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The Associations between Selected Demographic, Socioeconomic, and Health Factors for Depression in Elderly Americans

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The Associations between Selected Demographic, Socioeconomic, and Health Factors for Depression in Elderly Americans

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A Capstone Submitted to the Graduate Faculty

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Abstract

The topic analyzed was the demographic, socioeconomic, and health factors that may influence the depression status of elderly Americans aged 60 years or older in 2021. Depression status was identified as being notified of having depression through identifiable depressive symptoms or clinical diagnosis. It is currently defined as a mood disorder that causes a persistent feeling of sadness, loss of interest, and long-term difficulty in day-to-day activities. Elderly depression has been prevalent due to complications regarding issues of wealth, health accessibility, and increased risk of cognitive issues. The dataset is from the 2021 Behavioral Risk Factor Surveillance System (BRFSS), which is composed of telephone interviews in all U.S. states (n = 85,398 depression respondents). Within the dataset, collected variables such as gender, race/ethnicity, marital status, income, education level, and health insurance status were used as model predictors to determine associations within elderly depression (i.e. individuals aged 60 years or older). It was found that all variables, excluding health insurance status, were found to be statistically significant predictors of depression in elderly Americans (p<0.0001). However, through multiple logistic regression, a model containing all selected variables, including health insurance, was found to have the best prediction for depression. Disadvantaged demographic and socioeconomic groups such as being female, never married/separated, lower household income class, and having a low education status were found to increase the likelihood of depression in elderly Americans. Compared to most minorities, being white and non-Hispanic was also found to increase the likelihood of depression. This finding suggests that disparities are present within the American elderly population and that utilization of intervention programs can be targeted toward those at a higher risk for depression.

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Author's Page

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Chapter 1 Introduction

1.1 Summary

As people transition from adulthood into seniors, more concerning issues become apparent such as lower health status and decreased physical and mental capabilities. Seniors may be facing potential financial or social issues and also may experience coping with deaths from people that they care about. According to the World Health Organization, approximately 15% of adults aged 60 or older face a mental health problem and 7% have experienced unipolar depression [1]. It has also been noted that within current literature, depression has been linked to difficulties in social and cognitive processing, and conditions such as memory loss may be linked [2,3]. As a result, depression among the elderly remains a large issue within the U.S. and thus it is necessary to identify potential factors that may be associated with depression in order to explore different prevention methods and treatments.

Demographic differences may also be associated with disparities in depression status among the elderly, such as gender, race/ethnicity, and education level [4–6]. Throughout the

literature, these demographic factors have become apparent within both the elderly population and the population as a whole which contributes to the widening gap of populations most at risk for medical diagnosis of mental disorders and diminished mental health. Other factors within the environment of elderly American populations can also induce depression to occur such as socioeconomic factors and health concerns, which can prove to become fatal due to self-harm [7].

Certain socioeconomic and health factors amongst the elderly may also be associated with the development of depression. In particular, issues regarding low income and unaffordability to pay medical bills may cause increased levels of stress and anxiety which could lead to cases of depression [8,9]. Overall, such differences can cause inequalities to be present within the U. S. population, causing an overall decrease in the physical and mental health of disadvantaged populations.

1.2 Purpose

The purpose of this study is to determine the current demographic, socioeconomic, and health factors that are associated with depression status in elderly Americans aged 60 or older. By doing so, disadvantaged populations currently present amongst specific socioeconomic groups can be identified to gain a better understanding of depression dynamics amongst the elderly American population and investigate causal factors. It is also important to identify those factors that may influence depression amongst the elderly which can be useful for developing intervention strategies that would target the population most at risk within the U.S. The study, therefore, aims to analyze what specific populations have been significantly associated with the

development of depression. The studied population differences include race, gender, marital and social status, and health insurance status, and such knowledge will contribute to strengthening the overall existing literature on depression development in elderly Americans.

Chapter 2 Literature Review

2.1 Summary

Depression remains a serious public health issue in America causing high morbidity and mental health challenges among the elderly. Major disparities are present concerning certain demographic, socioeconomic, and health factors, which are associated with elderly depression status. This literature review investigated peer-review journals from PubMed and Google Scholar, through the Georgia State University library to interpret the demographic and socioeconomic risk factors associated with depression status in elderly adults over 60. Key search terminologies included elderly depression, social, economic, demographic, factors, questionnaire, and prevention strategies.

2.2 Demographic Factors

Within the literature, factors such as gender, marital status, race/ethnicity, have been suggested to be current predictors of depression within elderly populations. In particular, a research study regarding the use of Health for community survey (HCC) results for U. S. adults determined that major depressive disorder (MDD) was higher in women than men [10]. Another study done using responses from the National Comorbidity Study found that older women

report more depressive symptoms than older men within the U.S. [11]. In a larger scale study using the World Health Organization (WHO) survey responses, it was shown that in a cohort of people 65+, women had higher anxiety and mood disorders than men [4].

In the National Comorbidity Study, it was also reported that older married individuals appear to report fewer traumatic events and depressive symptoms than unmarried individuals [11]. In the other study done using the International Consortium of Psychiatric Epidemiology (ICPE) survey results, it was determined that unmarried individuals were more likely to experience depression than those married [12]. However, it appeared that there is limited research targeting associations between marital status and depression status specifically among the elderly.

The previously mentioned study regarding the use of HCC responses also found that African Americans have a lower lifetime prevalence of major depressive disorder (MDD) than whites but had a higher prevalence when a 12-month prevalence was measured [10]. This disparity of higher depression prevalence for whites compared to African Americans was explained due to elderly African Americans being less likely to receive therapy and are also less likely to receive a diagnosis for depression from a health care provider than non-Hispanic Whites [13]. In a different questionnaire study done for multiple biracial neighborhoods in Chicago, it was found that within the communities of adults 65 and older, Blacks were experiencing significantly more depressive symptoms than Whites [5].

2.3 Socioeconomic and Health Factors

Current literature regarding socioeconomic factors of income, education level, health insurance status, and signs of memory loss, have been determined to influence depression amongst elderly populations. A study done using data from national phone survey responses in

the U. S. determined that there was a significant association between income and depression status of adults aged 65+ [9]. Overall, household income in the U.S. tends to be a significant predictor of depression status with lower household income having higher depression prevalence, however, there are limited studies specifically targeting elderly U.S. populations [14].

Education level was also suggested to be a current predictor of depression amongst elderly Americans. In a study done in various areas of the U.S., an education level of fewer than 4 years of college was associated with a higher prevalence of depression [6]. However, there appeared to be a lack of current research studies in the past 5 years that focused on the association between education level and depression status.

Research within other countries reveals more current information regarding socioeconomic status within depressed elderly populations. A similar cross-sectional questionnaire study by Lee et al. has demonstrated that self-perceived health status, lower education level, and cognitive impairment were also significantly associated factors regarding elderly depression in Daejeon, South Korea [15]. Boen et al. revealed that income level and amount of social support were significantly associated with depression status among the elderly within Oslo [16].

There appeared to be limited research for associations between health insurance status and depression among elderly Americans. However, a study done using survey data from the health and retirement study (HRS) revealed that participants with private insurance status were significantly associated with lower depression prevalence than those without health insurance [8].

The currently available research involving the BRFSS dataset has not included the analyses of the demographic, socioeconomic, and health factors associated with depression in

elderly Americans, while BRFSS analyses of elderly Americans have been done before. In particular, a cross-sectional study by Gupta et al. utilized cohorts of elderly Americans aged 60 and older and compared associations in living alone, depression, and falls [17].

Overall, the literature highlights multiple socioeconomic, demographic, and health disparities within depression status among the elderly that have been determined through analysis of questionnaire responses. Within the questionnaire analysis, statistical methods have been used to determine which factors revealed statistical significance in elderly adults for various studied populations. Due to suggestive indications regarding evidence of an association between socioeconomic, demographic, and health factors, statistical analysis was done utilizing the selected factors.

2.4 Theoretical Concept

In the proposed theoretical model in Figure 1, within the psychosocial environment of elderly Americans, depression is impacted by demographic socioeconomic and health factors as mentioned within the literature review. Statistical analysis of current questionnaire data utilizing these factors is used to determine which groups within the U.S. are most affected. Through determined results, proposals of mental health intervention among targeted groups would be useful for giving adequate health treatment and reducing disparities present. The analysis of the 2021 U.S. questionnaire data was, therefore, the primary focus in determining current disparities among depression status in elderly Americans.

Chapter 3 Methods

3.1 Summary

Methods and design regarding statistical analysis of the selected demographic (gender, marital status, race/ethnicity), socioeconomic and health (income, education level, health insurance status) variables, and depression status among elderly Americans aged 60 and older were discussed. Georgia State University Institutional Review Board (IRB) approval is not required to use this public dataset since it is in the list of datasets pre-approved for such analysis by GSU.

3.2 Data Source

This study used data from the 2021 Behavioral Risk Factor Surveillance System (BRFSS) survey [18]. The BRFSS is a collaborative survey data collecting project between all states and focuses on collecting state-specific data on health risk behavior, chronic diseases and conditions, access to health care, and use of preventative health services for the causes of disease and disability in the United States. This was supported by the CDC and is conducted by collecting telephone-based survey responses which can then be utilized to determine possible associations between different factors and conditions.

3.3 Study Design

A cross-sectional study utilizing the BRFSS survey responses was used to determine potential associations between different demographic, socioeconomic, and health factors compared to the depression status of elderly aged 60+. The BRFSS dataset contains responses of the selected variables with a large sample size, which ensures more representative results within the U. S. It is also useful to utilize a cross-sectional study due to the constraint of time, resources, and reliability which is necessary to produce accurate results. Since the BRFSS 2021 dataset is available free online, no costs relating to data collection were necessary for the study. Data collection and analysis of the BRFSS dataset started on December 1st, 2022, and continued until March 1st. 2023. The research study was intended to finish by April 30th which allowed for adequate time to collect results. Costs for this study have been mainly time due to extensive statistical analysis and costs of the necessary software for data analysis and visualization of graphs. A personal computer was used to run the software.

The dependent variable was depression status based on the response of whether participants have been told they had depression. Depression here is defined as a mood disorder that causes a persistent feeling of sadness and loss of interest that causes long-term difficulty in day-to-day activities [1]. The independent variables were the selected demographic, socioeconomic, and health factors that were used to determine potential disparities within the dependent variable.

3.4 Dependent Variable

The outcome of this study was depression status among elderly Americans which was determined by if they have ever been told they have had depression from the BRFSS survey responses. As a result, the outcome is binary.

3.5 Independent Variables

The independent variables for the study were grouped based on demographic, socioeconomic, and health categories and most of them were categorial. Demographic variables included gender (male/female), marital status classified as married, divorced, widowed, separated, never married, and race/ethnicity classified as White non-Hispanic, Black non-Hispanic, Asian non-Hispanic, American Indian/Alaskan Native non-Hispanic, Hispanic, multiracial non-Hispanic, and other race non-Hispanic.

Socioeconomic factors included household income which was classified as Lower (0 - < $35,000), Middle ($35,000 - <$150,000), and High Class ($150,000 - >$200,000) based on 2018 pew research data [19]. Education level was classified as never attending school/only kindergarten, Grades 1-8, Grades 9-11, Grade 12 or GED, College 1-3 years, College 4 years or more.

The health factor included health insurance status which was classified as having some form of insurance or no form of insurance. These overall responses for both independent and dependent variables were self-reported on the 2021 BRFSS dataset.

3.6 Data Analysis

The dataset was exported from the BRFSS CDC website as an XPT file and run using the Statistical Analysis Software (SAS) version 9.4 [20]. Descriptive statistics were used in describing the distribution of elderly Americans aged 60 or more, the outcome variable of self-reported

depression status, and the independent variables: gender, marital status, race/ethnicity, income, education level, and health insurance status in 2021.

Individual and (then) multiple logistic regression models were fit to determine the potential associations between depression status and selected demographic, socioeconomic, and health factors. The χ^2 test was used for univariate analysis for pairwise comparisons between predictors. A p-value of < 0.05 was used to determine the presence of significant associations between depression status based on selected predictors within the elderly population. Odds ratio (OR) and 95% confidence intervals were calculated using logistic regression for each individual predictor and for a model containing all predictors. The Akaike information criterion (AIC) values were calculated to compare the considered predictive models for depression.

Chapter 4 Results

4.1 Characteristics of Study Participants

The overall study sample of elderly Americans aged 60 and older consisted of 146,247 participants (24,685 elderly Americans with depression and 121,562 without depression). All categories had either refusal and don't know/not sure (DK/NS) responses of less than 5% of the study population, except for household income, and were excluded from the study (DK/NS = 8.58%, refused = 15.84%). Elderly Americans with depression represented 16.88% of the study population compared to 83.12% without depression.

The distribution of sex was significantly different between depression groups (p<0.0001). Male elderly Americans represented 33.18% of those with depression compared to 49.24% of male elderly Americans of those without depression. Female elderly Americans represented a higher percentage of 66.82% of those with depression compared to 50.76% of female elderly Americans of those without depression (Table 1).

The distribution of marital status between groups of depression in elderly Americans was significantly different (p<0.0001). The majority of the study population were married followed by divorced, and widowed, with the minority being never married and separated for both depression status groups. The largest difference between depression groups was in married and divorced elderly Americans. Married elderly Americans represented 44.94% of those with depression compared to 57.04% of married elderly Americans without depression. Divorced elderly Americans represented 23.34% of those with depression compared to 14.56% of divorced elderly Americans without depression. Only married elderly Americans amongst marital status categories had a lower percentage of those depressed compared to those without depression (Table 1).

The distribution of race/ethnicity in elderly Americans was statistically significant between groups of depression, especially in Black and Asian non-Hispanics (p<0.0001). The majority of the population was White, followed by Black and Hispanic, with the minority being other race non-Hispanic and Hawaiian/Pacific Islander for both depression status groups. Black non-Hispanics represented 4.82% of those with depression compared to 6.96% of Black non-Hispanics without depression. Asian non-Hispanics represented 0.59% of those with depression compared to 1.58% of Asian non-Hispanics without depression. White non-Hispanics, Multiracial non-Hispanics, and Hispanics were the only groups with higher percentages of those with depression than those without depression (Table 1).

The distribution of household income in elderly Americans between groups of depression was significantly different (p<0.0001). The majority of the population was middle and lower class, with a minority in the higher class for household income for both depression

status groups. The middle class represented 50.54% of those with depression compared to 60.71% without depression. The lower class represented 44.95% of those with depression, compared to 31.32% without depression. The higher class represented 4.51% of those with depression compared to 7.97% of those without depression. Only the lower class had a lower percentage of those with depression compared to those without (Table 1).

The distribution of education level in elderly Americans between groups of depression was statistically significant, especially for the highest levels of education (p<0.0001). The population was distributed based on descending education with the highest percentage being those with the highest education of 4 years of college or more for both depression status groups. Those with 4 years of college or more with depression represented 38.47% compared to 40.94% without depression. Those with 1-3 years of college with depression represented 30.93% compared to 27.94% of those without depression. Elderly Americans with the highest education of 4 or more years of college and Grades 12 or GED were the only levels that have a lower percentage of those with depression compared to those without (Table 1).

The distribution of health insurance status in elderly Americans between groups of depression was the only predictor that was not statistically significant (p=0.8876). Those with health insurance represented a higher percentage of elderly Americans with insurance compared to those without insurance (98.4% vs 1.6%), however, percentages were identical between those with depression and those without depression. These descriptive characteristics are shown in Tables 1 and 3.

4.2 Data Analysis

To determine if interactions may be occurring between variables, pairwise chi-square analysis between predictor variables was done and each designated pair was statistically different as shown in Table 2 (p<0.0001).

The result of individual logistic regression for each selected predictor was shown in Table 3. By studying the association of depression in elderly Americans through logistic regression, selected predictors of sex, marital status, race/ethnicity, household income, and education. Among sex, females have about 2 times the odds of being depressed compared to the odds of males, and this was a significant difference (OR=1.954, CI=1.898-2.011).

Among marital status, divorced, never married, separated, and widowed elderly Americans all had increased odds compared to married elderly Americans (OR=2.035, 1.546, 2.42, 1.318). Of these, all had significantly increased odds with Separated elderly Americans having the highest increased odds (CI=1.963-2.109, 1.468-1.627, 2.185-2.683, 1.271-1.366).

Among race/ethnicity, only Multiracial non-Hispanic elderly Americans had significantly increased odds of being depressed compared to the odds of White non-Hispanics (OR=1.27, CI=1.147-1.412). Black non-Hispanics, Asian non-Hispanics, and Hawaiian/Pacific Islanders had significantly decreased odds of being depressed compared to the odds of White non-Hispanics (OR=0.673, 0.361, 0.578; CI= 0.633-0.717, 0.304-0.427, 0.421-0.793). There were no significant odds differences in being depressed for American Indian/Alaskan non-Hispanic, Multiracial non-Hispanics, and Hispanics vs White non-Hispanics.

Among different classes of household income, lower and middle-class elderly Americans have increased odds of depression compared to higher-class elderly Americans (OR=2.536,

1.471). These associations of being depressed were both statistically significant compared to the higher class (CI= 2.375-2.708, 1.379-1.570).

Among education levels, elderly Americans with an education level of grade 12 or GED was the only level with decreased odds of depression compared to odds of 4 years of college or higher (OR=0.983 CI=0.949-1.019). Highest education levels of grades 1-8, 9-11, and 1-3 years of college had significantly increased odds of depression compared to odds of 4 years of college or higher (OR=1.421,1.315,1.178; CI=1.324-1.525, 1.184-1.460, 1.140-1.218). There was no significant difference in odds of depression by health insurance status for elderly Americans (OR=1.008, CI=0.904-1.124).

Logistic regression was done to fit a model using the following predictors simultaneously: sex, marital status, race/ethnicity, household income, education, and health plan, as shown in Table 4. . Major differences between individual and multiple logistic regression for depression odds were also noted. Among marital status, widowed vs married elderly Americans have decreased odds for depression (OR=0.951, CI=0.914-0.989). Among races, only other races vs White non-Hispanics had insignificant odds for depression (OR=1.058, CI=0.910-1.229). Among education, only Grades 12 or GED vs 4 years of college was found to be significant in terms of odds of depression (OR=0.785. CI= 0.755-0.815). Another difference noted was statistical significance by health insurance status with decreased odds of depression for no insurance vs insurance in elderly Americans (OR=0.867, CI=0.776-0.969). Other models that included interaction variables were also considered in Table 5 and the full model containing no interaction variables had the lowest AIC value which was presented in Table 4 (AIC=127,577.04).

Chapter 5 Discussion

5.1 Discussion/Explanation

The distribution of the population (elderly Americans older than 60) in Figure 2 was similar to the U. S. population, regarding categories of demographic and socioeconomic factors. According to the U. S. Census Bureau, categories of sex, marital status, household income, race/ethnicity, and education level were accurate with the distribution of the study population [21]. The distribution of the overall U.S. population was not similar for health insurance status due to lower uninsured rates of the overall population, however, it was similar to Americans 65 and older [22]. Therefore, study results are considered representative of the U. S. population distribution.

As a result of our analysis, statistically significant differences in selected demographic and socioeconomic groups between elderly Americans with and without depression were found, however, differences in health insurance status were not significant in Table 1. This was

expected as the current literature emphasizes these disparities in depression for elderly Americans, which was noted in the literature review [8-17]. It was also noted that there was not much research evidence to support a significant difference in health insurance status regarding survey analysis; however, the understanding that those without health insurance would be less likely to be diagnosed with depression determined that the predictor should still be analyzed for logistic regression [23]. The results for Table 2 determined that interaction variables may be useful to include within the multiple logistic regression model.

Through individual logistic regression, significant odds of depression were found in all predictors, excluding health insurance status, in Table 3. All significant predictors were found to be risk factors when compared to reference values except Race/Ethnicity which was protective vs White-non-Hispanics. This may be caused by the stigma that racial/ethnic individuals are less inclined to reach out to services that diagnose mental health conditions such as depression, due to cultural differences as opposed to White non-Hispanic individuals [24]. Therefore, this supported the idea that White-non-Hispanic Americans would therefore be significantly more at risk for depression based on higher amounts of medical/psychological diagnosis.

Through multiple logistic regression which included all predictors in the logistic model, results of significant odds were relatively similar, however, health insurance status was found to be significant under this logistic model. The rationale for the utilization of this model was noted in Table 5 since the full model had the lowest AIC value which translates to the best-fit model. Within the literature, notable research supported the use of interaction variables in logistic models that can be used for predicting depression which was included and compared in Table 5

[25-29]. However, interaction variables were deemed not suitable for predicting depression in elderly Americans due to the higher AIC values of the corresponding models.

5.2 Limitations

Challenges that were present when conducting the study include the fact that it was a cross-sectional study for only the 2021 dataset, which only tracked associations captured at one point in time. Due to the lack of time for the study, this was adequate enough to draw the presented preliminary conclusions regarding associations in depression status among elderly Americans. Future considerations could be analyzing data regarding prior years of 2021 to determine whether they had the same associations found within the current study. Although the non-responses were kept at a minimum regarding survey questions, percentages of household income were relatively high which may cause the association of depression to income to be less representative of the U.S. population (i.e. Don't Know/Not Sure was 8.6% and Refused was 15.84%). The other challenge of the study was that participants' responses are self-reported, therefore people who may have replied yes to the depression survey question could not actually have a medical diagnosis of depression. This could therefore alter results and make it difficult to draw conclusions regarding depression status.

5.3 Conclusion

The study was important since it investigated how certain demographic, socioeconomic, and health variables are able to impact the development of depression in elderly Americans. Elderly populations in America have the highest suicide rates and the development of depression is known to cause an increased risk of suicide [30]. Through analysis of different variables contributing to the development of depression, it suggested that there are

disadvantaged groups at higher risk of depression and that disparities do exist within the American elderly population. Therefore, the study reinforced the need for interventions to target the most affected groups which can focus on reducing disparities and providing specific individuals with the treatments/education they need.

Appendix A: Tables

Table 1. Pairwise Chi-Square Analysis of Selected Predictors for Depression			
Participant Predictors (n=146,247)	**Depression Yes (n = 24,685)(%)**	**Depression No (n = 121,562)(%)**	**X^2(P-Value)**
Sex (%)			2,128(<0.0001)
Male	8,191(33.18)	59,863(49.24)	
Female	16,494(66.82)	61,699(50.76)	
Marital Status(%)			1,768(<0.0001)
Married	11,094(44.94)	69,343(57.04)	
Divorced	5,761(23.34)	17,699(14.56)	
Widowed	5,179(20.98)	24,568(20.21)	
Separated	526(2.13)	1,358(1.12)	
Never Married	2,125(8.61)	8,594(7.07)	

Race/Ethnicity (%)			342(<0.0001)
White NH	21,270(86.17)	101,757(83.71)	
Black NH	1,191(4.82)	8,461(6.96)	
American Indian/Alaskan NH	335(1.36)	1,606(1.32)	
Asian NH	145(0.59)	1,924(1.58)	
Hawaiian/Pacific Islander NH	43(0.17)	356(0.29)	
Other race NH	220(0.89)	977(0.80)	
Multiracial NH	461(1.87)	1,733(1.43)	
Hispanic	1,020(4.13)	4,748(3.91)	
Household Income (%)			1,826(<0.0001)
Higher Class ($150,000-<$200,000)	1,113(4.51)	9,686(7.97)	
Middle Class ($35,000 - <$150,000)	12,475(50.54)	73,797(60.71)	
Lower Class ($0 - < $35,000)	11,097(44.95)	38,079(31.32)	
Education (%)			217(<0.0001)
College 4 or more years	9,496(38.47)	49,768(40.94)	
College 1-3 years	7,634(30.93)	33,964(27.94)	
Grades 12 or GED	5,993(24.28)	31,938(26.27)	
Grades 9-11	1,076(4.36)	3,969(3.27)	
Grades 1-8	456(1.85)	1,818(1.50)	
Never attended/KG	30(0.12)	105(0.09)	
Health Plan (%)			0.02(0.8876)
Have insurance	24,288(98.39)	119,622(98.40)	
No insurance	397(1.61)	1,940(1.60)	
Total	16.88	83.12	

Missing, refused, Don't Know /Not Sure excluded from each predictor, column percentage of predictor counts indicated by parentheses

Table 2. Chi-Square Analysis and Pairwise Comparisons Between Selected Predictors				
Characteristic 1	**Characteristic 2**	**X^2**	**df**	**P-Value**
Sex	Marital Status	**6,302**	**4**	**<0.0001**
Sex	Race/Ethnicity	**287**	**7**	**<0.0001**
Sex	Household Income	**2,208**	**2**	**<0.0001**

Sex	Education	**501**	**5**	**<0.0001**
Sex	Health Plan	**67.5**	**1**	**<0.0001**
Marital	Race/Ethnicity	**3,759**	**28**	**<0.0001**
Marital	Household Income	**22,770**	**8**	**<0.0001**
Marital	Education	**4,250**	**20**	**<0.0001**
Marital	Health Plan	**773**	**4**	**<0.0001**
Race/Ethnicity	Household Income	**3,680**	**14**	**<0.0001**
Race/Ethnicity	Education	**11,437**	**35**	**<0.0001**
Race/Ethnicity	Health Plan	**900**	**7**	**<0.0001**
Household Income	Education	**23,396**	**10**	**<0.0001**
Household income	Health Plan	**1,010**	**2**	**<0.0001**
Education	Health Plan	**1,300**	**5**	**<0.0001**

Table 3.   Individual Logistic Regression of Depression with Single Selected Predictors

	OR	95% Confidence Interval		
Selected Predictor	**Estimate**	**Lower**	**Upper**	**P-value**
Sex Female Male	 1.954 Reference	 1.898 Reference	 2.011 Reference	<0.0001
Marital Status Divorced Never married Separated Widowed Married	 2.035 1.546 2.421 1.318 Reference	 1.963 1.468 2.185 1.271 Reference	 2.109 1.627 2.683 1.366 Reference	<0.0001

				<0.0001
Race/Ethnicity				<0.0001
Black NH	0.673	0.633	0.717	
American Indian/Alaskan NH	0.998	0.886	1.124	
Asian NH	0.361	0.304	0.427	
Hawaiian/Pacific Islander NH	0.578	0.421	0.793	
Other race NH	1.077	0.930	1.248	
Multiracial NH	1.273	1.147	1.412	
Hispanic	1.028	0.969	1.101	
White NH	Reference	Reference	Reference	
Household Income				<0.0001
Lower Class ($0 - < $35,000)	2.536	2.375	2.708	
Middle Class ($35,000 - <$150,000)	1.471	1.379	1.570	
Higher Class ($150,000-<$200,000)	Reference	Reference	Reference	
Education				<0.0001
Never attended/KG	1.498	0.998	2.249	
Grades 1-8	1.421	1.324	1.525	
Grades 9-11	1.315	1.184	1.460	
Grades 12 or GED	0.983	0.949	1.019	
College 1-3 years	1.178	1.140	1.218	
College 4 or more years	Reference	Reference	Reference	
Health Plan				0.8876
No insurance	1.008	0.904	1.124	
Insurance	Reference	Reference	Reference	

Table 4.   Multiple Logistic Regression of Depression With All Selected Predictors

	OR	95% Confidence Interval		
Predictor	**Estimate**	**Lower**	**Upper**	**P-Value**
Sex				<0.0001
Female	1.881	1.826	1.938	
Male	Reference	Reference	Reference	
Marital Status				<0.0001
Divorced	1.599	1.539	1.662	
Never married	1.333	1.263	1.407	
Separated	2.178	1.958	2.423	
Widowed	0.951	0.914	0.989	
Married	Reference	Reference	Reference	

|				
Race/Ethnicity				<0.0001
Black NH	0.531	0.498	0.567	
American Indian/Alaskan NH	0.827	0.733	0.933	
Asian NH	0.371	0.312	0.440	
Hawaiian/Pacific Islander NH	0.547	0.397	0.754	
Other race NH	1.058	0.910	1.229	
Multiracial NH	1.157	1.040	1.287	
Hispanic	0.838	0.779	0.903	
White NH	Reference	Reference	Reference	
Household Income				<0.0001
Lower Class ($0 - < $35,000)	2.181	2.031	2.342	
Middle Class ($35,000 - <$150,000)	1.351	1.265	1.444	
Higher Class ($150,000-<$200,000)	Reference	Reference	Reference	
Education				<0.0001
Never attended/KG	1.296	0.854	1.969	
Grades 1-8	1.020	0.912	1.141	
Grades 9-11	1.061	0.984	1.144	
Grades 12 or GED	0.785	0.755	0.815	
College 1-3 years	0.986	0.953	1.021	
College 4 or more years	Reference	Reference	Reference	
Health Plan				0.0122
No insurance	0.867	0.776	0.969	
Insurance	Reference	Reference	Reference	

Table 5.   Distinct Logistic Regression Models with Corresponding AIC Metric

Model	AIC Value
Depression = Sex, Marital, Race, Income, Education, Health Plan	127,577.04
Depression = Sex, Marital, Race, Income, Education	127,581.48
Depression = Sex, Marital, Sex*Marital	128,130.58
Depression = Race, Income, Education, Race*Income, Race*Education	130,267.80
Depression = Income, Education, Health Plan,	130,716.46

Income*Health Plan, Education*Health Plan	

Appendix B Figures
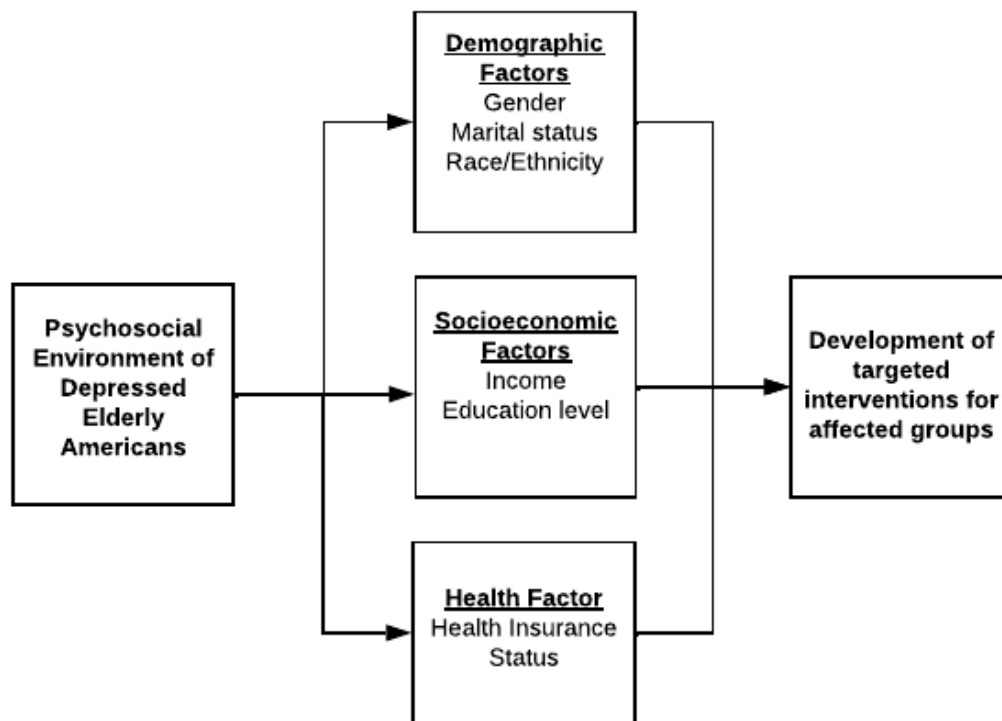
Figure 1. Theoretical framework of various factors affecting depression in elderly Americans
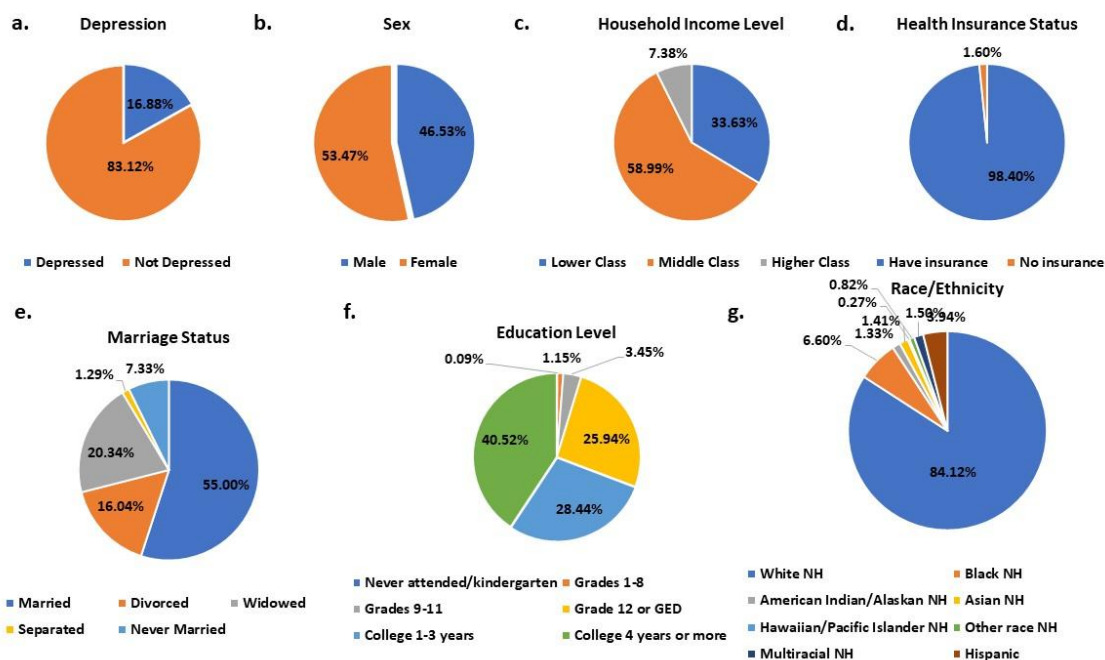
Figure 2. Distribution of Selected Characteristics in Study Population (n=146,247) (a) Percentage of elderly respondents classified by depression status. (b) Percentage of elderly respondents classified by sex. (c) Percent of elderly respondents classified by household income Level. (d) Percentage of elderly respondents classified by health insurance status. (e) Percentage of elderly respondents classified by marital Status (f) Percentage of elderly respondents classified by education Level. (g) Percentage of elderly respondents by race/ethnicity.

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