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Variation in the Trajectories of Depressive Symptoms: Results from the Americans' Changing Lives Study

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Abstract

This study examines the association between race and depressive symptoms over a 16-year study period. The analysis is based on the responses of 3,485 African-American and White respondents from four waves of the Americans' Changing Lives Panel Study. Growth mixture modeling was used to identify latent trajectory classes based on the reported levels of depressive symptoms over 16 years. Four latent trajectory classes were identified: two "high-risk" groups and two "low-risk" groups. Findings show the heterogeneity among and within racial groups in their trajectories of depressive symptoms and the distinct demographic and social relationship predictors for symptom trajectories.

Introduction

A long tradition of research has documented how racial differences persist on a number of dimensions, including residential areas (Williams and Collins 2001); jobs (Reskin 2000); income (Isaacs 2007); and education (Williams and Jackson 2005). These social and economic dimensions have important health consequences for African-Americans, in particular, because they are disproportionately represented in segregated neighborhoods, hazardous and/or lower-paying jobs, and lower socioeconomic positions compared to their White counterparts. As a consequence of these social inequities, African-Americans are reported to have poor physical health outcomes compared to Whites (Levin et al. 2001). Though studies on race and mental health tend to produce more mixed results compared to those for physical health outcomes, numerous studies document the higher mean levels of depressive symptoms among African-Americans compared to Whites (e.g., Myers et al. 2002).

Though past studies provide a foundation for our understanding about how race may influence mental health outcomes, most prior research on this issue is based on cross-sectional designs that provide only a snapshot comparison about the depressive symptoms of Whites and African-Americans. Because depressive symptoms shift and change over the life

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course, we lack investigations that capture how African-Americans and Whites differ in the course and trajectory of their depressive symptoms over an extended period of time. Current methodological approaches to the study of race and mental health tend to treat race as a homogenous stratification variable that limits our ability to uncover important demographic distinctions within racial groups and, more important, investigate how these distinctions influence mental health trajectories. Accordingly, some researchers have suggested the need for improvement in research designs and methods of analysis, including innovative research strategies that link exogenous social factors such as race and socioeconomic status, to trajectories of growth and decline in health outcomes (Alwin 2005).

In this article, we use innovative statistical methods to develop profiles of social and demographic factors that are associated with mental health and to examine the propensity of racial groups to match with these profiles. This study's approach combines current thinking about race, social relationships, and demographic factors that may account for observed differences in depression outcomes. We uncover important demographic and social distinctions within and between racial groups and how these distinctions influence depression profiles. Specifically, the purpose of this investigation is to identify trajectories of depressive symptoms over a 16-year period in a sample of African-American and White adults. Growth mixture modeling using Mplus 5.2 is used to examine the long-term effects of race, social support, and negative interactions on patterns of depressive symptoms across four waves of data. A study of the association between social relationships and depressive symptoms and the interplay between social relationships and demographic factors is significant in an etiologic sense for the development of high-risk and low-risk profiles of depression and for the design of interventions that specifically target the factors that put people most at risk for depression. This, in turn, could reduce the personal, social, and economic burden of depression.

Racial and Ethnic Disparities in Depression

Most studies examining trajectories of depressive symptoms focus on adolescents (Brown, Meadows, and Elder 2007); older adults (Taylor and Lynch 2004); and individuals with physical illness, such as myocardial infarction (Contrada et al. 2006). Few studies, however, examine depression trajectories among the general population of African-American and White adults. Consequently, there is little knowledge about depression trajectories among these populations. Available studies of race, ethnicity, and the prevalence and persistence of depression tend to use a race-comparison approach and have produced inconsistent findings. Some studies report higher rates of major depressive disorder (MDD; Dunlop et al. 2003) and depressive symptoms (Blazer et al. 1998; Jackson 1997; Myers et al. 2002) for African-Americans compared to Whites, whereas others report lower rates for African-Americans (Riolo, Nguyen, Greden, and King 2005) compared to Whites. Equivalent rates for depression (Dunlop et al.) and depressive symptoms (Gallo, Cooper-Patrick, and Lesikar 1998; Kessler and Neighbors 1987; Zhang and Snowden 1999) have been reported when confounding factors such as socioeconomic status (SES) are controlled. Studies that have examined dysthymia by race have reported higher lifetime prevalence for African-Americans compared to Whites (Riolo et al. 2005). A study using data from the National Comorbidity Study indicated that African-Americans have a lower lifetime prevalence of mood disorders, like depression compared to Whites but are more likely to be persistently ill (Breslau et al. 2005). However, these differences were not explained by differences in SES. A recent study using data from the National Survey of American Life (Williams et al. 2007) also found that African-Americans had lower lifetime prevalence but a higher risk of the persistence of MDD compared to Whites. In addition, African-Americans were more impaired by depression and less likely to receive treatment compared to Whites.

Other recent findings from the Collaborative Psychiatric Epidemiology Surveys have revealed new information about the prevalence, persistence, and disability of depression among racial and ethnic groups and have raised new and intriguing questions about the factors that might explain variation in risk between and within racial and ethnic groups (Alegria et al. 2007; Takeuchi et al. 2007; Williams et al. 2007). These studies highlight the need for renewed attention to identifying the factors responsible for the lower prevalence but higher persistence and impairment from depression for some racial groups. The extent to which social support networks serve a protective role has been identified as one particular social resource that needs to be investigated (Alegria et al., 2007; Takeuchi et al., 2007; Williams et al. 2007). Given the negative side of social networks (Lincoln, Taylor, and Chatters 2003, Lincoln et al. 2007), the extent to which social networks pose a particularly important risk for depression should also be examined. Whether social relationship factors influence depression trajectories in similar ways among different racial groups is an area of further exploration.

Social Relationships and Health

Family, friends, and church members have been documented as important sources of informal support. More important, the quality and quantity of support have been consistently linked to a host of physical and mental health outcomes, including mortality (Berkman and Syme 1994), heart disease (Kristenson et al. 1998), and depression (Miller et al. 2004; Wethington and Kessler 1986). This research highlights the health-restorative role of social support networks; that is, their ability to meet basic human need for social contact, to provide assistance, and affirmation. House, Landis, and Umberson (1988) summarized evidence showing that the association between social relationships and health is comparable with standard risk factors, including smoking, blood pressure, and physical activity. More recently, Miller et al. (2004) identified low levels of social support as the most important risk factor for depression among African-Americans even after adjusting for such covariates as medications, environmental factors (e.g., home and neighborhood conditions), functional status (e.g., physical disability), biomedical factors (e.g., blood pressure, weight, chronic conditions), and health service utilization characteristics.

This work has much to offer with respect to identifying social support as an important protective factor for depression. However, the overwhelming majority of studies in this area focus on the positive aspects of social relationships. The growing body of literature indicating that positive and negative aspects of social relationships are distinctive social occurrences and that negative interactions are an important predictor of psychological functioning (Lincoln et al. 2003, Lincoln, Chatters, Taylor, and Jackson 2007) has much to offer with respect to revealing additional linkages between social relationships and mental health. Available studies, in particular those that conceptualize negative interactions as a chronic stressor, provide strong evidence linking negative interaction to various aspects of mental health and psychiatric disorders.

Negative interactions, characterized by conflict, excessive demands, and criticism, are a direct source of stress that has serious consequences for physical and mental health. Negative interactions are associated with heightened physiological reactivity (King, Atienza, Castro, and Collins 2002); heightened susceptibility to infectious disease (Cohen, Doyle, Skoner, Rabin, and Gwaltney 1997); declines in physical functioning (Seeman and Chen 2002); mortality (Tanne, Goldbourt, and Medalie 2004); negative affect (Newsom, Nishishiba, Morgan, and Rook 2003); and depression (Rook 1984). Interpersonal stress such as negative interactions arouses more distress in individuals than do other types of stress (Zautra, Burleson, Matt, Roth, and Burrows 1994) and persists over a longer period of time, compared to many other types of stressors, which tend to dissipate more quickly (Bolger,

DeLongis, Kessler, and Schilling 1989). Additional evidence indicates that negative interactions do not exhibit the same level of threat to mental health for African-Americans as they do for Whites (Lincoln et al. 2003). This work suggests variation in the role of social relationships as a protective or risk factor for depression among diverse populations.

Social Position and Mental Health

Findings from available studies suggest that demographic factors, such as race, are linked to psychological distress and may continue to shape the trajectories of depressive symptoms over time. Empirical findings have consistently supported the link between social position and differential exposure and vulnerability to stressful experiences and chronic strains (Kessler, Mickelson, and Williams 1999), and resource allocation (e.g., coping skills, social support, and financial capital; Brown et al. 2007). Specifically, minority status is associated with poorer mental health outcomes compared to that of the majority group. Race comparison studies examining the impact of social position on health profiles clearly demonstrates the health differential between African-Americans and Whites. Most of these studies contribute the health disparity to SES. However, even when SES is controlled, the race differential remains. What is less clear is how race influences depression trajectories. Current theoretical and empirical research suggests that the association between low social position and depression steadily increases over the adult life course—primarily because of the cumulative exposure and effects of major stressors as individual's age among those occupying the lower social strata (Turner and Lloyd 1999). Accordingly, African-Americans are assumed to have more negative mental health profiles compared to Whites. However, it is important to consider the diversity within the African-American population. This diversity could, in fact, reveal important variation in mental health status that may be otherwise missed in race comparison studies.

In summary, the overall aim of this investigation is to apply a novel analytic method to the question of the relationship between race, social relationships, and depressive symptoms in a longitudinal representative sample of African-American and White adults. Specifically, the role of social relationships in determining particular trajectories for depression among African-American and Whites is investigated. The utility of a broad conceptual framework that highlights the natural heterogeneity that exists within social support networks—positive and negative aspects—how these interactions are determined by race and demographic factors, and how these associations determine specific depression trajectories over a 16-year period is examined. In addition, this study takes into account the heterogeneity both within and between racial groups and is concerned with empirically identifying demographic and social relationship profiles of depressive symptoms among a heterogeneous sample of African-American and White adults.

Methods

Data

The data for this investigation are from the Americans' Changing Lives Panel Study. This sample is a longitudinal cohort composed of a multistage stratified probability sample of non-institutionalized adults 25 years of age and older and living in the coterminous United States. African-Americans and persons 60 and older were over-sampled at a rate twice that of Whites younger than 60. Face-to-face interviews were conducted in 1986 (wave 1), resulting in 3,617 completed interviews and a response rate of 67 percent. All of these individuals were followed up with subsequent waves of data collection. Wave 2 (1989) also involved face-to-face interviews, had a sample size of 2,867 respondents, and represents 83 percent of survivors. Wave 3 (1994) involved telephone interviews and the sample

represents 83 percent of survivors ($N = 2,562$). Wave 4 (2002) also involved telephone interviews and represents 76 percent to 80 percent of survivors ($N = 1,758$).

Table 1 presents the characteristics of the sample for the current investigation. The present analyses are based on the responses of 3,485 African-American and White respondents (age 25+). At wave 1, the average age was 53.94 years ($SD = 17.59$). Approximately 63 percent of the respondents were women, and 66.4 percent were White. Approximately 54 percent of the respondents were married, the average number of years of education was 11.49 ($SD = 3.42$), and the average annual income was \$22,073 ($SD = \$18,896$).

Statistical Methods

The current investigation used growth mixture modeling (GMM) to identify trajectories of depressive symptoms over a 16-year period. GMM takes into consideration the effects of heterogeneity in a sample (Muthén and Muthén 2000; Muthén et al. 2002). Specifically, this technique uses earlier developmental patterns to provide more reliable predictions for later development by taking into account the heterogeneity of adult development. Muthén and colleagues (2002) report that GMM allows for the identification of several different profiles. One of the theoretical assumptions of the conventional growth model is that the data come from a single population and that the single-population model accounts for all of the variation in the individual trajectories. As the data, social psychology theories, and empirical findings suggest, however, there may be several heterogeneous subgroups within this population that require different sets of model specifications and assumptions. Using GMM, the different subgroups in the model can be conceptualized as classifying the individuals into different collections of depressive symptom trajectories. For this reason, mixture modeling has been referred to as a *person-centered* as opposed to a *variable-centered* analytic approach. Consequently, the application of GMM is extremely useful for identifying specific factors related to the development of depression and to other factors that may contribute to individual differences in depressive symptom trajectories. Mplus 5.2 was used to estimate the GMMs. This software also enables analysis with missing data (except on covariates), using maximum-likelihood estimation. All of the analyses utilize analytic weights to account for unequal probabilities of selection and nonresponse such that African-American and White respondents are weighted to their numbers and proportions in the full adult population.

Measures

Depressive Symptoms—Depressive symptoms were measured with 11 items from the Center for Epidemiological Studies-Depression scale (CES-D; Radloff 1977). This abbreviated CES-D has been found to have acceptable reliability and a similar factor structure compared to the original version. Item responses are coded 1 (“hardly ever”) to 3 (“most of the time”). These items measure the extent to which respondents felt depressed, happy, lonely, sad, that everything was an effort, that their sleep was restless, that people were unfriendly, that they did not feel like eating, that people dislike them, that they could not get going, and that they enjoyed life. Positively worded items (e.g., “enjoyed life”) were reverse-coded. The mean was computed across the 11 items, resulting in a continuous measure of depressive symptoms for each wave. A high score on these items indicated a greater number of depressive symptoms.

Emotional Support and Negative Interactions—The emotional dimension of social support from relatives and friends was measured by an index of two items that ask respondents the extent to which network members (1) make them feel loved and cared for and (2) are willing to listen to the respondent discuss worries or problems. Response categories ranged from 1 (“not at all”) to 5 (“a great deal”), with higher values on this index

indicating higher levels of emotional support received from relatives and friends. Cronbach's alpha for this two-item index was 0.723. Negative interaction with relatives and friends was measured by an index of two items that assess the extent to which they (1) make too many demands and (2) are critical of the respondent and what they do. Response categories ranged from 1 ("not at all") to 5 ("a great deal"), with higher values on this index indicating more frequent negative interactions with relatives and friends. Cronbach's alpha for this two-item index was 0.615.

Five covariates were included in the analysis as indicators of an underlying proneness to depression. Race is a dichotomous variable coded 1 for African-Americans and 0 for Whites. Gender is a dichotomous variable coded 1 for female and 0 for male. Age is represented by six categories and is measured in years. Education and income were used to measure SES. Education is represented by six categories and measured the highest grade completed. Income (total household) was represented by 10 categories. The frequency distribution of all the variables used in this analysis is presented in Table 1.

Missing Data—The Mplus software (version 5.2) uses a full-information maximum likelihood estimation under the assumption that the data are missing at random (Arbuckle 1996; Little 1995), which is a widely accepted way of handling missing data (Muthén and Shedden 1999; Schafer and Graham 2002). Overall, at least 83 percent of respondents had at least two of the four assessment time points from 1986 to 2002. The minimum covariance coverage recommended for reliable model convergence is .10 (Muthén and Muthén 2004). In this study, coverage ranged from .434 to .988.

Results

Model testing began with the comparison between linear and quadratic models for the full analysis sample for depressive symptoms at all four waves. Results indicated that a linear model fit the data better than a quadratic model. The next step in the analyses was to identify the number of trajectories needed to describe the data. The objective of GMM is to find the smallest number of classes of individuals with similar trajectories. GMM estimates mean growth curves, that is, initial status (intercept) and change (slope) for each class of adults and captures individual variation around these growth curves by the estimation of variances for each class. As classes were added, the variance for the intercept and the slope became non-significant and were fixed to zero. The Bayesian Information Criterion (BIC; Kass and Raftery 1995; McLachlan and Peel 2000) values were used to determine the optimal number of classes for the best representation of the data, with smaller BIC values indicating improvement over the previous model with one less class. The best method for determining the number of trajectories or classes is still a topic of debate and discussion. For the present study, the overall model selection was guided not only by BIC values but by entropy indices and the interpretability of the chosen model, as the BIC criterion tends to favor models with fewer trajectory classes (Wiesner and Windle 2004). Model selection was also guided by examining the reliability of the classifications via the estimated posterior probabilities of trajectory class membership for each individual (Muthén and Muthén 2000). The precision of the classification can be assessed by how well respondents are being classified into each trajectory class. A reliable classification will require the respondent to have posterior probabilities that are very high for belonging to a single trajectory class and very low probabilities for belonging to all other classes. Finally, the overall interpretability of the model based on class counts and substantive theory for model selection were considered.

Latent Trajectory Class Enumeration and Trajectory Class Differentiation

In the next step of the analyses, we estimated the GMM models for the sample to determine the number of trajectory classes present in the data. The resulting model was our base growth mixture model, which assumed within- and between-class variation (e.g., fully unconstrained model). Next, we investigated whether any of the parameters could be constrained to be equal. We limited our constraints to those parameters of interest, specifically the class-specific starting points in depressive symptoms (i.e., intercept), and the change in depressive symptoms over time (i.e., slope). Accordingly, we estimated a constrained model (no within-class variation and with between-class variation) and a fully constrained model (e.g., no within- or between-class variation). Information criteria were obtained for one-, two-, three-, four- and five-class solutions (Muthén 2004). Because models with different numbers of latent classes are not nested, the BIC (Schwartz 1978) was used to select the best fitting model. The BIC suggested that a fully constrained five-class solution was optimal. However, other fit indices were consulted to determine the best model for the data.

Specifically, for level of depressive symptoms, comparisons between one-class (BIC = 3,658.431), two-class (BIC = 3,183.119), three-class (BIC = 2,905.618), four-class (BIC = 2,771.252), and five-class (BIC = 2,764.653) models indicated that a five-class model was the best fit to the data (according to the BIC values). However, the additional fifth class resulted in a splitting of a well-interpretable fourth class into two poorly interpretable classes. Specifically, the additional class resulted in a reduction of the average across-class probabilities and the entropy, which is a standardized summary measure of the classification accuracy of placing participants into classes based on their model-based (i.e., posterior) probabilities. Moreover, the fifth class did not result in any significant relationships between the covariates and depressive symptoms in the regression models. Accordingly, the four-class model was finally chosen for interpretability purposes.

The estimated mean growth curves representing four different trajectory classes for depressive symptoms are shown in Figure 1. Class one (11 percent of the sample; $N = 398$), the “Increasers” class, had a lower intercept at time one and an increasing trajectory (i.e., slope) over time (Table 2). Class two (15 percent of the sample; $N = 536$), the “Slow Decliners” class, had a higher intercept at time one compared to the Increasers group, and a slightly decreasing trajectory over time (although not statistically significant). Class three (5 percent of the sample; $N = 168$), the “High Symptoms” class, had the highest intercept and a significant decline in depressive symptoms (i.e., decreasing slope) over time. Class four (68 percent of the sample; $N = 2,380$), the “Low Symptoms” class, had the lowest intercept at time one compared to the other three classes and had no meaningful change in depressive symptoms over time (i.e., flat slope). Estimated population average probabilities of class membership for each trajectory class were derived from the model-based probabilities for all respondents to be in each of the four trajectory classes (each respondent has a probability of membership for each of the four classes that sums to 1.00). The average across-class probabilities were 0.781 for the Increasers, 0.785 for the Slow Decliners, 0.840 for the High Symptoms, and 0.918 for the Low Symptoms, suggesting good definition of trajectory class membership. Accordingly, individuals in the sample have, on average, a relatively high probability of being assigned to the class to which they have been assigned. Though there are no specific guidelines regarding acceptable probability levels for determining class membership, some researchers have suggested that each class should differ from others with respect to at least one model parameter (Greenbaum et al. 2005). The results from the present analysis meet these criteria. Overall, the probabilities associated with class assignment indicated that the classes were well differentiated.

Effects of Baseline Covariates on Depressive Symptoms

The next step in the analysis was to examine the effects of the baseline covariates on the trajectories of depressive symptoms (Table 3). Results do not reveal a significant effect of race on any of the four trajectory classes. This suggests that African-Americans are just as likely as Whites to match to any of the four trajectories. Baseline age had a significant negative effect on the trend for adults with increasing symptoms ($\beta = -0.015$; $p < .05$). This suggests that among African-Americans and Whites whose depressive symptoms increase over time, older age is associated with decelerating growth in depressive symptoms. There are no other significant effects for age on the growth parameters in the remaining three trajectories (i.e., High Symptoms, Low Symptoms, Slow Decliners). Baseline education had a negative effect on the trend for African-American and White adults with low depressive symptoms ($\beta = -0.002$; $p < .05$). This suggests that baseline education is associated with decelerating growth in depressive symptoms among those respondents who have the lowest level of symptoms. Baseline education did not have a significant effect on depressive symptoms for adults in the remaining trajectory classes. Marital status had a significant negative effect on the trend for adults with increasing depressive symptoms. This suggests that among African-American and White adults with increasing depressive symptoms, being unmarried is associated with lower symptom acceleration ($\beta = -0.040$; $p < .05$). Baseline marital status did not have a significant effect on depressive symptoms for adults in the remaining trajectory classes. Finally, baseline negative interaction had a significant negative effect on trends for adults with increasing depressive symptoms. This suggests that baseline negative interactions with social network members is associated with decelerating growth in depressive symptoms for those respondents whose symptoms increase over time ($\beta = -0.035$; $p < .01$). Baseline negative interaction did not have a significant effect on depressive symptoms for adults in the remaining trajectory classes. Trajectory specific means and proportions for the covariates appear in Table 4.

Characteristics of Trajectory Membership

The next analysis characterizes trajectory membership by estimating the likelihood of adults with different levels of covariates belonging to a trajectory in relation to a comparison trajectory. The coefficient for race, age, gender, income, education, social support, and negative interaction (measured at baseline) is the result of a multinomial logistic regression using the latent class variable comparing the Increasesers, Slow Decliners and High Symptoms trajectory classes to the Low Symptoms trajectory class, which was set as the reference class (Table 5). These results indicate that age, education, income, social support and negative interaction are significantly related to trajectory membership.

Age significantly differentiates trajectory class membership such that younger African-Americans and Whites are more likely to have slow declining depressive symptoms compared to low symptoms (OR = 0.66; CI = 0.54–0.80). With respect to education, those with lower levels of education are more likely to have depressive symptoms that decline slowly over time (OR = 0.87; CI = 0.76–0.99) and to have high symptoms (OR = 0.84; CI = 0.73–0.97) than to have low symptoms.

Income significantly differentiates the Increasesers, the Slow Decliners, and the High Symptoms trajectory classes from the Low Symptoms trajectory class, such that those with less income are more likely to have depressive symptoms that increase (OR = 0.84; CI = 0.74–0.94), decline slowly (OR = 1.04; CI = 0.91–0.94), and to have persistently high symptoms over time (OR = 0.83; CI = 0.71–0.98) than to have low symptoms. Respondents who report higher levels of social support are less likely to have depressive symptoms that decline slowly over time (OR = 0.60; CI = 0.42–0.86) than to have low symptoms (i.e., they are more likely to have low symptoms over time). Finally, respondents who report

experiencing negative interactions with their social network members are more likely to have increasing symptoms (OR = 1.46; CI = 1.09–1.96) and high symptoms (OR = 1.79; CI = 1.20–2.66) than to have low symptoms over time.

Discussion

Most studies of race and depressive symptoms use a race comparison approach, which obscures the heterogeneity both within and between racial groups. This conventional approach assumes that race will be the defining characteristic of individuals with respect to depressive symptoms. In this article, we take an alternative approach that requires an understanding of the role of social location factors such as race and how they interact with other factors such as age, marital status, gender, SES, and social relationships to influence mental health trajectories. Based on four waves of panel data spanning a 16-year period from a large representative sample of African-American and White adults, this investigation sheds new light on the relationship between race, social relationships, and depressive symptoms. What distinguishes this study from most is that the methodological approach facilitated an examination of the heterogeneity within and between racial groups rather than a priori comparing two groups based solely on race. Four major findings emerge that extend previous findings using a race comparative approach. First, results from this investigation revealed multiple trajectories of depressive symptoms that included groups of adults following four different trajectories: (1) respondents who began and remained low on depressive symptoms throughout the 16-year study period (“Low Symptoms”); (2) those who had high levels of depressive symptoms that declined slightly over the study period but remained high (“High Symptoms”); (3) respondents who had relatively high levels of depressive symptoms that declined slightly—but not significantly—over the study period (“Slow Decliners”); and (4) those who had moderately high levels of depressive symptoms at baseline but whose symptoms increased over time (“Increasers”). Collectively, our findings suggest that the levels of depressive symptoms for African-Americans compared to Whites may be attributable, in part, to the presence of latent subpopulations of adults with different developmental trajectories of depressive symptoms. This developmental heterogeneity indicates that treating constructs such as depressive symptoms from a single population may mask potentially critical differences by averaging over contrasting trends. More specifically, results from the current investigation revealed distinct differences in the effects of baseline demographic and social relationship factors on the rate of change in depressive symptoms thereafter among the four trajectories. Thus, issues such as proper model specification and selection are critical to understanding complex relationships among structural factors such as race, and social factors such as social support and negative interactions and depressive symptoms in racial groups and should receive greater attention.

Second, our findings highlight the risk and protective factors for depression. The four trajectory classes differed statistically in terms of the parameters of the growth mixture models (e.g., baseline depressive symptom levels, changes over time, the relationship of covariates to trajectories). Beyond identifying individual differences in initial depressive symptoms, which could have been detected without examining longitudinal change, the incremental value of the growth mixture modeling approach was that it identified classes that also varied by the amount of change that occurred during the 16-year study period. Accordingly, the identified trajectories reflect differences that would not be apparent from a cross-sectional analysis of initial depressive symptoms only. There is reason to believe that the trajectory groupings were reliably distinctive; that is, individual patterns fell into latent class trajectories, and these trajectories may be usefully examined for characteristics that may reflect different etiological pathways and long-term outcomes. Of the covariates studied, age, education, income, social support, and negative interaction significantly predicted trajectory class membership in the multivariate models. As such, identifying

subpopulations at risk for depression with properly specified growth models may facilitate depression prevention and intervention efforts by targeting adults at special risk for depression.

Studies examining the exposure and vulnerability to stressors by social position consistently report that African-Americans are more at risk for depression because of their SES positioning relative to that of Whites. Our current study does not entirely support this position but offers a more complex picture of how race functions in the disease process. The third major finding from this study is that race was not a significant predictor of trajectory class membership. In contrast to previous race-comparative studies that report either higher or comparable levels of depressive symptoms among African-Americans compared to Whites, results from the current study demonstrate racial heterogeneity across all four latent trajectory classes—both African-Americans and Whites are represented in each of the four classes. Findings clearly demonstrate that African-Americans are no different than Whites with respect to their propensity to match with these four particular trajectories of depressive symptoms, further demonstrating the limitations of using race as the sole distinguishing characteristic to determine one's risk for depression. In addition, findings lend more support for the notion that (1) individuals have varying levels of risk for mental health problems, (2) individuals have a fundamentally different development of mental health problems, (3) other factors such as SES and social relationships are important for influencing disease trajectories, and (4) the classes are also heterogeneous with respect to gender, age, SES, marital status, and social relationships, further demonstrating the variation in risk and protective profiles among adults.

Finally, variability in social relationship factors is an important predictor of depressive symptoms. Social psychology theories are important for understanding how social factors influence proximal environments in which people live and for identifying those factors that lead to variability in the experience of health and illness. In the case of the present investigation, interaction with social network members significantly influenced depressive symptom trajectories and, accordingly, helps explain some of the variation in observed outcomes.

The multivariate models indicate that negative interaction is a stronger predictor of class membership compared to social support, which is consistent with findings from previous investigations that examine the dual nature of social relationships (Lincoln et al. 2003, 2007). With respect to the latent trajectory classes, respondents in the Increasesers and Low Symptoms classes reported similar levels of social support, whereas those in the Slow Decliners and High Symptoms classes reported experiencing similar levels of negative interaction. However, their trajectories are quite varied; suggesting that social support and negative interaction are important social resources that operate in different ways. More specifically, social support operates as more of a protective factor for those respondents with low symptoms but more of a risk factor for those with increasing symptoms. Negative interaction appears to be a risk factor for those respondents whose symptoms increase over time and for those with a persistently high level of symptoms.

In the case of higher levels of depressive symptoms, the classes of concern—that is, the trajectory classes that appear most in need of intervention—are identifiable only through mixture modeling analyses of longitudinal data. The two smallest trajectory classes, the Increasesers (11 percent of the sample) and High Symptoms (5 percent) classes, had the highest levels of depressive symptoms over the course of the study period. Members of these classes would likely have been “missed” in traditional categorization schema because the groups either would have been separated by race (e.g., race comparison approach) and/or the analyses would not have allowed for the distinction of the various classes. Moreover,

reported levels of depressive symptoms at the last time point look quite different for the Slow Decliners and Increasers trajectory classes compared to their initial levels. Analyses that look simply at cross-sectional reports of depressive symptoms would probably not have been able to differentiate the full process that separates these adults into meaningful subgroups. For example, the Low Symptoms and the Increasers trajectory classes report relatively low initial levels of depressive symptoms. In more traditional studies, these participants might be considered at low to moderate risk for depression. The current findings suggest, rather, that age, SES, social support, and negative interaction may be a constellation of factors that interact or accumulate over time and thus contribute to increased risk for depression. Identification of a group that is consistently high on depressive symptoms throughout the study period and a group whose symptoms increase over time suggests that unless these individuals receive some sort of intervention, they are at risk for depression. The finding that social support was not an effective resource for those in the high-risk groups and that negative interaction was a particularly significant risk factor for these groups underscores the role of social relationships—negative interaction in particular—as risk and protective factors for depression.

Interpretation of the findings from the current study should be considered within the context of the study's strengths and limitations. The CES-D was used to measure depressive symptoms, which may not fully capture the range of depressive symptoms in this sample. Previous research using the CES-D suggests that African-Americans express their emotional and mental health in ways that are not easily captured by measures developed for a Western conceptualization of depression (Perreira, Deeb-Sossa, Harris, and Bollen 2005; Vega and Rumbaut 1991). In addition, the covariates included in the analyses are only a subset of the social factors known to be associated with depression. In future studies, other covariates known to be associated with depression should be examined. Finally, the covariates in this study were measured at baseline to examine the long-term effects of these factors on depressive symptoms over time. Future studies should examine how changes in social status and social relationships over time are associated with changes in depressive symptoms.

Conclusion

This study represents an attempt to examine the trajectories of depressive symptoms among African-American and White adults. It incorporates important innovations in addressing these issues, including the use of a representative sample of African-Americans and Whites, GMM, and four waves of data over a 16-year period. Taken as a whole, these findings suggest a number of interesting avenues for future study. First, this work highlights the need to consider the heterogeneity within and across populations. Findings revealed depressive symptom trajectories that were quite heterogeneous with respect to race, further providing credence to the notion that race is not a genetic or biological distinction, but a social and cultural construct that is quite fluid (Omi and Winant 1994). Future studies should also consider the influence of sociodemographic factors over time. SES is a strong determinant of the degree to which mental health deteriorates or is maintained with increasing age in cross-sectional and longitudinal studies. Moreover, deficits in social support and experiencing negative interactions with social network members have long-term effects on mental health status. However, it is only with the aid of longitudinal studies that we see emerging evidence and theory that SES and social relationships play different roles with respect to mental health and the way mental health changes as people age over the adult life course. Findings of differential effects of SES, social support, and negative interaction in the current study lend additional support for this line of inquiry.

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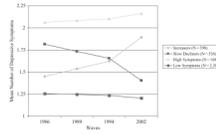


Figure 1.
Growth curves representing four trajectory classes for depressive symptoms.

Table 1Characteristics of the Wave 1 Sample ($N = 3,493$)

Variable	Frequency	%
Race		
African American	1,169	33.5
White	2,316	66.5
Sex		
Male	1,297	37.2
Female	2,188	62.8
Age		
25–34	696	20.0
35–44	564	16.2
45–54	374	10.7
55–64	666	19.1
65–74	751	21.5
75+	434	12.5
Household Income		
Less than \$5	512	14.7
\$5,000–\$9,999	618	17.7
\$10,000–\$14,999	484	13.9
\$15,000–\$19,999	360	10.3
\$20,000–\$24,999	296	8.5
\$25,000–\$29,999	275	7.9
\$30,000–\$39,999	373	10.7
\$40,000–\$59,999	356	10.2
\$60,000–\$79,999	120	3.4
\$80,000 or more	91	2.6
Education		
0–8 years	685	19.7
9–11 years	608	17.4
12 years	1,025	29.4
13–15 years	689	19.8
16 years	247	7.1
17 years	231	6.6
Marital Status		
Married	1,898	54.5
Divorced	168	4.8
Separated	395	11.3
Widowed	641	18.4
Never Married	383	11.0
Social Support		
A great deal	85	2.4

Variable	Frequency	%
Quite a bit	306	8.8
Some	800	23.0
A little	1,557	44.7
Not at all	737	21.1
Negative Interaction		
A great deal	2,077	59.6
Quite a bit	978	28.1
Some	331	9.5
A little	76	2.2
Not at all	23	0.7

Table 2

Estimated Growth Factor Means for the Four-Class Mixture Model

Class	Mean	SE	Z statistic
Increasesers ($N = 398$)			
Intercept	1.262	0.188	6.730***
Slope	0.194	0.065	2.964*
Decreasers ($N = 536$)			
Intercept	1.299	0.284	4.574**
Slope	0.021	0.114	0.180
High depressed ($N = 168$)			
Intercept	2.283	0.188	12.130***
Slope	-0.159	0.059	-2.678*
Low depressed ($N = 2,380$)			
Intercept	1.268	0.060	21.239***
Slope	0.007	0.018	0.380

Note:

* $p < 0.05$.** $p < 0.01$.*** $p < .001$.

Table 3

Coefficients for Intercepts and Slopes

Variable	Low symptoms		Decreasers		Increasers		High symptoms	
	b	SE	b	SE	b	SE	b	SE
African American								
Intercept	0.043*	0.018	0.047	0.093	0.065	0.097	0.064	0.066
Slope	0.003	0.004	0.000	0.027	-0.004	0.025	-0.036	0.026
Age								
Intercept	0.002	0.004	0.058*	0.029	0.040*	0.016	0.013	0.041
Slope	0.001	0.001	-0.008	0.008	-0.015*	0.005	0.019	0.012
Education								
Intercept	0.001	0.002	0.019	0.013	-0.008	0.013	0.001	0.010
Slope	-0.002*	0.001	-0.003	0.006	0.001	0.004	0.005	0.004
Income								
Intercept	-0.012*	0.003	-0.033	0.017	-0.019	0.011	-0.006	0.019
Slope	0.001	0.001	0.007	0.005	0.004	0.003	0.000	0.007
Female								
Intercept	0.006	0.013	0.119	0.062	0.048	0.077	0.173*	0.067
Slope	0.000	0.003	-0.010	0.022	0.017	0.025	-0.004	0.030
Unmarried								
Intercept	0.032*	0.016	0.139	0.091	0.183*	0.081	-0.030	0.113
Slope	-0.007	0.004	-0.034	0.026	0.040*	0.020	0.033	0.037
Social Support								
Intercept	-0.016	0.009	0.045	0.033	-0.027	0.027	-0.113*	0.036
Slope	0.002	0.002	-0.021	0.012	-0.014	0.008	0.026	0.013
Negative Interaction								
Intercept	0.032*	0.010	-0.013	0.028	0.139***	0.023	0.004	0.045
Slope	-0.004	0.003	0.002	0.007	-0.035**	0.007	-0.012	0.014

Note:

*
p < .05,
**
p < .01,

p < .001.

Table 4

Sample Statistics by Estimated Class Probabilities (Means)

Variable	Increasesers (N = 398)	Decreasers (N = 536)	High depressed (N = 168)	Low depressed (N = 2,380)
CES-D Wave 1	1.506	1.737	1.996	1.231
CES-D Wave 2	1.539	1.611	1.974	1.219
CES-D Wave 3	1.565	1.453	2.014	1.166
CES-D Wave 4	1.815	13.120	2.014	1.164
Black	0.150	0.150	0.238	0.102
Age	40.123	52.750	44.980	48.485
Education	11.502	12.241	10.958	12.763
Income	4.140	5.621	4.252	5.634
Female	0.607	0.558	0.523	0.508
Unmarried	0.426	0.284	0.315	0.288
Social Support	3.927	3.577	3.704	3.981
Negative Interaction	1.832	1.996	2.099	1.651

Table 5

Coefficients for effects of demographic and social relationship variables on depressive symptoms compared to low depressed

Variable	Odds ratio	(95% Confidence interval)
Race		
Increasesers vs. Low	1.10	(0.56, 2.16)
Slow decliners vs. Low	0.81	(0.31, 2.09)
High symptoms vs. Low	1.75	(0.64, 4.82)
Age		
Increasesers vs. Low	1.05	(0.91, 1.23)
Slow decliners vs. Low	0.66*	(0.54, 0.80)
High symptoms vs. Low	0.79	(0.60, 1.05)
Education		
Increasesers vs. Low	0.94	(0.86, 1.04)
Slow decliners vs. Low	0.87*	(0.76, 0.99)
High symptoms vs. Low	0.84**	(0.73, 0.97)
Income		
Increasesers vs. Low	0.84*	(0.74, 0.94)
Slow decliners vs. Low	1.04	(0.91, 1.18)
High symptoms vs. Low	0.83**	(0.71, 0.98)
Sex		
Increasesers vs. Low	1.29	(0.70, 2.36)
Slow decliners vs. Low	1.61	(0.88, 2.94)
High symptoms vs. Low	1.08	(0.47, 2.49)
Marital Status		
Increasesers vs. Low	1.10	(0.62, 1.93)
Slow decliners vs. Low	1.01	(0.50, 2.02)
High symptoms vs. Low	0.63	(0.19, 2.03)
Social Support		
Increasesers vs. Low	0.84	(0.53, 1.33)
Slow decliners vs. Low	0.60*	(0.42, 0.86)
High symptoms vs. Low	1.10	(0.65, 1.87)
Negative Interaction		
Increasesers vs. Low	1.46*	(1.09, 1.96)
Slow decliners vs. Low	1.36	(0.97, 1.91)
High symptoms vs. Low	1.79**	(1.20, 2.66)

Note:

* p > .05,

** p > .01.