

# Association Between Informal Caregivers and Risk of Psychological Distress

## Report Prepared by:

Allisandra G. Kummer, MPH Candidate

## Acknowledgements:

Courtney Lambert, Data Analysis Team Director

Kristy Thacker, BRFSS State Coordinator

Kristen Walker, MPH Candidate

## Abstract

Evaluating at-risk populations is vital in developing successful public health programs that promote healthy behaviors and provide social support. The Centers for Disease Control and Prevention (CDC) established the Behavioral Risk Factor Surveillance System (BRFSS) for collecting state level-data on risky behaviors, health conditions, and prevention services (Indiana State Department of Health, 2018). Data collected from the 2015 BRFSS Annual Survey was used to analyze caregiver status, length of time spent as a caregiver, and care recipient's main health issue and their associations with psychological distress. According to previous literature, informal caregivers are subject to increased levels of stress, putting them at risk for psychological distress. Race/ethnicity, income, sex, and age are influential factors in both caregiver status and psychological distress. It was hypothesized that being a caregiver would be significantly associated with psychological distress and race/ethnicity, age, income, and sex would be significant confounders of psychological distress.

Unadjusted bivariate associations were analyzed to identify significant associations between caregiver status and psychological distress. Those significant associations were used to inform logistic regression models for identifying which elements would significantly predict the odds of being in psychological distress. Caregiver status was not a significant predictor of poor mental health but was a significant predictor of depression. Income was a statistically significant confounder of poor mental health. Income, age, and sex were statistically significant confounders for a depressive disorder; however, age was not a biologically significant confounder for depression. Findings of this analysis suggest the 2015 BRFSS data reflect patterns seen in literature where caregiver status is a predictor of psychological distress. These associations are vital in understanding the relationship between caregiver status and psychological distress, and they should be used to inform future research and public health programs focused on addressing this issue.

## Introduction

Evaluating associations between risk behaviors, health conditions, and prevention services is vital in identifying high-risk populations and developing targeted programs for promoting healthy behaviors and support. The CDC established the BRFSS in 1984, the largest annual survey conducted worldwide, to collect this information from all 50 U.S. states, Washington D.C., and three U.S. territories (Centers for Disease Control and Prevention, 2020b). Indiana is one of 15 states that has been collecting BRFSS data since it was created (Indiana State Department of Health, 2018), and data from the 2015 Indiana BRFSS survey will be used to analyze associations between caregiver status, length of time spent as a caregiver, and care recipient's main health issue and their associations with psychological distress. Previous literature indicates influence from demographic variables such as race/ethnicity, age, sex, and income in determining likelihood of taking on a caregiving role. Likewise, these factors have shown associations with psychological distress. Length of time spent as a caregiver and care recipient's health issue may provide additional influence on having psychological stress due to stress experienced by taking on a caregiving role.

This report seeks to identify whether Indiana data reflects patterns seen in previous literature by analyzing these associations. Caregiving status was the independent variable with days of poor health and diagnosis of a depressive disorder being the dependent variables. Age, sex, income, and race/ethnicity were included in the analysis as potential confounding variables. Caregivers are subjects of interest directly affected by psychological distress, whereas care recipients and families are indirectly affected by the caregivers' psychological distress. It is hypothesized that being a caregiver significantly increases the odds of psychological distress, and race/ethnicity, age, income, and sex are influential confounders of psychological distress. Additionally, it is hypothesized that increased length of time spent as a caregiver and recipient's main health issue will also increase the odds of psychological distress.

## Literature Review

The objective of this analysis is to identify whether patterns of psychological distress among informal caregivers in Indiana reflect patterns observed in previous literature. Informal caregiving has continued to grow as life expectancy increases and chronic diseases have become more prevalent. Demands placed on caregivers have become more stressful, particularly when caregiving for individuals with dementia (Dilworth-Anderson et al., 2002), increasing the caregivers' risk of psychological distress. While psychological distress can be defined by many criteria, there are many disagreements (Drapeau et al., 2012); however, most researchers define psychological distress as the expression of depression and anxiety as a result of emotional suffering (Horwitz, 2002). Diagnostic criteria for depression includes identifiable changes in ability to function, loss of interest or depressed mood, and expressing symptoms for 14 days (American Psychiatric Association, 2013; Hooley et al., 2017). In addition, diagnostic criteria for generalized anxiety includes excessive anxiety, worry, and symptom expression for a majority of days during a six-month period, difficulty controlling the worry, the anxiety causes significant distress or impairment of functioning, and disturbance is not due to physiological effects or explained by another mental disorder (American Psychiatric Association, 2013). Taking on the caregiving role increases stress due to added responsibilities and worrying about the care recipient. Caregivers for those suffering from Alzheimer's Disease have higher rates of stress and psychological morbidity compared to caregivers providing care for those suffering from other health issues (González-Salvador et al., 1999). This demonstrates how stress, emotional suffering, and depression experienced by the caregiver may be induced or amplified by the main health issue of the care recipient, particularly if the disorder is severe or life threatening. Furthermore, chronic stress negatively impacts mental health, increasing risk of psychological distress (Marin et al., 2011). Long-term caregiving increases exposures to related stressors, increasing risk of chronic stress, and can influence development of psychological stress. Understanding

associations between caregiving and psychological distress may help with establishing targeted programs for supporting informal caregivers.

Previous literature indicates that caregiver status differs between racial groups. A recent study found that Hispanics had the highest rates of caregiving (21.0%) and whites had the lowest rates (16.9%) of all racial groups (National Alliance for Caregiving & AARP, 2015). Black and White Americans show significant differences in caregiving status often contributed to cultural differences between the two racial groups. Culture is classified as individual and group behaviors influenced by shared beliefs, symbols, and customs (Goodenough, 1999). Some cultural groups are socialized to be more community-oriented whereas others are more individualistic. Community-oriented groups place high value on filial obligation, reciprocity, and responsibility for caregiving (Dilworth-Anderson et al., 2002), making these groups more likely to take on caregiving roles than individualistic cultures. Beliefs and attitudes toward caring for dependents are culturally socialized in African-American communities (Dilworth-Anderson et al., 2005; Dilworth-Anderson et al., 2002; Roff et al., 2004). African-American families form interdependent relationships and expect reciprocity from family and community members whereas white Americans do not (Franklin, 1997). Additionally, African-American families have historically developed informal family networks that function as social service, welfare, and community-based intervention systems (Burton & Dilworth-Anderson, 1991; Franklin, 1997; Katz, 1993), supporting the idea that cultural norms related to race/ethnicity may influence informal caregiver status.

Cultural norms involving gender roles may also influence which respondents are more likely to take on caregiving responsibilities. Historically, men and women have been socialized to distinct gender roles (Finley, 1989; Neal et al., 1997). Women traditionally care for the children and household, whereas men are expected to provide for their family outside the home. Females are typically more nurturing than males, spend more hours caring for dependents, perform more tasks, and take on more caregiving responsibilities (Neal et al., 1997). Consistently across the literature, women are more likely to be caregivers compared to males, spend more hours on caregiving responsibilities, are college educated, and work full-time or part-time (Do et al., 2014; National Alliance for Caregiving & AARP, 2015; National Research Council, 2010). However, there are circumstances contrary their results.

African-American males had lower cultural justification scores than females, but white American males reported higher scores than females (Dilworth-Anderson et al., 2005). Dilworth-Anderson et al explain that a majority of the white male caregivers were husbands caring for their wives while the majority of African-American male caregivers were sons (2005). According to the hierarchical-compensatory model, husbands are likely to become caregivers for their wives because it is seen as an extension of their husband role, but sons are not usually socialized for caregiving and are instead socialized to provide financial support (Cantor, 1979), suggesting sons provide more distant care and will only take on primary care if adult daughters are not available defaulting responsibility to the sons (Dilworth-Anderson et al., 2005). Males and females show no differences in the prevalence caring for high levels of activities of daily living (Cook & Cohen, 2018) which may be explained by the changes in teaching gender roles. As gender fluidity becomes normalized, gender roles based on biological sex will dissolve and caregiving roles may become more similar between the two sexes.

In addition to race/ethnicity and gender, income and age are factors that influence the respondents' ability to take on a caregiving role. Previous studies suggest that caregivers are often low-income (Cook & Cohen, 2018; Kim et al., 2012; Pinquart & Sörensen, 2005); however, most caregivers have an income of \$50,000 or more (53%) which reflects the U.S. overall average for caregivers (National Alliance for Caregiving & AARP, 2015). Furthermore, individuals older than 50 years old are more likely to take on a caregiving role, and older individuals tend to spend more hours caring for others (National Alliance for Caregiving & AARP, 2015; National Research Council, 2010). This information may indicate an interaction between age and income on the influence of caregiver status.

In regard to psychological distress, African Americans and American-born Hispanics have a higher prevalence of stress than whites and foreign-born Latinos explained by sociological research on segregation (Williams et al., 2010). Those residing in disadvantaged neighborhoods are disproportionately exposed to stressful physical and social conditions such as pollution, deteriorating infrastructure, violence, extreme poverty, and unemployment (Santiago et al., 2011; Sternthal et al., 2011), demonstrating the role income plays in stress as well. In addition, aging increases production of stress hormones, increasing the individuals exposure to that stress response (Marin et al., 2011). Increased exposure can negatively alter stress reactivity and put the individual at a higher risk of cognitive impairment (Marin et al., 2011). Long-term exposure to multiple stressful conditions related to income, age, and race/ethnicity can increase risk of developing depressive disorders and psychological distress.

However, data shows a higher prevalence of depressive disorders among White Americans compared to Black and Hispanic Americans. Specifically, major depressive disorder is highest among people who are multiracial (11.3%) followed by those who are American Indian/Alaskan Native (8.0%), White (7.9%), Black and Hispanic (5.4%), Native Hawaiian/Other Pacific Islander (4.7%), and Asian (4.4%) (National Institute of Mental Health, 2019). There is also a higher prevalence of major depressive disorder among women (8.7%) than men (5.3%) (National Institute of Mental Health, 2019). This could be attributed to differing attitudes toward mental health disorders, access to mental health services, and trust for health professionals.

## Methods

Data for this project were obtained from the 2015 Indiana BRFSS survey using information collected from the optional caregiver module. The BRFSS survey is the nation's largest annual health-related telephone survey conducted in all U.S. states, collecting information on risk behaviors, chronic conditions, and use of preventative health services (Centers for Disease Control and Prevention, 2020b). The caregiver module collects information on informal or unpaid caregivers and their responsibilities to inform public health officials of potential health risks among this population (Centers for Disease Control and Prevention, 2020a). All analyses were conducted using SAS software version 9.4.

### *Data Cleaning*

The study dataset included a sample of 6,067 participants and 11 variables: caregiver status, length of time spent as a caregiver, care recipient's health issue, race/ethnicity, income, age, sex, days of poor health, depressive disorder diagnosis (yes/no), a weighting variable, and a stratification variable. Frequencies for each were taken prior to data cleaning to check the sample size for each variable. Responses where participants said "Don't know" or refused to answer were recoded as missing to keep those observations from being included in the analysis. Those observations where the respondent claimed their care recipient died within the past 30 days were also recoded as missing since those respondents would not have responded to any other questions in the caregiving module. Respondent who identified as multiracial, non-Hispanic (NH) were recoded as "Other" and categories of the variable for care recipient's main health issue that had less than 50 observations were recoded into the "Other" category. This was done to ensure the sample sizes were large enough to be analyzed with further stratification. Psychological distress was defined as a respondent having 14 days or more of self-reported poor mental health or having a diagnosis of a depressive disorder. A dichotomous variable was created to indicate whether a respondent experienced 14 or more days of poor mental health or less than 14 days of poor mental health.

### *Analytical Procedures*

A descriptive analysis was done to collect frequencies, percent, and confidence intervals for each variable. Unadjusted bivariate associations were assessed by cross tabulating caregiver status with the demographic and dependent variables, length of time spent as a caregiver and dependent variables, and care recipient main health issue and dependent variables. This step included calculating chi-square values and coefficients of variation for each row percent to determine significance of the association and variation from the mean. Associations were identified as significant at  $\alpha = 0.05$ . Significant associations between independent and dependent variables were assessed using logistic regression to determine the best models for predicting psychological distress. All demographic variables were included in the base models, and a backward elimination process was conducted eliminating least significant confounding variables from the model. Interaction terms were created between caregiver status and each demographic variable. These interaction terms were added to the models and assessed for significance. Final models were created to express which variables are the best predictors and confounders for psychological distress.

## Results

### Descriptive Analysis

Frequency distributions for all variables of interest adjusted by the weight and stratification variables are included in Table 1.

<b>Table 1.</b> Descriptive Analysis of All Variables			
		<b>N</b>	<b>% (95% CI)</b>
Race/ethnicity	<i>NH White</i>	5262	82.4 (80.8 – 84.0)
	<i>NH Black</i>	319	8.6 (7.4 – 9.8)
	<i>NH Other race/ethnicity</i>	198	3.4 (2.8 – 4.0)
	<i>Hispanic</i>	183	5.6 (4.6 – 6.7)
Sex	<i>Male</i>	2582	48.7 (46.8 – 50.6)
	<i>Female</i>	3485	51.3 (49.4 – 53.2)
Income	<i>&lt; \$10,000</i>	227	5.9 (4.8 – 7.0)
	<i>&lt; \$15,000</i>	296	5.5 (4.6 – 6.4)
	<i>&lt; \$20,000</i>	402	8.3 (7.2 – 9.5)
	<i>&lt; \$25,000</i>	500	9.2 (8.0 – 10.3)
	<i>&lt; \$35,000</i>	572	11.1 (9.8 – 12.3)
	<i>&lt; \$50,000</i>	845	16.3 (14.8 – 17.8)
	<i>&lt; \$75,000</i>	849	17.0 (15.5 – 18.5)
	<i>&gt; \$75,000</i>	1423	26.7 (25.0 – 28.5)
Age	<i>18-24 years</i>	278	13.6 (11.9 – 15.3)
	<i>25-34 years</i>	455	16.5 (14.8 – 18.1)
	<i>35-44 years</i>	621	16.2 (14.8 – 17.7)
	<i>45-54 years</i>	923	17.3 (15.9 – 18.6)
	<i>55-64 years</i>	1433	16.9 (15.8 – 18.1)
	<i>65 years and older</i>	2357	19.5 (18.4 – 20.6)
Caregiver Status	<i>Yes</i>	1208	23.3 (21.6 – 25.0)
	<i>No</i>	4027	76.7 (75.0 – 78.4)
Time Spent Caregiving	<i>&lt; 30 days</i>	206	19.0 (15.3 – 22.6)
	<i>1 mo. to &lt; 6mos.</i>	135	11.4 (8.9 – 13.9)
	<i>6 mos. to &lt; 2 years</i>	237	20.4 (17.0 – 23.8)
	<i>2 years to &lt; 5 years</i>	270	21.3 (17.9 – 24.7)

	> 5 years	342	27.9 (24.0 – 31.8)
Recipient's Main Health Issue	<i>Arthritis/Rheumatism</i>	88	8.9 (6.1 – 11.7)
	<i>Cancer</i>	95	8.6 (6.3 – 10.9)
	<i>Dementia/Cognitive Disorders</i>	120	7.9 (6.0 – 9.7)
	<i>Developmental Disorders</i>	51	4.7 (3.0 – 6.4)
	<i>Diabetes</i>	64	6.7 (4.6 – 8.7)
	<i>Heart Disease, Hypertension</i>	119	10.2 (7.5 – 13.0)
	<i>Other</i>	601	53.1 (48.8 – 57.4)
Poor Mental Health	< 14 days	1291	66.7 (63.5 – 69.8)
	14+ days	648	33.3 (30.2 – 36.5)
Depressive Disorder Diagnosis	Yes	1194	20.4 (18.9 – 22.0)
	No	4852	79.6 (78.0 – 81.1)

Abbreviations. CI: Confidence Interval, NH: non-Hispanic.  
Table displays raw frequencies, weighted percentages, and 95% Confidence Intervals. The denominator for each percentage is the number of Indiana respondents for that question. All percentages were weighted using the BRFSS weighting variable \_LLCPWT and stratified by the stratification variable \_STSTR.

### Unadjusted Bivariate Associations

Chi-square values for analyzing the unadjusted bivariate associations are included in Table 2. Statistically significant associations were found between caregiver status and sex ( $X^2 = 17.404$ ,  $p < .0001$ ), caregiver status and poor mental health ( $X^2 = 5.015$ ,  $p = .0251$ ), and caregiver status and diagnosis of a depressive disorder ( $X^2 = 16.209$ ,  $p < .0001$ ). There were no significant associations between caregiver status and race/ethnicity ( $X^2 = 5.134$ ,  $p = .162$ ), income ( $X^2 = 10.373$ ,  $p = .168$ ), or age ( $X^2 = 10.084$ ,  $p = .0729$ ). Length of time spent as a caregiver showed no significant associations with poor mental health ( $X^2 = 3.965$ ,  $p = .4108$ ) or diagnosis of a depressive disorder ( $X^2 = 2.057$ ,  $p = .7253$ ). Likewise, the care recipient's health issue showed no significant associations between poor mental health ( $X^2 = 7.571$ ,  $p = .2712$ ) or diagnosis of a depressive disorder ( $X^2 = 4.416$ ,  $p = .621$ ).

<b>Table 2.</b> Unadjusted Bivariate Associations			
<b>Bivariate Association</b>	<b>X<sup>2</sup></b>	<b>DF</b>	<b>Pr &gt; X<sup>2</sup></b>
Caregiver Status & Race/ethnicity	5.1340	3	.1622
Caregiver Status & Income	10.3738	7	.1684
Caregiver Status & Age	10.0840	5	.0729
Caregiver Status & Sex	17.4037	1	<b>&lt; .0001*</b>
Caregiver Status & Poor Mental Health	5.0151	1	<b>.0251*</b>
Caregiver Status & Depressive Disorder Diagnosis	16.2089	1	<b>&lt; .0001*</b>
Length of time & Poor Mental Health	3.9649	4	.4108
Length of time & Depressive Disorder Diagnosis	2.0570	4	.7253
Recipient Health Issue & Poor Mental Health	7.5712	6	.2712
Recipient Health Issue & Depressive Disorder Diagnosis	4.4158	6	.6206

\*Statistically significant at  $\alpha \leq .05$   
Table Displays unadjusted bivariate associations between caregiver status and the demographic and dependent variables. It also includes unadjusted bivariate associations between length of time and dependent variables as well as recipient health issue and dependent variables. All values were weighted using the BRFSS weighting variable \_LLCPWT and stratified by the stratification variable \_STSTR.

### Logistic Regression

Due to the significant association between caregiver status and poor mental health and a depressive disorder diagnosis, logistic regression base models were created with caregiver status as a predictor and race/ethnicity, income, age, and sex as potential confounders for poor mental health and a diagnosis of depression. P-values for the logistic regression models predicting poor mental health are included in Table 3. Backward elimination revealed that caregiver status was not a statistically significant predictor ( $p = .0696$ ) and income ( $p < .0001$ ) was the only statistically significant confounder in a model predicting poor mental health.

<b>Table 3.</b> Logistic Regression Models for Poor Mental Health				
<b>Effect</b>	<b>Base Model</b>	<b>W/o Sex</b>	<b>W/o Age</b>	<b>W/o Race/ethnicity†</b>
	<b>Pr &gt; F</b>	<b>Pr &gt; F</b>	<b>Pr &gt; F</b>	<b>Pr &gt; F</b>
Caregiver Status	.0639	.0681	.0593	.0696
Income	<b>&lt; .0001*</b>	<b>&lt; .0001*</b>	<b>&lt; .0001*</b>	<b>&lt; .0001*</b>
Race/ethnicity	.1011	.0963	.1108	
Age	.3364	.3331		
Sex	.7167			

\*Statistically significant at  $\alpha \leq .05$   
 †Final Model  
 Table Displays p-values for various logistic regression models for predicting poor mental health. All p-values were weighted using the BRFSS weighting variable \_LLCPWT and stratified by the stratification variable \_STSTR.

Caregiver status was a significant predictor ( $p = .0056$ ) with statistically significant confounders of sex ( $p < .0001$ ), age ( $p < .0001$ ), and income ( $p < .0001$ ), but race/ethnicity was not a significant confounder of a depressive disorder diagnosis ( $p = .0676$ ) (Table 4). Caregiver status ( $p = .0029$ ), sex ( $p < 0.0001$ ), age ( $p < .0001$ ), and income ( $p < .0001$ ) remained significant after race/ethnicity was removed from the model (Table 4), meaning these variables qualified for the final model.

<b>Table 4.</b> Logistic Regression Models for Depressive Disorder		
<b>Effect</b>	<b>Base Model</b>	<b>W/o Race/ethnicity†</b>
	<b>Pr &gt; F</b>	<b>Pr &gt; F</b>
Caregiver Status	<b>.0056*</b>	<b>.0029*</b>
Sex	<b>&lt; .0001*</b>	<b>&lt; .0001*</b>
Age	<b>&lt; .0001*</b>	<b>&lt; .0001*</b>
Income	<b>&lt; .0001*</b>	<b>&lt; .0001*</b>
Race/ethnicity	.0676	

\*Statistically significant at  $\alpha \leq .05$   
 †Final Model  
 Table Displays p-values for various logistic regression models for predicting poor mental health. All p-values were weighted using the BRFSS weighting variable \_LLCPWT and stratified by the stratification variable \_STSTR.

As shown in Table 5, there were no significant interaction effects between caregiver status and sex ( $p_{MH} = 0.6880$ ,  $p_{DD} = 0.8305$ ), race/ethnicity ( $p_{MH} = 0.6092$ ,  $p_{DD} = 0.9348$ ), age ( $p_{MH} = 0.3456$ ,  $p_{DD} = 0.2792$ ), or income ( $p_{MH} = 0.3852$ ,  $p_{DD} = 0.1992$ ).

<b>Effect</b>	<b>Pr &gt; F (MH)</b>	<b>Pr &gt; F (DD)</b>
Caregiver Status*Sex	.6880	.8305
Caregiver Status*Race/ethnicity	.6092	.9348
Caregiver Status*Age	.3456	.2792
Caregiver Status*Income	.3852	.1992

Abbreviations: MH = Poor Mental Health, DD = Depressive Disorder.  
Table Displays p-values for interaction effects. All p-values were weighted using the BRFSS weighting variable \_LLCPWT and stratified by the stratification variable \_STSTR.

The final logistic regression model for poor mental health included caregiver status as a predictor and income as a confounder. Income demonstrated statistical significance while caregiver status was not statistically significant (Table 3). Biological significance was characterized by having an odds ratio (OR) of at least 1.5. As shown in Table 6, results of the analysis showed caregiver status was not a biologically significant predictor of poor mental health (OR = 1.4). Some income levels were biologically significant for those with poor mental health when compared to incomes of \$75,000 or more: <\$10,000 (OR = 2.9), \$10,000-14,999 (OR = 1.8), \$15,000-19,999 (OR = 2.0), \$20,000-24,999 (OR = 2.3), and \$50,000-74,999 (OR = 6.0). Income levels that were not biologically significant were ranges \$25,000-34,999 (OR = 1.1) and \$35,000-49,999 (OR = 1.1).

<b>Parameter</b>		<b>Estimate</b>	<b>95% CI</b>	
Caregiver Status	Yes vs. No	1.425	1.048	2.085
Income	<\$10,000 vs. >\$75,000	<b>2.943*</b>	1.530	5.662
	<\$15,000 vs. >\$75,000	<b>1.794*</b>	0.941	3.418
	<\$20,000 vs. >\$75,000	<b>1.984*</b>	1.100	3.579
	<\$25,000 vs. >\$75,000	<b>2.347*</b>	1.366	4.035
	<\$35,000 vs. >\$75,000	1.142	0.618	2.110
	<\$50,000 vs. >\$75,000	1.149	0.666	1.983
	<\$75,000 vs. >\$75,000	<b>5.963*</b>	2.804	12.680

Abbreviations. CI: Confidence Interval.  
\*Biologically significant at OR=1.5  
Table Displays odds ratio estimates from the final logistic regression model for predicting poor mental health. All estimates were weighted using the BRFSS weighting variable \_LLCPWT and stratified by the stratification variable \_STSTR.

The final logistic regression model for a depressive disorder included caregiver status as a predictor and sex, age, and income as confounders. All demonstrated statistical significance (Table 4) and most showed biological significance for a diagnosis of a depressive disorder characterized by having an odds ratio (OR) of at least 1.5 (Table 7). Results of the analysis showed biologically significant OR values for caregivers (OR = 1.5), females (OR = 2.0), incomes <\$10,000 (OR = 2.5), incomes \$10,000-14,999 (OR = 2.8), \$15,000-19,999 (OR = 1.8), \$20,000-24,999 (OR = 2.0), \$25,000-34,999 (OR = 1.6), \$35,000-49,999 (OR = 1.9), and \$50,000-74,999 (OR = 2.6). Age was not biologically significant for those with a diagnosis



of a depressive disorder when compared to respondents age 18-24 years old: 25-34 years (OR = 0.45), 35-44 years (OR = 0.41), 45-54 years (OR = 0.58), 55-64 years (OR = 0.60), and 65 and older (OR = 0.36).

**Table 7.** Odds Ratio Estimates for a Depressive Disorder

Parameter		Estimate	95% CI	
Caregiver Status	Yes vs. No	<b>1.465*</b>	1.140	1.882
Sex	Female vs. Male	<b>2.0038*</b>	1.574	2.550
Age	25-34 years vs. 18-24 years	0.454	0.267	0.7772
	35-44 years vs. 18-24 years	0.414	0.243	0.707
	45-54 years vs. 18-24 years	0.580	0.367	0.914
	55-64 years vs. 18-24 years	0.596	0.383	0.928
	65 and older vs. 18-24 years	0.362	0.232	0.565
Income	<\$10,000 vs. >\$75,000	<b>2.529*</b>	1.571	4.069
	<\$15,000 vs. >\$75,000	<b>2.818*</b>	1.835	4.327
	<\$20,000 vs. >\$75,000	<b>1.781*</b>	1.184	2.680
	<\$25,000 vs. >\$75,000	<b>2.013*</b>	1.373	2.952
	<\$35,000 vs. >\$75,000	<b>1.633*</b>	1.112	2.397
	<\$50,000 vs. >\$75,000	<b>1.850*</b>	1.273	2.689
	<\$75,000 vs. >\$75,000	<b>2.595*</b>	1.568	4.294

Abbreviations. CI: Confidence Intervals.

\*Biologically significant at OR ≥ 1.5

Table Displays odds ratio estimates from the final logistic regression model for predicting a depressive disorder. All estimates were weighted using the BRFSS weighting variable \_LLCPWT and stratified by the stratification variable \_STSTR.

## Discussion

Results of the analysis showed caregivers were not significantly at greater odds of 14 or more days of poor mental health than non-caregivers which may be due to confounding effects of income. Caregivers did have 1.5 times greater odds of depression than non-caregivers. These findings suggest there are characteristics of informal caregiving that increase their odds of depression, which is seen in literature. Furthermore, length of time spent as a caregiver and the care recipient's health issue have no significant associations with either of the dependent variables, meaning they are not associated with psychological distress.

There were no interaction effects on poor mental health or depression between caregiver status and race/ethnicity, age, income, or sex. Respondents earning less than \$25,000 or those earning between \$35,000 - \$49,999 were at greater odds of poor mental health than those earning \$75,000 or more. Additionally, females were at 2.0 times greater odds of depression than men, and respondents earning less than \$75,000 were at greater odds of depression than those earning \$75,000 or more. This reflects patterns seen in the literature that females and lower-income individuals are at higher risk of psychological distress.

These findings suggest that informal caregivers in Indiana are at greater odds of depression. Understanding this association can be used to inform public health programs that provide mental health support for informal caregivers targeting stress relief and management. It also creates an opportunity for informing the general public of the predictors for psychological distress, raising awareness of their struggles, which could lead to community-driven support for informal caregivers in addition to public health programs.

## *Limitations*

The cross-sectional nature of the BRFSS survey limits the analysis to assess associations rather than causations. Cross-sectional surveys obtain information at one time, so there is no temporal component indicating independent variables precede the dependent variables. For this reason, it cannot be determined whether being a caregiver causes the psychological distress from this survey; however, associations can be evaluated. Surveys are subject to recall and response bias, meaning some respondents may have provided inaccurate or false information due to recalling incorrectly, being self-conscious, or subconsciously providing inaccurate answers. Additionally, the research is limited by excluding all missing data from the analyses rather than using statistical methods to account for the missing information. Moreover, the missing data may not be random, which may affect the accuracy of conclusions drawn from the analysis.

This analysis used data from the 2015 Annual BRFSS Survey because that was the most recent survey that included the caregiver module. Findings from the analysis are limited by the outdated data because it may not be representative of the current Indiana population; however, information from this report can be used for comparisons with future surveys using this module. In addition to being outdated, respondents from the 2015 survey were primarily from landlines, skewing the data toward older, NH White populations since those are the groups who still use landlines rather than cell phones. Most people have moved away from using landlines toward primarily using cell phones, and the BRFSS survey has started to include more cell phone users in data collection.

In order to analyze the data, some of the variables were consolidated into fewer categories to increase sample sizes. This limits the analysis to only evaluating broad categories rather than specific information, which is related to the nature of data collection and lack of diversity among the Indiana population. As the BRFSS survey collects more data from cell phone users, this could help increase the sample size for other racial groups and care recipient's main health issue, which could eliminate the need to consolidate categories. Finally, this analysis did not analyze interaction effects between the demographic variables, which may influence psychological distress. This limitation can be addressed in future analyses by assessing interactions between the demographic variables.

## *Future Directions*

Future research should focus on analyzing the association between caregiver status and psychological distress using the 2021 BRFSS survey, which will include the caregiver module. This analysis should be replicated for a comparison when the data becomes available and used to track changes in the Indiana population since 2015. Since this analysis was conducted to preface the 2021 data collection, this information can be used as justification for collecting more data from cell phone users to increase age and racial diversity among the data. This would ensure the sample is representative of the current population, creates diversity among respondents, and increases the sample size among categories included in the survey. Having a larger sample size would increase statistical power by making it easier to detect differences between groups. Additionally, future research should explore interaction effects between demographic variables to adjust for any influence those interaction would have on the relationships identified in the final model. Comparing the current report to future analyses can provide insight into changes that have occurred in Indiana as well as identifying other associations that may be involved in predicting psychological distress. Those comparisons can be used to inform future research outside of BRFSS that examines caregiver status as a cause of psychological distress, which could lead to developing programs that target specific areas of informal caregiving that cause psychological distress.

## **Conclusion**

This report identified caregivers as showing increased odds of depression compared to non-caregivers which may indicate increased risk of psychological distress for those providing informal care. This analysis provides an opportunity to compare the 2015 BRFSS data to what will be collected during 2021 and identify changes over time, inform future research, and guide public health programs.

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