Effects of Great Recession on Income Poverty

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**INTRODUCTION**

Insert Introduction.

**Study Aim 1**

Aim 1 of this study was to analyze whether households with working age adults with disability differed from households with no working age adults with disability, during the *great recession* 1, using “Income Poverty” as a measure of economic wellbeing, controlling for demographic factors such as gender, marital status, education, race and ethnicity.

*•* Hypothesis 1: It was hypothesized that households with working age adults with disabil- ity experienced worse “income poverty” levels through the great recession, controlling for demographic factors.

*•* Hypothesis 2: It was hypothesized that households with working age adults with disability experienced worse declines in income poverty levels during the great recession, controlling for demographic factors.

**Study Aim 2**

Aim 2 of this study was to analyze how demographic factors such as gender, marital status, education, race and ethnicity impacted economic wellbeing of households with a working age adult with disability, during the *great recession* .

1 Business Cycle Dating Committee, National Bureau of Economic Research (NBER)

**BACKGROUND**

Insert Literature review and background.

**DATA AND METHOD**

**DATA**

For this analysis data from US Census Bureau’s SIPP 2008 panel survey was used. Insert SIPP details. 2. There were three inclusion criteria for households in this study sample. First, the households that participated in wave six of the study were include in the study sample. Second, the reference persons of the households had to be same in all the waves the households participated in.

Give the reason why. Third, the reference persons had to be adults (18 years and older) throughout the household’s participation in the study. Full data from Jul 2008 through Jun 2013. This period overlapped with twelve of the eighteen months 3 of the “Great recession” and its long wake. In wave six, there were a total of 33,547 households that met the inclusion criteria. Of them, 7,443 households (22.16%) had at least one working age adult with disability.

**MEASURES**

*Dependent variable*

The ratio of average quarterly household income and federal poverty level (100% FPL) was chosen as a measure of income poverty and was used as the dependent variable in our analysis. We named the dependent variable FPL100-ratio. An FPL100-ratio lower than one in any quarter indicated the household was below 100% Federal poverty level in that quarter. In the sample, the quarterly income data ranged from -$27,180 to $108,900, the average being $5240 and median $3,874. The negative incomes were associated with households owning business that incurred lossed in those quarters. The FPL100-ratio ranged from -17.95 to 89.48, with the average being 3.817 and the median 2.924.

*Key Predictors*

2 For more information on the SIPP 2008 panel schedule, please refer to this [US Census Bureau website](http://www.census.gov/programs-surveys/sipp/data/2008-panel.html)

3 [NBER Recession Cycles](http://www.nber.org/cycles/)

There were two key predictors in our analysis: *time* and *adult disability* . We analyzed how households with a working age adult with disability differed from households with no working age adult with disability, over time. Time (quarters) was treated was a continuous variable, adult disability was treated as a dichotomous factor and the interaction between time and adult disability was treated as a continuous variable.

*Control variables*

The demographic factors like *gender* , *marital status* , *education* , *race* , and *ethnicity* of the reference persons of the households were used as control variables our analysis. The *race/ethnicity* factor had four categories “non-hispanic white”, “non-hispanic black”, “hispanic” and “others”. For simplicity, “white” and “black” indicated categories “non-hispanic white” and “non-hispanic black”. Explain

combining race and ethnicity. *Gender* of reference persons had two categories: “male” and “female”. *Education* of reference persons had three categories: “high-school or less”, “some college, diploma, associated degrees” and “bachelors or higher”. *Marital status* of reference persons had two categories: “married” and “not married”. Divorced or widowed reference persons were considered in the “not married” category.

**ANALYTIC STRATEGY**

A mixed (fixed and random) effects model was fit to analyze how households with a working age adult with disability differ from households with no working age adult with disability, during the great recession, using Income Poverty as a measure of economic wellbeing, controlling for demographic factors. Since this dataset is longitudinal in nature, to account for “between household” differences a mixed effect model was used. *Y* denoted the vector of responses (FPL100-ratio). Θ denoted the vector of fixed effect factors like gender, marital status, education level, race/ethnicity of reference person, along with their interactions. *β* denoted another fixed effect of time (in quarters), starting from 2008-Q3 and ending in 2013-Q1. *b* denoted the household level random effect (random intercept). The separate estimation of *bi* from *Eij* ensures the separate estimation of the two types of variability (between household, *bi*, and within household, *Eij* ). For example, a simple mixed-effects model for the analysis could be written as

*Yij* = *β*0 + *βtj* + *Xi*Θ + *bi* + *Eij* (1)

where, *Eij* are measurement errors, *i* ranges from 1 to *H* , the number of households, *j* from 1 to *T* , the total number of quarters. In this model, the response from the *ith* household at time *tj* is assumed to differ from the population mean *β*0 + *βtj* + *Xi*Θ by a household effect *bi* and a within household measurement error *Eij* . The within household and between household errors are assumed to be normal and independent 4. “time” was a fixed effect.

The trough, of the great recession was reached in the second quarter of 2009 (marking the technical end of the recession, defined as at least two consecutive quarters of declining GDP) 5. According to NBER, June 2009 was the final month of the recession. We checked if this was reflected in the FPL100-ratio as a downward trend in the initial quarters followed by an upward trend. A linear term in “time” was insufficient to capture this effect. We added a second order term time2 to test the change in direction of trend. The second order term was added after centering the original “time” variable, to avoid introducing multicollinearity. An indicator variable was used to denote the presence of working age adult with disability in a household. An interaction term between this indicator variable and time was also included to estimate the difference in slopes between households

with and without a working age adult with disability. Below is the final model that was fit:

*Yij* = *β*0 + *β*1*tj* + *β*2*t*2 + *βD* 1*D*

*j*

*i*

+ *βt*(1*Di*

*∗ tj* ) + *Xi*Θ + *bi* + *Eij* (2)

where, 1*Di* = 1, if household *i* has a working age adult with disability, else 1*Di* = 0. To test the hypotheses in aim 1 we tested the significance of *βD* (for hypothesis 1) and *βt* (for hypothesis 2). Significance of coefficients *β*1 and *β*2 were tested to analyze the overall trends of FPL100-ratio over the study period. In addition, interactions between demographic factors, and between disability

and demograhic factors were also tested. The demographic factors were considered as fixed effects.

The final model was fit with some of the fixed effect factors along with their interactions after performing “backward elimination” on the full model. Elimination of the fixed effects were done by the principle of marginality, that is: the highest order interactions are tested first: if they are significant, the lower order effects were included in the model without testing for significance. The p-values for the fixed effects are estimated from the F statistics, with “Satterthwaite” approximation

*b* )*, E*

*∼ N* (0*, σ*2 )*, bi*

*Eij , ∀i, j*)

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*|*=

(Satterthwaite (1946)) denominator degrees of freedom. The p-values for the random effect were computed from likelihood ratio tests (Morrell (1998)).

**Post-hoc tests**

Post-hoc tests were conducted between categories of all demographic factors and their interactions, by calculating differences of “Least Squares Means” using R package “lmerTest” (Kuznetsova et al. (2015)), with “Satterthwaite” approximation (Satterthwaite (1946)) of the denominator degrees of freedom.

**Multiple testing correction**

When conducting post-hoc tests for demographic factors and their interactions, due to multiple categories of these factors the size of the tests could be inflated. Sequentially rejective *Bonferroni procedure* (Holm (1979)) and *Benjamini-Hochberg procedure* (Benjamini and Hochberg (1995)) remain the two most popular multiple testing correction procedures. Holm’s sequentially rejective Bonferroni procedure controls the family-wise type-I error rate (FWER) and is more powerful than the classical Bonferroni procedure. Benjamini-Hochberg controls the false discovery rate (FDR) which is the expected value of false discovery proportion. Controlling FWER usually proves to be too conservative. Hence, we used the Benjamini-Hochberg procedure, which is less conservative, but more powerful than Bonferroni correction. All post-hoc test p-values reported were Benjamini-Hochberg corrected.

**Computational software**

All analysis were conducted using the statistical software R (R Core Team (2016)), version 3.3.1. The mixed effects models were fit using the R-package “lme4” (Bates et al. (2014)) and all hypothesis tests were done using the R package “lmerTest” (Kuznetsova et al. (2015)).

**RESULTS**

Table 1 illustrates the descriptive statistics of the sample. As noted earlier, not all households participated in all waves of the survey, other than wave six, which included questions on disability status. This table is a descriptive statistics of the sample during wave six. Add more writeup about

descriptive statistics

**Aim 1**

Aim 1 of this study was to analyze how households with a working age adult with disability differed from households with no working age adult with disability, during the *great recession* , using “Income Poverty” as a measure of economic wellbeing, controlling for demographic factors such as gender, marital status, education, race and ethnicity. Table 2 shows the mixed-effects regression results with FPL100-ratio (measure of income poverty) as the dependent variable, time and disability status as the key predictors and demographic factors as the control variables, as explained in equation 2. Results showed that households with working age adults with disability, on an average experienced significantly worse income poverty (FPL100-ratio, *βD* = *−*0*.*725*, p <* 0*.*001) compared with households with no working age adults with disability. This is also illustrated in figure 1, which shows the trends of FPL100-ratios of households with and without a working age adults with disability.

We could not prove hypothesis 2 of aim 1. Results showed that the trends of income poverty were not significantly different between households with and without working age adults with disability, over the study period (*βt* = 0*.*015*, p* = 0*.*9994). This is evident in figure 1 as well.

The regression results in table 2 showed that FPL100-ratio, on an average, **decreased** by 0*.*054

every year (*β*1 = *−*0*.*054*, p <* 0*.*001). The coefficient of the quadratic term of Time (*β*2 = 0*.*0073*, p <*

0*.*01) indicated rate of change of slope was positive. In other words, although the FPL100-ratio decreased over time (as *β*1 *<* 0), it flattened out and started increasing, in the latter parts of the study period.

As shown in table 2, gender was statistically significant; households with “female” reference persons had on an average 0.368 lower FPL100-ratio (*β* = *−*0*.*368*, p <* 0*.*001) compared to households with “male” reference persons. Marital status was statistically significant; households with “not- married” reference persons had on an average 0.611 lower FPL100-ratio (*β* = *−*0*.*611*, p <* 0*.*001) compared to households with “married” reference person. Race and ethnicity were statistically

significant; households with “black” reference persons had on an average 1.28 lower FPL100-ratio

(*β* = *−*1*.*284*, p <* 0*.*001) than households with “white” reference person. The difference was even more stark between households with hispanic and white reference persons (*β* = *−*1*.*505*, p <* 0*.*001). Education was also statistically significant; households with reference persons with “high school

or less” education levels had on an average 2.204 (*β* = *−*2*.*204*, p <* 0*.*001) lower FPL100-ratio

than households with reference persons with “bachelors or higher” education levels. All significant interactions between disability and demographic factors and between different demographic factors themselves are displayed in table 2.

**Aim 2**

Aim 2 of the study was to analyze how demographic factors such as gender, marital status, education, race and ethnicity were associated with economic wellbeing (measured by FPL100-ratio) of households with a working age adult with disability, during the study period. A separate mixed effects model was fit with the same demographic factors, on households with working age adults with disability. Table 3 shows the mixed-effects regression results with FPL100-ratio as the dependent variable, time as the key predictor and demographic factors as the control variables. Several post-hoc tests were conducted on factors with multiple levels and their interactions. Table 4 lists the post-hoc test results. Figure 2 displays the trends of the different subgroups of the data, separated by demographic factors.

Results from table 3 shows that gender, marital status, education, race and ethnicity and some of their interactions have statistically significant associations with FPL100-ratio for households with disability during the study period. This is also illustrated in figures 2a for gender, 2b for marital status, 2d for education and 2c for race and ethnicity.

Figure 2c illustrates that households with “hispanic” reference persons had minimum FPL100- ratios throughout the study period. Another important observation is the different shapes of the FPL100-ratios of the four races. Households with “white” reference persons had a gradual and steady incline in their average FPL100-ratios after 2011. However, this behavior was not observed in households with “black”, “hispanic” or “others” heads. In figure 2d, households where the education level of their heads were “high school or less” experienced a decline in their FPL100-ratios, just like the other groups, but never experienced any improvement in the latter parts of the study.

The association of marital status with FPL100-ratios between the two models is worth high- lighting. The association is almost double in households with disability (*β* = *−*0*.*611 in table 2 and

*β* = *−*1*.*119 in table 3).

Figure 3 illustrates the trends of FPL100-ratios of two contrasting household types: one with

white, married, male (with education bachelors or higher) as reference persons, the other with not married, black, female (with high school or less education).

**Discussion**

The FPL100-ratios decline sharply between 2008 and 2010, flatten out and then increase gradually after 2011. The quadratic term of Time in the model captures this behavior. It is noticable that the decline in FPL100-ratios was sharper than the gradual incline that followed. A similar behavior is observed in both types of households.

The positive sign of *βt* indicated that the downward trend of households with disability was not as steep as the households with no disability. This apparently contradictory finding led us to conclude that households with disability although had “significantly” worse FPL100-ratio throughout the study period, the households without disability experienced more severe declines in their FPL100- ratios. This could throw some light on the impact of different supplementary coverage programs on households with disability.

**Limitations**

1. Although a linear mixed effects regression model discovered some conventional and some interesting patterns in the relationships between response and demographic factors, along with disability, the trajectory of income poverty over the study period for some households were not linear. This modeling approach did not capture trajectory shapes of individual households. A non-parametric fitting of the income poverty trajectories could be tried as a pre-processing step before testing for differences in behavior between different groups of households.

2. Some households in the sample did not participate over all the waves. Since households that participated in wave six were included there were some households that were first interviewed in wave six and some that were no longer interviewed after wave six. There were no means of determining the reasons for dropping out from the survey, nor the reasons for late inception into the survey. Since the *great recession* was a significant economic and social event, we

included households without complete participation in order to maximize the sample size, and incorporate the effect of the recession on more households. If, however, the reasons for dropping out or late joining had an association with the outcome of the study (income poverty), including those households could increase bias in the estimates, in spite of the estimates being more stable (less variance). Chapter 2 in SIPP users guide 6 mentions that the survey weights are adjusted to account for some types of household nonresponse with the

objective of ameliorating the nonresponse bias.

6 https://www2.census.gov/programs-surveys/sipp/guidance/SIPP 2008 USERS Guide Chapter2.pdf

**1 Figures**

Figure 1: Trends of FPL100-ratios of households, by Disability status

Disability ● no yes

4.25

4.00

Average FPL100−ratio

●

● ●

●

●

●

●

● ● ● ● ● ● ● ●

●

● ● ● ● ● ●

3.75

3.50

3.25

2008 2009 2010 2011 2012 2013

Figure 2: Trends of FPL100-ratios, for households with a working age adult with disability (a) by gender (b)

by marital status (c) by race and ethnicity (d) by education, of reference person

Household head ● Female Male

Household head ● Married Not married

3.7

3.5

Average FPL100−ratio

4.0

● ● ●

●

●

● ● ●

● ● ● ● ● ● ● ● ● ● ● ● ● ●

3.5

Average FPL100−ratio

3.3 ●

3.1

2.9

●

●

●

●

●

●

●

● ● ● ● ●

● ● ●

● ● ● ● ● ●

3.0

2.5

2008 2009 2010 2011 2012 2013

2008 2009 2010 2011 2012 2013

(a)

(b)

Household head ● Black Hispanic Others White

Household head ● Bachelors or higher High School or less Some college, diploma, assoc

3.5

Average FPL100−ratio

● ● ● ● ●

● ●

5

●

● ● ● ● ● ● ● ● ● ● ● ● ● ●

3.0 4

Average FPL100−ratio

2.5

● ● ●

● ● ●

● ● ● ● ● ● ● ●

● ● ● ● ●

3

● ● ●

2008 2009 2010 2011 2012 2013

2008 2009 2010 2011 2012 2013

(c)

(d)

Figure 3: Trends of FPL100-ratios of households, for two contrasting household types

6.7

6.6

Married Male White Bachelors or higher Disability no

● ●

● ●

●

6.5

Average FPL100−ratio

6.4

●

●

● ●

● ●

●

● ● ●

● ● ●

● ●

●

2008 2009 2010 2011 2012 2013

Not married Female Black High School or less Disability yes

1.50

1.45

1.40

1.35

1.30

2008 2009 2010 2011 2012 2013

*Note* : The y-axes of the two subplots have different ranges.

Figure 4: Participation rates in different safety net programs, in eligible households (below 200% of FPL)

with Disab with No Disab

0.3

Food Stamps SSI

0.2

0.1

0.0

program participation rate

0.3

TANF Unemployment

0.2

0.1

0.0

2009 2010 2011 2012 2013 2009 2010 2011 2012 2013

time

**2 Tables**

Table 1: Descriptive statistics of the sample in wave six of the study

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | **HH with** | **No Disability** | **HH wit** | **h Disability** |
| **Demographic factors** | | **Number** | **Percentage** | **Number** | **Percentage** |
| Total | | 26,104 | 77.81 | 7,443 | 22.19 |
| Gender: | |  |  |  |  |
| Male | | 12,626 | 48.37 | 3,378 | 45.38 |
| Female | | 13,478 | 51.63 | 4,065 | 54.62 |
| Marital status: | |  |  |  |  |
| Married | | 13,555 | 51.93 | 3,968 | 53.31 |
| Not Married | | 12,549 | 48.07 | 3,474 | 46.67 |
| Race and ethnicity: | | | | | |
| White | | 18,765 | 71.89 | 4,965 | 66.71 |
| Hispanic | | 2,996 | 11.48 | 908 | 12.20 |
| Black | | 2,912 | 11.16 | 1,092 | 14.67 |
| Others | | 1,431 | 5.48 | 479 | 6.44 |
| Education: | | | | | |
|  | High school or less | 8,496 | 32.55 | 2,994 | 40.23 |
|  | Some college, diploma, assoc | 8,916 | 34.16 | 2,863 | 38.47 |
|  | Bachelors or higher | 8,692 | 33.30 | 1,586 | 21.31 |

Table 2: Mixed effects regression ouput testing the difference in income poverty between families with and without a working age adult with disability, over the *great recession* controlling for demographic factors. Only significant interactions (p-value *<* 0*.*05) have been reported.

|  |  |  |  |
| --- | --- | --- | --- |
| **Predictor and Control variables** | *β* | **Std. Error** | **p-value** |
| Intercept | 5.896 | 0.037 | 0.0000 |
| Time (*t*) | -0.054 | 0.002 | 0.0000 |
| Time-squared (*t*2) | 0.007 | 0.001 | 0.0000 |
| Adult Disability | -0.725 | 0.068 | 0*.*0000(5) |
| Adult Disability x Time | 0.015 | 0.004 | 0*.*9994(5) |
| Gender1: (Female) | -0.368 | 0.043 | 0.0000 |
| Marital status2: (Not married)  Race3: | -0.611 | 0.034 | 0.0000 |
| Race2: (Black) | -1.284 | 0.086 | 0.0000 |
| Race3: (Hispanic) | -1.505 | 0.088 | 0.0000 |
| Race4: (Others)  Education4: | -0.355 | 0.087 | 0.0000 |
| Education2: (Some college, diploma, assoc) | -1.516 | 0.045 | 0.0000 |
| Education3: (High School or less) | -2.204 | 0.048 | 0.0000 |
| Adult Disability x Gender | 0.195 | 0.050 | 0.0001 |
| Adult Disability x Education: |  |  |  |
| Adult Disability x Education2 | 0.112 | 0.068 | 0.1002 |
| Adult Disability x Education3 | 0.219 | 0.072 | 0.0022 |
| Gender x Marital status | -0.523 | 0.032 | 0.0000 |
| Gender x Education: |  |  |  |
| Gender x Education2 | 0.102 | 0.051 | 0.0448 |
| Gender x Education3 | 0.255 | 0.052 | 0.0000 |
| Marital status x Race: |  |  |  |
| Marital status x Race2 | 0.209 | 0.051 | 0.0000 |
| Marital status x Race3 | 0.529 | 0.046 | 0.0000 |
| Marital status x Race4 | 0.182 | 0.069 | 0.0081 |
| Marital status x Education: |  |  |  |
| Marital status x Education2 | 0.125 | 0.037 | 0.0008 |
| Marital status x Education3 | 0.234 | 0.038 | 0.0000 |
| Race x Education: |  |  |  |
| Race2 x Education2 | 0.337 | 0.087 | 0.0001 |
| Race3 x Education2 | 0.401 | 0.092 | 0.0000 |
| Race4 x Education2 | -0.208 | 0.104 | 0.0460 |
| Race2 x Education3 | 0.371 | 0.093 | 0.0001 |
| Race3 x Education3 | 0.499 | 0.092 | 0.0000 |

1 Base category of gender is “Male” 2 Base category of marital status is “Married”

3 Base category of race is “White” 4 Base category of education is “Bachelors or higher”

5 Note that these are p-values of one-sided tests based on hypotheses of aim 1.

Table 3: Mixed effects regression ouput testing the associations of demographic factors with income poverty, for families with a working age adult with disability over the *great recession* . Only significant interactions (p-value *<* 0*.*05) have been reported.

|  |  |  |  |
| --- | --- | --- | --- |
| **Predictor and Control variables** | *β* | **Std. Error** | **p-value** |
| Intercept | 5.361 | 0.076 | 0.0000 |
| Time (*t*) | -0.039 | 0.003 | 0.0000 |
| Time-squared (*t*2) | 0.006 | 0.002 | 0.0127 |
| Gender1: (Female) | -0.254 | 0.088 | 0.0039 |
| Marital status2: (Not married)  Race3: | -1.119 | 0.070 | 0.0000 |
| Race2: (Black) | -1.121 | 0.167 | 0.0000 |
| Race3: (Hispanic) | -1.295 | 0.159 | 0.0000 |
| Race4: (Others)  Education4: | -0.325 | 0.162 | 0.0442 |
| Education2: (Some college, diploma, assoc) | -1.668 | 0.088 | 0.0000 |
| Education3: (High School or less) | -2.155 | 0.089 | 0.0000 |
| Gender x Marital status | -0.371 | 0.058 | 0.0000 |
| Gender x Education: |  |  |  |
| Gender x Education3 | 0.223 | 0.100 | 0.0263 |
| Marital status x Race: |  |  |  |
| Marital status x Race3 | 0.636 | 0.082 | 0.0000 |
| Marital status x Race4 | 0.288 | 0.115 | 0.0124 |
| Marital status x Education: |  |  |  |
| Marital status x Education2 | 0.641 | 0.074 | 0.0000 |
| Marital status x Education3 | 0.759 | 0.074 | 0.0000 |

Race x Education:

Race2 x Education2 0.350 0.174 0.0438

1 Base category of gender is “Male” 2 Base category of marital status is “Married”

3 Base category of race is “White” 4 Base category of education is “Bachelors or higher”

Table 4: Post-hoc tests of demographic factors, for households with a working age adult with disability

|  |  |  |  |
| --- | --- | --- | --- |
| **Demographic factors** | **Estimate** | **t-value** | **p-value**1 |
| **Race and ethnicity**  White - Black | 0.90 | 11.19 | 0.0000 |
| White - Hispanic | 0.84 | 9.78 | 0.0000 |
| Black - Others | -0.61 | -5.49 | 0.0000 |
| Hispanic - Others | -0.56 | -4.67 | 0.0000 |
| White - Others | 0.29 | 3.11 | 0.0023 |
| Black - Hispanic | -0.06 | -0.49 | 0.6218 |
| **Education** |  |  |  |
| Bachelors or higher - High School or less | 1.60 | 21.08 | 0.0000 |
| Bachelors or higher - Some college, diploma, assoc | 1.13 | 15.29 | 0.0000 |
| Some college, diploma, assoc - High School or less | 0.47 | 8.21 | 0.0000 |
| **Gender x Marital status** |  |  |  |
| Male Married - Female Not married | 0.87 | 16.00 | 0.0000 |
| Female Married - Female Not married | 0.77 | 15.77 | 0.0000 |
| Male Not married - Female Not married | 0.46 | 9.74 | 0.0000 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Demographic factors** | **Estimate** | **t-value** | **p-value**1 |
| Male Married - Male Not married | 0.41 | 7.87 | 0.0000 |
| Female Married - Male Not married | 0.31 | 5.35 | 0.0000 |
| Male Married - Female Married | 0.10 | 2.03 | 0.0428 |
| **Marital status x Race and ethnicity** |  |  |  |
| Married White - Not married White | 0.84 | 23.37 | 0.0000 |
| Married White - Not married Black | 1.70 | 19.73 | 0.0000 |
| Married White - Not married Hispanic | 1.37 | 13.74 | 0.0000 |
| Married White - Married Hispanic | 1.16 | 12.66 | 0.0000 |
| Not married Black - Married Others | -1.27 | -10.16 | 0.0000 |
| Not married White - Not married Black | 0.86 | 9.96 | 0.0000 |
| Married White - Married Black | 0.94 | 9.87 | 0.0000 |
| Married Black - Not married Black | 0.76 | 9.73 | 0.0000 |
| Married White - Not married Others | 0.98 | 8.81 | 0.0000 |
| Not married Hispanic - Married Others | -0.93 | -6.81 | 0.0000 |
| Married Hispanic - Married Others | -0.73 | -5.52 | 0.0000 |
| Not married Black - Not married Others | -0.72 | -5.51 | 0.0000 |
| Not married White - Not married Hispanic | 0.53 | 5.30 | 0.0000 |
| Married Others - Not married Others | 0.55 | 5.00 | 0.0000 |
| Not married Black - Married Hispanic | -0.54 | -4.55 | 0.0000 |
| Married White - Married Others | 0.43 | 4.09 | 0.0000 |
| Married Black - Married Others | -0.51 | -3.89 | 0.0002 |
| Not married White - Married Others | -0.41 | -3.84 | 0.0002 |
| Not married White - Married Hispanic | 0.32 | 3.46 | 0.0007 |
| Married Black - Not married Hispanic | 0.43 | 3.27 | 0.0015 |
| Not married Black - Not married Hispanic | -0.33 | -2.73 | 0.0080 |
| Not married Hispanic - Not married Others | -0.38 | -2.73 | 0.0080 |
| Married Hispanic - Not married Hispanic | 0.20 | 2.69 | 0.0088 |
| Married Black - Married Hispanic | 0.22 | 1.79 | 0.0854 |
| Married Hispanic - Not married Others | -0.18 | -1.31 | 0.2116 |
| Not married White - Not married Others | 0.14 | 1.27 | 0.2202 |
| Not married White - Married Black | 0.10 | 1.02 | 0.3199 |
| Married Black - Not married Others | 0.04 | 0.32 | 0.7492 |
| **Marital status x Education** |  |  |  |
| Married Bachelors or higher - Not married High School or less | 2.27 | 26.30 | 0.0000 |
| Married Bachelors or higher - Married High School or less | 1.98 | 23.55 | 0.0000 |
| Married Bachelors or higher - Not married Some college, diploma, assoc | 1.87 | 21.45 | 0.0000 |
| Married Bachelors or higher - Married Some college, diploma, assoc | 1.46 | 17.37 | 0.0000 |
| Married Bachelors or higher - Not married Bachelors or higher | 1.07 | 15.84 | 0.0000 |
| Not married Bachelors or higher - Not married High School or less | 1.21 | 14.39 | 0.0000 |
| Married Some college, diploma, assoc - Not married High School or less | 0.82 | 11.81 | 0.0000 |
| Not married Bachelors or higher - Married High School or less | 0.92 | 10.10 | 0.0000 |
| Not married Bachelors or higher - Not married Some college, diploma, assoc | 0.80 | 9.90 | 0.0000 |
| Married Some college, diploma, assoc - Married High School or less | 0.53 | 7.95 | 0.0000 |
| Married Some college, diploma, assoc - Not married Some college, diploma, assoc | 0.41 | 7.61 | 0.0000 |
| Not married Some college, diploma, assoc - Not married High School or less | 0.41 | 6.48 | 0.0000 |
| Married High School or less - Not married High School or less | 0.29 | 5.87 | 0.0000 |
| Not married Bachelors or higher - Married Some college, diploma, assoc | 0.39 | 4.33 | 0.0000 |
| Not married Some college, diploma, assoc - Married High School or less | 0.12 | 1.62 | 0.1046 |
| **Race and Ethnicity x Education** |  |  |  |
| White Bachelors or higher - White High School or less | 1.66 | 25.14 | 0.0000 |
| White Bachelors or higher - Black High School or less | 2.52 | 24.36 | 0.0000 |
| White Bachelors or higher - Hispanic High School or less | 2.37 | 23.62 | 0.0000 |
| White Bachelors or higher - White Some college, diploma, assoc | 1.26 | 20.15 | 0.0000 |

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| --- | --- | --- | --- |
| **Demographic factors** | **Estimate** | **t-value** | **p-value**1 |
| White Bachelors or higher - Black Some college, diploma, assoc | 1.99 | 18.96 | 0.0000 |
| White Bachelors or higher - Hispanic Some college, diploma, assoc | 2.07 | 17.14 | 0.0000 |
| White Bachelors or higher - Others High School or less | 2.13 | 16.70 | 0.0000 |
| Others Bachelors or higher - Black High School or less | 2.35 | 13.87 | 0.0000 |
| Others Bachelors or higher - Hispanic High School or less | 2.20 | 13.00 | 0.0000 |
| White Some college, diploma, assoc - Black High School or less | 1.26 | 13.00 | 0.0000 |
| White Some college, diploma, assoc - Hispanic High School or less | 1.11 | 11.86 | 0.0000 |
| Others Bachelors or higher - Others High School or less | 1.96 | 11.16 | 0.0000 |
| White Bachelors or higher - Others Some college, diploma, assoc | 1.48 | 10.99 | 0.0000 |
| Others Bachelors or higher - Black Some college, diploma, assoc | 1.82 | 10.67 | 0.0000 |
| Others Bachelors or higher - Hispanic Some college, diploma, assoc | 1.90 | 10.39 | 0.0000 |
| Others Bachelors or higher - White High School or less | 1.49 | 9.72 | 0.0000 |
| White High School or less - Black High School or less | 0.87 | 8.95 | 0.0000 |
| Hispanic Bachelors or higher - Hispanic High School or less | 1.35 | 8.78 | 0.0000 |
| Hispanic Bachelors or higher - Black High School or less | 1.51 | 8.70 | 0.0000 |
| Black Bachelors or higher - Black High School or less | 1.42 | 8.60 | 0.0000 |
| Others Bachelors or higher - Others Some college, diploma, assoc | 1.31 | 7.89 | 0.0000 |
| White High School or less - Hispanic High School or less | 0.71 | 7.75 | 0.0000 |
| White Some college, diploma, assoc - White High School or less | 0.40 | 7.57 | 0.0000 |
| White Some college, diploma, assoc - Black Some college, diploma, assoc | 0.73 | 7.47 | 0.0000 |
| Black Bachelors or higher - Hispanic High School or less | 1.27 | 7.33 | 0.0000 |
| Others Bachelors or higher - White Some college, diploma, assoc | 1.09 | 7.15 | 0.0000 |
| White Some college, diploma, assoc - Others High School or less | 0.87 | 7.14 | 0.0000 |
| White Some college, diploma, assoc - Hispanic Some college, diploma, assoc | 0.81 | 7.06 | 0.0000 |
| Others Some college, diploma, assoc - Black High School or less | 1.04 | 6.92 | 0.0000 |
| White Bachelors or higher - Black Bachelors or higher | 1.10 | 6.90 | 0.0000 |
| Hispanic Bachelors or higher - Hispanic Some college, diploma, assoc | 1.05 | 6.63 | 0.0000 |
| White Bachelors or higher - Hispanic Bachelors or higher | 1.02 | 6.51 | 0.0000 |
| Others Some college, diploma, assoc - Hispanic High School or less | 0.89 | 5.99 | 0.0000 |
| Hispanic Bachelors or higher - Others High School or less | 1.11 | 5.93 | 0.0000 |
| Hispanic Bachelors or higher - Black Some college, diploma, assoc | 0.98 | 5.60 | 0.0000 |
| Black Bachelors or higher - Black Some college, diploma, assoc | 0.89 | 5.50 | 0.0000 |
| Black Bachelors or higher - Others High School or less | 1.03 | 5.45 | 0.0000 |
| Black Bachelors or higher - Hispanic Some college, diploma, assoc | 0.97 | 5.20 | 0.0000 |
| Black Some college, diploma, assoc - Black High School or less | 0.53 | 4.93 | 0.0000 |
| Black Bachelors or higher - Others Bachelors or higher | -0.93 | -4.62 | 0.0000 |
| Others Some college, diploma, assoc - Others High School or less | 0.65 | 4.34 | 0.0000 |
| Hispanic Bachelors or higher - White High School or less | 0.64 | 4.15 | 0.0000 |
| Hispanic Bachelors or higher - Others Bachelors or higher | -0.84 | -4.03 | 0.0002 |
| White High School or less - Others High School or less | 0.47 | 3.91 | 0.0002 |
| Hispanic Some college, diploma, assoc - Others Some college, diploma, assoc | -0.59 | -3.61 | 0.0004 |
| Hispanic Some college, diploma, assoc - White High School or less | -0.41 | -3.59 | 0.0004 |
| Black Bachelors or higher - White High School or less | 0.56 | 3.55 | 0.0006 |
| Black Some college, diploma, assoc - Others Some college, diploma, assoc | -0.51 | -3.40 | 0.0009 |
| Black Some college, diploma, assoc - White High School or less | -0.34 | -3.39 | 0.0009 |
| Hispanic Some college, diploma, assoc - Black High School or less | 0.45 | 3.25 | 0.0015 |
| Black Some college, diploma, assoc - Hispanic High School or less | 0.38 | 3.05 | 0.0030 |
| Black High School or less - Others High School or less | -0.39 | -2.77 | 0.0071 |
| Hispanic Some college, diploma, assoc - Hispanic High School or less | 0.30 | 2.62 | 0.0110 |
| Hispanic Bachelors or higher - Others Some college, diploma, assoc | 0.46 | 2.40 | 0.0200 |
| Black Bachelors or higher - Others Some college, diploma, assoc | 0.38 | 1.96 | 0.0598 |
| Hispanic High School or less - Others High School or less | -0.24 | -1.72 | 0.1008 |
| White Some college, diploma, assoc - Others Some college, diploma, assoc | 0.22 | 1.68 | 0.1065 |
| Hispanic Bachelors or higher - White Some college, diploma, assoc | 0.25 | 1.59 | 0.1270 |
| Others Some college, diploma, assoc - White High School or less | 0.18 | 1.37 | 0.1926 |
| Black High School or less - Hispanic High School or less | -0.15 | -1.27 | 0.2238 |

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| --- | --- | --- | --- |
| **Demographic factors** | **Estimate** | **t-value** | **p-value**1 |
| White Bachelors or higher - Others Bachelors or higher | 0.17 | 1.10 | 0.2921 |
| Black Bachelors or higher - White Some college, diploma, assoc | 0.16 | 1.02 | 0.3257 |
| Black Some college, diploma, assoc - Others High School or less | 0.14 | 0.93 | 0.3690 |
| Black Some college, diploma, assoc - Hispanic Some college, diploma, assoc | 0.08 | 0.54 | 0.6097 |
| Black Bachelors or higher - Hispanic Bachelors or higher | -0.09 | -0.41 | 0.6944 |
| Hispanic Some college, diploma, assoc - Others High School or less | 0.06 | 0.38 | 0.7043 |

*Note:* [1] The p-values of the levels of each factor or interaction have been adjusted for multiple testing

using Benjamini-Hochberg correction.

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