispanics subsamples were .15 [.09 to .21] and .16 [.07 to .24], respectively.

3.2. Predictors of self-reported discrimination

To establish a baseline, two logistic models were fit with other-perceived race/ethnicity (OPRE) and self-perceived race/ethnicity (SPRE), respectively, together with the two control variables (age and sex). Neither model produced strong results with r^2 's of 0.4% and 0.6%, respectively ($n \approx 4200$). Only the beta for Black had a $p < .05$ in the models. Similarly, a model was fit with skin brightness and the control variables. This also had poor validity, $r^2 = 0.4\%$, with a $p = .0009$ for skin brightness (beta = $-.12$). Thus confirming that neither social race group or skin tone is a good predictor of self-perceived discriminatory experiences.

Next up, the main model was fit by including including cognitive ability along with OPRE and the control variables. Model results are shown in Table 4.

Predictor	Beta	p
OPRE: White	ref	
OPRE: Black	0.044	0.787
OPRE: Asian	0.085	0.682
OPRE: American Indian	-0.125	0.762
Skin brightness	-0.051	0.467
IQ	-0.174	<.0001
Female	-0.046	0.538
Age	0.024	0.515

Table 4: Logistic regression results for the predicting self-perceived discrimination. $n = 4020$. $r^2 = .1.2\%$. Standardized betas.

Neither OPRE or skin brightness were useful predictors when IQ was included. Though IQ's validity was strongly beyond chance levels ($p < .0001$), the model as a whole was not very useful: $r^2 = 1.2\%$.

3.2.1. Robustness tests

A number of alternative specifications were tried to test the robustness of the main model's results.

First, SPRE was used instead of OPRE as a measure of socially perceived race. OPRE is arguably more relevant because the behavior of others depends on what they perceive which is not necessarily aligned with one's own perception of one's race/ethnicity. The model, however, produced equivalent results: IQ was the only predictor with detectable validity (taken as $p < .01$) and the model fit slightly better than the main model ($r^2 = 1.3\%$ vs. 1.2%).

Second, instead of considering skin brightness as a quasi-continuous variable (5-point scale), it was treated as an categorical variable. This approach would capture any non-linearities in the effect of the variable as the expense of reduced estimation precision. However, the model fit did not improve ($r^2 = 1.2\%$).

Third, an OPRE x IQ interaction was added based on a suggestion that IQ might function differentially by social race with respect to predicting self-perceived discrimination. However, model fit did not improve much ($r^2 = 1.3\%$) and no interaction beta had any detectable validity, while the main effect of IQ was retained (beta = $-.16$, $p = .001$).

3.3. Income

If the US has extensive pro-White/European racial discrimination in the employment market, this

should be reflected in validity of social race and skin tone after cognitive ability is included in the model. A three step approach was used. First, a model with social race (OPRE or SPRE). Second, add skin tone. Third, add IQ. Results are shown in Tables 5-7.

Model 1 – baseline, r^2 adj. = .050				
<i>Predictor</i>	<i>Beta</i>	<i>SE</i>	<i>CI lower</i>	<i>CI upper</i>
OPRE: White	0.00			
OPRE: Black	-0.20	0.04	-0.27	-0.12
OPRE: Asian	0.32	0.09	0.14	0.49
OPRE: American Indian	-0.28	0.19	-0.65	0.08
age	0.08	0.02	0.05	0.11
sex: Male	0.00			
sex: Female	-0.34	0.03	-0.41	-0.28
Model 2 – add skin tone, r^2 adj. = .052				
<i>Predictor</i>	<i>Beta</i>	<i>SE</i>	<i>CI lower</i>	<i>CI upper</i>
OPRE: White	0.00			
OPRE: Black	0.01	0.07	-0.13	0.15
OPRE: Asian	0.39	0.09	0.21	0.57
OPRE: American Indian	-0.21	0.19	-0.57	0.16
skin brightness	0.10	0.03	0.04	0.16
age	0.08	0.02	0.05	0.11
sex: Male	0.00			
sex: Female	-0.35	0.03	-0.41	-0.29
Model 3 – add IQ, r^2 adj. = .072				
OPRE: White	0.00			
OPRE: Black	0.02	0.07	-0.13	0.16

OPRE: Asian	0.41	0.09	0.23	0.60
OPRE: American Indian	-0.12	0.19	-0.50	0.26
skin brightness	0.05	0.03	-0.01	0.11
age	0.07	0.02	0.04	0.10
sex: Male	0.00			
sex: Female	-0.35	0.03	-0.41	-0.28
IQ	0.15	0.02	0.12	0.19

Table 5: Regression model results for log income. n = 3576-3725. OPRE = Interviewer-identified race/ethnicity.

In model 1, it can be seen that socially perceived race had some detectable validity for predicting income. However, in model 2 the validity of Black disappears once skin tone is added, while Asian's validity is somewhat increased. Thus, in the model Black appears to be a proxy for skin tone, while Asian is not. In model 3, after the inclusion of IQ, skin tone no longer has detectable validity, while Asian again becomes somewhat stronger. IQ has clearly detectable validity and substantially increases the model fit (from 5.2% to 7.2%) though it remains quite small overall.

Model 1 – baseline, r^2 adj. = .055				
<i>Predictor</i>	<i>Beta</i>	<i>SE</i>	<i>CI lower</i>	<i>CI upper</i>
SPRE: White	0.00			
SPRE: Black	-0.23	0.04	-0.31	-0.16
SPRE: Hispanic	0.00	0.05	-0.11	0.11
SPRE: Asian	0.39	0.09	0.21	0.58
SPRE: American Indian	-0.66	0.20	-1.04	-0.27
SPRE: Multi-racial	-0.09	0.08	-0.25	0.08
age	0.08	0.02	0.05	0.11
sex: Male	0.00			
sex: Female	-0.35	0.03	-0.41	-0.28
Model 2 – with cognitive ability, r^2 adj. = .057				

<i>Predictor</i>	<i>Beta</i>	<i>SE</i>	<i>CI lower</i>	<i>CI upper</i>
SPRE: White	0.00			
SPRE: Black	-0.07	0.08	-0.22	0.08
SPRE: Hispanic	0.05	0.06	-0.07	0.16
SPRE: Asian	0.45	0.10	0.26	0.64
SPRE: American Indian	-0.58	0.20	-0.97	-0.18
SPRE: Multi-racial	-0.04	0.09	-0.21	0.13
skin brightness	0.08	0.03	0.02	0.14
age	0.08	0.02	0.05	0.11
sex: Male	0.00			
sex: Female	-0.35	0.03	-0.41	-0.29
Model 3 – add IQ, r^2 adj. = .078				
SPRE: White	0.00			
SPRE: Black	0.00	0.08	-0.15	0.16
SPRE: Hispanic	0.15	0.06	0.03	0.26
SPRE: Asian	0.52	0.10	0.32	0.71
SPRE: American Indian	-0.48	0.20	-0.87	-0.09
SPRE: Multi-racial	-0.05	0.09	-0.22	0.12
skin brightness	0.04	0.03	-0.02	0.10
age	0.07	0.02	0.04	0.11
sex: Male	0.00			
sex: Female	-0.35	0.03	-0.41	-0.29
IQ	0.16	0.02	0.13	0.19

Table 6: Regression model results for log income. n = 3571-3730. SPRE = self-identified race/ethnicity.

The models with SPRE instead of OPRE essentially reproduced the same findings. The main notable finding is that Hispanic SPRE was associated with somewhat higher income after taking IQ into account. American Indian was detectably associated with lower income when using SPRE, but not when using OPRE.

The effects of social race in regressions may be taken to reflect different causal processes. On the discrimination model, other-perceived social race would be expected to be related to poorer social outcomes, all else equal. However, on a self-identification model, persons with mixed ancestry would tend to identify more strongly with a given social race depending on how well their own values match with the perceived values of that social race. Thus, smart and socially successful mixed African-Europeans would be more likely to identify with their White ancestry component (Smith, 2017). In an attempt to distinguish between the effects of SPRE and OPRE, a model was fit with both. Results are shown in Table 7.

Predictor	Beta	SE	CI lower	CI upper
SPRE: White	0.00			
SPRE: Black	-0.19	0.13	-0.43	0.06
SPRE: Hispanic	0.14	0.06	0.02	0.25
SPRE: Asian	0.44	0.17	0.12	0.77
SPRE: American Indian	-0.58	0.23	-1.04	-0.12
SPRE: Multi-racial	-0.12	0.09	-0.31	0.06
OPRE: White	0.00			
OPRE: Black	0.23	0.12	-0.01	0.46
OPRE: Asian	0.11	0.16	-0.20	0.42
OPRE: American Indian	0.12	0.22	-0.32	0.56
skin brightness	0.06	0.03	-0.01	0.12
age	0.07	0.02	0.04	0.10
sex: Male	0.00			
sex: Female	-0.35	0.03	-0.41	-0.29
IQ	0.16	0.02	0.13	0.19

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Table 7: Regression model results for log income. $n = 3576$. SPRE = self-perceived race/ethnicity, OPRE = interviewer- perceived race/ethnicity. $r^2 \text{ adj.} = .078$.

While the substantial standard errors disallow any certain conclusions, it appears that most of the validity of social race comes from the self-perceived variant, not the other-perceived. In fact, for other-perceived race/ethnicity, all the betas are *positive* compared to the White norm group though none are beyond chance levels. The findings are thus in line with self-identification models, not discrimination models.

As before, skin brightness had no detectable validity, while IQ, sex and age continued to have detectable validity.

4. Discussion and conclusion

Taken together, social race/ethnicity, skin tone, age, sex and cognitive ability were not good predictors of self-perceived discrimination ($r^2 = 1.2\%$). Clearly, whatever factors explain variation in self-perceived discrimination, they must be sought elsewhere. The main finding with regards to self-reported discrimination was that social race seemed to have little validity once cognitive ability was taken into account. Thus, it appears that the slightly higher rates of self-reported discrimination for Blacks and Hispanics compared to Whites is due to a slight association between cognitive ability and self-perceived discrimination. Such a correlation was found in this study, $r = -.14$.

With regards to (self-reported) income, the modeling results indicate that adding IQ to the models reduced the validity of social race measures, often to undetectable levels. The main exception to this pattern was for Asian Americans, who generally earned more than one would expect. A finding in line with previous research (Neisser et al., 1996).

In the final model, it was found that with regards to social race, it is primarily the self-perceived element that has validity for predicting income. This finding is in line with self-identification models where socially successful people with mixed ancestry tend to identify with the socially successful part of their ancestry. In general, future studies should include both other-perceived and self-perceived measures of social race in order to determine the relative importance and the causal underpinnings.

A major limitation is that the present study relied on the public-use subsample of the Add Health dataset. It was not practically possible to obtain the complete dataset. This necessarily reduced the precision of the estimates reported here, though most of them were fairly accurate.

Supplementary material and acknowledgments

Supplementary materials including code, high quality figures and data can be found at: <https://osf.io/pwuc4/>

Full R output and extra tables and figures can be found at

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