**5. Data**

The data are drawn from the National Longitudinal Study of Youth, 1997, and span the years from 1997 to 2011. We chose this sample period because it contains the most comprehensive and complete set of variables needed for this model. Unemployment spells (SPELL) are calculated using the weekly employment variables generated by the NLSY indicating if the respondent is employed, unemployed, or out of the labor force during each week within sample period.[[1]](#footnote-1) The length of an unemployment spell is determined by counting the number of consecutive weeks the respondent is classified as unemployed and spells end either by the respondent leaving the workforce or becoming employed. Employer specific measures, discussed below, are matched to unemployment spells using the unique job identifier created by NLSY.[[2]](#footnote-2) This generates a panel of unemployment gaps for individuals across the sample period that span across calendar years.

Tables 1 and 2 provide the names and definitions of the control variables used in the analyses. Because height and weight are not collected consistently across the sample period, we interpolate the missing values. Before interpolation, observations within the recorded height and weight that are larger than 2.5 standard deviations of the mean are assumed to be input errors and are removed. For the height of a respondent, the average height of the remaining observations is used for the height in all periods assuming little to no growth during the sample period and the weight measures are interpolated using a linear methodology built into the R package *tidyverse*. The imperial measures for each respondent are converted to metric and used to calculate the respondent’s BMI for that year. According to the standard BMI scale, individuals with a BMI between 18.5 and 24.9 are classified as having healthy weight, individuals with BMI values from 25 to 29.9 were classified as being overweight, and those with BMI values over 30 were classified as being obese.[[3]](#footnote-3)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 1** | | | | | | | | | | | | | |
| **Sample Summary Statistics by BMI Class** | | | | | | | | | | | | | |
|  | |  | **Full Sample** | | **Normal BMI** | | **Overweight BMI** | | **Obese BMI** | | | |
| **Variable** | **Description** | | **Mean** | **St. Dev** | **Mean** | **St. Dev** | **Mean** | **St. Dev** | **Mean** | **St. Dev** | |
| Spell | Length of Unemployment Period in Weeks | | 11.717 | 14.891 | 10.610 | 14.023 | 12.072 | 15.176 | 13.398 | 15.944 | |
| BMI | Body Mass Index | | 27.076 | 6.565 | 22.115 | 1.691 | 27.194 | 1.461 | 36.198 | 5.766 | |
| Normal | =1 if BMI >= 18.5 and BMI < 25 | | 0.473 | 0.499 |  |  |  |  |  |  | |
| Overweight | =1 if BMI >=25 and BMI <30 | | 0.274 | 0.446 |  |  |  |  |  |  | |
| Obese | =1 if BMI >=30 | | 0.254 | 0.435 |  |  |  |  |  |  | |
| Age | Years Old | | 22.751 | 3.549 | 22.000 | 3.390 | 23.129 | 3.512 | 23.742 | 3.573 | |
| Female | =1 if Female | | 0.487 | 0.500 | 0.490 | 0.500 | 0.411 | 0.492 | 0.566 | 0.496 | |
| Child6 | =1 if Child 6 year of age or less present in home | | 0.442 | 0.779 | 0.372 | 0.742 | 0.440 | 0.753 | 0.574 | 0.854 | |
| HH\_Size | Number of individuals with the household | | 3.642 | 1.787 | 3.633 | 1.771 | 3.595 | 1.792 | 3.708 | 1.809 | |
| Gfinc | Total Gross Family Income (IHS) | | 10.475 | 2.452 | 10.554 | 2.353 | 10.450 | 2.551 | 10.353 | 2.515 | |
| Score | Percentile Rank on ASVAB Exam | | 39.152 | 28.691 | 41.669 | 29.462 | 38.428 | 28.456 | 35.240 | 26.962 | |
| Married | =1 if Currently Married | | 0.125 | 0.331 | 0.092 | 0.289 | 0.137 | 0.343 | 0.173 | 0.379 | |
| NeverMarried | =1 if Never Married | | 0.842 | 0.365 | 0.879 | 0.326 | 0.828 | 0.378 | 0.787 | 0.409 | |
| Separated | =1 if Separated, Divorced, or Widowed | | 0.033 | 0.179 | 0.029 | 0.167 | 0.036 | 0.185 | 0.039 | 0.194 | |
| LessHS | =1 if Completed Less than High School | | 0.177 | 0.382 | 0.174 | 0.379 | 0.170 | 0.376 | 0.192 | 0.394 | |
| HS | =1 if Completed High school or GED | | 0.319 | 0.466 | 0.299 | 0.458 | 0.332 | 0.471 | 0.343 | 0.475 | |
| SomeCol | =1 if Completed some college or Associates Degree | | 0.198 | 0.398 | 0.172 | 0.377 | 0.207 | 0.405 | 0.237 | 0.425 | |
| CollegePlus | =1 if Completed Bachelors or Greater | | 0.305 | 0.461 | 0.355 | 0.479 | 0.291 | 0.454 | 0.229 | 0.420 | |
| White | =1 if White | | 0.456 | 0.498 | 0.509 | 0.500 | 0.443 | 0.497 | 0.373 | 0.484 | |
| Black | =1 if Black | | 0.351 | 0.477 | 0.320 | 0.466 | 0.357 | 0.479 | 0.402 | 0.490 | |
| Hispanic | =1 if Hispanic | | 0.193 | 0.394 | 0.171 | 0.377 | 0.200 | 0.400 | 0.224 | 0.417 | |
| Good | =1 if Self Reported Health as Good | | 0.596 | 0.491 | 0.666 | 0.472 | 0.625 | 0.484 | 0.433 | 0.496 | |
| Average | =1 if Self Reported Health as Average | | 0.297 | 0.457 | 0.257 | 0.437 | 0.285 | 0.451 | 0.382 | 0.486 | |
| Poor | =1 if Self Reported Health as Poor | | 0.108 | 0.310 | 0.077 | 0.266 | 0.090 | 0.286 | 0.184 | 0.388 | |
| NorCen | North Central Region (Midwest) | | 0.219 | 0.414 | 0.222 | 0.416 | 0.231 | 0.421 | 0.202 | 0.402 | |
| NorEst | Northeastern Region | | 0.144 | 0.351 | 0.153 | 0.360 | 0.137 | 0.344 | 0.133 | 0.340 | |
| South | South Region | | 0.423 | 0.494 | 0.404 | 0.491 | 0.415 | 0.493 | 0.467 | 0.499 | |
| West | West Region | | 0.214 | 0.410 | 0.221 | 0.415 | 0.217 | 0.412 | 0.197 | 0.398 | |
| SearchCT | Number of Methods Used for Job Search During Gap (1 - 12) | | 3.125 | 1.900 | 3.013 | 1.818 | 3.181 | 1.921 | 3.274 | 2.009 | |
| Ten | Weeks worked in current Job | | 23.784 | 54.429 | 21.689 | 50.945 | 25.195 | 57.417 | 26.165 | 57.196 | |
| Exp | Cumulative total of weeks employed at time of unemployment spell | | 191.856 | 152.048 | 169.662 | 142.130 | 203.462 | 154.780 | 220.698 | 160.528 | |
| Union | =1 if Job before gap had was union | | 0.019 | 0.137 | 0.015 | 0.123 | 0.023 | 0.148 | 0.022 | 0.147 | |
| Quit | =1 if Job ended voluntary | | 0.027 | 0.161 | 0.027 | 0.161 | 0.027 | 0.162 | 0.026 | 0.160 | |
| Forced | =1 if Job ended by being fired | | 0.007 | 0.084 | 0.006 | 0.080 | 0.007 | 0.086 | 0.008 | 0.091 | |
| Ended | =1 if Job ended due to firm circumstances | | 0.025 | 0.157 | 0.025 | 0.156 | 0.027 | 0.162 | 0.024 | 0.153 | |
| Illness | =1 if Job ended due to illness | | 0.001 | 0.030 | 0.001 | 0.023 | 0.001 | 0.034 | 0.001 | 0.038 | |
| Unknown | =1 if Job ending cause unknown | | 0.940 | 0.238 | 0.941 | 0.235 | 0.938 | 0.242 | 0.940 | 0.238 | |
| URate | Regional Unemployment Rate | | 6.004 | 1.861 | 5.731 | 1.678 | 6.118 | 1.893 | 6.391 | 2.058 | |
| Observations | Individual-Spell Count | | 16,210 | | 7,662 | | 4,438 | | 4,110 | |

It is possible that BMI and unemployment may be endogenous via two possible channels. The first is that concurrent unemployment may increase the probability of obesity and the second is that unemployment and obesity may be correlated to unobserved individual characteristics such as self-esteem or depression. In the former case, we estimate the models using both current and lagged BMI and show the results are stable for either measure. For the latter case, we estimate the models assuming frailty across the individual.

Other independent variables included in the analyses are of two types: the first describes the *personal characteristics* of the individual who experiences the unemployment spell and most of these are time variant. Besides obesity, we include age (Age), sex (Female), the presence of a child six years of age or young within the household (Child6), the household size (HH\_Size), a measure of gross family income (Gfinc),[[4]](#footnote-4) marital status (Married, NeverMarried\*, Separated), education (LessHS, HS\*, SomeCol, and CollegePlus), self-reported health status (Good\*, Average, Poor), and Census Region of residency (NorCen\*, NorEst, South, West).[[5]](#footnote-5) The time invariant measures are the respondent’s race (White\*, Black, and Hispanic) and ability (Score) as measured by the ASVAB Math and Verbal Score Percentile which is calculated by the NLSY and is similar to the Armed Forces Qualification Test (AFQT) utilized in the other surveys. To try and capture the job search behavior for a respondent during each employment spell, we create the variable (SERACHCT) which is a count of the number of search methods reported to have been utilized by the respondent during each unemployment spell.[[6]](#footnote-6)

The second type of independent variables are *job-specific characteristics* including the respondent’s tenure (Ten) in the job immediately prior to the unemployment spell, total labor market experience (Exp) measured as the sum of all previous employment tenures, the occupation (OCC) and industry (IND) of the job immediately prior to the unemployment spell[[7]](#footnote-7) and whether that job included union representation (Union). We also include indicator variables for reason that the unemployment spell started (Quit\*, Forced, Ended, Illness, Unknown).[[8]](#footnote-8) Finally, to capture market conditions we include the unemployment rate (Urate) for the Census region individual is reported to live in with the annual data obtained from the Saint Louis Federal Reserve Bank’s FRED website and the monthly rates are matched with the month and year the unemployment spell begins.

After limiting the data to spells that are fully identified with no missing values in the control variables, we have 16,210 unemployment spells spanning our time frame ranging in time from one to 217 weeks. Approximately 47% of our spells involve respondents classified as normal weight with 27% and 25% classified as overweight and obese, respectively. Around 46% of the respondents are white with 35% being black and almost 20% Hispanic. Women account for about 49% of the spells in the data.

**6. Results**

**6.1 Descriptive Analysis**

We begin with a discussion in Table 1 of the means and standard deviations of each variable for the full sample and for each of the three BMI classes in this study. For the full sample of 16,210 unemployment spells, the average spell lasted 11.7 weeks. There are 7,662 spells for respondents with a BMI in the normal range with an average duration of 10.6 weeks, 4,438 spells by those within the overweight BMI class (BMI between 25 and 30) with an average duration of about 12.1 weeks, and the remaining 4,110 spells involve those with a BMI of 30 or greater and last an average of 13.4 weeks. The increase in the spell duration across BMI classification is statistically significant at the highest level between each BMI class.

Chart

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Figure 1 shows the Kaplan–Meier estimated survival curves for the full sample those categorized as normal weight, overweight, and obese. Survival probability in this case is the likelihood that an unemployment spell will continue given that it has lasted until that time. The point at which that probability is 50% is shown with the dashed lines and occurs at 5 weeks for those in the normal BMI class, 6 weeks for those in the overweight class, and 8 weeks for those in the obese class. We also see that the survival curves are shifted out beyond the 95% confidence intervals for those in each class over most of the time in weeks.

While these factors seem to support the hypothesis that unemployment spell is impacted by BMI classification, looking at the other variables in columns two, three, and four of Table 1 show that the characteristics of the respondents vary by BMI class as well. As BMI class increases respondents tend to be older, more likely to have a child under the age of six present in the household, tend to have a smaller gross family income, a lower score on the cognitive test, and more likely to be married. The mean percentage of respondents with less than high school, high school, and some college increases with the BMI category while the percentage that have more than four years of college decreases with the BMI category. The percentage of respondents that are white declines as one moves up the BMI classifications and while the share of black and Hispanic rises. Those in the obese categories employed more search methods than the other two categories, had a longer tenure in their previous job, and have a longer period of overall employment.

Chart

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Figures 2 and 3 show the K-M Survival Curves for males and female subsamples respectively and the impact of BMI class appears to still hold. For both males and females, the mean duration, or point where survival of a spell is at 50%, are the same at 5, 6 and 8 weeks for normal, overweight, and obese classes. Figure 4, 5, and 6 break the sample into racial subsamples and the same results hold with the unusual the obesity impact being strongest for Hispanics and smallest between the obese and overweight respondents for whites.

Chart

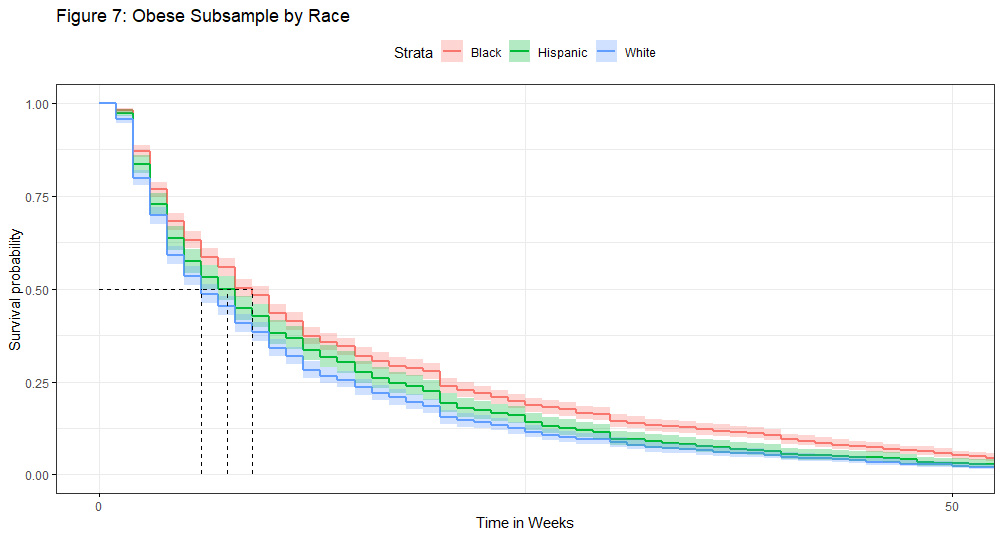
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Of particular interest are Figures 7 and 8 which show the KM survival curves for only the obese subsample divided by race and sex. In Figure 7 we see that among obese individuals, Blacks have the largest likelihood that an unemployment spell will continue with a mean of 9 weeks, followed by Hispanics with a mean of 7.5 weeks and Whites with a mean of 6 weeks. Figure 8 shows the obese subsample split by sex and it appears that both obese men and women suffer similar impacts on their duration, both with means of 8 weeks. Looking at the summary statistics for each of the subsample breakdowns shown here all indicate; however, that there are other differences that must be accounted for.

Chart, line chart

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**6.2 Regression Analysis**

Table 2 reports the results from several specifications of the simplest version of the model where unemployment spell length is regressed on an indicator denoting the BMI class of the unemployed individual. The first three columns show the results from the Cox Proportional Hazard model where a coefficient estimate less than zero indicates the hazard rate, or likelihood of ending a spell, is decreasing. We see that individuals that are obese at the start of the spell (column one) or in the year prior to the start of the spell (column two) see a statistically significant extension of their unemployment spell compared to those of normal BMI. The same is true, but to a lesser extent, for those individuals with a BMI within the overweight range. The magnitudes between the current and lagged BMI are the same across the two models indicating that simultaneity of the BMI classification and the existence of an unemployment spell is not biasing the results. The second concern regarding the endogeneity of the BMI classification and unemployment spell is that they may both be correlated to an unobserved individual characteristic. We address this by assuming frailty within the model by individual which allows the base hazard to differ by individual. The results, shown in column three, indicating that by allowing for a baseline hazard function to vary by individual increases the magnitude of the effect while retaining the statistical significance.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 2: Duration Models with only BMI Classifications** | | | | | | |
| Duration of Unemployment Spells – Cox Proportional Hazard and AFT Models | | | | | | |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| (Intercept) |  |  |  | 2.34\*\*\* | 2.34\*\*\* | 2.25\*\*\* |
|  |  |  |  | (0.01) | (0.01) | (0.02) |
| Overweight | -0.12\*\*\* | -0.13\*\*\* | -0.15\*\*\* | 0.13\*\*\* | 0.15\*\*\* | 0.16\*\*\* |
|  | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) |
| Obese | -0.21\*\*\* | -0.21\*\*\* | -0.28\*\*\* | 0.24\*\*\* | 0.23\*\*\* | 0.35\*\*\* |
|  | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.03) |
| Log(scale) |  |  |  | 0.05\*\*\* | 0.04\*\*\* | -0.30\*\*\* |
|  |  |  |  | (0.01) | (0.01) | (0.01) |
| AIC | 281732.03 | 277348.91 | 280772.14 | 111991.77 | 110438.61 | 108858.19 |
| Num. obs. | 16210 | 15984 | 16210 | 16210 | 15984 | 16210 |
| BIC |  |  |  | 112022.55 | 110469.32 | 134361.91 |
| Log Likelihood |  |  |  | -55991.89 | -55215.30 | -51114.08 |
| \*\*\*p < 0.001; \*\*p < 0.01; \*p < 0.05 | | | | | | |

A second concern is that the model may be mis-specified. Specifically, the Cox Proportional Hazard model assumes that the baseline hazards are equivalent and changes in each covariate impacts the hazard in a proportional manner. This assumption of proportionality can be tested using a Schoenfeld residual test and the result of such a test rejects the null hypothesis of proportional hazards for the obese coefficient.[[9]](#footnote-9) The alternative is to estimate a parametric version of the model known as an accelerated failure time model. Specifically we assume a Weibull distribution and estimate the model with current BMI classification (column four), lagged BMI (column five), current BMI with individual frailty (column six) and lagged BMI with individual frailty (column seven).[[10]](#footnote-10) In all estimates, the coefficients are statistically significant at the highest level and clearly show that unemployment duration lasts longer for individual with an overweight BMI and longer still for individuals with an obese BMI classification indicating that BMI may be having an impact on unemployment durations.[[11]](#footnote-11)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 3: AFT Model with Additional Covariates** | | | | | | |
| Duration of Unemployment Spells – Weibull Distribution | | | | | | |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| (Intercept) | 1.5820\*\*\* | 1.4655\*\*\* | 1.6167\*\*\* | 1.5126\*\*\* | 1.7502\*\*\* | 1.6504\*\*\* |
|  | (0.0924) | (0.0933) | (0.0924) | (0.0936) | (0.2278) | (0.2272) |
| Overweight | 0.0368 | 0.0611\*\* | 0.0340 | 0.0557\*\* | 0.0354 | 0.0498\* |
|  | (0.0208) | (0.0206) | (0.0206) | (0.0204) | (0.0204) | (0.0202) |
| Obese | 0.1319\*\*\* | 0.1190\*\*\* | 0.1195\*\*\* | 0.1000\*\*\* | 0.1142\*\*\* | 0.0932\*\*\* |
|  | (0.0254) | (0.0254) | (0.0250) | (0.0250) | (0.0248) | (0.0248) |
| Female | -0.0985\*\*\* | -0.0916\*\*\* | -0.0829\*\*\* | -0.0779\*\*\* | -0.0874\*\*\* | -0.0819\*\*\* |
|  | (0.0237) | (0.0238) | (0.0233) | (0.0234) | (0.0235) | (0.0236) |
| Age | 0.0501\*\*\* | 0.0549\*\*\* | 0.0247\*\*\* | 0.0305\*\*\* | 0.0271\*\*\* | 0.0335\*\*\* |
|  | (0.0040) | (0.0040) | (0.0043) | (0.0044) | (0.0043) | (0.0044) |
| Married | -0.0486 | -0.0509 | -0.0405 | -0.0424 | -0.0388 | -0.0416 |
|  | (0.0281) | (0.0281) | (0.0278) | (0.0278) | (0.0276) | (0.0276) |
| Separated | 0.1058\* | 0.0886 | 0.0734 | 0.0589 | 0.0644 | 0.0471 |
|  | (0.0499) | (0.0498) | (0.0493) | (0.0492) | (0.0492) | (0.0490) |
| Black | 0.2278\*\*\* | 0.2255\*\*\* | 0.2053\*\*\* | 0.2026\*\*\* | 0.2005\*\*\* | 0.1983\*\*\* |
|  | (0.0310) | (0.0311) | (0.0304) | (0.0305) | (0.0302) | (0.0303) |
| Hispanic | 0.0126 | 0.0115 | 0.0155 | 0.0146 | 0.0137 | 0.0132 |
|  | (0.0330) | (0.0330) | (0.0323) | (0.0324) | (0.0321) | (0.0321) |
| Child6 | 0.0001 | 0.0019 | 0.0053 | 0.0076 | 0.0070 | 0.0095 |
|  | (0.0117) | (0.0117) | (0.0116) | (0.0116) | (0.0115) | (0.0115) |
| GFinc | -0.0104\*\* | -0.0114\*\*\* | -0.0109\*\*\* | -0.0118\*\*\* | -0.0121\*\*\* | -0.0132\*\*\* |
|  | (0.0032) | (0.0032) | (0.0032) | (0.0032) | (0.0032) | (0.0032) |
| HS | -0.0841\*\* | -0.0687\* | -0.0849\*\* | -0.0704\* | -0.0870\*\* | -0.0729\* |
|  | (0.0297) | (0.0298) | (0.0293) | (0.0294) | (0.0290) | (0.0292) |
| SomeCol | -0.1208\*\*\* | -0.1348\*\*\* | -0.1300\*\*\* | -0.1412\*\*\* | -0.1322\*\*\* | -0.1443\*\*\* |
|  | (0.0349) | (0.0351) | (0.0344) | (0.0346) | (0.0342) | (0.0344) |
| CollegePlus | -0.0980\*\* | -0.1335\*\*\* | -0.1172\*\*\* | -0.1467\*\*\* | -0.1091\*\*\* | -0.1413\*\*\* |
|  | (0.0321) | (0.0328) | (0.0318) | (0.0324) | (0.0316) | (0.0321) |
| Score | -0.0055\*\*\* | -0.0051\*\*\* | -0.0054\*\*\* | -0.0050\*\*\* | -0.0054\*\*\* | -0.0050\*\*\* |
|  | (0.0005) | (0.0005) | (0.0005) | (0.0005) | (0.0005) | (0.0005) |
| Ten | 0.0010\*\*\* | 0.0010\*\*\* | 0.0010\*\*\* | 0.0010\*\*\* | -0.0004\* | -0.0005\* |
|  | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| Exp | 0.0003\*\* | 0.0003\*\* | 0.0001 | 0.0001 | 0.0000 | -0.0000 |
|  | (0.0001) | (0.0001) | (0.0001) | (0.0001) | (0.0001) | (0.0001) |
| Average | -0.0039 | -0.0019 | -0.0101 | -0.0078 | -0.0104 | -0.0078 |
|  | (0.0180) | (0.0181) | (0.0178) | (0.0179) | (0.0177) | (0.0178) |
| Poor | -0.0432 | -0.0404 | -0.0525 | -0.0499 | -0.0566\* | -0.0545\* |
|  | (0.0276) | (0.0276) | (0.0272) | (0.0273) | (0.0271) | (0.0271) |
| NorCen | -0.0817\* | -0.0837\* | -0.1154\*\* | -0.1190\*\* | -0.1130\*\* | -0.1168\*\* |
|  | (0.0367) | (0.0368) | (0.0360) | (0.0362) | (0.0357) | (0.0359) |
| South | -0.1002\*\* | -0.0978\*\* | -0.1197\*\*\* | -0.1184\*\*\* | -0.1180\*\*\* | -0.1166\*\*\* |
|  | (0.0332) | (0.0333) | (0.0326) | (0.0328) | (0.0324) | (0.0325) |
| **Table 3: AFT Model with Additional Covariates (cont)** | | | | | | |
| Duration of Unemployment Spells – Weibull Distribution | | | | | | |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| West | -0.1280\*\*\* | -0.1258\*\*\* | -0.1972\*\*\* | -0.1929\*\*\* | -0.1998\*\*\* | -0.1950\*\*\* |
|  | (0.0371) | (0.0373) | (0.0368) | (0.0370) | (0.0365) | (0.0367) |
| URATE |  |  | 0.0736\*\*\* | 0.0691\*\*\* | 0.0753\*\*\* | 0.0706\*\*\* |
|  |  |  | (0.0054) | (0.0055) | (0.0054) | (0.0054) |
| UNION |  |  | 0.0490 | 0.0131 | -0.0087 | -0.0496 |
|  |  |  | (0.0534) | (0.0534) | (0.0546) | (0.0548) |
| SearchCT |  |  | 0.0472\*\*\* | 0.0458\*\*\* | 0.0446\*\*\* | 0.0432\*\*\* |
|  |  |  | (0.0040) | (0.0040) | (0.0040) | (0.0040) |
| Forced |  |  | 0.4636\*\*\* | 0.4478\*\*\* | 0.2467\*\* | 0.2278\*\* |
|  |  |  | (0.0809) | (0.0807) | (0.0825) | (0.0823) |
| Ended |  |  | 0.4108\*\*\* | 0.4177\*\*\* | 0.2042\*\*\* | 0.2048\*\*\* |
|  |  |  | (0.0444) | (0.0444) | (0.0474) | (0.0474) |
| Illness |  |  | 0.1187 | 0.1448 | -0.1435 | -0.1287 |
|  |  |  | (0.2125) | (0.2150) | (0.2109) | (0.2128) |
| Quit |  |  | 0.3093\*\*\* | 0.3086\*\*\* | 0.0936\* | 0.0916\* |
|  |  |  | (0.0436) | (0.0436) | (0.0461) | (0.0461) |
| Occupation Fixed Effects | No | No | No | No | Yes | Yes |
| Industry Fixed Effects | No | No | No | No | Yes | Yes |
| Log(scale) | -0.3186\*\*\* | -0.3242\*\*\* | -0.3270\*\*\* | -0.3318\*\*\* | -0.3336\*\*\* | -0.3385\*\*\* |
|  | (0.0067) | (0.0067) | (0.0067) | (0.0067) | (0.0067) | (0.0067) |
| AIC | 107987.4825 | 106455.7981 | 107644.9211 | 106140.5574 | 107505.6264 | 105994.7576 |
| BIC | 132741.4565 | 130948.0442 | 132135.5496 | 130375.5881 | 132088.7167 | 130300.9573 |
| Log Likelihood | -50776.1747 | -50038.5319 | -50639.1241 | -49914.4060 | -50557.4584 | -49832.2385 |
| Num. obs. | 16210 | 15984 | 16210 | 15984 | 16210 | 15984 |
| \*\*\*p < 0.001; \*\*p < 0.01; \*p < 0.05 | | | | | | |

Table 3 shows the results from the accelerated failure model assuming a Weibull baseline hazard function with individual frailty when additional covariates are added to the model. Columns (1) and (2) show the results when adding a set of individual specific covariates, columns (3) and (4) add job specific covariates without controlling for occupation or industry while columns (5) and (6) include fixed effects for both occupation and industry. Among the six columns in Table 3, columns (1), (3), and (5) use the current BMI classification while columns (2), (4), and (6) use the lagged BMI classification. In all cases individuals with a BMI classification of obsess show increases in the duration of their unemployment spells of about 10% compared to those with a normal BMI and those results are statistically significant at the highest level. This 10% increase implies that an obese individual will experience an unemployment spell lasting about 1.6 weeks longer than those with normal BMI, all else held equal. For those that are overweight, the magnitude of the impact of the BMI classification is more sensitive to the specification with the impact ranging between 3 and 5% or about between 4 days and a week. In terms of statistical significance, the impact is only significant when the lagged BMI classification is used and then, at best, only significant at the 5% level.

Across all specifications in Table 3, the impact from other covariates are rather stable in both magnitude and statistical significance across models with some larger changes being observed for the job-specific measure when the occupations and industry are controlled for. Among those that are significant we observe that women see a shorter duration compared to men, on average, while age increases the duration of unemployment spells. As we have seen already, unemployment spells for Black indivdiausl tend to be significantly longer compared to Whites while Hispanic see no statistically significant change in duration. Having a higher gross family income and increasing levels of education all shorten the duration of an unemployment spell as one would expect as the gross family income and education level likely indicates the type of job of the individual Likewise, higher scores on the cognitive test lead to shorter durations as well likely for similar reasons.

The only case where signs change across specifications is when the tenure variable is used. Having a longer tenure at a specific job tends to slightly increase the duration of the subsequent unemployment spell except when we control for occupation and industry after which the impact becomes negative indicating a shorter duration. The size of the impact, however, is very small making it economically insignificant. Similarly, the impact from self-reported poor health becomes statistically significant when we control for occupation and industry, however, the sign is not as expected as poor health is shortening the unemployment spell. The key element to keep in mind is that we are not including cases where an individual leaves the workforce due to illness and there may be some effect from the fact the health insurance tends to be tied to employment. Region also seems to impact the length of employment with those in the reference category of the Northeast having the longest duration while those in the West have the shortest duration. Given the economic expansion in many western states, this is not a surprising result.

Adding job specific controls show the greatest sensitivity to specification as the magnitude of some covariates is strongly impacted by controlling for occupation and industry. Focusing on the last two columns of Table 3 we see that higher unemployment rates within the region extends the duration, as expected, as does the case where a person if fired, quit, or the job ended compared to those cases where job ending is unknown. We see a similar impact, albeit not statistically significant, when an unemployment spell is started due to illness as we did with poor self-reported health. Two other interesting results are that union representation does impact the duration of the subsequent unemployment spell and the more search methods an individual uses, the longer the duration. This result, however, could be endogenous as an individual utilizes more search options the longer an unemployment spell lasts. We are not concerned with this possible endogeneity as it is not related to the variables in question.

**6.3 Analysis by Types**

As investigated in the K-M Survival graphs above, we seek to investigate how the BMI impact on unemployment duration may vary by sex and race. Table 4 shows the results when we split the sex identifier and the race identifier variable into the three BMI classifications and estimate the full model with occupation and industry controls.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 4: BMI Classification Interactions** | | | | | |
| Duration of Unemployment Spells – Weibull Baseline Hazard | | | | | |
|  | Female | Male | White | Black | Hispanic |
| Normal BMI | -0.0965\*\*\* | REF | REF | 0.2157\*\*\* | -0.0319 |
|  | (0.0289) | (0.0360) | (0.0406) |
| Overweight BMI | -0.0127 | 0.0226 | 0.0602\* | 0.2245\*\*\* | 0.0703 |
|  | (0.0337) | (0.0273) | (0.0300) | (0.0389) | (0.0443) |
| Obese BMI | 0.0147 | 0.0761\* | 0.0794\* | 0.2817\*\*\* | 0.1315\*\* |
|  | (0.0357) | (0.0354) | (0.0373) | (0.0416) | (0.0491) |
| Log(scale) | -0.3386\*\*\* | | -0.3386\*\*\* | | |
|  | (0.0067) | | (0.0067) | | |
| (Intercept) | 1.6604\*\*\* | | 1.6561\*\*\* | | |
|  | (0.2275) | | (0.2276) | | |
| AIC | 105995.7023 | | 105993.2659 | | |
| BIC | 130306.4228 | | 130295.7121 | | |
| Log Likelihood | -49832.1221 | | -49831.9814 | | |
| Num. obs. | 15984 | | 15984 | | |
| \*\*\*p < 0.001; \*\*p < 0.01; \*p < 0.05 | | | | | |

The first two columns of results in Table 4 show the model where the female identifier is replaced with the sex identifiers split across BMI classification and we see clear indications that the sexes are treated differently, and we see the cause for the shorter unemployment spells results in Table 4. Specific we see that women of normal BMI see a shorter unemployment spell compared to men of normal BMI while women of overweight or obese BMI see statistically similar durations as men of normal BMI. Breaking the results down by sex indicate that the negative BMI impact is being driving by men of obese status with those individuals showing a 10% increase in the duration of their unemployment spells. In terms of how weight may impact individuals of different sexes differently, this is an interesting result in that women of normal weight (according to BMI) see a shorter duration while obese men see a longer duration compared to all others.

The last three columns in Table 4 create similar variables as in the first two columns with the races being divided out by BMI class. Whites with a BMI that is classified as overweight or obese see an increase in the duration of their unemployment spell of about 7% statistically significant at only the 5% level. For Hispanics, only those with a BMI high enough to be obese see any impact on the duration of unemployment spells, however, this result is large at 13% and is significant at the 1% level. Blacks of all BMI classifications see very large increases in duration compared to Whites with a normal BMI. Normal and Overweight Black individuals see a 20%, or almost two weeks, increase in unemployment spells, all else equal. Blacks classified as obese see an almost 30% increase in unemployment spell duration.

Table 5 breaks the race results down further by splitting each race into the two sexes. We see that for when broken down by sex, White men BMI has no discernible impact on the duration of their unemployment and many of the White result in Table 4 are being driving by the still present and highly significant negative impact on duration enjoyed by White women with a normal BMI. Of additional interest is that the impact felt by Hispanics is also not significantly large enough to pick up in the regressions. In the case of Hispanics, this could be related to the sample size within each of the six categories being large enough to generated statistically significant results.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 5: BMI Classification Interactions with Sex and Race** | | | | | | |
| Duration of Unemployment Spells – Weibull Baseline Hazard | | | | | | |
|  | White | | Black | | Hispanic | |
|  | Male | Female | Male | Female | Male | Female |
| Normal BMI | REF | -0.1365\*\*\* | 0.2008\*\*\* | 0.1094\* | -0.1058 | -0.0896 |
|  | (0.0390) | (0.0480) | (0.0486) | (0.0569) | (0.0548) |
| Overweight BMI | 0.0257 | -0.0271 | 0.1307\* | 0.1917\*\*\* | 0.0728 | -0.0677 |
|  | (0.0388) | (0.0503) | (0.0520) | (0.0523) | (0.0580) | (0.0650) |
| Obese BMI | 0.0244 | 0.0039 | 0.2551\*\*\* | 0.1867\*\*\* | 0.1200 | 0.0144 |
|  | (0.0524) | (0.0540) | (0.0609) | (0.0527) | (0.0665) | (0.0690) |
| Log(scale) | -0.3389\*\*\*  -0.3389\*\*\*  -0.3386\*\*\*  (0.0067) | | | | | |
|  | (0.0067)  (0.0067) | | | | | |
| (Intercept) | 1.6857\*\*\*  1.6857\*\*\*  1.6561\*\*\*  (0.2276) | | | | | |
|  | (0.2283)  (0.2283) | | | | | |
| AIC | 105986.6148  105986.6148 | | | | | |
| BIC | 130289.6967  130289.6967 | | | | | |
| Log Likelihood | -49828.5731  -49828.5731 | | | | | |
| Num. obs. | 15984  15984 | | | | | |
| \*\*\*p < 0.001; \*\*p < 0.01; \*p < 0.05 | | | | | |  |

The largest and most disturbing results can be seen in the two Black columns of Table 5 showing that Black mean see a very large impact in unemployment spell duration and that the magnitude of these are dependent on the BMI classification. Specifically, Black males with a normal BMI have a 20% increase in their unemployment spell while Black men classified as overweight see only a 13% increase in duration. Obese black men see an even larger impact at more than 25%. Interesting, Black women fare better compared to their male counterparts; however, they still do see an increase in unemployment duration compared to White men. There is also a glimmer of the idea that women of a normal BMI gain some advantage in the job search market, but not nearly as large as White women. Black women with a normal BMI see only a 10% increase in duration compared to the overweight or obese Black women who see a nearly 20% increase in duration. In all cases we are using the lagged BMI classification as that measure seem to perform slightly better in the regression diagnostics. We are also estimating all of the models shown in Table 4 and 5 with industry and occupational fixed effects and the other covariates are available upon request.

1. An alternative approach to identify unemployment spells is to use the questions which ask about the start and stop of employment. One problem with this method is that the question asks the interviewer to insert the interview date if the respondent is still employed causing confusion in the coding. Additionally, using these questions makes measuring spells across calendar years difficult and there is no indicate if the respondent is unemployed or out of the labor force. [↑](#footnote-ref-1)
2. In the weekly data, unemployment spells that are ended by employment are indicated using a unique job id. [↑](#footnote-ref-2)
3. Centers for Disease Control and Prevention (2017). We remove individuals with a BMI classified as underweight and we can show the estimates to be robust to the removal of individuals classified as underweight since such a low BMI may be an indication of an unobserved illness. [↑](#footnote-ref-3)
4. The reported gross family income is adjusted using the Inverse Hyperbolic Sine method which is like the natural log yet allows observations equal to zero. [↑](#footnote-ref-4)
5. The reference category is indicated with an asterisk. For the race category, individuals classified as “mixed” are removed. [↑](#footnote-ref-5)
6. This variable is very problematic in that there are many missing observations which we set equal to zero. [↑](#footnote-ref-6)
7. For both the occupation and industry we aggregate the individual codes into the specific categories as defined by the census. [↑](#footnote-ref-7)
8. There are several missing or skipped observations for this question, so the category UNKNOWN is used to capture these events. [↑](#footnote-ref-8)
9. This test was performed using the *cox.zph()* command that is built into the survival package available in R. [↑](#footnote-ref-9)
10. The Weibull distribution was chosen based on a visual inspect of the fitted K-M curves and comparing the log likelihoods of the estimation of the K-M curve across several distributions. This was all carried out with built in functions in the survival R package. [↑](#footnote-ref-10)
11. Comparison between the Cox Proportional Hazard coefficients and those from the parametric estimation is done by simply adding a negative sign to the estimates from the parametric regression. [↑](#footnote-ref-11)