George Mason University

Master of Health Informatics

HAP 719

Association Between Chronic Health Conditions and Demographic Characteristics on Falls

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Association Between Chronic Health Conditions and Demographic Characteristics on Falls

Introduction

The National Center for Health Statistics collected data on U.S. residents living in residential care settings in 2010. The collection was named the 2010 National Survey of Residential Care Facilities (NSRCF) and was conducted via proxy interviews with facility administrators, not directly with the residents. The data collected on residents included residents ' demographics, living arrangements, activities, health conditions (both physical and mental), cognitive and physical functioning, as well as services received [1].

The objective of this study is to further analyze the data collected through the NSRCF. The analysis will examine the descriptive statistics and relationship between independent variables (chronic health conditions and demographic characteristics) and the dependent variable (falls).

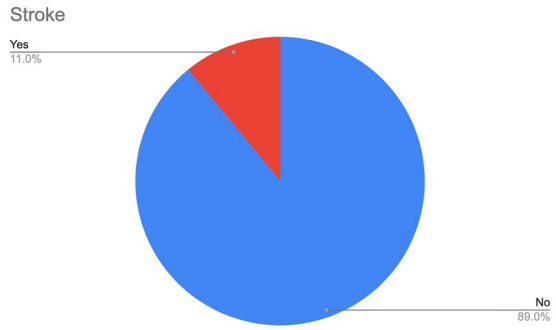
The hypothesis stands that increased chronic health condition frequency will positively affect fall rate, gender difference will not affect fall rate, increased age will positively affect fall rate, and an increased Medicaid access will negatively affect fall rate.

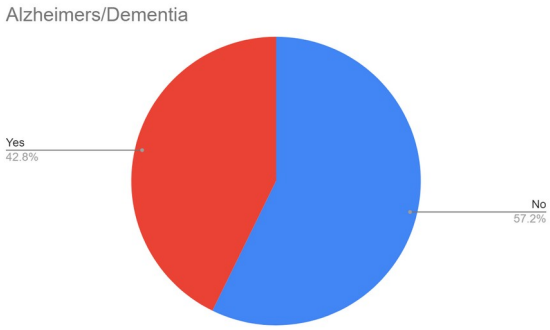
Methods

STATA, a statistical analysis software, was used to conduct descriptive statistics and statistical hypothesis testing. Since each variable is categorical, logistic regression method was used to find any significant association. Pie charts were created for visualization using Google sheets.

Sample

The sample size (n) consists of 7,903 records.





Stroke: 867 (10.97%) of residents HAD a stroke. Whereas 7,036 (89.03%) residents DIDN'T HAVE a stroke.

Alzheimer's/Dementia: 3,379 (42.76%) of residents HAVE Alzheimer's or dementia. Whereas 4,524 (57.24%) residents DON'T HAVE Alzheimer's or dementia.

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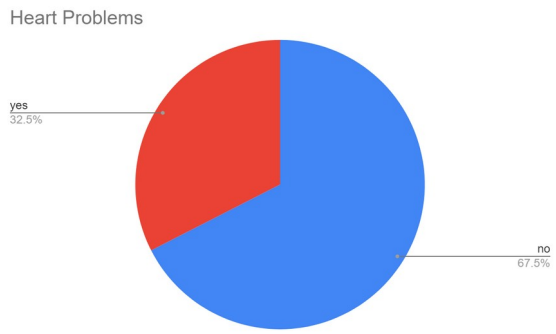
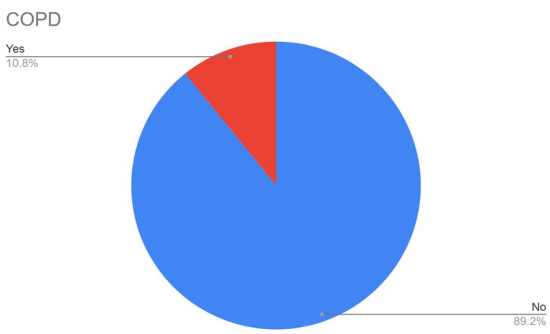
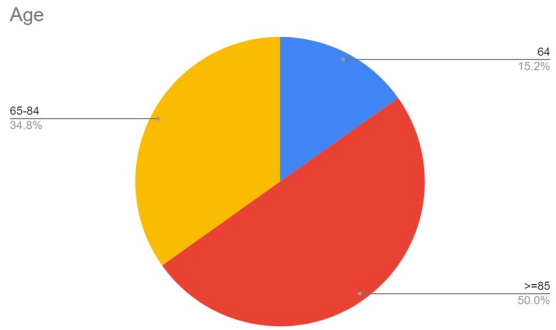
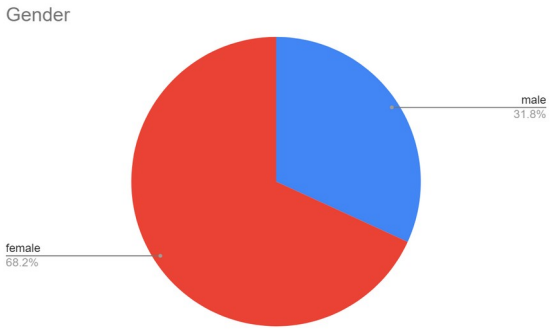




Heart Problems: 2,570 (32.52%) of residents HAVE heart problems. Whereas 5,333 (67.48%) residents DON'T HAVE heart problems.

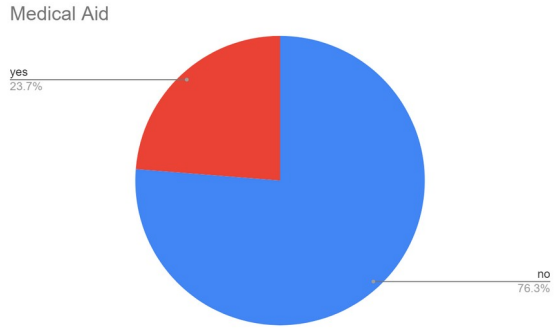
COPD: 855 (10.82%) of residents HAVE COPD. Whereas 7,048 (89.18%) residents DON'T HAVE COPD.

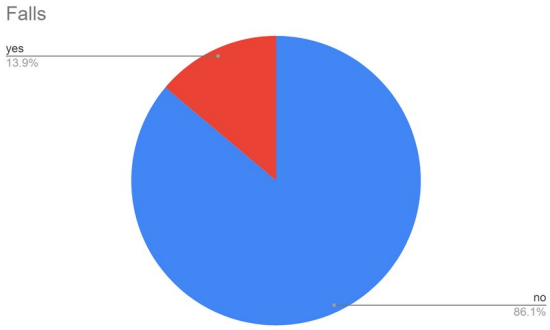




Age: 1,200 (15.18%) of residents are aged 64. 2,754 (34.85%) of residents are between the ages of 65 and 84. 3,949 (49.97%) of residents are either older than or equal to the age of 85.

Gender: 2,516 (31.84%) of residents are male. Whereas, 5,387 (68.16%) residents are female.





Medical Aid: 1,876 (23.74%) of residents HAVE medical expenses paid by Medicaid. Whereas 6,027 (76.26%) of residents DON'T HAVE medical expenses paid by Medicaid.

Falls: 1.096 (13.87%) of residents HAD falls. Whereas 6,807 (86.13%) residents DIDN'T

HAVE falls.

Hypothesis Testing

Logistic regression modeling was used to find the effect of the independent variable(s) on the dependent variable.

Ho Null hypothesis: There is no significant association between the independent (chronic health conditions or demographic characteristics) and the dependent variable (falls).

Ha Alternative hypothesis: There is significant association between the independent (chronic health conditions or demographic characteristics) and the dependent variable (falls).

If the p-value is more than 0.05, the null hypothesis will be accepted and the alternate hypothesis will be rejected.

If the p-value is less than 0.05, the null hypothesis will be rejected and the alternate hypothesis will be accepted.

When CI has a value of 1 or exceeds the value of 1 then there is not sufficient evidence for statistically significant association between the two variables.

When CI has a value less than 1 then there is significant evidence for statistically significant association between the 2 variables.

Logistic Regression of Falls and Stroke

```
Logistic regression                                     Number of obs =  7,903
                                                        LR chi2(1)    =   0.02
                                                        Prob > chi2   = 0.8974
Log likelihood = -3181.4456                             Pseudo R2     = 0.0000
```

falls	Odds ratio	Std. err.	z	P>|z|	[95% conf.	interval]
stroke	1.013557	.1059584	0.13	0.898	.8257768	1.244038
_cons	.1569629	.0314512	-9.24	0.000	.1059836	.2324639

Number of obs = 7,903, The sample size includes 7,903 observations.

LR chi2(1) = 0.02: This is the likelihood ratio chi-square test which tells us that its value is 0.02 with a p-value of 0.8974 meaning that the model produced above as a whole doesn't fit significantly better than an empty model. Model doesn't have any predictors and isn't a good model.

Odds Ratio of 1.01: Residents who were reported as having a stroke are 1.01 times more likely to experience a fall than residents who weren't. The p-value is 0.898 which means the findings

aren't significant (P> |z|). Additionally, the 95% CI for the odds ratios ranges from 0.826 to 1.24, containing the value of 1. This confirms that the odds ratio value isn't statistically significant.

Logistic Regression of Falls and Alzheimer's/Dementia

```
Logistic regression                                     Number of obs =  7,903
                                                        LR chi2(1)    =  35.81
                                                        Prob > chi2   = 0.0000
Log likelihood = -3163.5501                             Pseudo R2     = 0.0056

------------------------------------------------------------------------------
       falls | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
         alz |   .6765762    .044143    -5.99   0.000     .5953609    .7688703
       _cons |   .2936137   .0303407   -11.86   0.000     .2397822    .3595304
------------------------------------------------------------------------------
```

Number of obs = 7,903, The sample size includes 7,903 observations.

LR chi2(1) = 35.81: This is the likelihood ratio chi-square test which tells us that its value is 35.81 with a p-value of 0.000 meaning that the model produced above as a whole does fit significantly better than an empty model. Model has predictors and is a good model.

Odds Ratio of 0.677: Residents who were reported as having Alzheimer's or dementia are 0.677 times less likely to experience a fall than residents who weren't. The p-value is 0.000 which means the findings are significant (P< |z|). Additionally, the 95% CI for the odds ratios ranges from 0.595 to 0.769, not containing the value of 1. This confirms that the odds ratio value is statistically significant.

Logistic Regression of Falls and Heart Problems

```
Logistic regression                                     Number of obs =  7,903
                                                        LR chi2(1)    =  11.19
                                                        Prob > chi2   = 0.0008
Log likelihood = -3175.8575                             Pseudo R2     = 0.0018

------------------------------------------------------------------------------
       falls | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       heart |   1.256679   .0851731     3.37   0.001     1.100355     1.43521
       _cons |   .1488583   .0060697   -46.71   0.000     .1374248    .1612429
------------------------------------------------------------------------------
```

Number of obs = 7,903, The sample size includes 7,903 observations.

LR chi2(1) = 11.19: This is the likelihood ratio chi-square test which tells us that its value is 11.19 with a p-value of 0.0008 meaning that the model produced above as a whole does fit

significantly better than an empty model. Model does have predictors and is a good model.

Odds Ratio of 1.26: Residents who were reported as having heart problems are 1.26 times more likely to experience a fall than residents who weren't. The p-value is 0.001 which means the findings are significant (P< |z|). Additionally, the 95% CI for the odds ratios ranges from 1.10 to 1.44, not containing the value of 1. This confirms that the odds ratio value is statistically significant.

Logistic Regression of Falls and COPD

```
Logistic regression                                     Number of obs =  7,903
                                                        LR chi2(1)    =   0.35
                                                        Prob > chi2   = 0.5570
Log likelihood = -3181.2814                             Pseudo R2     = 0.0001
```

falls	Odds ratio	Std. err.	z	P>|z|	[95% conf.	interval]
copd	1.064261	.1135294	0.58	0.559	.8634685	1.311745
_cons	.1430958	.0293159	-9.49	0.000	.0957728	.2138018

Number of obs = 7,903, The sample size includes 7,903 observations.

LR chi2(1) = 0.35: This is the likelihood ratio chi-square test which tells us that its value is 0.35 with a p-value of 0.557 meaning that the model produced above as a whole doesn't fit significantly better than an empty model. Model doesn't have any predictors and isn't a good model.

Odds Ratio of 1.06: Residents who were reported as having COPD are 1.06 times more likely to experience a fall than residents who weren't. The p-value is 0.559. which means the findings aren't significant (P> |z|). Additionally, the 95% CI for the odds ratios ranges from 0.863 to 1.31, containing the value of 1. This confirms that the odds ratio value isn't statistically significant.

Logistic Regression of Falls and Age

```
Logistic regression                                     Number of obs =  7,903
                                                        LR chi2(2)    =  63.78
                                                        Prob > chi2   = 0.0000
Log likelihood = -3149.5652                             Pseudo R2     = 0.0100

------------------------------------------------------------------------------
       falls | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
         age |
       65-84 |   1.828433   .2235265     4.94   0.000     1.438863    2.323479
        >=85 |   2.333697    .272498     7.26   0.000     1.856319     2.93384
             |
       _cons |   .0830325    .009009   -22.94   0.000     .0671264    .1027077
------------------------------------------------------------------------------
```

Number of obs = 7,903, The sample size includes 7,903 observations.

LR chi2(1) = 63.78: This is the likelihood ratio chi-square test which tells us that its value is 63.78 with a p-value of 0.0000 meaning that the model produced above as a whole does fit significantly better than an empty model. Model does have predictors and is a good model.

Odds Ratio of 1.82: Residents between the ages of 65-84 are 1.82 times more likely to experience a fall than residents at age 64 (reference group). The p-value is 0.000 which means the findings are significant (P< |z|). Additionally, the 95% CI for the odds ratios ranges from 1.44 to 2.32, not containing the value of 1. This confirms that the odds ratio value is statistically significant.

Logistic Regression of Falls and Gender

```
Logistic regression                                     Number of obs =  7,903
                                                        LR chi2(1)    =  47.19
                                                        Prob > chi2   = 0.0000
Log likelihood = -3157.8598                             Pseudo R2     = 0.0074

------------------------------------------------------------------------------
       falls | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
      gender |
      female |   1.659408   .1263852     6.65   0.000       1.4293    1.926563
       _cons |   .1117985   .0074112   -33.05   0.000     .0981769    .1273101
------------------------------------------------------------------------------
```

Number of obs = 7,903, The sample size includes 7,903 observations.

LR chi2(1) = 47.19: This is the likelihood ratio chi-square test which tells us that its value is 47.19 with a p-value of 0.000 meaning that the model produced above as a whole does fit significantly better than an empty model. Model does have predictors and is a good model.

Odds Ratio of 1.66: Female residents are 1.66 times more likely to experience a fall than male residents (reference group). The p-value is 0.000 which means the findings are significant (P< |z|). Additionally, the 95% CI for the odds ratios ranges from 1.43 to 1.93, not containing the value of 1. This confirms that the odds ratio value is statistically significant.

Logistic Regression of Falls and Medicaid

```
Logistic regression                                     Number of obs =  7,903
                                                        LR chi2(1)    =   0.30
                                                        Prob > chi2   = 0.5825
Log likelihood = -3181.3028                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
       falls | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
    medicaid |   .9586045   .0739298    -0.55   0.584     .8241245    1.115029
       _cons |   .1626157    .006039   -48.91   0.000        .1512    .1748934
------------------------------------------------------------------------------
```

Number of obs = 7,903, The sample size includes 7,903 observations.

LR chi2(1) = 0.30: This is the likelihood ratio chi-square test which tells us that its value is 0.30 with a p-value of 0.583 meaning that the model produced above as a whole doesn't fit significantly better than an empty model. Model doesn't have any predictors and isn't a good model.

Odds Ratio of 0.959: Residents who were reported as having Medicaid coverage are 0.959 times less likely to experience a fall than residents who weren't. The p-value is 0.584. which means the findings aren't significant (P> |z|). Additionally, the 95% CI for the odds ratios ranges from 0.824 to 1.12, containing the value of 1. This confirms that the odds ratio value isn't statistically significant.

Results

After concluding analysis, it can be noted that 50% (2/4) of listed chronic health conditions and 66% (⅔) of demographic variables significantly indicate fall rate in U.S. residents living in residential care settings. Residents with Alzheimer's & dementia, or heart problems are at a greater risk for falling. Whereas the analysis did not find sufficient evidence to indicate a relationship between stroke or COPD rate and fall rate. Age positively correlates with the falling frequency, and female residents are at a greater risk of falling than male residents. Whereas the analysis did not find sufficient evidence to indicate a significant relationship between Medicaid assistance and fall rate.

Discussion

Though the data still stands as a good marker and is relevant, the NSRCF was conducted in 2010 which is now almost 10 years ago. The National Center for Health Statistics or another organization should conduct another round of surveys for the coming decade.

Conclusion

The United States will see a sharp increase in the number of people who need long-term care. Experts estimate that by 2050 the rate will increase to 27 million[1]. Although assisted living and residential care is an important and growing segment of the long-term care industry, there is an information gap about these communities and their residents. The data used in this analysis helps to identify how residential care and assisted living communities can effectively meet the needs of elders and adults with disabilities and shape future long- term care policies. Continuous conduction of surveys like the NSRCF followed by thorough data analysis and delivery to key stakeholders will ensure quality of care that minimizes disparity.

References

1. U.S Department of Health and Human Services. (2010). *National Survey of Residential Care Facilities, National Health Care Surveys*. Retrieved from https://www.cdc.gov/nchs/data/nsrcf/nsrcf_brochure.pdf.