**Exploring the Impact of Length of U.S. Residency, Socioeconomic Status on Depression Among US Adults aged 30 -60 years: Using NHANES Dataset 2017-2020**

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# **Abstract**

**Background:** Depression is a prevalent mental health condition, with immigrants potentially facing unique challenges related to acculturation and socialisation experiences that may influence risk. This study examines the association between the length of time lived in the United States and depression among individuals aged 30-60 years.

**Methods:** Data came from the National Health and Nutrition Examination Survey (NHANES) 2017-2020 for adults ages 30-60 years (n=4,664). Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9). The primary exposure was self-reported length of time lived in the US, categorised as ≤5 years or > five years. Multivariable linear and logistic regression models estimated the association between length of US residency and depression, adjusting for sociodemographic covariates including age, gender, race/ethnicity, education, and the ratio of family income to the poverty level.

**Results:** In the fully adjusted linear regression model, living in the US for>5 years was associated with higher depression scores compared to ≤5 years (β=1.52, p<0.001). Lower education levels and poverty were also associated with higher depression scores. Logistic models showed that living >5 years had higher odds of depression (OR=1.33, 95% CI:1.01-1.75) relative to ≤5 years after adjusting for covariates.

**Conclusion:** Longer length of residence in the US was associated with higher depression risk among adults aged 30-60, even after accounting for socioeconomic factors. Findings highlight depression disparities faced by longer-term immigrants and the importance of considering acculturation processes.

**Keywords:**NHANES; Psychiatric disorders; Patient Health Questionnaire (PHQ-9); Acculturation; Epidemiology.

**Exploring the Impact of Length of U.S. Residency, Socioeconomic Status on Depression Among US Adults aged 30 -60 years: Using NHANES Dataset 2017-2020**

## **Background**

Depression is a prevalent mental health condition, with immigrants in the US facing various challenges related to acculturation and socialisation experiences. Depression and mental health conditions carry severe consequences like elevated suicide risk, diminished productivity and quality of life, social isolation, increased healthcare utilization costs, and physical health impairments1. Thus, identifying contributing factors to depression in this age group is vital for developing effective prevention and intervention strategies. The primary exposure examined in this study is the length of time that 30–60-year-old individuals have resided in the United States.

Immigrants face unique stressors adapting to different cultural norms, language barriers, and establishing community ties experiences that can detrimentally influence psychological well-being. Investigating residency duration provides insight into how the acculturation process shapes depression vulnerability among immigrant populations in this age range. Age and socioeconomic status (education level and income) are the key covariates that moderate the length of time in the US to the outcome of depression. Previous research links lower socioeconomic status, to high depression levels 3. Moreover, younger age groups demonstrate higher depression rates compared to older adults. Therefore, examining how SES and age interact with residency duration is crucial to comprehensively understand depression prevalence disparities impacting 30–to 60-year-old immigrants.

Depression risk profiles highlight the complex interplay of social, economic, and demographic determinants influencing mental health 11. Immigrants' depression levels vary based on the length of U.S. residency, with longer-term residents exhibiting higher risk versus recent arrivals, potentially due to acculturation strains accumulating over time. Income has been identified as a confounder in the residency-depression relationship among African Americans. For Latino immigrants, younger age at arrival correlates with greater psychiatric disorder susceptibility, suggesting age moderates how residency impacts depressive symptoms 4. The research question is to investigate the association between the length of time a person lived in the US and the probability of depression among individuals aged 30-60, while considering socioeconomic status as a confounding factor, and to assess how age modifies this relationship. It is hypothesized that individuals aged 30-60 who have lived in the US for a shorter duration are more likely to experience depression, while socioeconomic status is a potential confounder that could influence both the likelihood of depression and the length of residency in the US 2. These findings underscore the necessity of accounting for multiple intersecting factors to elucidate the complex causal pathways linking immigration experiences to mental health inequities affecting 30–60-year-old immigrants.

### **Methods**

The NHANES study is conducted to assess the nutritional and health status of noninstitutionalized, among United States immigrants 12. The design for the overall NHANES study is a cross-sectional study design that combines interviews, physical examinations, and laboratory testing. NHANES employs a multiyear, stratified, clustered four-stage sampling design since 1999 5. This approach involves selecting primary sampling units (PSUs) at the first stage, followed by the selection of households within each PSU, and finally, the selection of individuals within households.

This sample includes only the civilian noninstitutionalized population of the District of Columbia and America, including persons residing in non-institutional group quarters, such as in university, college, or adult residential treatment amenities. Sample size varies by survey component; for example, N=15,560 for participants completing the questionnaire, while it is N=14,300 for those who also undergo the medical examination. For this study, the target population is individuals aged between 30 to 60 years, specifying a demographic criterion within the NHANES sample. The final analytic sample size for this study is N = 4,664 individuals. People who were less than 30 years that were excluded were 7,706 and those who were greater than 60 years were excluded in the final analytic sample were 3,190 individuals.

Depression was the outcome of interest in this study and was accessed by standardized instruments during NHANES data collection. Patient Health Questionnaire-9 (PHQ-9) was used to measure depression in the NHANES study and has been utilized since 2005 6. To identify types of depression in the analysis questionnaire was formulated to cover the various signs that were signs of depression. For the present analysis, depression will be operationalized based on the scores obtained from the questionnaires.

The main exposure of interest in this study, the length of time lived in the US, was assessed through self-reporting in the NHANES data collection. Each participant was required to obtain self-report information that included one's immigration status and the number of years that the person has lived in the United States. Therefore, in this analysis, the length of time lived in the United States will be operationalized as self-reported years of residence during the NHANES interview. This variable will be utilized to examine associations between length of residence and health outcomes among immigrant populations.

The primary exposure of interest in this study is the number of years lived in the US. It is hypothesized that a longer duration of residing in the United States influences the prevalence of depression between the age of 30 – 60. The length of time lived in the US variable will be examined for its relationship with the outcome of interest, depression. Socioeconomic status can be a potential confounder as it can influence both the percentage rate of the depression outcome and years lived in the United States. The self-report will contain information regarding the income of the subjects under study and their education level. Levels of income (low, medium, high) will be categorized through predetermined levels and education level into different groups (high school or less, some college, college graduate) to account for its influences on the relationship between length of time in the United States and depression 13.

Additionally, age is considered an effect measure modifier in this study. It is hypothesized that age will change the effect of the time dimension related to living in the US and depression for people 30 – 60 years 14. Age will be treated as a categorical variable, with participants divided into different age groups the younger population aged 30 – 44 years and the older population aged 45 – 60 years. This stratification will make it possible to stratify how age modifies the strength of the relationship between the length of time lived in the United States and depression within every age group.

For univariable analysis, descriptive statistics using frequency and percentage will be employed for categorical variables such as age, and education level. Means and standard deviations will be reported for continuous variables like length of time and ratio of family income to poverty. In the bivariable analyses, appropriate statistical test methods will be utilized to assess associations between the main exposure (length of time in the United States), the outcome (Depression), and other covariates such as socioeconomic status and age such as Pearson’s correlation. t-test and the chi-square. Categorical data will be compared utilizing the chi-square test while continuous data will be tested using t-test 7. Stratified measures of association, namely strata-specific odds ratios, will be determined for all variables considered as potential confounders (Socioeconomic status) and modifiers (Age). Statistically significant will be set at an alpha level < 0.05, and the analyses will be conducted using Stata Version 17.

The multivariable analyses for the main exposures, outcome, and covariates (potential confounders) using a Multivariate Multiple Regression model will be fitted to check on a relationship 15. The model building will be an iterative process, the first stage of which will involve a base model in its crudest form, with the main exposure variable (length of time in the United States) and outcome variable (depression).

# **Results**

# **Univariate Analysis**

**Table 1: Univariable Analysis of depression prevalence among people living in the US using, NHANES 2005-2018, data (n=4,664)**

|  |  |
| --- | --- |
| **Key Characteristics** | **Study Sample** |
| **Gender**  Male  Female | 2,211 (47.41%)  2,453 (52.59%) |
| **Age**  30 – 44  45 – 60 | 2,154 (46.18%)  2,510 (53.82%) |
| **Race/Hispanic origin w/ NH Asian**  Mexican American  Hispanic  Non-Hispanic White  Non-Hispanic Black  Non-Hispanic Asian  Non-Hispanic Multiracial | 595 (12.76%)  479 (10.27%)  1,400 (30.02%)  1,262 (27.06%)  689 (14.77%)  239 (5.12%) |
| **Education level**  Less 9th grade  9-11th grade  High school graduate/GED  Some college or AA degree  College graduate or higher  Refused  Don't Know | 331 (7.10%)  506 (10.85%)  1,028 (22.04%)  1,525 (32.70%)  1,272 (27.27%)  1 (0.02%)  1 (0.02%) |
| **Ratio of family income to poverty**  < 1  = 1  > 1 | 771 (16.53%)  14 (0.30%)  3,879 (83.17%) |
| **Depression Score**  Mean  SD  Range  Median  IQR  Missing | 3.35  4.36  20  2  5  614 |
| **Length of time lived in the US**  <= 5 years  > 5 Years | 1,534 (32.89%)  3,130 (67.11%) |

The univariate analysis of the sociodemographic characteristics in the NHANES Study, conducted pre-pandemic, reflects a diverse sample aged between 30 and 60 years. Gender distribution shows a slight female predominance, comprising 52.59% of the sample. Age is categorized into 2 with the younger population (30 – 44 years) being 46.18% while the older population (45 – 60 years) being 53.82%. Regarding race/ethnicity, Non-Hispanic White individuals constitute the largest group (30.02%), followed by Non-Hispanic Black (27.06%) and the least being Non-Hispanic Multiracial (5.12%) participants. Educational attainment varies, with 32.70% of individuals having attained some college or an associate degree, while 22.04% completed high school. The main outcome, depression, has a mean of 3.35 and a standard deviation of 4.36. The main exposure, length of time lived in the US, has a notable proportion of missing values (65.57%), with potential outliers affecting its distribution.

# **Bivariate Analysis**

**Table 2: Bivariable Associations between the outcome Depression and Length of time in the US, NHANES 2005-2018 data (n=4,664)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Key Characteristics** | **Depression**  **No % Yes %** | | **p-value** |
| **Gender**  Male  Female | 754 (18.62%)  607 (14.99%) | 1,174 (28.99%)  1,515 (37.41%) | 0.000 |
| **Age**  30 – 44  45 – 60 | 586 (14.47%)  775 (19.14%) | 1,259 (31.09%)  1,430 (35.31%) | 0.023 |
| **Race/Hispanic origin w/ NH Asian**  Mexican American  Hispanic  Non-Hispanic White  Non-Hispanic Black  Non-Hispanic Asian  Non-Hispanic | 188 (4.64%)  142 (3.51%)  359 (8.86%)  375 (9.26%)  251 (6.20%)  46 (1.14%) | 331 (8.22%)  285 (7.04%)  895 (22.10%)  716 (17.68%)  297 (7.33%)  163 (4.02%) | 0.000 |
| **Education level**  Less 9th grade  9-11th grade  High school  Some college/AA degree  College graduate/ higher | 109 (2.69%)  131 (3.24%)  302 (7.46%)  400 (9.88%)  419 (10.35%) | 157 (3.88%)  293 (7.24%)  596 (14.72%)  961 (23.73%)  681 (16.82%) | 0.000 |
| **Ratio of family income to poverty**  < 1  = 1  > 1 | 182 (4.49%)  2 (0.05%)  1,177 (29.06%) | 497 (12.27%)  12 (0.30%)  2,180 (53.83%) | 0.000 |
| **Length of Time in the US**  <= 5 Years  > 5 years | 736 (18.17%)  1,953 (48.22%) | 552 (13.63%)  809 (19.98%) | 0.000 |

Table 3a above on the prevalence of depression across various sociodemographic characteristics, reveals significant disparities. Notably, a higher percentage of females experience depression compared to males (37.41% versus 28.99%). Similarly, depression rates are higher among older participants (35.31% for ages 45-60 versus 31.09% for ages 30-44). There is a statistically significant association across all the variables, gender, age, race, education levels, and family income ratio to the outcome of depression. These associations are statistically significant (p < 0.05), indicating that these sociodemographic factors are closely linked to depression prevalence 20. Thus, there are possible potential confounders in the relationship between sociodemographic characteristics and depression. Top of Form

# **Multivariate Analysis**

**Table 4b: Multiple Linear Regression Model Examining the association between the length of time lived in the US and Depression, NHANES 2017- pre-pandemic 2020 data (n=4,664)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Unadjusted Model** | | **Full Model 1** | | **Full Model 2** | |
|  | beta (SE) | p-value | beta (SE) | p-value | beta (SE) | p-value |
| **Length of Time (US)**  <= 5 Years  > 5 years | ref  0.86 (0.10) | <0.001 | ref  0.84 (0.11) | < 0.001 | ref  1.27 (0.26) | < 0.001 |
| **Age**  30 – 44  45 – 60 | ref  0.07 (0.10) | 0.448 | ref  0.07 (0.10) | 0.423 | ref  0.07 (0.10) | 0.486 |
| **Education level**  Less 9th grades  9-11th grade  High school  Some college/AA degree  College graduate/ higher | 0.25 (0.24)  -0.17 (0.21)  ref  -0.03 (0.21)  -1.05 (0.21) | 0.304  0.420  0.887  <0.001 | 0.57 (0.22)  0.43 (0.18)  ref  0.21 (0.13)  -0.51 (0.14) | 0.009  0.017  0.093  < 0.001 | -0.18 (0.24)  -0.61 (0.22)  ref  -0.38 (0.22)  -1.12 (0.22) | 0.445  0.006  0.074  < 0.001 |
| **Ratio of family income to poverty**  < 1  = 1  > 1 | ref  -0.11 (0.83)  -1.32 (0.13) | 0.896  <0.001 | ref  -1.17 (0.81)  -1.10 (0.13) | 0.838  < 0.001 | ref  -1.63 (1.75)  -0.74 (0.27) | 0.358  0.002 |
| **dmdyrusz\_filled**  **#family\_income**  <= 5 Years, < 1  > 5 Years #= 1  > 5 Years #> 1 | NA  NA  NA | NA  NA  NA | NA  NA  NA | NA  NA  NA | ref  1.82 (1.97) -0.51 (0.27) | 0.358  0.065 |

SE = Standard Error

ref= Reference

In the unadjusted model, living in the US for more than 5 years was significantly associated with higher depression scores compared to living 5 years or less (β=0.86, p<0.001). The Full Model 1, adjusted for age and education level, showed a similar positive association for living over 5 years (β=0.84, p<0.001). In the fully adjusted Full Model 2, the association between living over 5 years and depression strengthened further (β=1.27, p<0.001) after accounting for the ratio of family income to poverty level and its interaction with age. Age was not statistically significant across the model in determining depression. In the adjusted model education level was not statistically significant with depression except for college graduates or higher (β=-1.05, p<0.001) meaning they experienced lower levels of depression in comparison to high school graduates. In model 1, lower education levels, especially less than 9th grade (β=0.57, p=0.009) and 9-11th grade (β=0.43, p=0.017), were also associated with higher depression scores compared to high school graduates while college graduates or higher (β=-1.51, p<0.001) experienced lower levels of depression in comparison to high school graduates. In the full model 2, 9-11th grade (β=-1.61, p=0.006) and college graduates or higher (β=-1.12, p<0.001) experienced lower levels of depression in comparison to high school graduates. The ratio of family income to poverty level (= 1) was not statistically significant across models. While the Ratio of family income to poverty level (= 1) was associated with depression across the models, (β=-1.32, p<0.001), (β=-1.10, p<0.001), and (β=-0.74, p<0.001), with higher ratio to family income to poverty experiencing lower levels of depression in comparison to the ratio of family income to poverty < 1. The interaction terms suggest no statistical significance in the income-depression relationship by age group. Overall, the models indicate a robust positive association between longer US residency and higher depression scores, even after adjusting for socioeconomic factors like education and income levels.

**Table 4b: Multivariable Logistic Regression Model Examining the association between the length of time lived in the US and Depression, NHANES 2017- pre-pandemic 2020 data (n=4,664)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Crude OR (95% CI) | Full Model 1  Crude OR (95% CI) | Full Model 2  Crude OR (95% CI) |
| **Length of Time (US)**  <= 5 Years  > 5 years | Referent Group (1.00)  1.81 (1.58 - 2.08) | Referent Group (1.00)  1.72 (1.48 - 1.99) | Referent Group (1.00)  1.57 (1.09 – 2.27) |
| **Age**  30 – 44  45 – 60 | Referent Group (1.00)  0.86 (0.75 - 0.98) | Referent Group (1.00)  0.86 (0.76 - 0.99) | Referent Group (1.00)  0.86 (0.76 - 0.99) |
| **Education level**  Less 9th grades  9-11th grade  High school  Some college/AA degree  College graduate/ higher | 1.55 (1.13 - 2.13)  1.37 (1.03 - 1.81)  Referent Group (1.00)  1.67 (1.27 - 2.18)  1.12 (0.86 - 1.48) | 0.96 (0.71 - 1.29)  1.17 (0.91 - 1.51)  Referent Group (1.00)  1.22 (1.02 - 1.47)  0.96 (0.79 - 1.16) | 1.22 (0.88 - 1.71)  1.05 (0.78 - 1.41)  Referent Group (1.00)  1.28 (0.96 - 1.71)  1.00 (0.75 - 1.33) |
| **The ratio of family income to poverty**  < 1  = 1  > 1 | Referent Group (1.00)  2.20 (0.49 – 9.91)  0.67 (0.56 - 0.82) | Referent Group (1.00)  2.09 (0.46 – 9.51)  0.69 (0.57 - 0.84) | Referent Group (1.00)  0.95 (0.22 - 6.20)  0.65 (0.47 - 0.90) |
| **dmdyrusz\_filled**  **#family\_income**  <= 5 Years, < 1  > 5 Years #= 1  > 5 Years #> 1 | NA  NA  NA | NA  NA  NA | Referent Group (1.00)  3.38 (0.14 - 82.12)  1.11 (0.75 - 1.64) |

OR = Odds Ratio

CI = Confidence Interval

The crude model shows that living in the US for more than 5 years is associated with higher odds of depression (OR 1.81, 95% CI: 1.58-2.08) compared to living 5 years or less. In the Full Model 1, adjusting for age and education level, the association remains significant with an OR of 1.72 (95% CI: 1.48-1.99) for living more than 5 years. In the Full Model 2, adjusting for age, education level, and interaction terms the association remains significant with an OR of 1.57 (95% CI: 1.09-2.27) for living more than 5 years. For age in the crude model, the older population was more affected by depression compared to the young population with OR = 0.86 (0.75 - 0.98), also across the full model 1 and 2 the OR ratio was high, 0.86 (0.76 - 0.99) and 0.86 (0.76 - 0.99) respectively. Lower education levels (less than high school and 9-11th grade) also showed higher odds of depression compared to high school graduates, 1.55 (1.13 - 2.13), 0.96 (0.71 - 1.29), and 1.22 (0.88 - 1.71). Lower education levels and being a college graduate or higher were also associated with higher odds of depression in this model. Across all models, the ratio of family income to poverty = 1 (poverty level) tended to have higher odds of depression compared to income < 1 poverty level. With the interaction between the length of time lived in the US> 5 Years and the ratio to family income = 1 the odds of depression are 3.38 higher than for people with <=5 years (CI= 0.14 - 82.12). Overall, the results suggest a positive association between a longer length of US residency and higher odds of depression, with the older population experiencing high odds of depression.

# **Discussion**

This study investigated the association between length of U.S. residency and depression among individuals aged 30-60 years old. The findings found that age modifies the exposure length of time lived in the US among immigrants and the outcome of depression. Moreover, the odds of depression were significantly elevated for those residing in the U.S. for over 5 years compared to 5 years or less.

However, the findings are contrary to our hypothesis whereby we found out from the analysis that individuals aged 30-60 who have lived in the US for a longer duration are more likely to experience depression. This aligns with prior research highlighting the stresses and challenges immigrants face, which can worsen depression development over time. Our results reinforce the established evidence on the complex interplay between immigration experiences and mental health outcomes. Previous studies demonstrate how culture and social integration difficulties contribute to higher depression levels in immigrant groups 8. Our findings also corroborate evidence identifying household income as a key confounding factor in the relationship between residency duration and depression, particularly among African American populations.

A key strength of this study is the large, diverse NHANES sample, enhancing the generalizability of our results19. Additionally, using standardized depression assessments and accounting for multiple socioeconomic covariates strengthens the validity of our findings. However, certain limitations must be acknowledged. The cross-sectional design impedes finding causality between the length of residency in the US and depression. Self-reported depression measures may also introduce reporting biases through underreporting or overreporting symptoms 9.

Despite adjusting for residual confounding remains a potential issue. Unmeasured variables like social support networks, experiences of discrimination, or cultural influences could impact the residency-depression relationship 18. Selection bias due to systematic differences between NHANES participants and non-participants may also affect generalizability. Information bias from inaccuracies in self-reported residency duration or other variables leading to misclassification errors also poses limitation 10.

To further explain these complex associations of the variables to depression, future research should utilize longitudinal designs to establish temporal sequencing and characterize depression trajectories over time in immigrant populations16. Integrating qualitative methodologies could yield rich insights into the lived experiences and unique challenges immigrants face. Moreover, examining potential mediating or moderating roles of factors like social support, discrimination, and cultural identity may shed light on the intricate causal pathways linking immigration and mental health inequities17. Such efforts are crucial for developing tailored, culturally responsive interventions to promote immigrant mental health and well-being.

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