**Methods**

We conducted statistical analyses on a study sample of 2038 participants aged 69 years and older using SAS version 9.4. A PROC FREQ function and PROC MEANS function were utilized to obtain descriptive characteristics of all participants. A series of PROC LOGISTIC functions were utilized to create two predictor variable logistic regression models observing the association between low gait speed and alive mortality status adjusting for various covariates such as BMI, DSST, Sex, FEV1, and Smoke Status separately. Another PROC LOGISTIC function was conducted to perform a multivariable logistic regression model to observe the association between low gait speed and alive mortality status adjusting for BMI, DSST, Sex, FEV1, and Smoke status. Finally, a PROC LOGISTIC function was conducted to perform a multivariable logistic regression model to observe the association between low gait speed and alive mortality status adjusting for BMI, DSST, Sex, FEV1, and Smoke status, and the interaction between sex and low gait speed.

**Results**

A PROC FREQ function was utilized to obtain descriptive statistics of the study sample (see Table 1). An observed 55.3% of the sample were smokers in comparison to 44.7% of the study sample that were non-smokers, there were 10 missing observations. We examined that 57.1% of the study sample received higher education in comparison to 42.9% that did not; an observed 6 observations were denoted as missing. An estimated 46.5% of the study sample were males and 53.5% were females. Investigators identified that 64.5% of the study sample was alive at the end of the study while 35.5% of the study sample were deceased with 5 observations omitted due to missing data. We observed an estimated 73.4% of participants did not have low gait speed in comparison to 26.6% that did with an observed 144 observations denoted as missing data (see Table 1).

**Table 1. Descriptive Statistics of Participant Characteristics**

|  |  |
| --- | --- |
| Variable | Frequency (%) |
| Smoke Status:  Non-smoker  Smoker | 906 (44.7%)  1122 (55.3%) |
| Higher Education:  No  Yes | 871 (42.9%)  1161 (57.1%) |
| Sex:  Male  Female | 948 (46.5%)  1090 (53.5%) |
| Mortality Status:  Deceased  Alive | 722 (35.5%)  1311 (64.5%) |
| Low Gait Speed:  No  Yes | 1391 (73.4%)  503 (26.6%) |

A PROC MEANS function was conducted to observe participant characteristics (see Table 2). Missing observations were examined and omitted from some portions of the analysis. Mean age in years at enrollment was 86.4 (stddev = 8.7) and at last contact was 90.1 (sttdev = 9.1). Mean grip strength in kilograms was observed to be 21.7 (stddev = 9.5). Mean gait speed in meters/seconds was observed to be 0.77 (stddev = 0.3). Mean FEV1 or lung function was 1.8 units (stddev = 0.7). Mean DSST (cognitive score) was 31.5 (stddev = 13.9). Mean BMI in kg/m2 was 17.4 (stddev = 2.9). Mean follow up in years was 3.7 (stddev = 1.5).

**Table 2. Descriptive Statistics of Participant Characteristics**

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | N | Mean | Standard Deviation |
| Age at last contact (yrs) | 2038 | 90.1 | 8.7 |
| Age at enrollment (yrs) | 2038 | 86.4 | 9.1 |
| Grip Strength (kg) | 1969 | 21.7 | 9.5 |
| Gait Speed (m/s) | 1894 | 0.77 | 0.3 |
| FEV1 | 1629 | 1.8 | 0.7 |
| DSST | 1802 | 31.5 | 13.9 |
| BMI (kg/m2) | 1919 | 17.4 | 2.9 |
| Follow Up (yrs) | 2038 | 3.7 | 1.5 |

A series of PROC LOGISTIC functions were conducted to obtain crude and adjusted estimates of the association between low gait speed and alive mortality status (see Table 3). There was significant evidence that those who were identified to have low gait speed had 18% decreased odds of being alive at the end of the study in comparison to those who did not (OR = 0.18, 95% CI: 0.14 – 0.23). Those who were identified to have low gait speed had 18% decreased odds of being alive at the end of the study in comparison to those who were not, adjusting for BMI and was observed to be statistically significant as the null value of OR =1 did not fall within our 95% confidence interval (crude-OR = 0.18, 95% CI: 0.14 – 0.23). Those who were identified have low gait speed had 17% decreased odds of being alive at the end of the study period in comparison to those who did not, adjusting for sex, and was observed to be statistically significant as the null value (OR = 1) was not found in our 95% confidence interval (crude-OR = 0.17, 95% CI: 0.13-0.21). Those who were identified to have low gait speed had 23% decreased odds of being alive at the end of the study in comparison to those who did not and was observed to be statistically significant as our null value (OR = 1) was not found in the 95% confidence interval, adjusting for FEV1 (OR = 0.23, 95% CI: 0.18 – 0.30). Those who were observed to have low gait speed had 35% decreased odds of being alive at the end of the study in comparison to those who did not and was observed to be statistically significant as the null value was not observed in our 95% Confidence Interval, adjusting for DSST (OR = 0.35, 95% CI: 0.27 – 0.45). Those who were observed to have low gait speed had 18% decreased odds of being alive at the end of the study in comparison to those who did not and was observed to be statistically significant as the null value was not observed in the 95% Confidence Interval, adjusting for smoke status (OR = 0.18, 95% CI: 0.15 – 0.23). Those who were identified to have low gait speed had 74% decreased odds of being alive at the end of the study in comparison to those who did not and was observed to not be statistically significant as the null value (OR = 1) was observed in the 95% Confidence Interval, adjusting for BMI, sex, FEV1, DSST, and smoke status (OR = 0.74, 95% CI: 0.47 – 1.17). Each of the observed covariates in the analysis were found to confound the association between low gait speed and alive mortality status as the percent change in estimates was >10% (see Table 3).

**Table 3. Odds Ratio Estimates Between Low Gait Speed and Alive Mortality Status with Various Covariates**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Odd Ratio Estimate of Low Gait Speed with Alive Mortality Status | | | 95% Confidence Interval |  |
| Low Gait Speed | 0.18 | | | 0.14 – 0.23 |  |
| Crude and Adjusted Estimates of Low Gait Speed with Various Covariates | | | | | |
| Covariate | Crude Odds Ratio Estimate | 95% Confidence Interval | Adjusted Odds Ratio Estimate | 95% Confidence Interval | Percent Change in Odds Ratio Estimates |
| Low Gait Speed |  |  | 0.74 | 0.47 - 1.17 |  |
| BMI | 0.18 | 0.14 – 0.23 |  |  | 75.7% |
| Sex | 0.17 | 0.13 – 0.21 |  |  | 77.0% |
| FEV1 | 0.23 | 0.18 – 0.30 |  |  | 68.9% |
| DSST | 0.35 | 0.27 – 0.45 |  |  | 52.7% |
| Smoke Status | 0.18 | 0.15 – 0.23 |  |  | 75.7% |

A PROC LOGISTIC function was conducted to perform a multivariable logistic regression model observing the association between low gait speed and alive mortality status adjusting for BMI, sex, FEV1, DSST, and smoke status with interaction between sex and low gait speed (see Table 4). Since the interaction term not significant (p-value = 0.6691), sex and low gait speed are not associated with alive mortality status, but the effect of low gait speed, on average, decreases with sex (ß = -0.16) (see Table 4). There was no significant evidence that males with low gait speed had 86% decreased odds of being alive at the end of the study in comparison to females (OR = 0.86, 95% CI: 0.45 – 1.67). There was no significant evidence that females with low gait speed had 73% decreased odds of being alive at the end of the study in comparison to males (OR = 0.73, 95% CI: 0.39 – 1.40) (see Table 4).

**Table 4. Interaction Logistic Regression Model of Sex on the Association Between Low Gait Speed and Alive Mortality Status**

|  |  |  |  |
| --- | --- | --- | --- |
| Likelihood Estimates of the Interaction Term | | | |
| Variable | Slope Estimate | Chi-Square | p-value |
| Sex\*Low Gait Speed | -0.16 | 0.18 | 0.6691 |
| Parameter Estimates of Male and Female Categories | | | |
| Sex | Odds Ratio Estimate | 95% Confidence Interval |  |
| Male | 0.86 | 0.45 – 1.67 |  |
| Female | 0.73 | 0.39 – 1.40 |  |

A PROC LOGISTIC function with a plots = all option was utilized to produce model-fit graphics and statistics for a multivariable logistic regression model observing the association between low gait speed and alive mortality status adjusting for BMI, DSST, Sex, FEV1, and Smoke Status (see Figure 1). The C-statistic was observed to be 0.821, which is close to 1, indicating the model is a very good fit for the data examined and is displayed in the graph (see Figure 1).

**Figure 1. Model Fit Graphic of Multivariable Logistic Regression Between Low Gait Speed and Alive Mortality Status Adjusting for BMI, DSST, Sex, FEV1, and Smoke Status**

**A screen shot of a graph

Description automatically generated**

**Conclusion**

We observed that there was significant evidence that low gait speed was associated with alive mortality status at the end of the study (OR = 0.18, 95% CI: 0.14 – 0.23) (see Table 3). We conducted crude and adjusted multivariable logistic regression analyses to determine if BMI, DSST, Sex, FEV1, and Smoke status confounded the association between low gait speed and alive mortality status. We observed that each observed covariate confounded the association between low gait speed and alive mortality status as the percent change in odds ratio estimates was >10% (see Table 3). We were interested to see if there were difference in alive mortality status between males and females using low gait speed as our exposure of interest. We observed that there was no significant difference between males and females in alive morality status, but the effect of low gait speed, on average, decreases with change in sex (ß = -0.16, p-value = 0.6691) (see Table 4). Finally, we observed if the multivariable logistic regression model observing the association between low gait speed and alive mortality status adjusting for BMI, DSST, Sex, Smoke Status and FEV1, fit the data well. We observed that the model fits the data very well as the observed C-statistic (C-statistic = 0.821) was very high (see Figure 1).

**Appendix**

proc import out = Project

datafile = '/home/u63114430/BS852/Final Project/project\_data.csv'

DBMS = CSV replace;

getnames = yes;

run;

Data new\_project;

set Project;

if 0 < gait\_speed < 0.6 then low\_speed = 1;

else if gait\_speed >= 0.6 then low\_speed = 0;

if alive = 'Yes' then alive = 1;

else if alive = 'No' then alive = 0;

if sex = 2 then sex = 1;

else if sex = 1 then sex = 0;

follow\_up = age\_last\_contact - age\_enrollment;

run;

/\* Creating Descriptive Statistic \*/

proc freq data = new\_project;

tables smoke high\_ed sex alive low\_speed;

run;

proc means data = new\_project n mean stddev;

var subject Age\_last\_contact Age\_enrollment grip\_strength gait\_speed fev1 DSST BMI follow\_up;

run;

/\* Model 1: Observing Association Between Low Gait Speed and Mortality \*/

proc logistic data = new\_project descending;

class low\_speed (ref = '0')/param = ref;

model alive (event = '1') = low\_speed;

run;

/\* Crude Analysis of Low\_Speed and BMI (Compare with Model 1) \*/

proc logistic data = new\_project descending;

title 'Low\_Speed Gait and BMI';

class low\_speed (ref = '0')/param = ref;

model alive (event = '1') = low\_speed BMI;

run;

/\* Crude Analysis of Low\_Speed and Sex \*/

proc logistic data = new\_project descending;

title 'Low Speed Gait and Sex';

class low\_speed (ref = '0') sex (ref = '0')/param = ref;

model alive (event = '1') = low\_speed sex;

run;

/\* Crude Analysis of Low\_Speed and FEV1 \*/

proc logistic data = new\_project descending;

title 'Low Speed Gait and FEV1';

class low\_speed (ref = '0')/param = ref;

model alive (event = '1') = low\_speed FEV1;

run;

/\* Crude Analysis of Low\_Speed and DSST \*/

proc logistic data = new\_project descending;

title 'Low Speed Gait and DSST';

class low\_speed (ref = '0') /param = ref;

model alive (event = '1') = low\_speed DSST;

run;

/\* Crude Analysis of Low\_Speed and SMOKE \*/

proc logistic data = new\_project descending;

title 'Low Speed Gait and Smoke';

class low\_speed (ref = '0') smoke (ref = '0') /param = ref;

model alive (event = '1') = low\_speed smoke;

run;

/\* Adjusted Analysis Between Low Gait Speed and Mortality \*/

proc logistic data = new\_project plots=all descending;

class low\_speed (ref = '0') high\_ed (ref = '0') sex (ref = '0') smoke (ref = '0') /param = ref;

model alive (event = '1') = low\_speed smoke sex gait\_speed fev1 DSST BMI;

run;

/\* Difference between Males and Females Interaction Model Survival Analysis may be good here too \*/

proc logistic data = new\_project descending;

class low\_speed (ref = '0') high\_ed (ref = '0') sex (ref = '0') smoke (ref = '0') /param = ref;

model alive (event = '1') = follow\_up grip\_strength gait\_speed fev1 DSST BMI sex|low\_speed;

estimate 'Male' low\_speed 1/ exp cl;

estimate 'Female' low\_speed 1 low\_speed\*sex 1/ exp cl;

run;