Original Research

Adjustment for Covariates of Major Depressive Episodes among Men and Women Aged 65 Years Old and Older

Areen Omary [1, *], Tameka Chambers [2]

1. Texas A&M University System, West Texas A&M University, 720 Tyler St., Amarillo, TX, USA; E-Mail: aomary@wtamu.edu
2. Purdue University, 515 W Cypress Creek Rd, Fort Lauderdale, FL, USA; E-Mail: micatlc@yahoo.com

* **Correspondence:** Areen Omary; E-Mail: aomary@wtamu.edu

Academic Editor: Calogero Caruso

Special Issue: Depression in Elderly

Abstract

The current study aimed to examine if sex can significantly predict risk for lifetime major depressive episodes among adults aged 65 and older with and without adjustment for covariate variables of race, education, marital status, health, and poverty. Secondary data was obtained from the National Survey on Drug Use and Health public-use data file to achieve study goals. The study participants were males and females aged 65 years or older. The unweighted sample included 3,969 adults aged 65 years or older, representing a weighted population size of 50,986,065.86 in the US. Lifetime major depressive episode.The study findings confirmed that sex could significantly predict risk for lifetime major depressive episodes among adults aged 65 or older *with and without adjustment for health determinants* of race, education, marital status, health, and poverty. Four of the five variables, including race, education, health, and poverty, were significant once as covariate variables adjusted for and once as predictor variables. In contrast, marital status was insignificant both as a covariate

and a predictor variable. Close attention is required to the adults aged 65 or older at risk for lifetime major depressive episode diagnosis, particularly women, to meet their unique needs.

1. Introduction

Depression is a depleting silent disease caused by the depletion of serotonin, norepinephrine, or dopamine in the central nervous system [1] which occurs in 7.2% of the US adult population [2]. It is also one of the most common mental health problems among the aging population and is considered a significant public health concern in the US among adults aged 65 or older. According to some estimates, it accounts for less than 1% to about 5% in the community but rises to 13.5% in older adults who require home healthcare and to 11.5% in older hospitalized patients [3]. Between 2018 and 2060, the number of Americans ages 65 and older is projected to nearly double from 52 million to 95 million. The 65-and-older age group's share of the total population will rise from 16 percent to 23 percent [4]. The increased rate in older populations translates to a more racially and ethnically diverse, more aging population, and a higher population rate with unique physical and mental health challenges that need to be addressed.

Depressive disorders – both major depressive disorder and subthreshold depressive symptoms – are the most common psychiatric disorders in adults aged 65 or older [5]. Moreover, depressive symptoms are often overlooked and untreated because they co-occur with other problems encountered by adults aged 65 or older [5]. Adults aged 65 or older with depressive symptoms have poorer functioning than those with chronic medical conditions such as lung disease, hypertension, or diabetes. Depression also increases the perception of poor health, the utilization of health care services, and costs [5]. Depression in older adults is associated with a more chronic course (i.e., higher rate of relapse), which is likely moderated by medical comorbidity. Moreover, cognitive deficits secondary to depressive disorders are often complex to differentiate from dementia and remain a tremendous clinical challenge. This is complicated because depressive disorders in adults aged 65 or older have been defined as risk factors or prodrome of neurodegenerative diseases, possibly reflecting underlying vascular and/or degenerative processes [6].

Individuals with late-life depression represent a heterogeneous group with symptoms that may fall anywhere on a spectrum ranging from a sub-threshold mood disorder to significant depression. Heterogeneity suggests that more covariates may impact the risk for major depression, including social determinants of health. Social determinants of health, which are the conditions in places where people are born, live, learn, work, and play, can profoundly impact their health, including their risk for major depression [7-9].

Evidence suggests that health determinants may change the risk for major depression among adults aged 65 or older [10]. Growing older requires accommodations that may influence self-worth and image and loss of spouse, friends and meaningful commodities for adults aged 65 or older [10]. Nevertheless, distinguishing the risk for major depression among men and women and the covariates that may influence the risk for depression are often overlooked among men and women

aged 65 or older and is drastically under-recognized, resulting in a lack of appropriate treatment diminished quality of life.

A robust literature about the higher prevalence of major depression among women over men has been documented [11-14]. With a progressively aging population, identifying covariate variables that impact the risk chances for men and women for depression becomes increasingly important due to the increased rate of the older population in the US. Although health determinants (e.g., race, education, marital status, health, and poverty) can influence the risk for depression among men and women aged 65 years or older [10, 15-17] to date, there is insufficient empirical evidence to conclude that health determinants impact the risk for major depression among adults aged 65 or older.

Identifying health determinants to assess risk among men and women at increased risk for major depression while adjusting for health determinants as covariates would allow delicate distinction between at-risk populations of adults aged 65 years or older to develop focused prevention programs to meet the needs of each population.

The present exploratory retrospective study has two objectives to address this gap in evidence: first, it aims to examine if sex can significantly predict risk for lifetime major depressive episode (MDE) among adults aged 65 and older while adjusting for race, education, marital status, health, and poverty as covariate variables. Second, to explore if sex can significantly predict risk for lifetime MDE among adults aged 65 and older without adjustment for the covariate variables of race, education, marital status, health, and poverty.

2. Materials and Methods

2.1 Data Source

This study's data were obtained from the 2018 National Survey on Drug Use and Health (NSDUH) public-use file of the Substance Abuse and Mental Health Services Administration. The NSDUH is the primary and nationally representative source of annual estimates of illicit drugs, alcohol, and tobacco use among the noninstitutionalized US population (including civilians living on military bases) aged 12 and older. The NSDUH includes modules focusing on mental health problems, and most questions are administered using audio computer-assisted self-interviewing. This method is designed to provide the respondent with a highly private and confidential mode for responding to questions to increase the level of honest reporting about illicit drug use, mental health problems, and other sensitive behaviors [18]. The survey enables users to produce estimates of demographic characteristics, drug and alcohol use, and mental health problems from national, regional, state, and sub-state areas; the present study used public-use data and documentation from the NSDUH 2018 survey (*http://www.datafiles.samhsa.gov*).

2.2 Study Population

The public-use data file contained 56,313 records of noninstitutionalized individuals, representing a weighted population of 273,753,042.56 in the US. The study participants were males and females aged 65 years or older. The unweighted sample included 3,969 adults aged 65 years or older, representing a weighted population size of 50,986,065.86 in the US.

2.3 Data Coding

All NSDUH records of 18 years and older were included in the study. Records of adults aged 65 years or older were coded as "1" while others were coded as "0". The main independent variable was sex that included two groups: males and females. Covariate variables included race, education, marital status, health, and poverty (Flow Diagram 1). Race variable included White, Black/African American, Native American/Alaskan Native, Native Hawaiian/other Pacific Islander, Asian American, more than one race, and Hispanic American; education level was categorized into five groups (less than high school, high school graduate, college/associate degree, college graduate, and aged 12–17 years); marital status included four groups: single, divorced,/separated, widowed and married; health was assessed by asking the individual to describe his general health. Responses were divided into four categories: fair/poor, good, very good, and excellent; and poverty predictor into three levels: living in poverty, income up to twice the federal poverty threshold, and income more than twice the federal poverty threshold. In the NSDUH, poverty was measured by the family income relative to poverty thresholds. The US Census Bureau assigns a poverty threshold for each combination of family size and the number of children in the household. To be at 100% of the poverty threshold is equivalent to having a family income similar to the poverty threshold. A poverty level of less than 100% indicates having a family income less than the poverty threshold and, therefore, as defined by the Federal government, living in poverty. A greater than 100% poverty level means a greater family income than the poverty threshold [18]. Because the study included only participants aged 65 years or older, category five in education level (those aged 12–17 years) were coded "0" and excluded from further analysis.
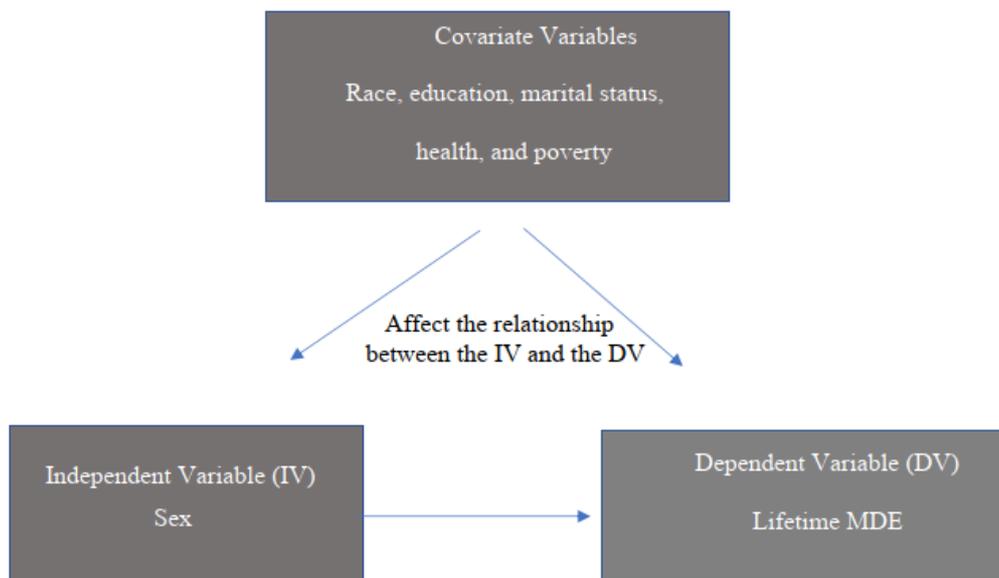

Diagram 1 Flow chart of the analysis of predictors and covariates of lifetime MDE in adults aged 65 and older.

The outcome variable was lifetime MDE. Adults aged 65 years or older were considered to have a lifetime MDE if they reported at least five or more of the following nine symptoms nearly every day in the same 2-week period within their lifetime, in which at least one was either of the first two factors: (1) depressed mood most of the day; (2) markedly diminished interest or pleasure in all or almost all activities most of the day; (3) significant weight loss or gain when not dieting, or decrease or increase in appetite; (4) insomnia or hypersomnia; (5) psychomotor agitation or retardation; (6) fatigue or loss of energy; (7) feelings of worthlessness; (8) diminished ability to think or concentrate or indecisiveness; (9) recurrent thoughts of death or recurrent SI. Unlike the lifetime MDE symptoms listed above, recurrent thoughts of death or SI did not need to have occurred nearly every day [19, 20]. This definition is based on the that found in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition [21].

Adults aged 65 or older were classified as not having MDE in their lifetime if they met either of these conditions: (1) reported experiencing fewer than five out of the nine criteria used to define adults with MDE in their lifetime [18, 21]; (2) the number of criteria used to define adults with MDE in their lifetime is unknown, and the respondent reported at least one of the following: (A) never feeling either of the following for several days or longer: sad, empty, depressed, discouraged about how things are in life, and a loss of interest in most things that they usually found enjoyable; (B) experienced the feelings in item A nearly every day for two weeks or longer, but not most of the day; (C) experienced item B most of the day, but the feelings only lasted for less than an hour when the mood was most severe and frequent; (D) experienced item C for at least an hour, but only when the mood was most severe and frequent, the emotional distress was mild, and there was never a time when emotional distress was so severe that the person could not be cheered up or carry out daily activities [18, 21]; (E) experienced item D and the emotional distress was more than mild, or at some point, the person could not be cheered up or carry out daily activities, but they never had any other problems during those weeks, such as changes in sleep, appetite, energy, and the ability to concentrate and remember, or feelings of low self-worth [2].

2.4 Ethical Considerations

This study used secondary publicly available data from the NSDUH collected and coded by the Substance Abuse and Mental Health Services Administration, US Department of Health and Human Services. NSDUH data are publicly available and contain no identifying information regarding respondents; there is no risk of disclosing or violating individual privacy; thus, informed consent was not obtained. The appropriate institutional review board approved all study procedures in a public university in the US.

2.5 Statistical Analysis

As the NSDUH is a national survey that uses multistage and deeply stratified sampling, data were weighted to obtain unbiased estimates for survey outcomes in the population represented to ensure accurate point estimation regarding standard errors and allows generalizability of the results to the entire US population [18].

Because of the complex sample design of the NSDUH, estimates were calculated using a method in SPSS 27 that is unbiased for linear statistics. This method is based on multistage clustered sample designs where the first stage (primary) sampling units are drawn with replacement. Accordingly, the

data has been weighted to obtain unbiased estimates for survey outcomes in the population to represent civilian members of the noninstitutionalized population in the US. Design variables variance estimation (pseudo) replicate within stratum (VEREP), variance estimation (pseudo) stratum (VESTR), and the person-level analysis weights (ANALWT_C) are applied to the statistical analyses to account for the sampling method used in data collection, ensure accurate point estimation regarding the standard errors, and allow the results of the analyses to be generalized to the entire US population.

The ANALWT_C comprises 16 weight components from the analytic file, and two additional weight calibration adjustments are done for the public use file [18]. Each weight component accounts for either a selection probability at a selection stage or an adjustment factor adjusting of nonresponse, coverage, or extreme weights. VEREP and VESTR are nesting variables used to capture explicit stratification and identify clustering with the NSDUH data. These are needed to compute the variance estimates correctly [18] and ensure accurate point estimation regarding standard errors, allowing generalizability of the results to the entire US population [18].

A weighted multinomial logistic regression (MLR) analysis was used to examine the risk for a lifetime MDE for men and women aged 65 or older, with and without adjustment for the five covariate variables of race, education, marital status, health, and poverty, while holding sex as a constant variable. The MLR is a prediction test of likelihood odds that indicates the chances of one event occurring compared to other events [22]. Because lifetime MDE is a categorical variable, the MLR analysis is the appropriate statistical model for estimating the probabilities of their presence or absence. The model fit was examined using Pearson and Deviance criteria; statistics that measure the overall model performance were controlled. Wald Statistics, changes in log-likelihood, and odds ratios for predicting lifetime MDE were also calculated.

To examine whether demographic variables significantly predicted lifetime MDE among adults aged 65 or older with and without MDE while adjusting for the health determinants as potential covariates, a weighted multinomial logistic regression (MLR) analysis was performed with each of the study variables race, education, marital status, health, and poverty, treated once as independent variables and once as covariates. All statistical analyses were performed using IBM SPSS Statistics, version 27.0 premium (SPSSCorp Inc). A two-tailed $p<.05$ was considered statistically significant.

3. Results

To measure the likelihood ratios of men and women aged 65 or older for a lifetime MDE diagnosis with and without adjustment for the covariate variables, MLR analyses were conducted for sex with and without adjustment for the covariate variables. The MLR test results confirmed that sex significantly predicts risk for lifetime MDE among adults aged 65 or older with and without adjustment for the five health determinants, race, education, marital status, health, and poverty, demonstrating a substantially better fit than the intercept-only model ($p<0.05$) (Table 1 and Table 2).

Table 1 Tests of the model effects predicting lifetime MDE[a] with adjustment for the five health determinants among adults aged 65 years or older.

Source	df1	df2	Wald F	P^b
Source (Corrected Model)	df1 6.00	df2 45.00	Wald F 8.16	Sig. .00
(Intercept)	1.00	50.00	81.49	.00
Sex	1.00	50.00	13.97	.00
Marital status	1.00	50.00	1.24	.27
Race	1.00	50.00	8.34	.00
Education	1.00	50.00	20.71	.00
Health	1.00	50.00	8.31	.00
Poverty	1.00	50.00	5.21	0.02

[a] MDE: Major Depressive Episode
[b] Significance level set at p<0.05

Table 2 Tests of the model effects predicting lifetime MDE[a] without adjustment for the five health determinants among adults aged 65 years or older.

Source	df1	df2	Wald F	P^b
(Corrected Model)	18.00	33.00	6.29	.00
(Intercept)	1.00	50.00	161.64	.00
Sex	1.00	50.00	13.81	.00
Marital status	3.00	48.00	1.94	.13
Race	6.00	45.00	13.73	.00
Education	3.00	48.00	6.15	.00
Health	3.00	48.00	2.77	.05
Poverty	2.00	49.00	3.58	.03

[a] MDE: Major Depressive Episode
[b] Significance level set at p<0.05

3.1 Multinomial Logistic Regression Analyses

Among adults aged 65 and older with lifetime MDE, the estimated coefficient for the sex predictor with adjustment for the covariate variables confirmed that men had a lower risk to have a lifetime MDE diagnosis than women (Exp (B) = 0.45 for men; p<0.05; Table 3).

Table 3 Parameter estimates of the five predictors of lifetime MDE[a] with adjustment for the five health determinants among adults aged 65 years or older [b].

Lifetime MDE[a,c]	Parameter	B	Standard Error	95% Confidence Interval Lower	Upper	Hypothesis Test T	df	P[d]	Exp(B)	95% Confidence Interval for Exp(B) Lower	Upper
	(Intercept)	-3.75	.44	-4.64	-2.86	-8.46	50.00	.00	.02	.01	.05
	Males	-.79	.21	-1.22	-.36	-3.73	50.00	.00	.45	.29	.69
	Females	.00[e]	.	.	.	.	.	.	1.00	.	.
	Marital status	-.08	.08	-.24	.07	-1.11	50.00	.27	.91	.78	1.07
	Race	.14	.05	.04	.25	2.88	50.00	.00	1.15	1.04	1.28
	Education	.37	.08	.21	.54	4.55	50.00	.00	1.46	1.23	1.72
	Health	.20	.07	.06	.35	2.88	50.00	.00	1.23	1.06	1.42
	Poverty	-.28	.11	-.51	-.06	-2.56	50.00	.01	.75	.59	.93

[a] MDE: Major Depressive Episode

[b] Authors` analysis of data from the 2018 *National Survey for Drug Use and Health (NSDUH) for adults aged 65 or older* (N = 3,969) representing a weighted population size of 50,986,065.86.

[c] Reference category: no lifetime major depressive episodes

[d] Significance level p<0.05

[e] Set to zero because this parameter is redundant

The estimated coefficient for the sex predictor without adjustment for the five covariates of race, education, marital status, health, and poverty showed a similar result that confirmed that men had lower chances than women to meet the diagnostic criteria of a lifetime MDE (Exp (B) = 0.44 for men, Table 3). Further, results showed that the four variables of race, education, health, and poverty were significant predictors and covariates in the study.

The estimated coefficients for the race, education, marital status, health, and poverty as predictors of lifetime MDE diagnosis among adults aged 65 and older were as follows: across the sex variable, men had a lower risk than women for lifetime MDE (Exp (B) = 0.44 for men, p<0.05; Table 4). Across racial groups, Hispanic and Black Americans had a lower risk for lifetime MDE compared to White- Americans (Exp (B) = 0.34 for Hispanic-Americans, and Exp (B) = 0.45 for Black-Americans; p<0.05; Table 4), whereas Native-Pacific Americans had a higher risk for lifetime MDE than White-Americans aged 65 or older adults (Exp (B) = 14.28 for; p<0.05; Table 4). The groups that had an insignificant risk for lifetime MDE were the multi-racial, Native-Americans, and Asian Americans (Exp (B) = 0.77 for multi-racial; Exp (B) = 0.89 for Native Americans; and Exp (B) = 0.35 for Asian Americans; p>0.05; Table 4). As for the level of education, all 65 years and older adults without a college degree had a decreased risk for lifetime MDE compared to those with a college

degree (Exp (B) = 0.43 for less than high school education, Exp (B) = 0.40 for high school graduate, Exp (B) = 0.73 for some college education; p<0.05; Table 4). Similarly, estimate coefficient results of the health predictor confirmed that 65 years and older adults with very good and excellent health had a significantly lower risk for lifetime MDE than those with fair/poor health (Exp (B) = 0.52 for excellent health, and Exp (B) =0.66 for very good health; p<0.05; Table 4). As for 65 years and older adults with good health, they had an insignificant risk for lifetime MDE compared to those with fair/poor health (Exp (B) =0.82 for good health; p = 0.85; Table 4). Finally, the predictor poverty level coefficient estimates showed that living in poverty had a higher risk to be diagnosed with lifetime MDE compared to the reference group 65 years and older adults with income more than twice the federal threshold of poverty (Exp (B) = 2.00 for living in poverty; p<0.05; Table 4). However, those with income up to twice the federal threshold for poverty had an insignificant risk for lifetime MDE compared to the reference group, with income more than twice the federal threshold for poverty (Exp (B) = 1.09 for income up to twice the federal threshold of poverty; p = 0.69; Table 4). Nevertheless, the marital status estimate coefficients were insignificant for never married, divorced/separated, and widowed, compared to married 65 years and older adults (Exp (B) = 1.58 for never been married, Exp (B) = 1.14 for widowed, and Exp (B) = 1.40 for separated-divorced; p>0.05; Table 4).

Table 4 Parameter estimates of the five predictors of lifetime MDE[a] without adjustment for the five health determinants among adults aged 65 years or older[b].

Lifetime MDE [a,c]	Parameter	B	Standard Error	95% Confidence Interval Lower	Upper	Hypothesis Test T	df	P [d]	Exp (B)	95% Confidence Interval for Exp (B) Lower	Upper
	(Intercept)	-1.56	.25	-2.08	-1.05	-6.16	50.00	.00	.20	.12	.34
	Sex										
	Males	-.81	.21	-1.25	-.37	-3.71	50.00	.00	.44	.28	.68
	Females	.00[e]	.	.	.	.	.	.	1.00	.	.
	Marital status										
	Never been married	.45	.31	-.17	1.09	1.45	50.00	.15	1.58	.84	2.97
	Widowed	.13	.20	-.27	.54	.65	50.00	.51	1.14	.76	1.71
	Separated/Divorced	.33	.17	-.01	.69	1.90	50.00	.06	1.40	.98	2.01
	Married	.00[e]	.	.	.	.	.	.	1.00	.	.
	Race										
	Hispanic	-1.06	.37	-1.81	-.31	-2.84	50.00	.00	.34	.16	.73
	Multi-racial	-.25	.53	-1.33	.83	-.46	50.00	.64	.77	.26	2.29
	Asian American	-1.04	.71	-2.47	.38	-1.46	50.00	.15	.35	.08	1.47
	Native Pacific	2.65	.40	1.83	3.47	6.51	50.00	.00	14.28	6.28	32.43
	Native American	-.11	.87	-1.87	1.64	-.13	50.00	.89	.89	.15	5.19
	Black American	-.79	.30	-1.41	-.18	-2.62	50.00	.01	.45	.24	.83

White American	.00[e]	.	.	.	.	.	.	1.00	.	.
Education										
Less high school	-.83	.26	-1.37	-.29	-3.09	50.00	.00	.43	.25	.74
High school grad	-.90	.22	-1.35	-.44	-3.98	50.00	.00	.40	.25	.63
Some college	-.30	.17	-.65	.04	-1.73	50.00	.08	.73	.51	1.04
College grad	.00[e]	.	.	.	.	.	.	1.00	.	.
Health										
Excellent	-.65	.24	-1.14	-.16	-2.66	50.00	.01	.52	.31	.85
Very good	-.40	.17	-.76	-.05	-2.32	50.00	.02	.66	.46	.94
Good	-.19	.17	-.53	.15	-1.13	50.00	.26	.82	.58	1.16
Fair/poor	.00[e]	.	.	.	.	.	.	1.00	.	.
Poverty level										
Living in poverty	.69	.26	.17	1.21	2.67	50.00	.01	2.00	1.19	3.37
Income up to 2x fed threshold	.08	.22	-.35	.53	.39	50.00	.69	1.09	.69	1.70
Income more than 2x fed threshold	.00[e]	.	.	.	.	.	.	1.00		.

[a] MDE: Major Depressive Episode

[b] Authors` analysis of data from the 2018 *National Survey for Drug Use and Health (NSDUH) for adults aged 65 or older* (N = 3,969) representing a weighted population size of 50,986,065.86.

[c] Reference category: no lifetime major depressive episodes

[d] Significance level p<0.05

[e] Set to zero because this parameter is redundant

4. Discussion

The present study aimed to investigate if sex can significantly predict the risk for lifetime MDE among adults aged 65 or older with and without adjustment for health determinants of race, education, marital status, health, and poverty. Results revealed that sex could predict lifetime MDE among men and women aged 65 or older with and without adjustment for the five health determinants. The findings were consistent with previous research about major depression gender differences that show that the major depression risk for women is almost twice as high as for men[12, 23]. However, the previous studies examined differences between younger men and women groups than participants aged 65 or older.

Across racial groups, older Hispanic and Black aged 65 or older had a decreased risk for major depression compared to White participants. These results align with earlier studies that showed that Black and Hispanic older adults showed lower levels of depressive symptoms compared to older White adults [24, 25]. However, regarding older Native Americans and Native-Pacific Americans,

little research has been conducted about the risk for major depression among older adults. In one study, researchers examined health determinants of depression among older Native-Pacific American and White American older adults in the Midwest to measure geriatric depression and found that childhood neglect, household dysfunction, perceived health, and living alone were significant predictors of depressive symptoms among Native-Pacific Americans [26]. In alignment with these earlier results, our study results show that without adjustment for covariates, Native-Pacific Americans had a higher risk for lifetime MDE than White-Americans aged 65 and older adults. These results suggest that Native-Pacific American older adults are at increased risk for lifetime MDE that requires special clinical attention.

Regarding poverty predictor, our study found that adults aged 65 or older living in poverty are at increased risk for lifetime MDE. Other researchers suggested that mental health determinants such as education, poverty, and health impact the risk for mental disorders and poor mental health and marital status [27]. Moreover, a study examining older adults in Finland, Poland, and Spain found that poor income and education independently increased the risk of major depression [28]. These studies results support our study findings and suggest that adults 65 or older may be especially susceptible to MDE due to poverty living conditions particularly those who are less mobile due to physical conditions. As such, they may become more prone to social isolation and less accessibility to mental health care and social network, which can exacerbate the risk for MDE [29].

However, in both hypotheses, marital status was the only variable found insignificant both as an independent and a covariate variable of lifetime MDE diagnosis among adults aged 65 or older. Earlier research showed that marriage benefits diminish or disappear at older ages, but various exceptions were found in gender and race/ethnicity comparisons across age groups [30-34]. For example, in the National Longitudinal Mortality Study, which consisted of 281,460 men and women aged 45 and older, researchers examined the impact of marital status on mortality. They found that for persons aged 45–64, each non-married group generally showed statistically significant increased risk compared to their married counterparts. However, those aged 65 years or older tended to have a smaller risk ratio than younger counterparts [35]. It could be that since the study participants were adults aged 65 and older, their marital status did not have a significant impact on their risk for a lifetime MDE. Thus, marital status was an insignificant predictor and covariate of lifetime MDE in both models.

Despite its strengths, this study has some limitations. First, the NSDUH survey is cross-sectional, and, hence, no directionality or causality can be assumed between study variables. Second, because the target population comprised noninstitutionalized civilians from the US, a small proportion (approximately 3%) of the population was excluded. This proportion included active-duty military and individuals in institutional group quarters (e.g., hospitals, prisons, nursing homes, treatment centers). If these groups' mental health status differs from that of noninstitutionalized civilians, the NSDUH may be slightly inaccurate regarding mental health estimates of the total population. Third, there might have been discrepancies in female versus male respondents, which may be attributed to women's longer life expectancy than men [36-38]. Thus, the present study could have included more women than men in the widowed adult group. Fourth, older adults may have impediments, such as cognitive decline or psychotic features, and, therefore, have difficulty understanding the meaning of questions and recalling information such as symptoms and experiences, which may have caused some biased results in the diagnosis [6, 39-41].

5. Conclusion

Special clinical attention is required for adults aged 65 or older at risk for lifetime MDE to meet their unique needs. Clinical care should be informed by an integrative approach that combines evidence-based mental and physical care of adults aged 65 or older that has been proven effective and useful to meet their needs.

Special consideration must be given to women, those without available supportive networks, comorbid physical illness, and major depression, no children or family members, going through bereavement, or enduring cognitive decline and poor health. Future research should consider examining additional potential covariates (e.g., comorbid physical and psychiatric conditions, availability of family support, family and personal conflicts, and rural-urban residency) for major depression risk among older adults, particularly those with poor health. Women aged 65 or older need special attention to cope with major depression, including affordable community programs that use integrative preventive approaches among the aging population to equip them with later life skills to prevent major depression and enhance self-efficacy. Native Pacific Americans aged 65 or older are considered at-risk populations for lifetime MDE requiring close attention and tailored clinical interventions that meet the community's particular needs. This can be achieved using community-centered approaches that integrate Native Pacific American community members' voices in assessment and include personalized treatment plans to address the psychological needs of older adults in the community in a timely manner.

Finally, geriatric training must be integrated into a broad range of academic clinical programs at the university level, and not merely for those who select gerontology as their specialty, to change the way clinicians think about major depression in adults aged 65 or older so that healthcare and mental health systems are well prepared and equipped with a trained staff who can cope with the predicted exponential growth of the aged 65 or older population in the foreseeable future.

Author Contributions

Areen Omary and Tameka Chambers developed the manuscript. Areen Omary wrote the first draft of the manuscript, designed the study, conducted the analyses, and wrote the results and discussion. Tameka Chambers contributed to the introduction and discussion chapters and aided in preparing the manuscript. Both authors discussed the results and commented on the manuscript.

Competing Interests

The authors have declared that no competing interests exist.

References

1. Hasler G. Pathophysiology of depression: Do we have any solid evidence of interest to clinicians? World Psychiatry. 2010; 9: 155-161.
2. Substance Abuse and Mental Health Services Administration. Key substance use and mental health indicators in the United States: Results from the 2018 National Survey on Drug Use and Health [Internet]. Rockville: Substance Abuse and Mental Health Services Administration; 2019. Available from: https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHNationalFindingsReport2018/NSDUHNationalFindingsReport2018.pdf.

3. Centers for Disease Control and Prevention. Depression is not a normal part of growing older [Internet]. Atlanta: Centers for Disease Control and Prevention; 2021. Available from: https://www.cdc.gov/aging/depression/index.html.

4. United States Census Bureau. The next four decades: The older population in the United States: 2010 to 2050 [Internet]. Suitland: U.S. Census Bureau; 2010. Available from: https://www.census.gov/prod/2010pubs/p25-1138.pdf.

5. World Health Organization. Mental health of older adults [Internet]. Genève: World Health Organization; 2017. Available from: https://www.who.int/news-room/fact-sheets/detail/mental-health-of-older-adults.

6. Leyhe T, Reynolds III CF, Melcher T, Linnemann C, Klöppel S, Blennow K, et al. A common challenge in older adults: Classification, overlap, and therapy of depression and dementia. Alzheimers Dement. 2017; 13: 59-71.

7. Centers for Disease Control and Prevention. Social determinants of health and alzheimer's disease and related dementias [Internet]. Atlanta: Centers for Disease Control and Prevention; 2021. Available from: https://www.cdc.gov/aging/disparities/social-determinants-alzheimers.html.

8. Northwood M, Ploeg J, Markle-Reid M, Sherifali D. Integrative review of the social determinants of health in older adults with multimorbidity. J Adv Nurs. 2018; 74: 45-60.

9. Dong X, Chang ES, Wong E, Simon M. The perceptions, social determinants, and negative health outcomes associated with depressive symptoms among US Chinese older adults. Gerontologist. 2012; 52: 650-663.

10. Tanner EK, Martinez IL, Harris M. Examining functional and social determinants of depression in community-dwelling older adults: Implications for practice. Geriatr Nurs. 2014; 35: 236-240.

11. Oquendo MA, Bongiovi-Garcia ME, Galfalvy H, Goldberg PH, Grunebaum MF, Burke AK, et al. Sex differences in clinical predictors of suicidal acts after major depression: A prospective study. Am J Psychiatry. 2007; 164: 134-141.

12. Kuehner C. Gender differences in unipolar depression: An update of epidemiological findings and possible explanations. Acta Psychiatr Scand. 2003; 108: 163-174.

13. Kessler RC. The epidemiology of depression among women. In: Women and depression: A handbook for the social, behavioral, and biomedical sciences. New York: Cambridge University Press; 2006. pp.22-37.

14. Kendler KS, Gardner CO, Neale MC, Prescott CA. Genetic risk factors for major depression in men and women: Similar or different heritabilities and same or partly distinct genes? Psychol Med. 2001; 31: 605-616.

15. von dem Knesebeck O, Pattyn E, Bracke P. Education and depressive symptoms in 22 European countries. Int J Public Health. 2011; 56: 107-110.

16. St John PD, Montgomery PR. Marital status, partner satisfaction, and depressive symptoms in older men and women. Can J Psychiatry. 2009; 54: 487-492.

17. Rendall MS, Weden MM, Favreault MM, Waldron H. The protective effect of marriage for survival: A review and update. Demography. 2011; 48: 481-506.

18. Center for Behavioral Health Statistics and Quality. 2018 National Survey on Drug Use and Health Public Use File Codebook [Internet]. Rockville, MD: Substance Abuse and Mental Health Administration; 2019. Available from: https://www.datafiles.samhsa.gov/sites/default/files/field-uploads-

protected/studies/NSDUH-2018/NSDUH-2018-datasets/NSDUH-2018-DS0001/NSDUH-2018-DS0001-info/NSDUH-2018-DS0001-info-codebook.pdf.

19. Substance Abuse and Mental Health Services Administration. 2018 National Survey of drug use and health: Detailed tables [Internet]. Rockville: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration; 2019. Available from: https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHDetailedTabs2018R2/NSDUHDetailedTabs2018.pdf.

20. Substance Abuse and Mental Health Services Administration. Key substance use and mental health indicators in the United States: Results from the 2017 National survey on drug use and health [Internet]. Rockville: Substance Abuse and Mental Health Services Administration; 2018. Available from: https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHFFR2017/NSDUHFFR2017.pdf.

21. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®). Washington: American Psychiatric Pub.; 2013.

22. Harrell FE. Regression modeling strategies: With applications to linear models, logistic regression, and survival analysis. New York: Springer; 2015.

23. Hyde JS, Mezulis AH. Gender differences in depression: Biological, affective, cognitive, and sociocultural factors. Harv Rev Psychiatry. 2020; 28: 4-13.

24. Assari S, Lankarani MM. Reciprocal associations between depressive symptoms and mastery among older adults; black-white differences. Front Aging Neurosci. 2017; 8: 279.

25. Hooker K, Phibbs S, Irvin VL, Mendez-Luck CA, Doan LN, Li T, et al. Depression among older adults in the United States by disaggregated race and ethnicity. Gerontologist. 2019; 59: 886-891.

26. Burnette CE, Roh S, Lee KH, Lee YS, Newland LA, Jun JS. A comparison of risk and protective factors related to depressive symptoms among American Indian and Caucasian older adults. Health Soc Work. 2017; 42: e15-e23.

27. Carod-Artal FJ. Social determinants of mental health. In: Global mental health. Cham: Springer; 2017. pp.33-46.

28. Domènech-Abella J, Mundó J, Leonardi M, Chatterji S, Tobiasz-Adamczyk B, Koskinen S, et al. The association between socioeconomic status and depression among older adults in Finland, Poland and Spain: A comparative cross-sectional study of distinct measures and pathways. J Affect Disord. 2018; 241: 311-318.

29. Joshi S, Mooney SJ, Rundle AG, Quinn JW, Beard JR, Cerdá M. Pathways from neighborhood poverty to depression among older adults. Health Place. 2017; 43: 138-143.

30. Scafato E, Galluzzo L, Gandin C, Ghirini S, Baldereschi M, Capurso A, et al. Marital and cohabitation status as predictors of mortality: A 10-year follow-up of an Italian elderly cohort. Soc Sci Med. 2008; 67: 1456-1464.

31. Robards J, Evandrou M, Falkingham J, Vlachantoni A. Marital status, health and mortality. Maturitas. 2012; 73: 295-299.

32. Staehelin K, Schindler C, Spoerri A, Stutz EZ, Swiss National Cohort Study Group. Marital status, living arrangement and mortality: Does the association vary by gender? J Epidemiology Community Health. 2012; 66: e22.

33. Franke S, Kulu H. Cause-specific mortality by partnership status: Simultaneous analysis using longitudinal data from England and Wales. J Epidemiology Community Health. 2018; 72: 838-

844.

34. Assari S. Social determinants of depression: The intersections of race, gender, and socioeconomic status. Brain Sci. 2017; 7: 156.

35. Johnson NJ, Backlund E, Sorlie PD, Loveless CA. Marital status and mortality: The national longitudinal mortality study. Ann Epidemiol. 2000; 10: 224-238.

36. Austad SN. Why women live longer than men: Sex differences in longevity. Gend Med. 2006; 3: 79-92.

37. Zarulli V, Jones JA, Oksuzyan A, Lindahl-Jacobsen R, Christensen K, Vaupel JW. Women live longer than men even during severe famines and epidemics. Proc Natl Acad Sci USA. 2018; 115: E832-E840.

38. Crimmins EM, Shim H, Zhang YS, Kim JK. Differences between men and women in mortality and the health dimensions of the morbidity process. Clin Chem. 2019; 65: 135-145.

39. Gournellis R, Oulis P, Howard R. Psychotic major depression in older people: A systematic review. Int J Geriatr Psychiatry. 2014; 29: 784-796.

40. Nelson JC, Bickford D, Delucchi K, Fiedorowicz JG, Coryell WH. Risk of psychosis in recurrent episodes of psychotic and nonpsychotic major depressive disorder: A systematic review and meta-analysis. Am J Psychiatry. 2018; 175: 897-904.

41. Jääskeläinen E, Juola T, Korpela H, Lehtiniemi H, Nietola M, Korkeila J, et al. Epidemiology of psychotic depression-systematic review and meta-analysis. Psychol Med. 2018; 48: 905-918.

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