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Taking the Edge Off: The Role of Stressful Events and Perceived Stress on Alcohol Use and Problems Among Older Adults

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TAKING THE EDGE OFF: THE ROLE OF STRESSFUL EVENTS AND PERCEIVED STRESS ON ALCOHOL USE AND PROBLEMS AMONG OLDER ADULTS

by

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ABSTRACT

Alcohol misuse by older adults is a significant public health concern and is projected to worsen with the aging of the "baby boom" generation. To help understand the nature of older adult alcoholism, it is crucial to investigate factors such as stress that may influence consumption and problem use among older adults. Findings are mixed on the role of stress and coping in alcohol use, and studies comparing the role of stress and coping in alcohol use on different age groups are rare. Therefore, this study had the following aims: 1) To test a stress and coping model of current alcohol use, at-risk drinking, and alcohol-related problems in a nationally representative sample of older adults; 2) To investigate cohort differences in the Stress and Coping model between young adult (20-39), early middle age (40-59), and older adult (60+) life stages.

This investigator conducted secondary analysis of the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC). An overall model of stress and coping was tested using structural equation modeling (SEM) with a subsample of older adult, middle-aged, and young adult current drinkers. Multiple group models tested group differences in the overall model, and interaction tests were conducted to test for a stress buffering effect of social support.

Older adults endorsed lower levels of stressful life events, cognitive appraisal of stress and social support than younger age groups; alcohol consumption, at-risk drinking and rate of alcohol problems were also lower. In all age groups, higher levels of stressful events were associated with cognitive appraisal of stress, but in older adults, cognitive appraisal was associated with decreases in alcohol use. Among younger age groups, cognitive appraisal was associated with problem use, but not at-risk drinking or increased

consumption. Interaction models were nonsignificant, suggesting that social support does not buffer the effect of stressful events on cognitive appraisal. The overall findings highlight limits of a global stress and coping model of alcohol use. Implications include the need to consider contextual and developmental factors in stress-related drinking including unique stresses in late life, and changing relationships between stress and drinking in older adulthood.

Chapter 1: Overview of Specific Aims

Geriatric alcohol misuse has often been described as the "silent epidemic" because of its unique characteristics and pattern of underdetection (O'Connell, Chin, Cunningham, & Lawlor, 2003). Alcohol misuse by older adults is a significant public health concern and is projected to worsen with the aging of the "baby boom" generation. This cohort is unique for its large numbers and its historically elevated rates of alcohol and other substance use compared to previous generations (Colliver, Compton, Gfroerer, & Condon, 2006; Patterson & Jeste, 1999); it is likely that this cohort will continue to exhibit higher prevalence of substance use and problems as it ages. Older adult substance use disorder treatment needs are forecasted to increase from 1.7 million in 2001 to 4.4 million in 2020, potentially straining the healthcare system (Gfroerer, Penne, Pemberton, & Folsom, 2003). These shifts in prevalence and service needs have led researchers and policy makers to advocate for more research in this understudied area (Jeste et al., 1999; Patterson & Jeste, 1999).

To help understand the nature of the emerging problem of older adult alcohol use, problems, and alcoholism, it is crucial to investigate factors that influence consumption and problem use among older adults. It is especially important to understand the role of mutable factors, as these may provide a focus for effective interventions. By understanding the relationships between these factors, responsive prevention and treatment models can be developed to address specific aspects of risk.

Stress and coping are two such factors and are part of a framework for understanding alcohol consumption and problem use in older adults. Stress and coping

models are drawn from the tension-reduction hypothesis (Greeley & Oei, 1999). In this theory, alcohol consumption is seen as a behavior to offset tension. Stress-coping theory expands on this notion, incorporating constructs of social support, cognitive appraisal, and coping behaviors. "Social support" is a complex construct encompassing both emotional and direct support. "Cognitive appraisal" relates to the perception of the individual regarding the magnitude of their stress and their ability to cope, and coping behavior relates to actions taken to manage stressors. Under this theory, alcohol is the coping behavior itself, functioning to offset stress.

In older adult populations, findings are mixed on the roles of stress and coping in alcohol use (e.g. Glass, Prigerson, Kasl, & Mendes de Leon, 1995; Jennison, 1992; La Greca, Akers, & Dwyer, 1988; Welte & Mirand, 1995), with some research identifying associations between stressors and increased drinking, while other studies have not found a relationship. Additionally, studies comparing the role of stress and coping, specific to alcohol use, in older adults compared to younger individuals are rare. Evidence suggests that stress and coping vary based on life stage, but research on age differences is scant (McCreary & Sadava, 2000). Although research has focused extensively on stress and drinking, conceptual models of stress and coping have not been tested specifically in older adults. Therefore, this dissertation develops and tests a stress-coping model of older adult drinking, with the following aims:

Aim 1: To test a stress and coping model of current (past-year) alcohol use (average daily use), at-risk drinking (defined as 5+ drinks for men and 4+ drinks for women or greater than 14 drinks per week), and alcohol-related problems (DSM-IV criteria) in a

nationally representative sample of older adults interviewed in the National Epidemiological Sample of Alcohol and Related Conditions (NESARC).

Aim 2: To investigate cohort differences among current drinkers in the Stress and Coping model between young adult (20-39), middle age (40-59), and older adult (60+) life stages.

To achieve these aims, this investigator has conducted a secondary analysis of the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC). The NESARC survey is a nationally representative sample of noninstitutionalized individuals age 18 years and older (Grant, Kaplan, Shepard, & Moore, 2003), surveyed during 2001-2002 (Wave 1) and again in 2004-2005 (Wave 2).

For this dissertation, the investigator analyzed a subsample of current (past year) drinkers age 60 or older at wave 2 (for Aim 1) and a larger subsample of all current drinkers across all ages (Aim 2). A theoretical model of stress and coping was tested via structural equation modeling (SEM) using measures of stressful events, social support, cognitive appraisal, and alcohol use. This research has implications for alcohol screening and intervention with older adults. By understanding relationships between stress, social support, cognitive appraisal, and alcohol use, treatments can be refined to address important mediating relationships. On a theoretical level, this research will add to current understanding of the stress-alcohol relationship in later life compared to earlier life stages.

Chapter 2: Background and Significance

Prevalence of alcohol consumption and problems among older adults

A large proportion of older adults drink. Past-year alcohol consumption by older adults has been estimated at approximately 45% (National Institutes of Health, 2006; Office of Applied Studies, 2004). Alcohol abuse and dependence have lower 12-month prevalence among older adults, but large-scale epidemiologic studies conducted 10 years apart suggest that prevalence of alcohol abuse is increasing in this population

In a study comparing the National Longitudinal Alcohol Epidemiologic Survey (NLAES) (1991-1992) and NESARC (2001-2002) data (Grant et al., 2004), two large epidemiologic surveys of the United States, researchers identified a significant increase in prevalence of 12-month DSM-defined Alcohol Abuse among older adults in both males and females age 65 and older. For men, the 12-month prevalence rate rose from 0.52 to 2.38%, and for women, 0.04 to 0.36%. Past 12-month Alcohol Dependence rates showed no significant changes, showing a slight decline from 0.39 to 0.24%. Changes in prevalence rates among older adults are especially important, as the number of older adults in the population is also increasing.

Hazardous and at-risk drinking among older adults

Hazardous and at-risk drinking comprise a broader definition of alcohol pathology than do abuse or dependence among older adults. "Hazardous use" is a general term taken to mean that alcohol use that creates harm or potential injury to the older adult in the form of consumption level, comorbidities, and/or medication interactions. "At-risk drinking" is defined more specifically as exceeding consumption guidelines developed by the National Institute of Alcoholism and Alcohol Abuse (NIAAA), (i.e. more than 7

drinks per week for men, more than four drinks for women; No more than 2 drinks per occasion). This also includes the idea of "binge" drinking, in which the individual consumes an excess of alcohol on a given occasion. Some researchers believe that hazardous or at-risk benchmarks are a more valid means of conceptualizing alcohol pathology in late life (Moore et al., 2006; Moore et al., 1999). Using a large population based longitudinal survey, Moore and colleagues (2006) found that at-risk drinking was common among drinkers over age 60, with 27% of respondents in their study meeting the definition of at-risk drinkers.

Public Health consequences of alcohol misuse among older adults

Psychiatric Conditions associated with older adult problem drinking

As in younger groups, psychiatric comorbidity is common among older problem drinkers (Christensen, Low, & Anstey, 2006; Oslin, 2000). The most common psychiatric conditions include other substance abuse/dependence and depression. Nicotine and prescription medications are the most common substances used and misused by older problem drinkers. In a study by Nakamura and colleagues (1990), smoking was associated with heavy alcohol consumption among a community sample of older adults. Severity of alcohol misuse is also associated with increased likelihood of nonmedical use of prescription drugs (including opioids, stimulants, tranquilizers, and sedatives) (McCabe, Cranford, & Boyd, 2006). This issue is a special concern for older adults, who have the highest rates of total medication use (including prescription, over-the-counter drugs, vitamins and minerals, and herbal supplements (Kaufman, Kelly, Rosenberg, Anderson, & Mitchell, 2002).

Among adults 65 and over, those with a lifetime diagnosis of Alcohol Dependence

have more than four times the odds of having lifetime Major Depression than those without Alcohol Dependence. (Grant & Harford, 1995). The authors note, "Although not entirely consistent for abuse only diagnoses, the odds ratios associated with dependence and combined abuse and dependence had a tendency to increase with age most predominantly in terms of lifetime comorbidity (p. 203)." Among older adults discharged from inpatient depression treatment, researchers (Blixen, McDougal, & Suen, 1997) found that 37% had some additional substance dependence/abuse/psychiatric comorbidity. Of the comorbid group, more than 70% had depression. In a study of comorbidity among alcoholics in the VA system, researchers found that comorbid depression was more common with increasing age (Blow, Cook, Booth, Falcon, & Friedman, 1992). Although studies are limited, other comorbidities are present in older problem drinkers as well. In a study of Bipolar Disorder in late life, researchers found that almost 40% of persons with Bipolar Disorder had a past-year alcohol use disorder (Goldstein, Herrmann, & Shulman, 2006). Recent research focused on gambling and older adults found that recreational gamblers were more than twice as likely to have an alcohol use disorder, and pathological gamblers were six times more likely to have an alcohol use disorder (Pietrzak, Morasco, Blanco, Grant, & Petry, 2007). Speer and Bates (1992), looking at comorbidity among older (55+) psychiatric inpatients found that almost 60% of individuals, with comorbid depression and substance use disorders also had a personality disorder.

Health and older adult drinking levels

The relationship between alcohol use and physical health is complex. Light to moderate alcohol use (usually defined as 1 drink per day in older adults and less than 4

drinks per week in older women) is associated with cardiovascular benefits and lower mortality than abstinence and heavy use (Lang, Guralnik, Wallace, & Melzer, 2007; Mukamal et al., 2006; Pearl, 1926; Thun et al., 1997), often referred to as the "J" or "U" shaped curve (Pearl, 1926; Skog, 1996). Nonetheless, age-related changes in body composition lead to different alcohol effects in older adults. Compared with younger groups, older adults have increased body fat and decreased water (Vestal et al., 1977) and therefore have less body fluid with which to distribute the alcohol (Moore, Whiteman, & Ward, 2007; Vestal et al., 1977; Vogel-Sprott & Barrett, 1984). This leads to higher blood alcohol levels at the same level of consumption compared with younger individuals of the same gender. Furthermore, changes occur in liver function as people age (Durnas, Loi, & Cusack, 1990). These differences in alcohol response may contribute to medical comorbidities associated with use, such as falls, functional disability, and decreasing brain functioning, and put older adults at unique higher risk of alcohol related health consequences (Oslin, 2000). Recent experimental research also suggests older adults are more impaired than young adults at a given alcohol consumption level but they are less aware of their level of intoxication (Gilbertson, Ceballos, Prather, & Nixon, 2009).

Older adults with a chronic history of heavy use show decreased functioning in a variety of domains, but in studies of *current* heavy drinkers, much of the research is inconclusive, with some studies having identified higher rates of functional impairment (Leveille, LaCroix, Hecht, Grothaus, & Wagner, 1992), while others having not detected an association between functional impairment and increased alcohol use (Blow et al., 2000; Ensrud et al., 1994; Jung, Ostbye, & Park, 2006; LaCroix, Guralnik, Berkman, Wallace, & Satterfield, 1993). These studies give some support to the notion of a U-

shaped curve related to alcohol related health outcomes, but much of the research is limited by cross sectional design and great variability in measures of consumption, different age categories and health related variables. Risk of falling also follows a U-shaped curve based on consumption (Mukamal, Robbins, Cauley, Kern, & Siscovick, 2007), and findings regarding risk are mixed. In a review of health effects on drinking in older adults, Reid and colleagues (2002) found no clear answer to the question of alcohol and falls in older adults. Four studies identified increased risk, while 21 found no association; one study found decreased risk of falls. Some explanations for the lack of findings include limited statistical power, underreporting, and not distinguishing nondrinkers and former drinkers. Additionally, many of these studies did not consider patterns of use, such as binge drinking. This may explain negative findings in many studies.

More recent studies point to complexity in the relationship between alcohol use and falls. Using epidemiological data, (Sorock, Chen, Gonzalgo, & Baker, 2006) researchers found increased odds of a fatal fall among drinkers over 65. Brennan and Greenbaum (2005) found that nursing home residents with alcohol related diagnoses were more likely to have experienced falls and have hip fractures. Applying a longitudinal design, medical researchers have found increased risk of falls associated with heavy alcohol consumption (+14 drinks per week) (Mukamal et al., 2004). It is likely that a bidirectional relationship exists between alcohol use and health; consumption may cause changes in health status, but changes in health status may also reduce consumption (Moos, Brennan, Schutte, & Moos, 2005; Satre & Arean, 2005; Satre, Gordon, & Weisner, 2007).

When considering the issue of cognitive impairment and alcohol use, consumption levels are again a central factor in health consequences. Additionally, the extent of individual drinking history influences the level of cognitive problems. Beneficial effects have been identified in low to moderate drinking compared with abstinence and heavy use (Anttila et al., 2004; Britton, Singh-Manoux, & Marmot, 2004; Mukamal et al., 2003; Reid et al., 2006; Solfrizzi et al., 2007). Among studies that found increased risk of cognitive impairment, only heavy alcohol use (14 or more drinks per week) was found to be associated with impairment, with other studies of moderate or light consumption have been inconclusive (Mukamal, Longstreth, Mittleman, Crum, & Siscovick, 2001; Reid et al., 2002). Additionally, a number of research studies point to increased stroke risk among heavy drinkers (Bazzano et al., 2007; Hvidtfeldt et al., 2008; Perreira & Sloan, 2002; Reid, Fiellin, & O'Connor, 1999) which may lead to stroke related cognitive impairment.

Stress and Coping models of Older Adult Drinking

Research specific to older adults. Researchers have investigated the relationship between stress and alcohol use among older adults for many years, yet findings in this area have been mixed, with some studies identifying associations between stress and drinking, and other studies having negative findings. Some of the discrepancies may be a result of varied methodologies and measurements of stress and of alcohol use. Additionally, studies have used varied clinical and epidemiological samples, potentially tapping different subgroups of older adults, leading to disparate findings. Essentially, important relationships between stress, social support, and alcohol use may be most pronounced for individuals who engage in risk drinking. Finally, few studies have

assessed the structure of these relationships among older adults.

An early study of elderly problem drinkers found that 70% of late onset problem drinkers reported an environmental influence such as bereavement as a cause of their drinking, as opposed to 30% of long-term problem drinkers (Rosin & Glatt, 1971). Findings from this research implicated stress as a factor in late-onset alcohol problems. A later study also used a clinical sample of older individuals arrested for driving under the influence (DUI) (Wells-Parker, Miles, & Spencer, 1983). Again, results showed an association between stressful events and alcohol use, in that DUI offenders reported more stressful events than a comparison group of older adult alcohol users without DUI's.

As researchers have considered important covariates and utilized community samples, hypothesized relationships between stress and alcohol use have become more complex. In a longitudinal study of late-life problem drinkers, Schutte et al. (1994) found that physical health-related stressors were associated with remission. Other studies have analyzed the impact of different types of stressors. Glass and colleagues (1995) found that the loss of a spouse, move or spousal illness predicted increased consumption. In a study of stress, depression, and alcohol use, Krause (1995) found that alcohol use reduced the effects of stresses related to unimportant life roles, while increasing the effect of stress on salient roles.

Type of stress was one area of development in this research, but studies also began to consider other factors such as social support. In a study of older adults in retirement and age heterogeneous communities, LaGreca and colleagues (1988) considered both social support and coping resources. They did not find any relationship between stress and drinking in their community sample, but grouped a large percentage

of past year abstainers (38%) with current users. This approach is problematic in that recent abstainers likely represent a different population such as alcoholics in recovery or other former problem drinkers who quit. Additionally, this research used a simple four level indicator of drinking, and the sample was not representative in terms of race and income. Together, these methodological limitations may have obscured relationships between stress and drinking. Welte and Mirand (1995) used a dichotomous measure of drinking to assess relationships between alcohol and stress. They did find a relationship between problem use and stress, leading to the conclusion stress exacerbates problem drinking, rather than being a direct cause of drinking. In 1992, Jennison (1992) used a general population sample to analyze the relationship of stressful events and social support to alcohol use among adults aged 60 and older. Jennison did find relationships between certain stresses (i.e. divorce), total number of stresses and increased alcohol use, even when controlling for social support.

The most extensive series of studies on alcohol use and stress-coping factors were completed by Moos, Brennan, Schutte, Mertens, and their colleagues. Brennan and Moos (1990) found that older problem drinkers have more stressful life events, fewer social supports and more chronic stress than nonproblem drinkers. Their research has identified associations between the use of avoidant coping strategies and drinking problems over time (Brennan & Moos, 1996; Brennan, Moos, & Mertens, 1994; Schutte, Brennan, & Moos, 1998; Schutte, Byrne, Brennan, & Moos, 2001). They have also found that environmental factors, such as exposure to drinking, combined with stressors influence drinking (Lemke, Brennan, Schutte, & Moos, 2007). Integral to their research has been

the development of a stress-coping model that has been applied to stress-related drinking in older adults (Finney & Moos, 1984; Moos & Schaefer, 1993).

General Population research on Stress, Coping and Alcohol

There is an extensive history of research focused on the various stress related concepts and drinking in general population samples. In an early review, Pohorecky (1981) noted that findings on the relationship between alcohol and stress reduction were inconclusive. Since that time, studies have explored the role of stress and alcohol using cross sectional and longitudinal designs. Researchers have used event-based measures, perceived stress, and specific types of measures and have focused on potential moderating factors (e.g. coping strategies).

In 1990, Cole and colleagues (1990) analyzed differences in stressful events and perceived stress based on drinking levels "abstainers", "common drinkers" and "problem drinkers" in a large sample of business/industry employees. They found significantly different levels of stress and stressful events among the groups even when controlling for demographic factors. In a sample of transit employees, Ragland and colleagues (1995) also found a "strong positive association" between stressful events, job stress and alcohol consumption. Similar to Cole et al., the study looked at associations between stressful events and heavy drinking. Greater stressful events and job related stress were associated with higher levels of alcohol use. In a longitudinal study, Holahan et al., (2001) found that drinking to cope with stress was associated with alcohol consumption and problems over ten years, and that drinking to cope strengthened the relationship between alcohol and emotional distress.

Numerous studies have gone beyond simple counts of stressful events and considered the role of specific types of stressful events. In a population sample, Jose and colleagues (2000) analyzed the relationship between specific life events and both heavy drinking and abstention. Additionally, the investigators looked at gender differences in stressful event related drinking. For men, divorce was positively associated with abstention. Divorce was associated with decreased odds of abstention among women, but the loss/death of a friend was associated positively with abstention. In women, relocation and divorce were associated with heavy drinking, and for men heavy drinking was associated with being a crime victim, divorce, breaking up, and having financial problems.

Like this study, others have explored gender and various vulnerability factors for alcoholism. Cooper and colleagues (1992) studied the moderation effects of gender, alcohol expectancies and coping strategies. They found "modest support", but asserted that individual characteristics need to be considered stating, "These findings suggest that a general tension reduction theory of alcohol use is overly broad and that individual characteristics must be considered in order to account for stress-related effects on alcohol use and abuse (p. 148). " Two recent studies using a large population survey also considered potential modifying factors. Dawson, Grant and Ruan (2005) used exploratory factor analysis to group fourteen stress related variables into four categories, health, social, job and legal, and then studied associations between these constructs and six different measures of drinking (average daily consumption, frequency of heavy drinking, frequency of moderate drinking, usual quantity consumed and largest quantity consumed. Number of stressful events was associated with all measures of drinking.

Health related stressors were not associated with any measure of drinking, but decreased moderate drinking among was found individuals with low socioeconomic status. Social stress increased all measures of drinking, with a gender interaction. Male gender was associated with stronger social stress and alcohol consumption relationship. Legal stresses were associated with increased daily consumption, increased heavy drinking, and decreased moderate drinking among men only, and job stress increased the daily consumption among poor drinkers only. In the same data, these investigators also looked at age of drinking onset as a moderator of the stressful event and drinking relationship (Dawson, Grant, & Li, 2007). They found that earlier age of drinking onset increased the strength of associations between the number of stressors and alcohol consumption. When they removed stressors that might have resulted from drinking, the relationship disappeared.

Life stage Comparisons of Stress, Coping and Alcohol Use.

There has been limited research on life stage differences in the role of stress on drinking and problem drinking in older adults versus other age groups. This work has centered primarily on adolescence and young adult life stages. This research has identified differences in the relationship of stress and drinking. In studying alcohol use from the college years to young adulthood, Perkins (1999) found that while alcohol use decreased after college, drinking in response to stress became more prominent. Conversely, in another study assessing the longitudinal relationship of stress and alcohol use, researchers found that the relationship between stress and alcohol use became weaker over time. Using longitudinal methods, Rutledge and Sher (2001) assessed the role of stress and drinking from college into young adulthood and reported that stress

related drinking was related to a combination of negative life events, motivation to drink for stress reduction, male gender, and oldest age (21 years old). Comparing two cohorts of young adults in their twenties and thirties, one study found direct positive relationships between stress and alcohol problems in both cohorts, but an indirect relationship between stress and alcohol consumption mediated by both positive affect and hostility in the older sample only (McCreary & Sadava, 2000). Research on the role of stress and alcohol use comparing early adulthood, midlife and older adulthood is limited, but research on adolescence and young adulthood suggests that these relationships vary for different age groups.

Age Differences in overall Stress and Coping

Research specific to stress, coping and alcohol use is limited, but more research has focused on stress and coping in different age groups. Studies suggest that middle age and older adults endorse fewer stressful events than younger age groups (Almeida & Horn, 2004), but are more likely to endorse loss-related events . In part, these differences may be an artifact of the types of events included in stressful event scales, which are often more pertinent to younger age groups (e.g., work related stresses) (Aldwin, 2007). Folkman and colleagues found that older adults were less likely to endorse daily hassles than younger groups (Folkman, Lazarus, Pimley, & Novacek, 1987). Additionally, types of stressful events vary at different life stages. Middle-aged individuals endorse stressors such as financial, housing, work or children, and older adults endorse greater health stress (Aldwin, Sutton, Chiara, & Spiro, 1996; Martin, Grunendahl, & Martin, 2001). These differences are likely to be a function of increasing roles in early adulthood and midlife, followed by decreased roles in late life as well as

health status differences between younger, middle-aged and older adults.

Similarly, older adults view events as less stressful, which may itself be a form of coping. In a study of coping across the lifespan, Diehl and colleagues (1996) found that older individuals were more likely to reinterpret situations more positively though a focus on the positive aspects of a stressor. The nature of coping is different as well. According to one developmental researcher, "….individuals may become less interested in direct action and more interested in meaning, more selective in the types of problems they deal with, and more judicious in the expenditure of energy to achieve their goals (Aldwin, 2007, p. 296)". Comparing the coping responses of younger (approx. mean age 40) and older (approx mean age 68) individuals, Folkman et al., found that the younger individuals used more "active, interpersonal and problem-focused forms of coping" and older individuals used "proportionally more passive, intrapersonal emotion-focused forms of coping (Folkman et al., 1987, p. 182).

The Self-Medication Hypothesis: Alcohol consumption as coping mechanism

The "self-medication" hypothesis (SMH) helps to explain how alcohol use functions as a coping mechanism for stressful events. Built on clinical observation (Duncan, 1974; Khantzian, Mack, & Schatzberg, 1974), SMH contends that alcohol and drugs are used to ameliorate painful affective states, and that one's drug of choice is a function of how the drug affects different mood states(e.g. narcotics versus cocaine) (Khantzian, 1985; Suh, Ruffins, Robins, Albanese, & Khantzian, 2008). Critics of the SMH hypothesis have noted that alcohol use may be a cause of distress (Frances, 1997), yet a number of studies support SMH. In an experimental study, Colder found that increased physiological stress reactivity was associated with more frequent use of alcohol

to cope (Colder, 2001). Addressing the temporal issue, a number of studies have used experience sampling methods to discern relationships between affective states and alcohol use. Hussong and colleagues (2008), in a study of adolescent drinking, found evidence for SMH and mood-related consequences of drinking . In a community sample, Also using experience sampling, Swendsen et al. found that "…. nervous mood states lead to increases in later alcohol consumption and alcohol intake (when examined cross-sectionally) is indeed associated with lower levels of nervousness (2000)" Research specific to older adults is more limited. Brennan and colleagues have studied the role of alcohol in the self-medication of physical pain and found that reported pain was associated with increased drinking among older problem drinkers (Brennan, Schutte, & Moos, 2005).

Summary of Gaps and Limitations of Current research

Although the literature on stress and drinking behavior among older adults has advanced in recent decades, the structural relationships between stressful events, cognitive appraisal, and drinking remain equivocal in older adult populations. Given the prominence of stress and coping theory in the treatment of alcohol problems among older adults, increased understanding of the inter-relationships of these constructs is vital. Additionally, recent research suggests that hypothesized relationships between stress and drinking are moderated by age of drinking onset (Dawson et al., 2007) and vary by life stage (Aseltine & Gore, 2000). Although research on life stage differences in stress and coping is extensive, scant research has looked at life stage differences in structural models that include alcohol related variables. This adds credence to the need to consider age differences in a stress-coping model or alcohol use. The NESARC sample offers a

unique opportunity for studying these relationships, as it is a large nationally representative sample and contains valid/reliable measures of stressful event, social support, cognitive appraisal of stress, and alcohol use and problem use. To ground the aims of this research in theory, the stress and coping framework will be reviewed as it guides Aim 1 of this research. This review will outline the major elements of the theory and the modification and application of theory for this project.

Chapter 3: Conceptual Framework

Stress coping theory, as developed by Moos and colleagues (Finney & Moos, 1984; Moos & Schaefer, 1993), is a foundation for this analysis. Stress and coping theory is based on the hypothesis that alcohol is a means of reducing tension (Greeley & Oei, 1999). In this sense, alcohol consumption is a behavioral option available to individuals in response to stressful situations and is related to overall patterns of coping. This particular version of the Stress Coping Model has the advantage of application directly to alcohol use among older adults. It has been utilized as a theoretical foundation for treatment approaches specific to this population (Moos, 2007).

According to the model (See Figure 1), demographic factors (Panel I) (i.e., sex, socioeconomic status, religion, ethnicity) and personal factors (Panel II) (i.e., mental and physical health, self-concept, alcohol related beliefs) presage stressful events and influence the presence of life events, coping efforts and drinking behavior. Personal factors include "stable dispositional characteristics"(p. 238)(Moos & Schaefer, 1993) such as personality and optimism, as well as demographic factors (Holahan, Moos, & Schaefer, 1996b). Simply put, demographic and personal factors are envisioned to predict all other major concepts in the model, including, stressful events, cognitive appraisal, coping strategies, and alcohol use. Finney and Moos comment, "Sociodemographic and personal factors may exert 'indirect effects' on problem drinking by influencing the individuals' exposure to stressful life circumstances, the availability of social resources, and the use of coping responses in dealing with stressful situations (1984, p. 283)."

Life stresses occur in the context of these preexisting risks (See Panel III). In the work of Moos and colleagues these have been termed "Stressful Life Circumstances" (Finney & Moos, 1984) and "Life Crises and Transitions" (Holahan, Moos, & Schaefer, 1996a; Moos & Schaefer, 1993). In this model, stressors are divided into three categories, chronic stressors, stressful life events, and "daily hassles"(Finney & Moos, 1984, p. 283). For older adults, stressful life events might include such issues as retirement or relocation while daily hassles refers to the daily frustrations individuals experience such as arguments with friends or traffic delays. Chronic stressors include long-term strains such as poverty that are serious and longstanding, but are not event driven. In this model, "social network resources" (see Panel III) interact with stressful events and "…. are the factors most often focused on as the potential mediators and moderators of the effects of life stressors. (p. 284)"

In the Stress Coping model, the "stress buffering" hypothesis posits an interaction between stressful events and cognitive appraisal. Cohen and Wills write, "….support may intervene between the stressful event (or expectation of that event) and a stress reaction by attenuating or preventing the stress appraisal response (1985, p. 312)". Under the stress-buffering hypothesis, social support decreases the negative effects of stressful experiences by altering the individuals' perceptions of events threatening or insurmountable (Cohen, 2004). Social support is envisioned to affect the cognitive appraisal of stress through, "…a sense of predictability and stability in one's life situation, and recognition of self worth (p. 311)". Since this theory was developed, the research literature has demonstrated the positive impact of social support on levels of psychological distress (Taylor & Stanton, 2007), and stress buffering models have

fostered the development of social support interventions to improve mental health (Kawachi & Berkman, 2001).

Individuals interpret events in the form of cognitive appraisals and utilize coping strategies (Panel IV) in the Stress Coping Model. Cognitive appraisals include both perceptions of the threat of life events, and one's belief in their ability to cope with those events (Lazarus & Folkman, 1984). Cognitive appraisal has two components: primary appraisal which refers to the one's perceptions of the stressor itself as a threat to well-being, and secondary appraisal which deals with one's belief in their ability to cope with a given stressor. Coping strategies have been organized along two dimensions "approach" versus "avoidance" coping and "cognitive" versus "behavioral" coping (Holahan et al., 1996a). "Approach coping" is marked by active attempts to resolve the stressor, and "avoidance coping" is the opposite, often entailing withdrawal or denial. "Behavioral" and "cognitive" coping are simply different avenues for coping with stressful events. For example, in the stress-coping framework, alcohol use is one behavioral response to stress, and may be associated with certain styles of coping. Under this conceptual framework, all the parts of the system have reciprocal relationships, and influences are bidirectional. Taken together, pre-existing characteristics, stressful events, cognitive appraisal, and coping behaviors are posited to influence health and well-being

Although stress-coping theory has guided this dissertation, I have modified the theory to incorporate findings from literature in order to create a model that is testable using SEM methodology. The stress-coping framework (Figure 2) used for this analysis begins with the occurrence of a stressful event or events. Measures of stressful events were used to predict cognitive appraisal of the events. In this model, social support

moderates the relationship between stressful events and cognitive appraisal. The experience of stress then leads to the use of various coping behaviors, such as alcohol consumption, as a means of coping with or self-medicating difficult feelings. There were multiple alterations to the Moos's Stress and Coping Model listed below:

1. The model tested herein is recursive in that the structural model is unidirectional. It focuses on the role of the stress and coping as a predictor of alcohol related pathology rather than vice versa. However, the original Stress and Coping model considers bidirectional relationships.
2. Demographic and personal factors (e.g., race) are control variables in SEM models influencing all stress and alcohol related variables unidirectionally, even though they are related to all concepts (i.e., stressful events, cognitive appraisal, and coping strategies) in the Stress Coping Model bidirectionally.
3. Although an important component in the Stress and Coping Model, coping strategies were not included in models tested here.
4. In the Stress and Coping Models, health and well-being are distal outcomes. Because of the cross-sectional nature of the sample, physical and mental health disability will be control variables.

With these alterations to Stress and Coping theory, an SEM model was tested based on the schematic depicted in Figure 2. The model assessed aspects of the stress-coping framework describing relationships between the stressful events, cognitive appraisal, social support, and alcohol use. This model is designed to resolve inconsistencies in the data regarding stress, coping, and alcohol use among older adults; and goes beyond linear regression to understand the interconnections of the stress-coping

framework. Aim 1 tests the following hypotheses:

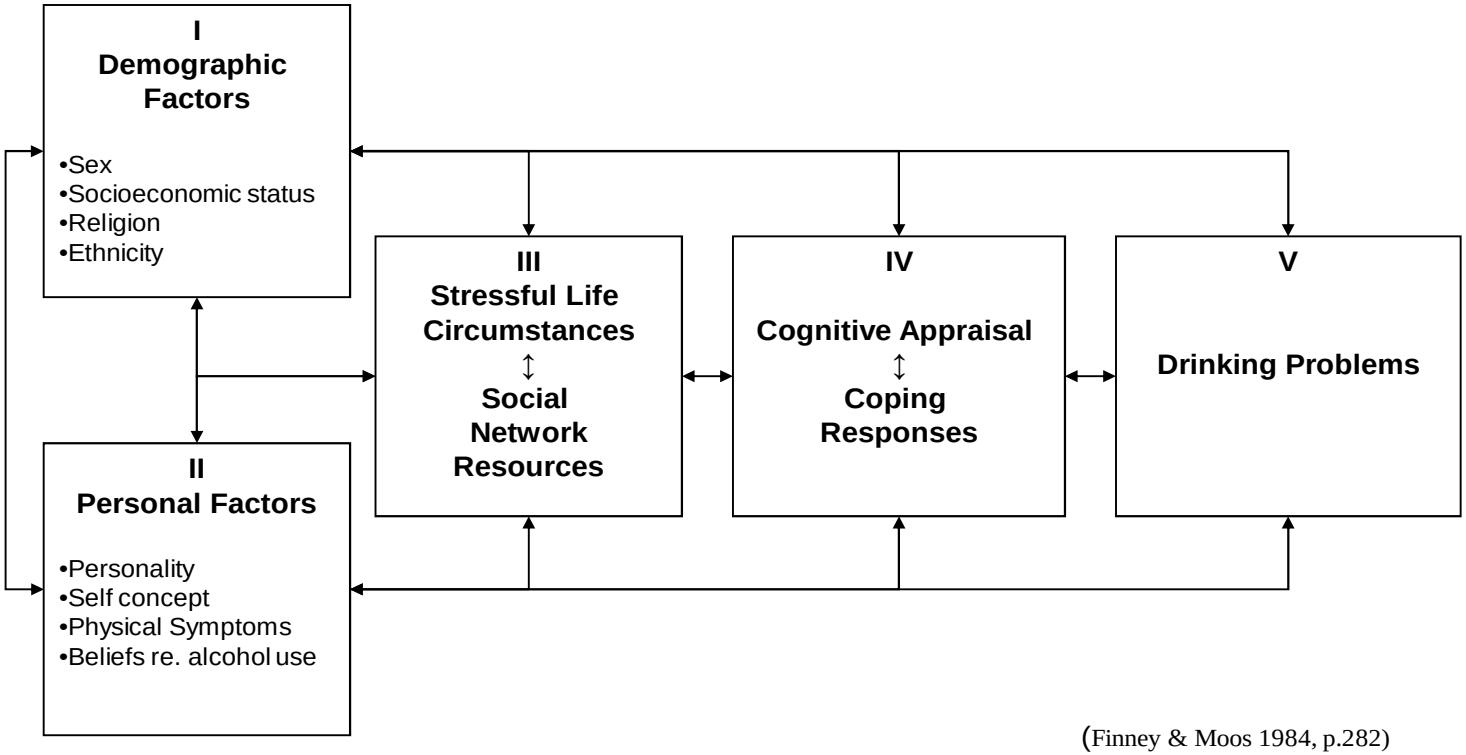
Aim 1: To test a stress and coping model of current (past-year) alcohol use, at-risk drinking (defined as 5+ drinks for men and 4+ drinks for women), and alcohol-related problems in a nationally representative sample of older adults interviewed in the National Epidemiological Sample of Alcohol and Related Conditions (NESARC).

Hypothesis 1a: Increased stressful events will be associated with an increase in cognitive appraisal of stress.

Hypothesis 1b: Increased cognitive appraisal of stress will be associated with higher levels of consumption, greater likelihood of risk drinking (as defined by NIAAA guidelines) and problem use.

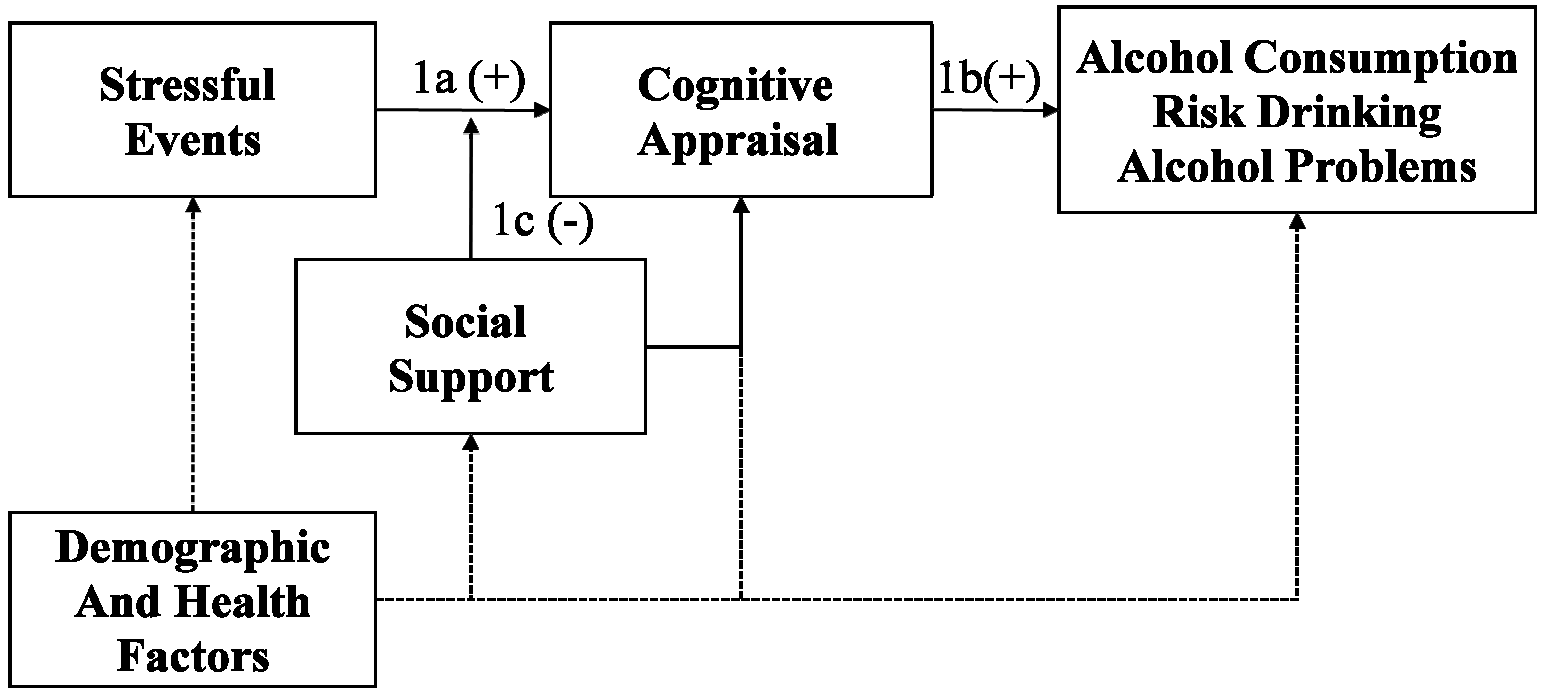
Hypothesis 1c: Social support will moderate the relationship between stressful events and cognitive appraisal.

Figure 1: Stress and Coping Conceptual Framework of Finney & Moos



(Finney & Moos 1984, p.282)

Figure 2: Adapted model used for Structural Equation Models



→ Stress-coping relationships

⇢ Covariate relationships

adapted from Finney & Moos 1984, p.282; Moos & Schaefer, 1993, p.237)

Developmental Systems Theory and the Life Course Perspective (Aim 2)

Aim 2 explores life stage differences in relationships between stress, cognitive appraisal, and alcohol use among drinkers of different age groups. This aim is built on the notion that subgroup differences unfold over the life course and are present in older adults. As such, developmental systems theory (DST) serves as a guiding theoretical framework for understanding this heterogeneity. DST integrates understanding of the social, psychological, and physiological factors that shape alcohol use behaviors during late life. Robert Zucker, a developmental theorist explains, "To understand the interaction of alcohol-related processes and aging therefore requires an understanding of both the core neurobiological structure of the disorder as well as the contextual factors that encourage the alcoholic display or suppress its development (p. 5)(1998, p. 5)." DST is particularly relevant to stress coping models because stress and coping are contextual factors, important when combined with other risk factors.

A central tenet of the DST is the concept of the multilayered structure of influence over time. These layers of variability have reciprocal relationships with "dynamic interaction (p. 55)"(Ford & Lerner, 1992) at multiple levels. Furthermore, these influences have a "nested structure (p. 644)"(Zucker, 2006, p. 644); individuals with earlier risk factors may be more susceptible to later risk, such as stressful events. Essentially, stress and coping are important to subpopulations of drinkers as part of a multi-causal developmental process. In essence, nested risk factors lead to multiple subpopulations, distinct in their responses to subsequent risks (such as stressful events) that unfold over time. This becomes important for older adult drinkers because contextual factors such as stress may more powerfully influence subgroups of drinkers

possessing other risk factors most powerfully. Subgroup analysis is then essential in understanding differences in the stress coping model at different points in the life course. Pearlin and Skaff (1996) advocated the inclusion of a life course perspective in the study of stress noting, "….the life course serves as a rich background for observing and making sense of the kinds of stressors to which people are likely to be exposed and the moderating resources they are able to bring to bear (p. 240)." Changes in social roles may affect the types of life stressors that people experience across the life course and the ways that individuals cope with them (Almeida & Horn, 2004).

This researcher considers age-related subgroup differences in the stress-coping model between older adults and younger age groups. The purpose of this analysis is to understand potential cohort or age differences in the relative importance of stress and social support in alcohol consumption and problems. Aim 2 tested the following hypotheses:

Aim 2: To investigate cohort differences among current drinkers in the Stress and Coping model between young adult (20-39), middle age (40-59), and older adult (60+) life stages.

Hypothesis 2a: For different age groups, the structure of stressful events (defined through EFA methods) will vary, (i.e., different types of stressful events will be important for different age groups) based on age group.

Hypothesis 2b: For different age groups, stressful events (defined through EFA methods) will be associated with an increase in cognitive appraisal of stress.

Hypothesis 2c: For different age groups, cognitive appraisal of stress will be associated with higher levels of consumption, greater likelihood of at-risk

drinking (as defined by NIAAA guidelines), and problem use.

Hypothesis 2d: In each age group, social support will moderate the relationship between stressful events and perceived stress.

A multi-group analysis was conducted using early, middle and late life classifications based on age in years. Age groups are based on the work of Levinson who pioneered the study of adult development. In his work, he divided the adult life into three major developmental eras, "Early Adulthood" (age 17-45), "Middle Adulthood" (age 40-65) and "Late Adulthood" (65+) (Levinson, 1986). According to Levinson, these life stage classifications were a result of research. He wrote, "The life structure develops through a relatively orderly sequence of age-linked periods during the adult years. I want to emphasize that this is a finding not an a priori hypothesis (p. 7)". At the boundary of each developmental era, Levinson described transition periods, Early Adult Transition (Age 17-22), Mid-Life Transition (Age 40-45) and Late Adult Transition (Age 60-65). For the purposes of this dissertation, each transition period was included in the stage following it. Essentially, each life stage was seen as beginning at the start of its transition period; therefore, late life for this dissertation was demarcated by the beginning of the late life transition at age 60.

Chapter 4: Research Design and Methods

Sample

For Aim 1, this analysis utilized a subsample of older current drinkers of the NESARC survey (age 60+ at time 2). For Aim 2 all current drinkers (n=22,177) in the Wave 2 NESARC survey were included (Grant, Kaplan et al., 2003). (For preliminary analysis (Exploratory Factor Analysis), the complete sample was used.) The survey gathered information regarding alcohol use and other substance use and a variety of comorbid conditions from individuals in all 50 states and the District of Columbia living in households and various group settings (shelters, college dormitories, etc.). The NESARC utilized a multistage sampling structure, oversampling young adults, Hispanics and African Americans to obtain precise statistical estimation in these populations, and ensure representation of racial and ethnic subgroups (Grant, Kaplan et al., 2003). The overall response rate for NESARC Wave 1 was 81%. The data were weighted to adjust for oversampling and nonresponse on variables including age, race/ethnicity, sex, region, and place of residence. Data were also adjusted to be representative of the population of the United States in 2000 Census (Evans, Price, & Barron, 2001). Hot deck imputation was conducted on background variables including age during Wave 1 of the NESARC survey. If values were collected at Wave 2 they were added; otherwise the original imputed values were left in Wave 2 (Grant, Kaplan, & Moore, 2007). In-person interviews were conducted from 2001-2002 by U.S. Census workers who were given training by the NIAAA and the U.S. Census Bureau. Interviewers administered the Alcohol Use Disorder and Associated Disabilities Interview Schedule – DSM-IV version (AUDADIS-IV), shown to be reliable in assessing DSM-IV alcohol disorders, and

consumption in the general population (Grant, Harford, Dawson, Chou, & Pickering, 1995). Three years later, 80% of respondents were re-interviewed (2004-2005), with a revised version of the AUDADIS that included new measures including recent stressful events, cognitive appraisal (Perceived Stress Scale)(Cohen, Kamarck, & Mermelstein, 1983), and social support (Interpersonal Support Evaluation List) (Cohen, Mermelstein, Kamarck, & Hoberman, 1985) among others.

Measures/Variables

Variables used to subset data

For the overall analysis of drinking among older adults, current drinkers (at least one drink in the past year) age 60 or older at Wave 2, were included. For comparing older adults to the general population, multiple age categories were used. Three groups were included, those ages 20-39, 40-59, and 60 and older. Age was imputed by the NIAAA at Wave 1, so there were no missing values.

Stressful Events and Cognitive Appraisal Measures

Two measures of stress were included in the NESARC Wave 2 survey, a scale of stressful life events occurring in the last 12-months and the Perceived Stress Scale-4 (PSS4) (Ruan et al., 2007), a measure of the cognitive appraisal of stress. The stressful events scale includes fourteen dichotomous items on a summative scale (See Appendix A). Items include stressors in various domains including work, legal social, and health-related stresses in the past year (Dawson et al., 2005). The PSS-4 is a 4-item scale that measures subjective stress. Using a past month frame, questions ask about the frequency of "cognitively meditated emotional responses"(Ruan et al., 2007) from Never (coded 0) to Very often (coded 4) (Appendix B). Two of the items are reverse coded. Recent

analysis using data from NESARC (Wave 2) indicates excellent reliability for the Stressful life events (Cronbach's α=0.86) (Ruan et al., 2007) and the PSS-4 measures (Cronbach's α=0.84) (Ruan et al., 2007). Although the PSS-4 does not measure one's cognitive appraisal of a specific stressor, it assesses the cognitive appraisal of one's overall stress. The PSS is an empirically validated measure that is derived from Lazarus's concept of appraisal (Monroe & Kelly, 1995, p. 138). In the case of this dissertation, this global measure was used as a measure of overall cognitive appraisal.

Social Support Measure

The Interpersonal Support and Evaluation List 12 (ISEL-12) (See Appendix C) was used to measure perceived social support. It contains 12 items measuring the perceived availability of social resources. Items are arranged on a 4-point Likert scale coded definitely false, probably false, probably true, and definitely true. The ISEL contains three subscales (Cohen et al., 1985) (four items each). "Belonging" subscale refers to the availability of individuals with which to share activities, the "Tangible" subscale refers to perception that one can get material aid, and the "Appraisal" subscale measures perceived ability to talk about one's problems. Half of the items are reverse coded to address social desirability bias (Ruan et al., 2007). Recent research using Wave 2 of NESARC has found good reliability for this instrument (Cronbach's α=0.82) (Ruan et al., 2007).

Alcohol-related measures

Average daily volume of alcohol in the last 12-months, at-risk use, and alcohol-related problems were central to this analysis. The average daily volume measure was created by the NESARC research team and detailed in the NESARC data notes

(Appendix D) (National Institute of Alcohol Abuse and Alcoholism, 2004). At-risk use was measured by a single variable focused on NIAAA measures of risk drinking (more than 14 standard drinks per week or no more 4 standard drinks on any day, and For women, no more than 7 standard drinks per week or no more 4 standard drinks on any day) (National Institute of Alcohol Abuse and Alcoholism, 2008). The at-risk use variable was measured dichotomously based on exceeding risk-drinking guidelines in the past year. Alcohol-related problems are dichotomous indicators of DSM-IV criteria (Appendix E) based on AUDADIS-IV questions. If an individual endorsed any past-year abuse or dependence criteria, they were considered positive for alcohol problems.

Sociodemographic and Health-related measures

Health-related measures include the Short Form-12 Health Survey (SF-12) (Ware, Kosinski, & Keller, 1996). The SF-12 contains 12 items measuring components of self-rated health. Main subscales include the physical health component scale (PCS), and mental health component scale (MCS). The SF-12 has the advantage of being a norm-based index, and shows good reliability and validity in older adults(Resnick & Nahm, 2001). Past-year Generalized Anxiety and Major Depressive Disorder diagnoses derived from the AUDADIS-IV were also included in the model. These diagnoses have been shown to have good to excellent reliability in general population samples (Grant, Dawson et al., 2003). Socio-demographic covariates in the model included age, gender, race/ethnicity, education, income, and marital status. All socio-demographic variables were imputed by NIAAA using hot deck methods. In the NESARC dataset, age was measured in years, and was included in SEM models as a demographic covariate. Gender was measured dichotomously. The race/ethnicity measure used in this analysis contains

five mutually exclusive groups (White, Black, American Indian/Alaska Native, Asian/Native Hawaiian/Other Pacific Islander, and Hispanic--any race) derived from multiple questions. Income will be measured using a four-level variable ($0-$24,999; $25,000-$49,999; $50,000-$99,999; >$100,000). Education was dummy-coded into three categories: those with less than a high school education, high school graduates or GED recipients, and those with education beyond high school (i.e. university or technical college). Marital status was a dichotomous variable; individuals were coded as either currently married or living as married or not currently married.

Models also controlled for history of alcohol problems. Alcohol abuse and dependence were measured at NESARC time 1 and time 2. A three level variable was created using the following ordered categories: no history of alcohol abuse/dependence, history of alcohol abuse only and alcohol dependence with or without abuse at any time before the past year.

Analytic Strategy

Structural equation modeling (SEM) was used to test the components of the stress-coping model outlined in Figure 2. SEM refers to a group of techniques used to analyze theoretical models (Schumacher & Lomax, 2004). Based on factor analysis and linear regression, SEM models have two components, a measurement model, and a structural model. The measurement model uses confirmatory factor analysis to define the presence of latent, or unobserved, variables. The structural model component specifies relationships between the latent variables using regression based techniques. Importantly, SEM has strong distributional assumptions, requiring extensive preliminary analysis to properly specify and estimate SEM models.

Preliminary Analysis

For this analysis, I analyzed univariate and multivariate information on variables included in SEM models. The purpose of this analysis was twofold, to explore the basic epidemiology of the older adult subsample and, assess distributional properties of the variables. Recent developments in SEM modeling offer avenues for modeling variables that are not normally distributed, such as dichotomous variables, count variables, zero-inflated variables and for modeling interaction between latent variables (Muthén & Muthén, 1998-2008). Proper specification of SEM models requires knowledge of these variable properties. Additionally, transformation of certain variables was necessary to normalize certain variables that cannot be addressed through alternative estimation techniques (e.g. logistic or Poisson). These analyses were completed for the older adult drinkers (age +60) (n=4360), middle-aged (age 40-59) (n=9,208) and young adult (age 20-39) (n=8,609) subgroups. Model based imputation was specified in SEM using Full Information Maximum Likelihood (FIML) methodology. Preliminary analysis was conducted using SAS®, STATA®, and SUDAAN® (Research Triangle Institute, 2004). SUDAAN® and STATA® are designed for survey data analysis such as NESARC, including self-identifying primary sampling units (PSUs).

Measurement Model Development

Following preliminary data analysis, a measurement model was tested. A two-step approach enabled this researcher to assess the convergent and discriminant validity of the constructs in the models, such as social support, before testing the structural relationships between these constructs (Anderson & Gerbing, 1988).

Exploratory Factor Analysis of past-year stressful events

For the measure of current stressors, exploratory factor analysis (EFA) was used to identify the factor structure of this measure in using the complete sample. The complete sample was used for this analysis to assess the factor structure for the overall population. For this preliminary analysis, estimation techniques were used that are appropriate for EFA models with categorical indicators. Specifically, weighted least squares estimation with mean adjustment (WLSM) was used, and factors were allowed to correlate using Geomin rotation. Using information on the number of factors and indicators derived from the EFA model, latent stressful event factors and their indicators were incorporated in the overall measurement model using Confirmatory Factor Analysis.

After EFA model analyses, an overall measurement model was estimated. CFA analysis of each instrument was estimated using data on subscale scores as indicators. For the measure of social support, the ISEL subscales served as indicators of the latent social support variable. The same approach was taken for the measure of cognitive appraisal with the PSS-4 item scores acting as indicators of the latent variable. Evaluation of model fit were based on measures of model fit (χ^2, RMSEA, RMSR), and comparative fit indices (i.e., Tucker Lewis Index) (Tucker & Lewis, 1973) based on current standards for assessing model fit (Hu & Bentler, 1999). Measurement models and SEM models utilized Weighted Least Squares Mean and Variance Adjusted (WLSMV) estimation, which is appropriate for estimating SEM models that contain non-normal and categorical data. Additionally, complex survey capabilities available (e.g. accounting for sampling weights, stratification and clustering) in M*plus*® were used to estimate models appropriately.

Full Structural Equation Models

After the measurement model was specified, the structural elements of the model were added. This included regression pathways between the variables based on stress-coping framework, including covariates and dependent variables of use and problems (See Figure 2). Consistent with the measurement model, both global and specific measures of model fit were analyzed. Models were estimated one for each of the age groups: older adult (60+), middle-aged (40-59), and young adult (20-39). Because of high correlation between the outcome variables of interest, (alcohol consumption, at-risk drinking, and alcohol related problems), models were run separately for each alcohol related outcome variable. There were nine models estimated, three models for each of the three age cohorts.

Multi-group Models

Once the overall SEM models were fitted to the data for each subgroup independently, multi-group models were specified based on current practice for estimating measurement invariance (e.g. Kline, 2005). First, level of measurement invariance assessed the extent to which the measurement properties of the latent variables are the same across the different groups, and the extent that there are group mean differences in the latent variables. First, models were estimated to test for "configural invariance" or the pattern of fixed and estimated loadings based on model fit statistics for the subgroup models, and a measurement model for the complete sample of drinkers. Next, a second multi-group model assessed the presence of "weak factorial invariance" or simply the presence of equal factor loadings across the groups. Based on findings from nested model tests, "strong factorial invariance" was tested by constraining both

intercepts/thresholds and loadings to be equal across the groups. If the models displayed strong invariance, then structural parameters were estimated and examined between the groups.

Model Modifications

Modifications to SEM models were made based on LaGrange Multiplier values with a chi-square value of 10 or greater that also have theoretical justification. Consultation with committee members ensured that the data was not over-fit to the model. Because of the size of the NESARC survey dataset, issues of inflated χ^2 values of tested models were considered. To address this issue, other fit indices were assessed in CFA and SEM models, such as RMSEA and CFI and TLI indexes.

Moderation hypotheses testing

Because of differences in the estimation of interaction in SEM models, a separate series of SEM models were conducted to assess for a moderation effect as hypothesized in hypothesis 1c. Instead of using WLSMV (Weighted Least Squares, Means and Variance adjusted) estimation, the models were estimated using Maximum Likelihood with robust standard errors (MLR). Additionally, a numerical integration algorithm was used to model categorical and censored data. Models that included an interaction between the stressful event and social support latent variables were compared to models that did not include the interaction. Information criteria (AIC, BIC, and ABIC) were used to compare interaction versus no interaction models. Nested model testing (using -2Log Likelihood) was also used to test whether the interaction term improved model fit.

Power Considerations

A power analysis was conducted using a procedure developed by MacCallum and colleagues (MacCallum, Browne, & Sugawara, 1996). Under this approach, power is estimated by effect size of the root-mean-square error of approximation (RMSEA) based on a null (ε_0=.05) and alternative value (ε_a=.04) of RMSEA for a given significance level (α=.05). Given the sample sizes (n=6350) older adult; Note: 50% subsample of the older adult drinkers) and estimated degrees of freedom (97), power for this analysis is essentially 1.0. Additionally, an analysis was conducted to calculate the power to detect path coefficients of varying sizes. It was found that there is 80% power to detect any path coefficient $\beta \geq 0.06$. Therefore, there was ample power to conduct this analysis.

Chapter 5: Results

Preliminary Analyses: Exploratory Factor Analysis of the Stressful Events Scale

Overview

Exploratory factor analyses (EFA) were conducted on the stressful events scale using the complete NESARC sample (Wave 2) prior to constructing the structural equation models. The EFA models were used to discern the factor structure of the 14 stressful event items. Based on the results of the EFA models, the stressful events factor of the model was developed. Preliminary analyses began with bivariate models assessing levels of endorsement of stressful events within the different age groups. EFA models were then run for one factor through five factor models. A total of 41 cases were missing on all items and were excluded from the analyses leaving a total sample of 34,612. Findings from the EFA were used to create stressful event domains; these domains were used as indicators of the stressful events factor in the measurement model of the overall stress and coping model.

Stressful Event Endorsement and Age Groups

The most commonly endorsed stressful event in all three age groups of the NESARC sample was the death of a loved one with 32% of individuals endorsing this type of stressor. Older age groups were more likely to report that they had a family member or friend die in the past year. More than 37% of older adults reported the death of a family member compared with 32% of middle aged individuals and 29% of young adults (See Table 1). This was the only stressor that was more common in older adults. The second most common stressor overall was changes to job status including new responsibilities, work hours or changing jobs. This was very uncommon among the older

subsample (4.07%) compared with their younger counterparts. The third most commonly endorsed item related to moving (20.90%); it was most commonly endorsed among young adults (34.22%) but less so among older adults (9.5%).

The stressful events items overall were significantly more common among young adults and middle aged adults. With the exception of the death of loved ones, the young adult subsample endorsed the highest levels of stress, followed by the middle-aged adults; lower percentages of older adults reported each life stressor.

Table 1: Stressful Event Endorsement by Age Group in the Full NESARC Sample

Item (During the last 12 months…)	Total n=34,653		Young (20-39) n=11,534		Middle (40-59) n=13,656		Older (60+) n=9,436		χ^2‡
	n	wt.%	n	wt.%	n	wt.%	n	wt.%	
1. Did you move or have anyone new come to move-in with you?	7100	20.90	3839	34.22	2362	16.45	899	9.50	126.41***
2. Were you fired or laid off from your job?	1892	5.35	999	8.36	750	5.20	143	1.49	86.62***
3. Were you unemployed or looking for a job for over a month?	3181	8.86	1771	14.76	1224	8.16	186	1.86	91.07***
4. Have you had had trouble with your boss or a coworker?	2812	8.01	1447	12.10	1238	8.64	127	1.48	97.87***
5. Did you change jobs, job responsibilities or work hours?	7224	21.43	4031	35.52	2830	20.22	363	4.07	107.02***
6. Did you get separated, divorced or break off a steady relationship?	1859	4.79	1084	8.49	677	4.12	98	0.77	93.68***
7. Have you had serious problems with a neighbor, friend or relative?	2012	5.52	841	6.69	831	5.80	340	3.50	30.96***
8. Have you experienced a major financial crisis, declared bankruptcy, or more than once been unable to pay your bills on time?	4702	11.98	3137	16.63	2058	12.82	507	4.34	100.65***
9. Did you have serious trouble with police or the law?	425	1.21	237	2.05	161	1.04	27	0.33	37.24***
10. Was something stolen from you, including things that you carry, like a wallet, or something inside or outside your home?	3525	9.76	1609	13.54	1358	9.17	558	5.52	59.67***
11. Has anyone intentionally damaged or destroyed property owned by you or someone else in your house?	2357	6.58	1046	8.59	982	6.77	329	3.53	45.62***
12. Did any of your family members or close friends die?	11652	32.60	3464	29.11	4618	32.75	3570	37.13	34.30***
13. Were any of your family members or close friends physically assaulted, attacked or mugged?	1334	3.60	628	5.16	547	3.58	159	1.49	39.17***
14. Did any of your family members or close friends have serious trouble with the police or the law?	2400	6.51	1112	9.09	934	6.26	354	3.35	59.73***
Any Stressful Event in the last 12 months	23383	66.76	8929	77.08	9319	66.27	5135	53.44	92.10***

‡All $\chi 2$ have df=2; ***p<.001

Exploratory Factor Analyses of Stressful events

Following bivariate analyses of stressful events, exploratory factor analyses were conducted on the stressful event items in the NESARC survey. Geomin (oblique) rotation was used with the WLSM estimator in M*plus*®. Model based Full Information Maximum Likelihood (FIML) estimation was used to address missing data. Models were tested for ranging from one to five factors using the complete NESARC sample.

The one factor model of the data showed strong factor loadings for all the variables (See Table 2) with the exception of the factor related to death of a family member or friend (.15); model fit was also poor (χ^2=4082.54; p<.0001; TLI=.86; CFI=.88). The two factor model showed some improvement in model fit (χ^2=1209.71; p<.0001; TLI=.97; CFI=.95), but many of the items did not load strongly on a single factor. Moving or having someone move in with you (Item 1), problems with a coworker or boss (Item 4), relationship breakup/divorce (Item 6), and financial crisis (Item 8) showed almost equivalent significant factor loadings on both factors as shown in Table 2. The three factor model displayed some improvement in model fit (χ^2=845.46; p<.0001; TLI=.98; CFI=.96) over the two factor model. As with the two factor model, there were problems with near equivalent loadings for Item 1, Item 6, Item 8, and Item 9. The four factor model showed further improvement in overall model fit (χ^2=430.659; p<.0001; TLI=.99; CFI=.98). Factor loadings for most of the previous problematic items improved with the exception of Item 8 (financial crisis). Although the size of the sample contributed to significant factor loadings on multiple factors for many of the items, each item showed a strong primary factor loading. A five-factor model (not shown) was run and showed improvement in model fit (χ^2=180.279; p<.0001; TLI=1.00; CFI=.99), but

numerous items equivalently loaded on various factors. Specifically, financial crisis loaded on a near equivalent level on two factors.

In deciding the number of factors, both model fit and interpretability were considered. Examination of eigenvalues using a scree plot (Figure 3) shows a leveling off after 3 factors, but the 4 factor model displayed improvements in model fit and greater interpretability of the factors. The four factor model was chosen as a balance of model fit and interpretability.

Based on the factor model discussed, the 14 items were reduced to 4 stress-related domains, "victimization" (Items 10 & 11), "work-related" (Items 2, 3, 4 & 5), "living situation" (Items 1 & 6), and "family-related" (Items 7, 8, 9, 12, 13 & 14). For the victimization items, the theft (Item 10) and vandalism (Item 11) questions were combined into a single dichotomous item based on whether an individual endorsed either of the items. Work related stresses were combined including being fired/laid off (Item 2), being unemployed (Item 3), boss/coworker problems (Item 4), and job change (Item 5) into a single dichotomous item. A third stressful event domain (living situation) was developed by combining the item focused on moving or having someone move in with you (Item 1) and divorce/breakup (Item 6). The fourth factor was developed using items related to conflict with family or friends (Item 7), own financial problems (Item 8), own legal problems (Item 9), death of family member or friend (Item 12), and family crime victimization (Item 13) or family legal problems (Item 14).

The four stressful event domains are shown in Table 3. Consistent with the original 14 item scale, three of the stressful event domains showed higher percentages of endorsement among the two younger age groups. The prevalence of victimization, work-

related and living situation domains was highest in young adults, slightly lower among middle-aged, and lowest among older adults. The fourth domain showed similar prevalence across the three age groups with less pronounced differences in endorsement between the groups.

In considering the use of single dichotomous items versus count variables, two issues were primary. In the older adult subsample, rates of endorsement were very low, even in the full sample. For theoretical reasons, it was important to consider stressful life events as a unitary construct, less focused on separating out different types of stressors, and more focused on how stresses in different aspects of people's lives come together to impact their level of perceived stress. For the purpose of testing a moderating role for social support, a single stressful events factor is more parsimonious and decreases the computational burden of estimating multiple interactions between multiple stressful event factors and perceived stress. Therefore, for the measurement model, the stressful event domains were used as indicators of a single stressful events latent variable.

Because the goal of this study was to test the model across different age groups, a generic group of stressors was used to model stressful events. Even as older adults were less likely to endorse most of the stressful events queried in the NESARC survey, other stressors salient to older adults were not included. Although health related disability was assessed, changes in health status such as hearing loss, loss of driving privileges, and caregiving responsibilities were not included.

Table 2: Exploratory Factor Analysis of Stressful Events

Item (During the last 12 months…)	1 Factor	2 Factor		3 Factor			4 Factor			
1. Did you move or have anyone new come to move in with you?	**.44**	**.30**	**.24**	**.44**	**.26**	-.02	.01	**.63**	.01	.04
2. Were you fired or laid off from your job?	**.82**	**.91**	-.04	**.90**	**-.43**	.00	**.97**	**-.09**	**-.01**	.00
3. Were you unemployed or looking for a job for over a month?	**.79**	**.87**	**.01**	**.87**	**-.36**	.01	**.84**	**.04**	.00	-.01
4. Have you had had trouble with your boss or a coworker?	**.57**	**.38**	**.31**	**.46**	.03	**.17**	**.32**	.18	.18	.06
5. Did you change jobs, job responsibilities or work hours?	**.64**	**.61**	**.16**	**.48**	.00	-.05	**.49**	**.35**	.00	-.02
6. Did you get separated, divorced or break off a steady relationship?	**.52**	**.28**	**.36**	**.44**	**.30**	.06	.04	**.55**	.05	**.07**
7. Have you had serious problems with a neighbor friend or relative?	**.52**	.01	**.63**	**.08**	**.16**	**.54**	-.03	**.12**	**.52**	**.11**
8. Have you experienced a major financial crisis, declared bankruptcy, or more than once been unable to pay your bills on time?	**.62**	**.30**	**.45**	**.35**	-.03	**.41**	**.28**	.08	**.40**	.05
9. Did you have serious trouble with police or the law?	**.64**	**.24**	**.51**	**.30**	.02	**.44**	**.19**	**.12**	**.44**	.06
10. Was something stole from you, including things that you carry like a wallet, or something inside or outside your home?	**.53**	**-.07**	**.71**	.02	**.29**	**.54**	.03	.05	**.19**	**.51**
11. Has anyone intentionally damaged or destroyed property owned by you or someone else in your house?	**.52**	**-.13**	**.74**	-.02	**.32**	**.57**	.01	-.21	.44	**.95**
12. Did any or your family members or close friends die?	**.15**	**-.06**	**.24**	**.12**	**-.13**	**.38**	.01	**-.21**	**.44**	-.05
13. Were any of your family members or close friends physically assaulted, attacked or mugged?	**.47**	.01	**.56**	.01	.05	**.63**	.02	**.08**	**.65**	.02
14. Did any of your family members or close friends have serious trouble with the police or the law?	**.48**	.02	**.55**	.02	.00	**.58**	-.03	.01	**.72**	**-.08**
MODEL FIT	χ^2=4082.54 p<.0001 df=77 TLI=.86 CFI=.88	χ^2=1209.71p <.0001 df=64 TLI=.97 CFI=.95		χ^2=845.46 p<.0001 df=52 TLI=.98 CFI=.96			χ^2=430.66 p<.0001 df=41 TLI=.99 CFI=.98			

Bold=sig. factor loading; n=34,612

Figure 3: Scree Plot for Exploratory Factor Analyses of Stressful Events

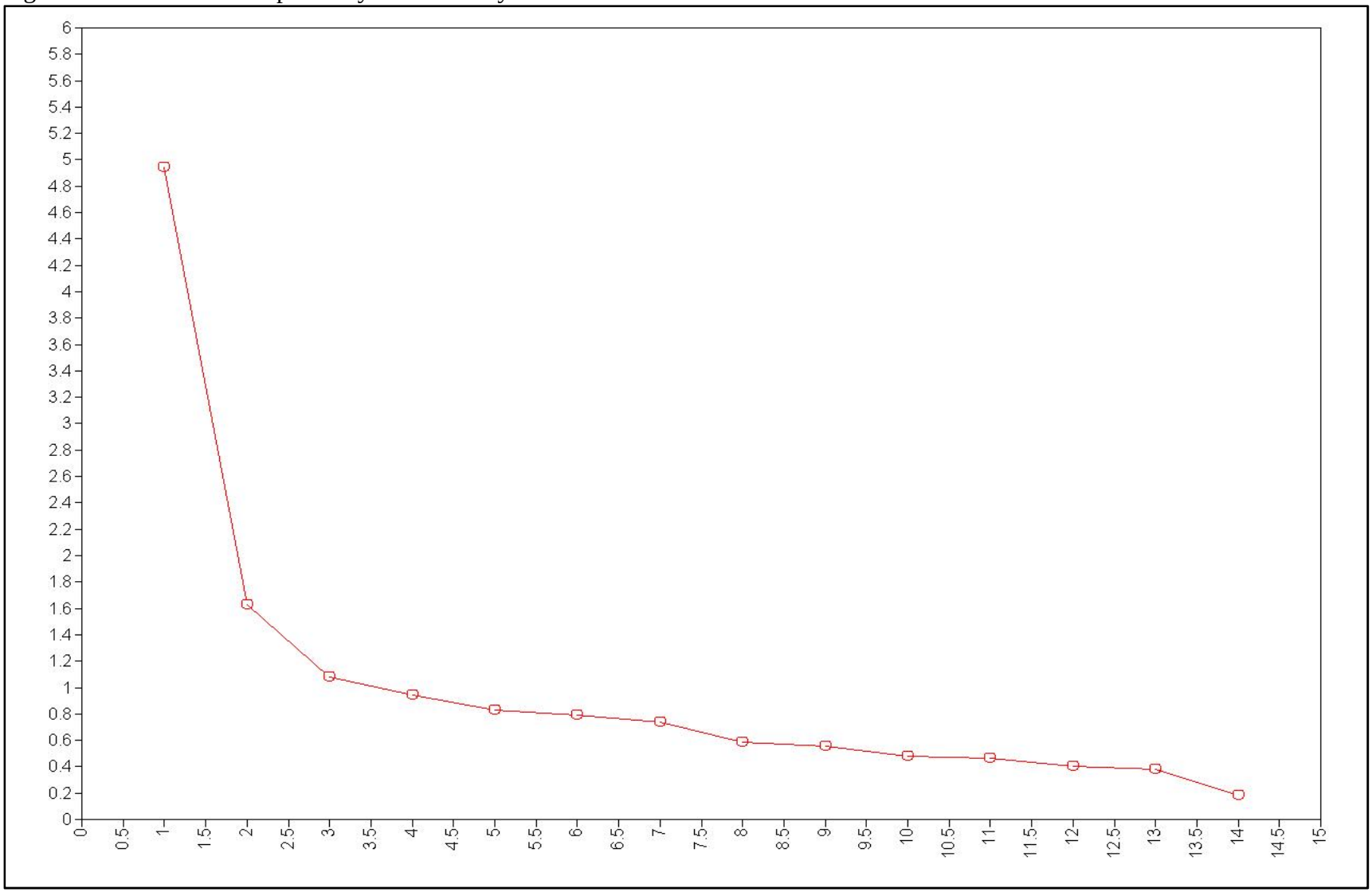


Table 3: Stressful Event subtypes by age group – Full Sample

Stress Subtype	Total n=34,653		Young (20-39) n=11,534		Middle (40-59) n=13,656		Older (60+) n=9,436		$\chi 2$
	n	wt.%	n	wt.%	n	wt.%	n	wt.%	
Victimization (Theft, Vandalism)	4851	13.50	2138	17.95	1925	13.12	788	7.99	60.96***
Work-related (Fired, Unemployed, Probs. with Boss, New Job)	11985	34.01	5930	50.84	5053	34.73	1002	9.96	110.19***
Living Situation (Move, Break up)	8058	23.19	4347	37.94	2743	18.65	968	10.02	125.71***
Family-related (Friend conflict, Financial Legal, Death/Loss, Assault Family, Legal)	14273	39.83	4581	38.35	5749	40.69	3971	40.97	5.45**

**p<.01; ***p<.001; Note: Stressful events were not mutually exclusive

Sample characteristics

Sociodemographic features by age cohorts

Preliminary analyses focused on the overall NESARC sample, Wave 2 with the purpose of obtaining an understanding of stressful events in the population as a whole. A subsample of past year current drinkers (n=22,177) will be used for all subsequent analyses. In the total sample, 66.18 wt. % were current drinkers. Among the young adult group, rates of current drinking were the highest, at 76.16% (n=8609); Percentages of current drinking were lower among middle-aged adults (68.51wt.%; n=9208) and the lowest among older adults (49.23wt.%; n=4360)

The purpose of analyzing current drinkers reflects the assumption that nondrinkers are a separate population than current drinkers. Because they do not use alcohol currently (past-year), their risk of drinking due to stress would be low. Since alcohol consumption is an endogenous variable in this model, inclusion of a large number of nondrinkers would add little to understanding of alcohol use in relation to stress while necessitating the use of more complex estimation techniques.

For structural equation modeling, current drinkers (at least 1 drink – past year) were divided into three categories based on age group. Per the introduction, the age group divisions were as follows: Young Adult (20-39), Middle-Aged Adult (40-59) and Older Adult (60+). Before model testing, bivariate analyses were conducted comparing variables in the model across all three age groups.

Table 4 displays sociodemographic information by age group. Household income categories varied across the three age groups. In the young adult group, the percentage

(19.35%) at the highest level was slightly lower than the percentage at the same income among all current drinkers (19.35%). In the middle aged group, endorsement of incomes greater than $100,000 (26.83%) was more common than in the sample as a whole. Higher percentages of older adults were in the two lowest income categories, $0-$24,999 (28.32%) and $25,000-49,999 (32.03%). As noted in Table 4, these group differences were statistically significant. It is likely a function of the role of work at different life stages. Younger adults may be over-represented in the lower income brackets as they have had less time in the job market. In middle age, it is likely that individuals are at the peak of their earning potential, and in older adulthood earnings likely decrease as people enter retirement, scale back their work responsibilities or both. This is reflected in the analyses sample in the younger (68.39%) and middle aged (71.93%) groups a majority of individuals are working full time (+35 hours), but among older adults, only 20% are currently working.

Unlike income, the gender make up of the sample was not significantly different across the age groups. There were more males (52.08%) (See Table 4) in the sample as compared with the overall NESARC sample where there are (47.92%) males. Males in the NESARC sample endorsed current drinking at higher rates (71.92%) than females whose rate of current drinking was (60.89%). The subsample reflects these differences in current drinking endorsement.

Among the three age cohorts, the middle-aged group were the most likely to be currently married (73.35%), and young adults were the least likely to be married (53.95%); older adults fell in between the other two groups (67.09%). This is likely a function of the fact that many young adults in their twenties may not have married yet,

and older adults have a greater likelihood of divorce or widowhood due to age and the length of time married.

In terms of ethnic/racial makeup of the sample, Caucasian people were present in higher percentages in the older adult sample than in both the middle-aged and the younger cohorts. Changes in the ethnic makeup of the country may be reflected in the sample composition of NESARC, although the proportion of ethnic/racial minority older adults is expected to increase dramatically in the future (Wykle & Ford, 1999). In the middle-aged and young adult cohorts, African American, Asian, and Latino groups showed higher proportions than in the older adult group suggesting that older adults will be a much more diverse group as these cohorts age. American Indians were the exception to this trend, with similar percentages across the three age cohorts.

Levels of educational attainment also showed age group differences. The two younger age groups had higher percentages of individuals who pursued education after high school, approximately 68% compared with 55% of older adults. These differences likely represent changes in educational opportunities in recent generations.

Unlike these cohort effects, indicators of physical and mental health reflected age effects. Using the SF-12 as a measure of physical disability, scores declined from the young adult subgroup to the older adult subgroup, with the middle-aged individuals showing levels of disability near the mean value. Lower scores on the SF-12 denote lower functioning level/higher disability. Unsurprisingly, levels of disability were significantly higher in the older age groups as evidenced by the lower SF-12 scores. Nonetheless, scores above the population norm in young adults (54.57), and middle aged adults (51.65) were slightly above the population norm of 50, and older adults were

slightly lower than the population norm (Ware, Kosinski, Turner-Bowker, & Gandek, 2002). Scores in the older adult subsample likely reflect age related increases in disability. Current diagnoses of Generalized Anxiety Disorder and Major Depression were much lower than in young and middle-age groups.

Table 4: Sociodemographic and health covariates by age group, past-year drinkers only

Measure	All Drinkers n=22,177		Young(20-39) n=8,609		Middle(40-59) n=9,208		Older(60+) n=4,360		χ^2 or f
	n	wt.%	n	wt.%	n	wt.%	n	wt.%	
Household Income									22.95***
$0-24,999	4995	19.10	1932	20.61	1543	13.27	1520	28.32	
$25,000-49,999	6224	26.48	2567	28.37	2298	22.00	1359	32.03	
$50,000-100,000	7358	35.08	2938	35.84	3284	37.90	1036	27.43	
+100,000	3700	19.35	1172	15.18	2083	26.83	445	12.22	
Gender									
Female	11782	47.92	4734	47.83	4817	48.08	2231	47.78	.06
Male	10395	52.08	3875	52.17	4391	51.92	2129	52.22	
Marital Status									
Currently Married/Cohabit.	12423	64.43	4361	53.95	5704	73.35	2358	67.09	62.48***
Race/ethnicity									
African American	3426	9.16	1465	11.20	1461	8.80	500	5.61	35.04***
Asian	498	3.22	263	4.41	188	2.79	47	1.62	8.70***
Latino/Hispanic	3852	10.64	1951	15.28	1462	8.87	439	4.57	26.32***
Native-American	354	1.99	131	1.88	168	2.33	55	1.49	4.31*
Caucasian	14047	74.99	4799	67.22	5929	77.21	3319	86.70	43.84***
Education									
Less than HS graduate	2326	9.54	879	9.87	747	7.48	700	11.92	22.70***
High School	5556	25.04	1978	22.47	2246	24.61	1332	31.44	20.85***
Some College or more	14295	65.42	5752	67.66	6215	67.91	2328	55.34	28.49***
Mental Health									
Anxiety Disorder (past year)	883	3.81	374	4.25	420	4.34	89	1.76	33.61***
Major Depression (past year)	1980	8.45	941	10.53	842	8.49	197	3.98	46.89***
Continuous Measures	m	se	m	se	m	se	m	se	
Physical Health (mean SF-12)	51.95	.10	54.57	.10	51.65	.15	47.02	.20	688.45***
Mean Age (in years)	45.26	.18	29.39	.08	48.69	.07	70.43	.14	N/A

*p<.05;**p<.01;***p<.001

Alcohol-related measures by age cohort

Alcohol use, at-risk drinking (Defined by NIAAA Physician guidelines - Appendix E) and alcohol related problems also varied considerably across the three age subgroups (See Table 5). Older adults consumed the lowest average amounts of alcohol (0.43 oz.) with the middle aged (0.55 oz.) and younger adults (0.58 oz.) displaying the highest levels of drinking in the sample. Each age group averaged less than one standard drink (0.6 oz.) per week with young adult drinkers averaged closest to this value. Levels of risk drinking showed a similar increase in from the older adult group (12.85%) to the young adult group (61.38%). Alcohol related problems were most common in the young adult group; almost 40% of the sample endorsed at least one current DSM-IV alcohol abuse or dependence criterion. In the middle age and older adult groups, this level was much lower, 26.42% and 12.85% respectively.

Prior to past year alcohol related disorders were higher among the middle and older adult groups, but abuse history was more common in the middle aged group while history of abuse and dependence were nearly the same in young adult groups. Contrary to the notion that older adulthood would be associated with an increased likelihood of alcohol history, the overall percentage of older adults with a history of DSM-IV alcohol abuse and/or dependence was lower than in the younger age cohorts. This may be a function of differential mortality in that many individuals at high risk die before reaching older adulthood. A competing notion is that older adults are less likely to endorse alcohol criterion as a result of recall biases due to memory of stigma.

Table 5: Alcohol-related variables by age group

Measures	All Drinkers n=22,177		Young(20-39) n=8,609		Middle(40-59) n=9,208		Older(60+) n=4,360		χ^2 or f
	n	wt.%	n	wt.%	n	wt.%	n	wt.%	
Alcohol measures									
Average daily cons.	0.54 oz		0.58		0.55		0.43		30.39***
Median daily cons.	0.12		0.13		0.13		0.11		
Exceed NIAAA guidelines†	10131	47.25	5048	61.48	3977	43.68	1106	24.89	82.05***
Any Alcohol Problems	6383	29.05	3281	39.33	2506	26.43	596	12.85	84.08***
Alcohol Problems among risk drinkers	5338	52.31	2899	58.02	2061	49.71	378	32.23	46.32***
Alcohol covariate: History of Alcohol Use Disorder									
No History	13349	58.62	4905	54.83	5306	56.19	3138	71.85	40.95***
Alcohol Abuse only	5247	24.32	1836	21.63	2468	27.19	943	22.35	
Alcohol Dep. with or without Abuse	3581	17.06	1868	23.54	1434	15.90	279	5.80	

***p<.001; †See appendix E for detail of guidelines.

Stressful event domains by age cohort

Consistent with levels of drinking, mental health disorders, and physical health, stress related variables generally decreased monotonically across the three age groups. Older adults endorsed lower levels of victimization, work-related and system change related stressful events in the past year (See Table 6). Among all age groups, victimization-related events (theft and vandalism) were the least common but were most frequently endorsed in the youngest age group.

Work-related events were endorsed by more than half of the young adult group (53.82%) and more than a third of the middle-aged respondents; only 10.23% of the older adults endorsed work-related stresses. Differences in this domain may be due to retirement of older adults; if they are not working, they cannot experience work related stresses. Among older adults working full time in the past year, 19.18% reported a work related stress. Fewer older adults and middle aged individuals endorsed stressors in the system change domain (relationship breakup or move). Older adults were the least likely to experience this stressor which may be more common in young adults who are less settled in their work and romantic lives.

Family-related stresses were the exception to the trend toward decreasing stressful event endorsement. Approximately 40% of each age group endorsed this domain. The difference in the endorsement of this domain is likely related to the endorsement of Item 12 (death of a loved one) in the original Stressful Events Scale (See Table 1). In the complete NESARC sample, older adults were more likely to endorse having experienced the death of a family member or close friend. Although the rates of endorsement of this

stress domain are nearly equivalent in the three subgroups, the stresses they represent are different for each group. Among young adults, they may represent peer conflict and financial problems, but in older adulthood family and friend related stressors are increasingly a result of death and loss. This is consistent with the analysis conducted on the full sample in Table 1.

Perceived Stress and age cohort

Levels of perceived stress as measured by the Perceived Stress Scale also showed decreases with age (See Table 6). The mean scores of the four item measure are the highest in the youngest age group (3.94), lower in middle ages, and lower still among the oldest group. The item mean values were also significantly different across age groups for all the items with the exception of the Perceived Stress Scale – Item 2 (confident), a reverse coded item focused on one's confidence in their ability to handle problems. Looking at item frequencies for the PSS-2 item (confident) (Table 7), a somewhat larger percentage of older adults endorsed never feeling confident in their ability to handle their personal problems. In all other items, older adult (and middle aged individuals to a lesser degree) reported lower levels of perceived stress.

Social support and age cohort

Although levels of perceived stress were lower in the older adult sample, they report lower levels of social support as shown in Table 6. Using the ISEL-12 as a measure of support, the mean score in the young adult group was 43.38 compared with 42.83 in the middle age cohort and 42.16 in the older adult cohort. Although levels of social support were significantly lower among older adults, all three age cohorts endorsed

similar levels of tangible support. The other subscales decreased with increasing age cohort.

Table 6: Stress and Social Support variables by Age Group, current drinkers only

Measures	All Drinkers n=22,177		Young (20-39) n=8,609		Middle (40-59) n=9,208		Older (60+) n=4,360		χ^2 or f
	n	wt.%	n	wt.%	n	wt.%	n	wt.%	
Stressful Event Domains									
Victimization	3467	14.94	1738	19.41	1350	13.78	379	7.92	52.68***
Work-related	8702	38.22	4693	53.82	3517	35.84	492	10.23	92.91***
Living situation	5770	25.64	3421	39.79	1894	18.88	455	10.10	102.41***
Family-related	9321	40.64	3582	40.33	3885	40.64	1854	41.33	0.43
	m		m		m		m		
Cognitive Appraisal									
Perceived Stress Scale-4	3.71		3.94		3.76		3.12		59.67***
Control (Item 1)	0.87		0.88		0.94		0.70		69.02***
Confident (Item 2)	0.79		0.80		0.77		0.80		1.06
Your way (Item 3)	1.13		1.21		1.12		1.00		40.23***
Piling up (Item 4)	0.92		1.05		0.94		0.62		235.29***
Social Support									
Interpersonal Support Evaluation List-12	42.93		43.38		42.83		42.16		58.48***
Belonging	13.91		14.15		13.83		13.57		89.02***
Tangible	14.48		14.52		14.47		14.40		4.26*
Appraisal	14.53		14.71		14.53		14.14		81.42***

*p<.05;**p<.01;***p<.001

Table 7: Cognitive Appraisal (Perceived Stress Scale) Item Responses by Age Group, current drinkers only

Scale Item	All Drinkers n=22,177		Young (20-39) n=8,609		Middle (40-59) n=9,208		Older (60+) n=4,360		χ^2
	n	wt.%	n	wt.%	n	wt.%	n	wt.%	
Control (PSS-1)									
0	10322	47.47	3876	46.39	3993	44.01	2453	57.16	13.33***
1	5718	26.19	2309	27.03	2424	26.70	985	23.30	
2	4655	20.32	1878	20.68	2112	22.74	665	14.38	
3	902	3.83	348	3.71	429	4.40	125	2.84	
4	518	2.20	183	2.20	222	2.14	113	2.33	
Confident (PSS-2)									
0	12338	56.49	4517	53.57	5170	56.84	2651	61.94	11.87***
1	5350	24.49	2352	27.64	2224	24.53	774	17.73	
2	2265	9.44	986	10.27	916	9.51	363	7.51	
3	691	2.91	226	2.49	297	2.95	168	3.70	
4	1479	6.67	512	6.03	579	6.17	388	9.12	
Your Way (PSS-3)									
0	6306	29.08	2111	25.02	2622	29.19	1573	37.45	11.43***
1	8825	41.12	2386	41.52	3758	42.34	1581	37.69	
2	5083	21.77	2247	25.23	2032	20.59	804	16.93	
3	843	3.49	358	3.84	343	3.40	142	2.93	
4	1056	4.54	390	4.38	428	4.47	238	5.00	
Piling Up (PSS-4)									
0	8899	40.79	2898	34.19	3550	39.31	3451	57.59	16.01***
1	7215	33.19	2942	35.80	3125	35.91	1148	27.19	
2	4587	19.57	2101	23.10	1920	19.81	566	11.56	
3	1016	4.13	476	4.91	416	4.02	124	2.69	
4	403	1.67	176	1.99	173	1.67	54	0.98	

Measurement Model Development

Using the model outlined in the introduction as a guide (See figure 2), a measurement model was developed following the guidelines of the two step approach (Anderson & Gerbing, 1988) . The measurement model was developed using the older adult subsample. Latent variables were created to represent the constructs outlined in the stress and coping model outlined by Moos and colleagues (Finney & Moos, 1984; Moos & Schaefer, 1993). The "Stressful Events" construct was represented by the four dichotomous indicators developed using exploratory factor analyses. The three Interpersonal Support Evaluation List (ISEL-12) subscales served as indicators for the "Social Support" latent variable, and Cognitive Appraisal of stress was represented by the four Perceived Stress Scale (PSS-4) items, "Control" (Item 1), "Confident" (Item 2), "Your Way" (Item 3) and "Piling Up (Item 4).

Because a number of indicators were categorical or non-normally distributed, methodologies for conducting confirmatory factor analyses on categorical data were used; The WLSMV estimation (Weight Least Squares estimator, Means and Variance adjusted) method was used to run the model. For categorical and ordinal variables, probit models were estimated. This includes both the "Stressful Events" and "Cognitive Appraisal" variables. The Appraisal, Belonging, and Tangible subscales were censored from above, with large percentages of respondents endorsing the highest level of social support. (For a graphical representation, please see Appendix E.) To adjust for this difference, a censored or Tobit regression model was used to estimate the parameters for the "Social Support" latent variable. A graphic display of the measurement model can be seen in Figure 4. Because of reverse scoring of the items and information from

modification indices, errors for items Confident (PSS-2) and Your Way (PSS-3) as well as Control (PSS-1) and (Piling Up) PSS-4 were correlated in the model.

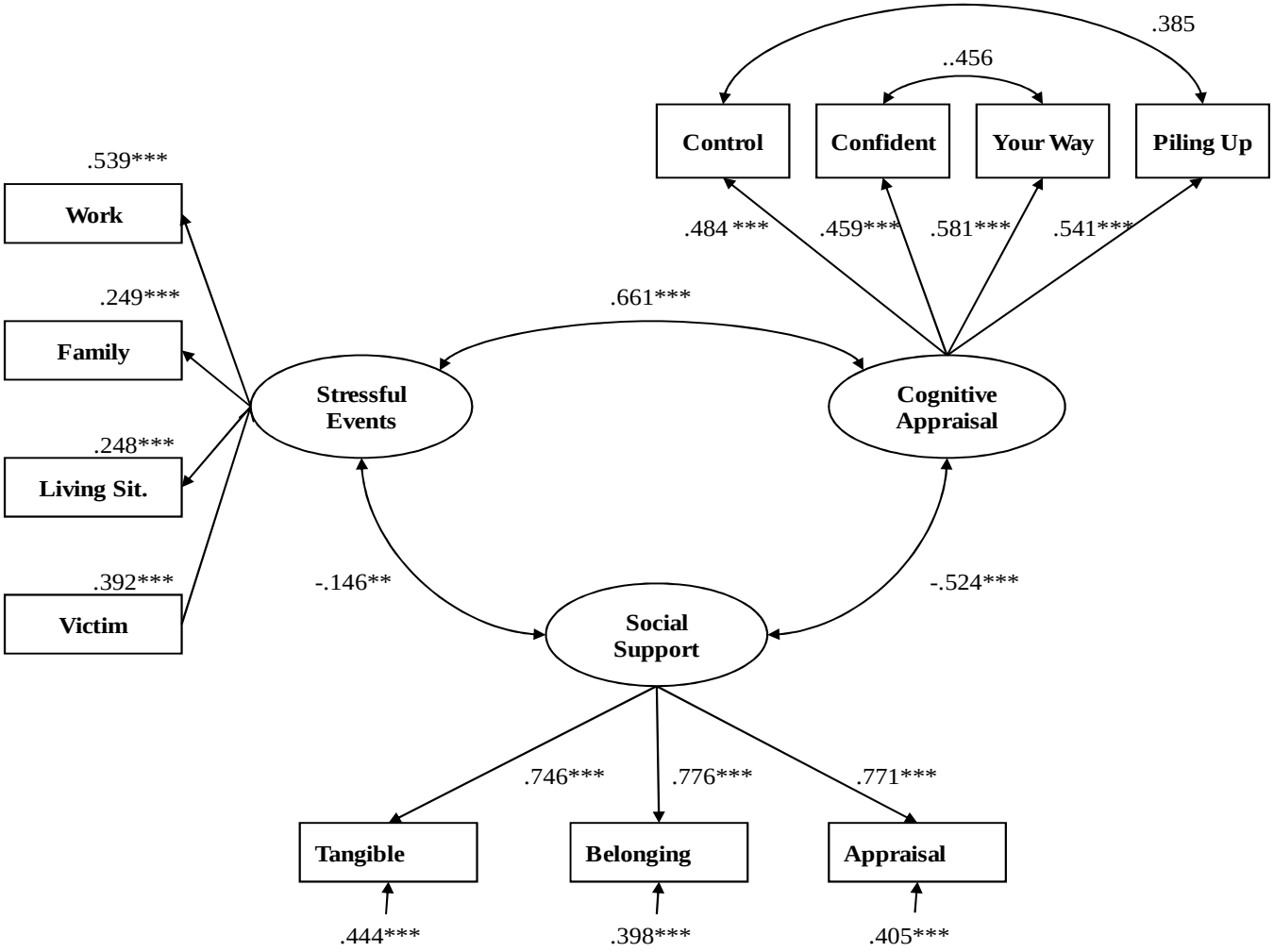
Overall model fit for the measurement model (See Table 8) was good in the older adult subsample. The Tucker-Lewis Index (TLI) (.985), Comparative Fit Index (CFI) (.986), and Root Mean Square Error of Approximation (RMSEA) (.010) values were all within acceptable ranges, but the model chi-square ($\chi^2(23)=97.419$) was significant. The chi-square value was likely the result of the size of the analysis sample. Given the overall size of the sample and the values of comparative fit statistics, overall model fit was good. All parameters in the model were statistically significant, but this may be a result of the large sample size as well. Overall, standardized factor loadings were acceptable, but loadings for family related stresses (.249) and system-change (.248) were both low. Stressful events were highly correlated with cognitive appraisal in the model (.661) and social support was negatively correlated with cognitive appraisal (-.524). Although statistically significant, social support and stress events showed a weaker correlation (.146). Overall model fit statistics and model parameters suggest that the measurement model is acceptable for the older adult subsample.

Table 8: Measurement model

Latent Variable/ Indicator	λ (se)	z	standardized	E or δ	z	φ	z
Stressful Events						.291(0.072)	4.037***
Victimization	.726(.154)	4.024***	.392				
Work-related	1	1	.539				
Living situation	.459(.114)	5.024***	.248				
Family-related	.461(.092)	4.985***	.249				
Stressful Events with Cognitive Appraisal			.661			.661(.074)	9.019***
Cognitive Appraisal						.235(.023)	10.017***
Control (1)	1	N/A	.484				
Confident (2)	.947(.074)	12.756***	.459				
Your way (3)	1.199(.085)	14.064***	.581				
Piling up (4)	1.118(.050)	22.184***	.541				
PSS-1/PSS-4			.385	.283(.020)	13.980***		
PSS-2/PSS-3			.456	.330(.021)	15.499***		
Cognitive Appraisal with Social Support			-.524			-524(.026)	-20.256***
Social Support						5.907(.234)	25.282***
Belonging	1	N/A	.776	3.911(.198)	19.742***		
Tangible	1.000(.031)	32.039***	.746	4.858(.281)	17.311***		
Appraisal	1.099(.033)	33.004***	.771	4.708(.250)	18.797***		
Social Support with Stressful Events			-.146			-146(.045)	-3.253**

Note: $\chi^2(23)=97.419$; p<.001; TLI=.985; CFI=.986; RMSEA=.010;WRMR=1.202; n=4360; ***p<.001

Figure 4: Measurement model, older adults



Structural Equation Models: Older Adults

Structural parameters were added to the measurement model, and a full structural equation model was estimated. Parameters estimating the relationships of model variables included in the model, and observed covariates and alcohol related endogenous variables were also included in the model. Exogenous covariates included marital status, high school and college education, income, history of alcohol problems, race, gender, age, physical health, Major Depression (past-year), and Generalized Anxiety Disorder(past-year). All covariates in the model estimated associations with all latent variables and alcohol related outcomes. Because of high correlations between different alcohol-related outcomes, average daily consumption, at-risk use, and alcohol problems, three separate models were estimated: one for consumption (mean daily consumption), one for alcohol problems, and one for at-risk drinking. Additionally, alcohol consumption was log transformed to adjust for nonnormality. The WLSMV (Weighted Least Squares, Means and Variance adjusted) estimator was used for this model in keeping with the measurement model. Additionally, categorical estimation techniques were used for dichotomous measures of at-risk drinking and alcohol related problems. No changes were made to the measurement portion of the SEM model.

SEM model of alcohol consumption – Older Adults

The model focused on alcohol consumption fit the data at an acceptable level (Table 9 & Figure 5). The chi-square value was significant, but this is common in models with very large sample size. TLI (.942) and CFI (.949) values were at or near accepted cutoff values (Hu & Bentler, 1999), and the RMSEA (.009) was well below the

standard cutoff value of .08. The Weighted Root Mean Residual (WRMR) value was somewhat high compared to ideal values from simulation studies (Yu, 2002), but little research has been conducted to assess the performance of this fit statistic in models that include both continuous and categorical indicators and in large samples. Because the preponderance of fit indices suggested good fit, the model was deemed acceptable.

Item factor loadings changed somewhat with the inclusion of covariates and structural paths (See Table 9). This was especially true for the Stressful Events latent variable. The standardized loading was good for the work related domain (.840), but other loadings were poor. The Family/Support factor loading was particularly poor, with a factor loading of (.150) and the system change (.282) and victimization (.297) variables also showed worsened loadings in the full model (See Table 9). Standardized loadings for the Cognitive Appraisal and Social Support variables were fair to good, suggesting that these indicators load well on the stressful event latent construct in the older adult drinker subsample.

There was a positive association between stressful events and cognitive appraisal ($b=.405$; $\beta=.593$; $z=4.571$; $p<.001$), and social support was negatively associated with cognitive appraisal of stress ($b=-727$; $\beta=-.441$; $z=-7.257$; $p<.001$) as hypothesized in the model. Contrary to stated hypotheses, cognitive appraisal was associated with a decrease in alcohol consumption ($b=-.251$; $\beta=-.144$; $z=-2.365$; $p<.05$), although this relationship is comparatively trivial given the statistical power of the sample. The path model diagram is presented in Figure 5 without covariates.

Standardized covariate parameter estimates are presented in Table 10. Being married, older, and in better health were all associated with significantly lower levels of

the stressful event latent variable. Conversely, African American race and past-year Major Depression were associated with significantly increased levels of the stressful events construct. Having a history of alcohol problems was also weakly associated with stressful events. Being currently married was also associated with higher levels of social support as was higher income and better health. Latino ethnicity, older age, and having a history of alcohol problems were all associated with lower levels of social support. In terms of cognitive appraisal, being female, being currently married, Major Depression and Generalized Anxiety Disorder were associated with higher levels of cognitive appraisal of stress. Better health was associated with lower levels of cognitive appraisal.

A history of alcohol related problems was associated with significantly higher levels current alcohol consumption. Significant demographic predictors of increased consumption included having a college education, higher levels of income and better health. Conversely, Asian American race and female gender were associated with lower average consumption levels. Mental health variables were marginally related to consumption; past-year Generalized Anxiety Disorder was associated with increased consumption and Major Depressive Disorder was associated with decreased consumption.

Table 9: Older adult structural model for Average Daily Alcohol Consumption

Measurement Parameters	λ (se)	z	standardized	E or δ	z		
Stressful Events							
Work-related	1	N/A	.840				
Victimization	.354	5.797***	.297				
Living situation	.336(.052)	6.394***	.282				
Family/Support	.178(.044)	4.040***	.150				
Cognitive Appraisal							
Control (1)	1	N/A	.574				
Confident (2)	.777(.062)	12.485***	.446				
Your way (3)	.980(.066)	14.921***	.562				
Piling up (4)	1.089(.047)	23.337***	.625				
PSS-1/PSS-4			.225	.225(.023)	9.908***		
PSS-2/PSS-3			.388	.388(.018)	21.865***		
Social Support							
Belonging	1	N/A	.778	3.720(.187)	19.843***		
Tangible	1.027(.033)	32.705***	.747	4.752(.238)	19.931***		
Appraisal	1.127(.034)	31.032***	.776	4.732(.271)	17.478***		

Structural Model Parameters	b (se)	z	β
Stressful Events→Cognitive Appraisal	.405(.089)	4.571***	.593
Social Support→Cognitive Appraisal	-.727(.100)	-7.257***	-.441
Cognitive Appraisal→Average Daily Consumption	-.251(.106)	-2.365*	-.144

Note: $\chi^2(65)=242.687$; p<.001; TLI=.942; CFI=.949; RMSEA=.009;WRMR=1.413; n=4353; *p<.05; **p<.01; ***p<.001
β=standardized

Figure 5: Older adult (60+) structural model – Alcohol Consumption

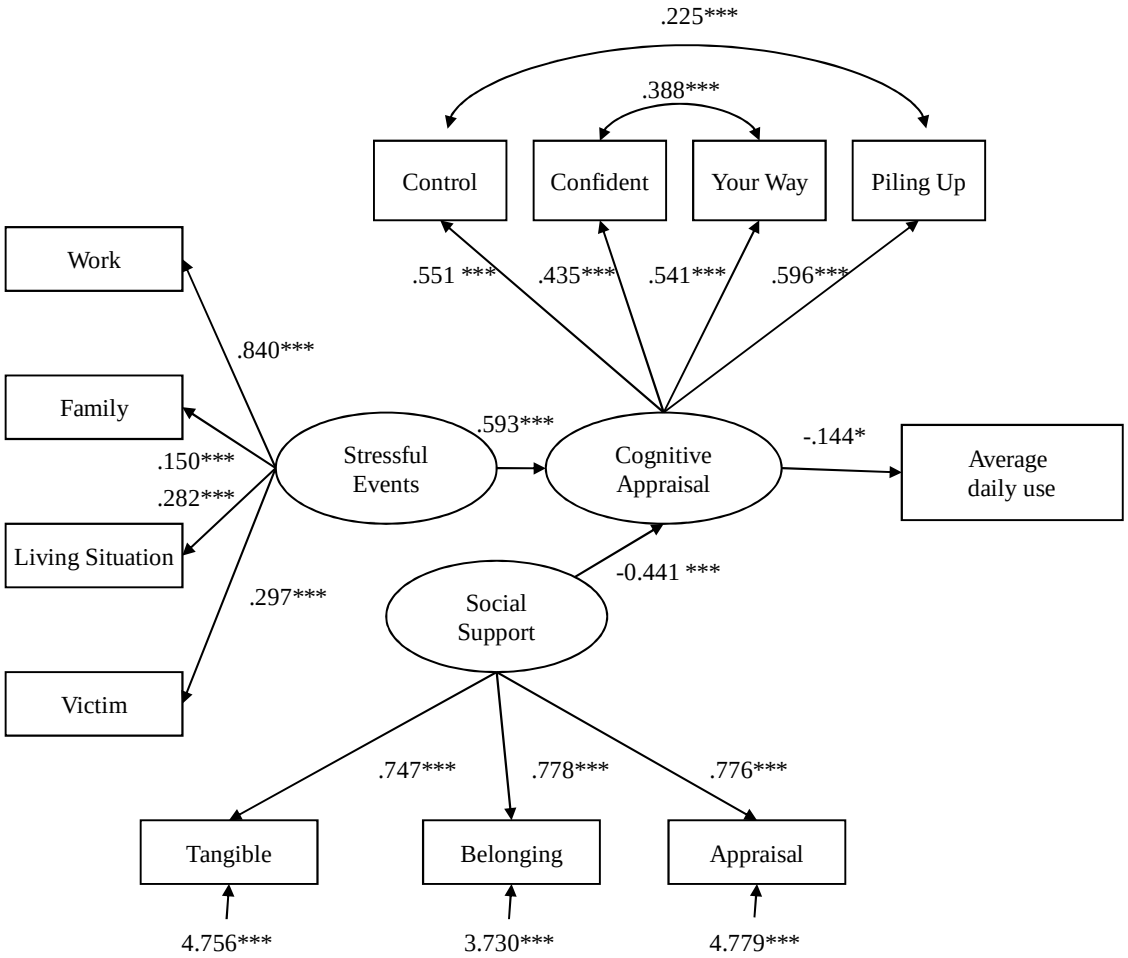


Table 10: Covariate standardized estimates for the older adult structural model Average Daily Alcohol Consumption (Covariates not shown but were included in model)

Covariate	Stressful Events	Social Support	Cognitive Appraisal	Average Daily Consumption
Currently Married	-.333***	.269***	.266**	-.115
High School Education	-.107	-.073	.113	.199
College Ed.	-.070	-.085	.062	.629***
Income	.006	.113***	-.054	.165***
History of alcohol problems	.123*	-.139***	-.043	.756***
African American	.514***	-.056	-.140	-.066
Native American	.038	-.004	-.279	.219
Asian American	.248	-.130	.552	-1.43***
Latino	.154	-.211***	-.029	-.125
Female	-.094	.076*	.309***	-.758***
Age(years)	-.059***	-.015***	.020**	.005
Physical Health (SF-12)	-.009**	.009***	-.021***	.018***
Major Depression - PY	.454**	-.231*	.740***	-.447*
Generalized Anxiety - PY	.369	-.469**	.405*	.578*

*p<.05; **p<.01; ***p<.001

SEM model of at-risk drinking – Older Adults

Another SEM model was estimated on the older adult subsample, but this model included only at-risk drinking as a dichotomous outcome. The variable at-risk drinking is defined as consuming over the guidelines defined as healthy by the NIAAA in the past-year (See Appendix E for details). It was not possible to model all alcohol related outcomes in a single SEM model due to high correlations between the alcohol related variables (consumption, at-risk drinking, and alcohol problems). Since the overall model was the same with the exception of at-risk drinking, fit indices were acceptable ($\chi^2(67)=237.534$; TLI=.943; CFI=.950; RMSEA=.009); Similar to the alcohol consumption model, the direction and relative strength of measurement and structural parameters were largely the same (See Table 11 & Figure 6). Contrary to hypothesized relationships, the relationship between cognitive appraisal and at-risk drinking was nonsignificant (b=-.038; β=-.020; z=-.520). Significant covariates of at-risk drinking included marital status, older age and alcohol history. Being married and older age were associated was decreased likelihood of at-risk drinking. Having a history of alcohol related problems was associated with increased likelihood of at-risk drinking (Table 12). Although significantly associated with consumption, past-year Major Depression and Generalized Anxiety were not associated with at-risk drinking. Similarly, those with college education and currently married people were less likely to endorse at-risk drinking even though they consumed more on average.

Table 11: Older adult structural model for at-risk† drinking

Measurement Parameters	λ (se)	z	standardized	E or δ	z		
Stressful Events							
Work-related	1	N/A	.848				
Victimization	.354	5.748***	.294				
System Change	.332(.052)	6.346***	.282				
Family/Support	.175(.044)	4.040***	.148				
Cognitive Appraisal							
Control (1)	1	N/A	.569				
Confident (2)	.787(.063)	12.400***	.447				
Your way (3)	.994(.067)	14.875***	.565				
Piling up (4)	1.094(.047)	23.183***	.622				
PSS-1/PSS-4			.229	.229(.023)	10.114***		
PSS-2/PSS-3			.386	.386(.018)	21.730***		
Social Support							
Belonging	1	N/A	.777	3.736(.188)	19.926***		
Tangible	1.028(.033)	32.027***	.748	4.753(.238)	19.948***		
Appraisal	1.128(.034)	31.027***	.776	4.780(.271)	17.478***		

Structural Model Parameters	b (se)	z	β
Stressful Events→Cognitive Appraisal	.389(.086)	4.536***	.580
Social Support→Cognitive Appraisal	-.106(.008)	-13.306***	-.444
Cognitive Appraisal→At-Risk Drinking	-.038(.075)	-.512	-.020 (n.s.)

Note: $\chi^2(67)=237.534$; p<.001; TLI=.943; CFI=.950; RMSEA=.009;WRMR=1.401; n=4353; *p<.05; **p<.01; ***p<.001

† For men, no more than 14 standard drinks per week or no more 4 standard drinks on any day, and b) For women, no more than 7 standard drinks per week or no more 4 standard drinks on any day.

Figure 6: Older adult (60+) structural model – At-Risk Drinking

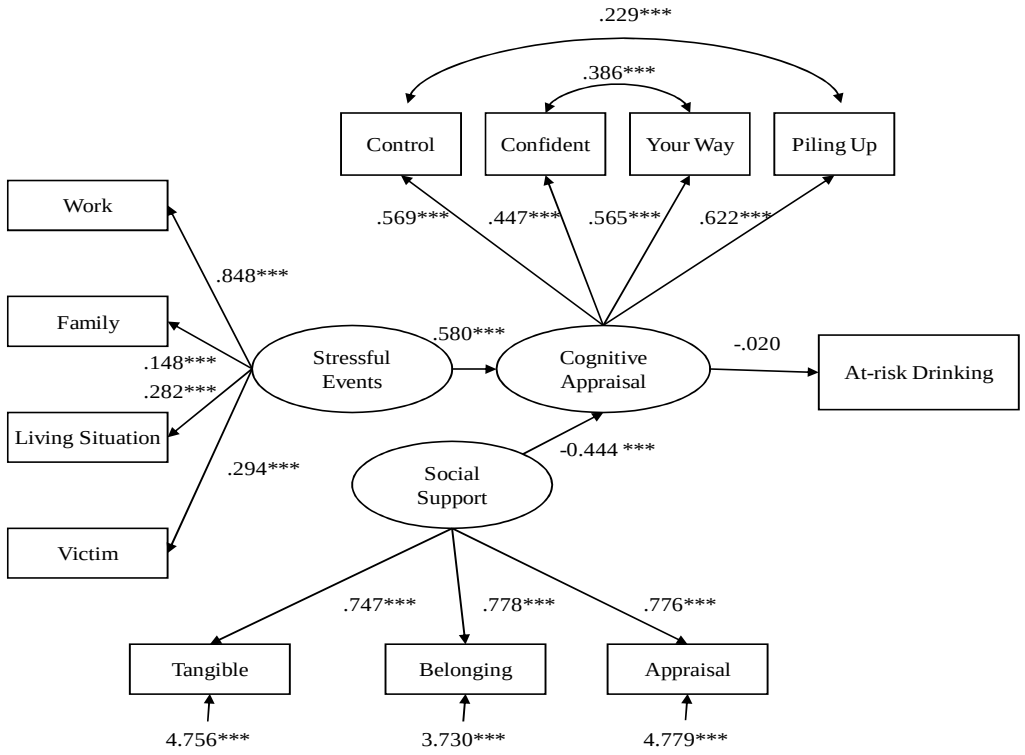


Table 12: Covariate standardized estimates for the older adult structural model – At-Risk Drinking
(Covariates not shown but were included in model)

Covariate	Stressful Events	Social Support	Cognitive Appraisal	At-Risk Drinking
Married	-0.333***	0.268***	0.261**	-0.223***
High School Education	-0.111	-0.073	0.113	0.026
College Ed.	-0.068	-0.085	0.057	0.072
Income	0.006	0.113***	-0.054	0.053
History of alcohol problems	0.123*	-0.140***	-0.042	0.553***
African American	0.512***	-0.056	-0.132	-0.008
Native American	0.039	-0.004	-0.272	0.063
Asian American	-0.247	-0.131	0.549	-0.426*
Latino	0.154	-0.212**	-0.026	0.098
Female	-0.098	0.075	0.309***	-0.087
Age(years)	-0.059***	-0.015***	0.020	-0.022***
Physical Health	-0.009**	0.009***	-0.021***	0.006*
Major Depression - PY	0.437**	-0.228*	0.757***	-0.133
Generalized Anxiety - PY	0.355	-0.464**	0.421*	0.131

*p<.05; **p<.01; ***p<.001

SEM model of problem drinking – Older Adults

A final model was estimated in the older adult subsample focused on problem drinking in the past-year. As with the other two models, latent variable relationships, indicators, and error covariances were specified in the same way (Table 13 & Figure 7). Alcohol related problems were now the focus of interest. For this endogenous outcome, alcohol problems were defined as endorsing any alcohol related diagnostic criteria in the past-year. Similar to previous models, the data fit the model within the acceptable range ($\chi^2(67)=235.604$; $p<.001$; TLI=.943; CFI=.949; RMSEA=.009;WRMR=1.395). As with the other models, the chi-square value was significant, but comparative fit indices suggested that the model fit was good. As previously reported, stressful events were positively associated with cognitive appraisal and social support negatively associated with cognitive appraisal.

In this model where alcohol problems were the outcome of interest, there was no association between cognitive appraisal and alcohol-related problems (b=.158; β=.090; z=1.820), when adjusting for covariates. Significant sociodemographic and health related predictors included marital status, income, gender and age (See Table 14). Higher levels of income, African American race/ethnicity and a history of alcohol related problems were associated with increased likelihood of having alcohol related problems, while female gender, being married, and being older were associated with decreased likelihood of alcohol problems.

Moderation tests: the stress buffering hypothesis in older adults

To test the hypothesis that social support moderates the relationship between stressful events and perceived stress, a latent variable interaction model was run. The SEM model using alcohol consumption (average daily use) as an outcome was estimated, first with a latent variable interaction included, and then without the interaction in place. For the purposes of model convergence, the scales of the latent variables in the model were fixed to 1.

As noted above, a single moderation path was added to the model and compared to an identical model without latent variable moderation. Interactions were estimated using the LMS method (Klein & Moosbrugger, 2000). Instead of using WLSMV estimation, the models were estimated using maximum likelihood with robust standard errors (MLR) and numerical integration. This estimation technique is required for interaction testing, but has the disadvantage of no absolute fit testing (chi-square) and no traditional comparative fit statistics using chi-square such as TLI and CFI. It is possible to compare models using Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), and sample size adjusted Bayesian Information Criteria (ABIC) and log likelihood (-2LL) values. Moderation hypotheses were tested by comparing AIC, BIC and ABIC of the interaction model with those without the interaction term. Additionally, interaction parameter estimate was assessed for strength and direction and nest model testing using model log likelihoods.

Based on model specifications, two models were estimated for the older adult subsample. One included an interaction term of stressful events and social support latent variables, and the other did not. Model fit indices are listed in Table 15 for the model. The older adult moderation model showed worse model fit on all indices. AIC, BIC and

ABIC values were lower in the interaction better model fit. Using model comparisons of -2LL values, there was significant difference in model fit between the models, but the interaction parameter itself was nonsignificant. Based on this information, the hypothesis that social support moderates the relationship between stressful events and cognitive appraisal was not supported.

Older adults – Findings related to hypotheses

The hypothesis that stressful events are associated with higher levels of cognitive appraisal of stress was supported by these analyses, as was the notion that social support is associated with lower levels of cognitive appraisal of stress. Social support did not buffer the relationship of stressful events with cognitive appraisal of stress. Additionally, cognitive appraisal was not associated with any of the alcohol related variables in the models tested among older adults. There was a weak statistical relationship between decreased alcohol consumption and increased cognitive appraisal of stress (See table 16 for standardized estimates from models for cognitive appraisal and covariates).

In terms of covariates, certain communalities were present. A history of alcohol problems was significantly positively associated with all alcohol related outcomes while older age was protective of at-risk drinking and alcohol problems. Being currently married was negatively associated with at risk drinking and alcohol problems and better health was associated with higher consumption and slightly greater likelihood of risk drinking.

Table 13: Older adult structural model for Alcohol Problems

Measurement Parameters	λ (se)	z	standardized	E or δ	z		
Stressful Events							
Work-related	1	N/A	.852				
Victimization	.348(.060)	5.824***	.296				
System Change	.332(.052)	6.330***	.281				
Family/Support	.176(.044)	4.024***	.150				
Cognitive Appraisal							
Control (1)	1	N/A	.567				
Confident (2)	.788(.063)	12.434***	.447				
Your way (3)	.998(.067)	14.935***	.566				
Piling up (4)	1.096(.047)	23.087***	.621				
PSS-1/PSS-4			.230	.230(.023)	10.193***		
PSS-2/PSS-3			.386	.386(.018)	21.825***		
Social Support							
Belonging	1	N/A	.777	3.739(.187)	19.987***		
Tangible	1.029(.033)	30.953***	.748	4.734(.239)	19.823***		
Appraisal	1.130(.034)	32.833***	.777	4.772(.270)	17.663***		
Structural Model Parameters					b (se)	z	β
Stressful Events→Cognitive Appraisal					.386(.083)	4.606***	.578
Social Support→Cognitive Appraisal					-.106(.008)	-13.345***	-.444
Cognitive Appraisal→Problem Drinking					.158(.087)	1.821	.090

Note: $\chi^2(67)=235.604$; p<.001; TLI=.943; CFI=.949; RMSEA=.009;WRMR=1.395; n=4353; *p<.05; **p<.01; ***p<.001

Figure 7: Older adult (60+) structural model – Problem Drinking

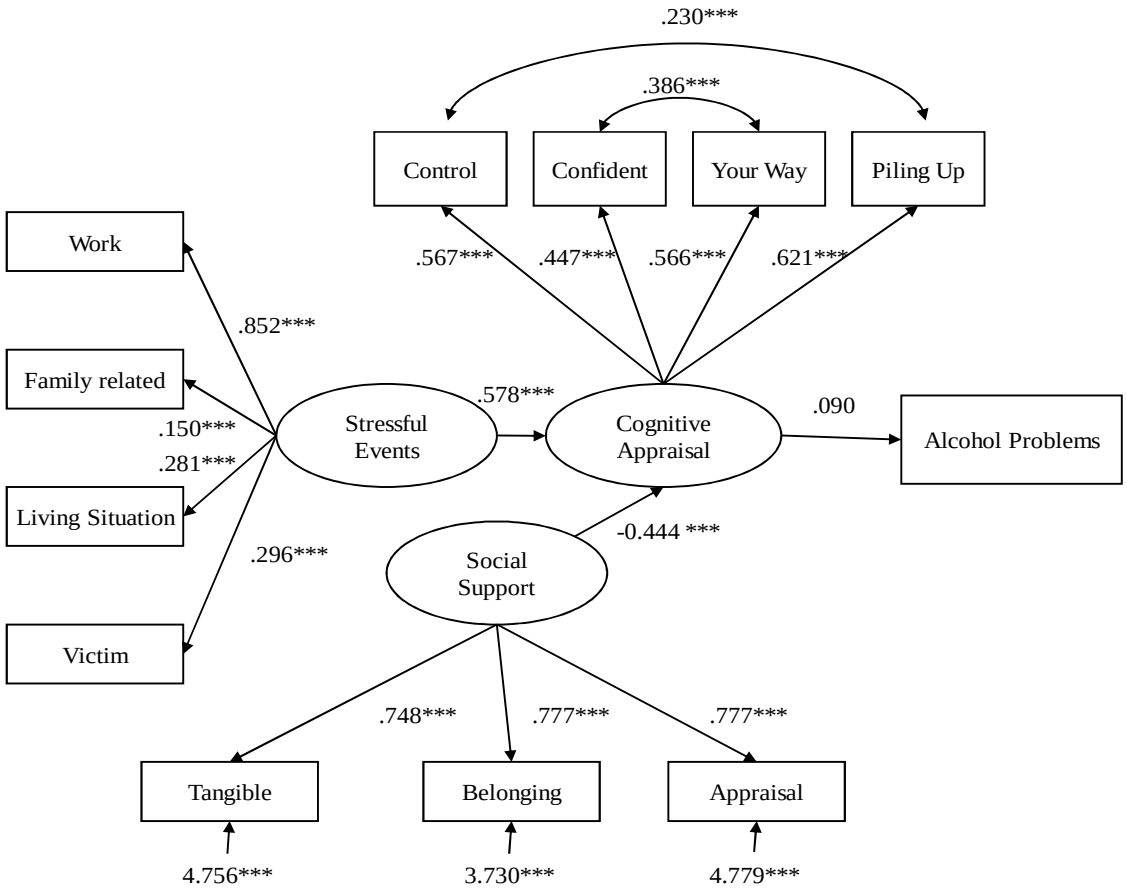


Table 14: Covariate standardized estimates for the older adult structural model – Problem Drinking
(Covariates not shown but were included in model)

Covariate	Stressful Events	Social Support	Cognitive Appraisal	Alcohol Problems
Married	-0.331***	0.266***	0.258**	-0.120**
High School Education	- 0.111	-0.073	0.112	-0.110
College Ed.	-0.067	-0.085	0.056	0.014
Income	0.006	0.113***	-0.054	0.018
History of alcohol problems	0.122*	-0.140***	-0.041	0.628***
African American	0.511***	-0.055	-0.129	0.205*
Native American	0.039	-0.004	-0.275	-0.007
Asian American	-.0245	-0.130	0.545	-0.252
Latino	0.152	-0.212**	-0.024	0.179
Female	-0.091	0.075	0.304***	-0.276***
Age(years)	-0.058*	-0.015***	0.019*	-0.019***
Physical Health	-0.009**	0.009***	-0.021***	0.002
Major Depression - PY	0.439	-0.222*	0.761***	-0.100
Generalized Anxiety – PY	0.329	-0.450**	0.449*	0.065

*p<.05; **p<.01; ***p<.001

Table 15: Moderation model comparisons using information criteria

Age Group	**Moderation?**	**AIC**	**BIC**	**ABIC**	**-2LL**	**Inter. b**	**p**	**Diff -2LL**	**p**
Older Adults	Interaction	114851.548	115514.925	115184.455	57321.774	.009	.876	3.974	.046
	No Interaction	114864.520	115521.518	115194.226	57329.260	n/a			
Middle Aged	Interaction	220310.936	221044.968	220717.650	110052.468	.005	.904	10.964	<.001
	No Interaction	220391.921	221118.826	220794.687	110093.960	n/a			
Young Adults	Interaction	210892.641	211584.474	211273.047	105348.321	.017	.863	.923	.
	No Interaction	210968.144	211652.918	211344.669	105387.072	n/a			

AIC=Akaike Information Criterion; BIC=Bayesian Information Criterion; -2LL=-2Log-Likelihood

Table 16: Summary of standardized estimates for SEM models, older adults only

	Average Daily Consumption	NIAAA at-risk use	Alcohol Problems
Cognitive Appraisal	-.141*	-.020	.090
Covariates			
Married	-.115	-0.223***	-0.120**
High School Education	.199	0.026	-0.110
College Ed.	.629***	0.072	0.014
Income	.165***	0.053	0.018***
History of alcohol problems	.756***	0.553***	0.628***
African American	-.066	-0.008	0.205*
Native American	.219	0.063	-0.007
Asian American	-1.43***	-0.426*	-0.252
Latino	-.125	0.098	0.179
Female	-.758***	-0.087	-0.276***
Age(years)	.005	-0.022***	-0.019***
Physical Health	.018***	0.006*	0.002
Major Depression - PY	-.447*	-0.133	-0.100
Generalized Anxiety – PY	.578*	0.131	0.065

*p<.05; **p<.01; ***p<.001

Structural Equation Models: Middle-aged adults

In the interest of understanding life stage differences in the stress and drinking relationship, the same SEM model was estimated in middle-aged (40-59) and young adult (20-39) drinkers. For each age group, a model was run for each alcohol related outcome, alcohol consumption, at-risk drinking and alcohol related problems. For the middle-aged adults, the model focused on alcohol related problems will be presented first as alcohol problems were important in this age group.

SEM model of alcohol related problems – Middle aged adults

For the middle-aged SEM model, overall model fit was acceptable (Table 17). The chi-square value was significant ($\chi^2(69)=457.903$; $p<.001$), but the TLI (.939), CFI (.945) and RMSEA (.013) values suggest acceptable fit. The WRMR value was again higher than the suggested cutoff of 1.00, but it is unclear whether this statistic is suitable to models with both continuous and categorical variables and in large samples. Item level fit of the models was somewhat different than the older adult sample. Indicators of the Stressful events latent variable showed somewhat better loading values; standardized loadings of victimization (.665), family/social (.428), and system change (.361) were fair. Standardized factor loadings for the cognitive appraisal items (PSS1-PSS4) were also fair, and the factor loadings for social support were good. As hypothesized, the stressful events latent variable was associated with cognitive appraisal of stress ($b=.416$; $z=9.944$; $\beta=.424$; $p<.001$), and higher levels of social support were associated with lower levels of cognitive appraisal ($b=-.133$; $z=-23.183$; $\beta=-.453$; $p<.001$). In the middle aged group, cognitive appraisal of stress was also associated with increased likelihood of endorsing

one or more alcohol related problems (b=.296; z=6.018; β=.193). (Please see figure 8 for a path model.)

Sociodemographic and health related covariates also showed significant relationships with model constructs (See Table 18). A history of alcohol problems, African American race, Major Depression, and Generalized Anxiety Disorder were associated with significantly higher levels of stressful events; being married, having higher levels of income, older age, and better health were associated with lower levels of stressful events. For social support, being married, having higher income, being female and better health were associated with higher levels of social support. History of alcohol problems, Major Depression, and Generalized Anxiety Disorder were associated with lower social support. To a lesser extent, increased age was also associated with lower social support. In terms of cognitive appraisal, women and married people endorsed higher levels of cognitive appraisal. Both Major Depression and Generalized Anxiety Disorder were strongly associated with higher levels of cognitive appraisal. Consistent with stressful events, better physical health was associated with lower cognitive appraisal of stress.

For alcohol problems, previous history of alcohol problems was the strongest predictor of endorsing current alcohol problems. Other significant covariates included better physical health and African American race. Being currently married, college education, female gender, and older age were associated with decreased likelihood of having an alcohol problem.

Table 17: Middle-aged adult (40-59) structural model for alcohol problems

Measurement Parameters	λ (se)	z	standardized	E or δ	z	
Stressful Events						
Work-related	1	N/A	.665			
Victimization	.643(.058)	11.112***	.428			
Living Situation	.716(.052)	13.836***	.476			
Family related	.542(.045)	12.166***	.361			
Cognitive Appraisal						
Control (PSS-1)	1	N/A	. 653			
Confident (PSS-2)	.860(.040)	21.361***	. 562			
Your Way (PSS-3)	.976(.042)	23.353***	. 637			
Piling Up (PSS-4)	1.045(.030)	35.264***	. 682			
PSS-1/PSS-4			.210	.210(.015)	14.356***	
PSS-2/PSS-3			.359	.359(.013)	27.940***	
Social Support						
Belonging	1	N/A	.752	3.795(.155)	24.468***	
Tangible	1.115(.025)	44.582***	.780	3.953(.175)	22.596***	
Appraisal	1.322(.036)	36.983***	.810	4.638(.242)	18.679***	

Structural Model Parameters	b (se)	Z	β
Stressful Events→Cognitive Appraisal	.416(.042)	9.944***	.424
Social Support→Cognitive Appraisal	-.133(.006)	-23.183***	-.453
Cognitive Appraisal→Alcohol Problems	.296(.049)	6.018***	.193

Note: $\chi^2(69)=457.903$; p<.001; TLI=.939; CFI=.945; RMSEA=.013;WRMR=1.836; *p<.05; n=9196; **p<.01; p<.001

Figure 8: Middle aged adult (40-59) structural model - alcohol problems

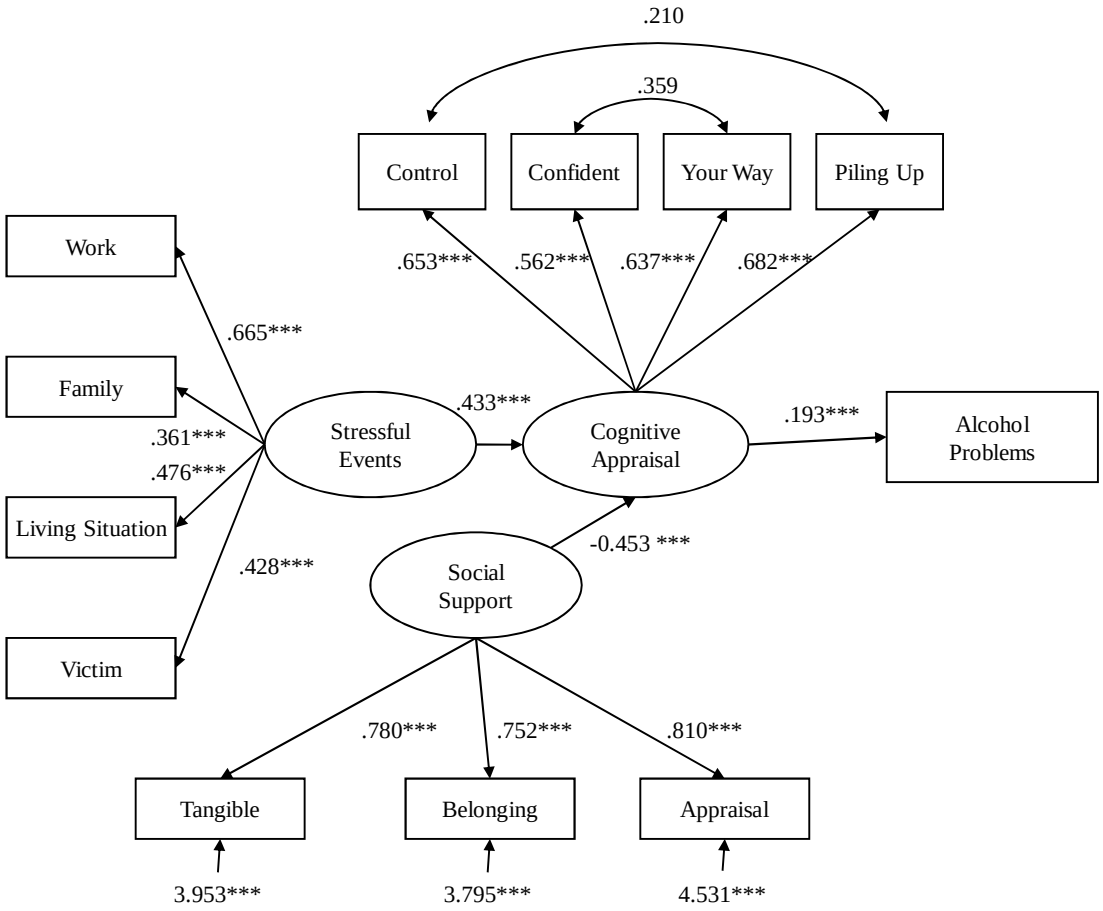


Table 18: Covariate standardized estimates for the middle-aged adult (40-59) structural model alcohol problems (Covariates not shown but were included in model)

Covariate	Stressful Events	Social Support	Cognitive Appraisal	Alcohol Problems
Married	-.300***	.187***	.174***	-.232***
High School Education	.007	.078	.013	.115
College Ed.	.174*	.072	-.067	-.224**
Income	-.197***	.106***	-.043*	.034
History of alcohol problems	.239***	-.075***	-.007	.589***
African American	.253***	.040	-.059	.359***
Native American	.380**	.030	-.156	-.131
Asian American	-.101	-.131	.028	-.173
Latino	.103	-.073	-.068	-.114
Female	.025	.206***	.260***	-.332***
Age(years)	-.031***	-.008**	-.001	-.013***
Physical Health	-.015***	.007***	-.012***	.009***
Major Depression - PY	.684***	-.229***	.644***	-.050
Generalized Anxiety – PY	.407***	-.411***	.648***	.135

*p<.05; **p<.01; ***p<.001

SEM model of At-risk Drinking – Middle aged adults

Because alcohol related outcomes were highly correlated (making a single model impossible), separate SEM models were estimated for the middle aged subsample for each alcohol related outcome in keeping with the procedure for older adults. Therefore, models for alcohol problems, at risk drinking, and alcohol consumption were conducted separately. Please see Table 19 and Figure 9 for information on the measurement and structural relationships in the model.

The overall fit of the model was fair; the chi-square value was significant ($\chi^2(65)=468.969$; $p<.001$), but measures of model fit were near accepted cutoff values (TLI=.938; CFA=.944; RMSEA=.013). Consistent with the alcohol problems model (Table 15), there was a strong positive association between stressful events and cognitive appraisal, and there was a negative relationship between social support and cognitive appraisal. Unlike the model focused on alcohol problems, cognitive appraisal was not significantly associated with at-risk use in middle-aged adults which is contrary to the hypothesis. At-risk drinking was associated with a history of alcohol related problems, and higher levels of better physical health (Table 20).

Table 19: Middle-aged adult structural model for at-risk drinking

Measurement Parameters	λ (se)	z	standardized	E or δ	z	
Stressful Events						
Work-related	1	N/A	.666			
Victimization	.639(.058)	11.043***	.426			
Living Situation	.719(.052)	13.768***	.479			
Family-related	.540(.045)	12.114***	.360			
Cognitive Appraisal						
Control (PSS-1)	1	N/A	. 652			
Confident (PSS-2)	.866(.040)	21.361***	. 565			
Your Way (PSS-3)	.982(.041)	23.353***	. 641			
Piling Up (PSS-4)	1.039(.029)	35.264***	. 678			
PSS-1/PSS-4			.212	.212(.015)	14.734***	
PSS-2/PSS-3			.356	.356(.013)	27.574***	
Social Support						
Belonging	1	N/A	.753	3.789(.156)	24.343***	
Tangible	1.114(.025)	44.703***	.780	3.950(.174)	22.642***	
Appraisal	1.321(.036)	36.752***	.809	4.544(.242)	18.783**	

Structural Model Parameters	b (se)	Z	β
Stressful Events→Cognitive Appraisal	.406(.042)	9.708***	.412
Social Support→Cognitive Appraisal	-.133(.006)	-23.144***	-.453
Cognitive Appraisal→At-Risk Use	-.017(.042)	-.415	-.011

Note: $\chi^2(65)=468.969$; p<.001; TLI=.938; CFI=.944; RMSEA=.013;WRMR=1.847; n=9196; *p<.05; **p<.01; p<.001

Figure 9: Middle aged adult (40-59) structural model – at-risk drinking

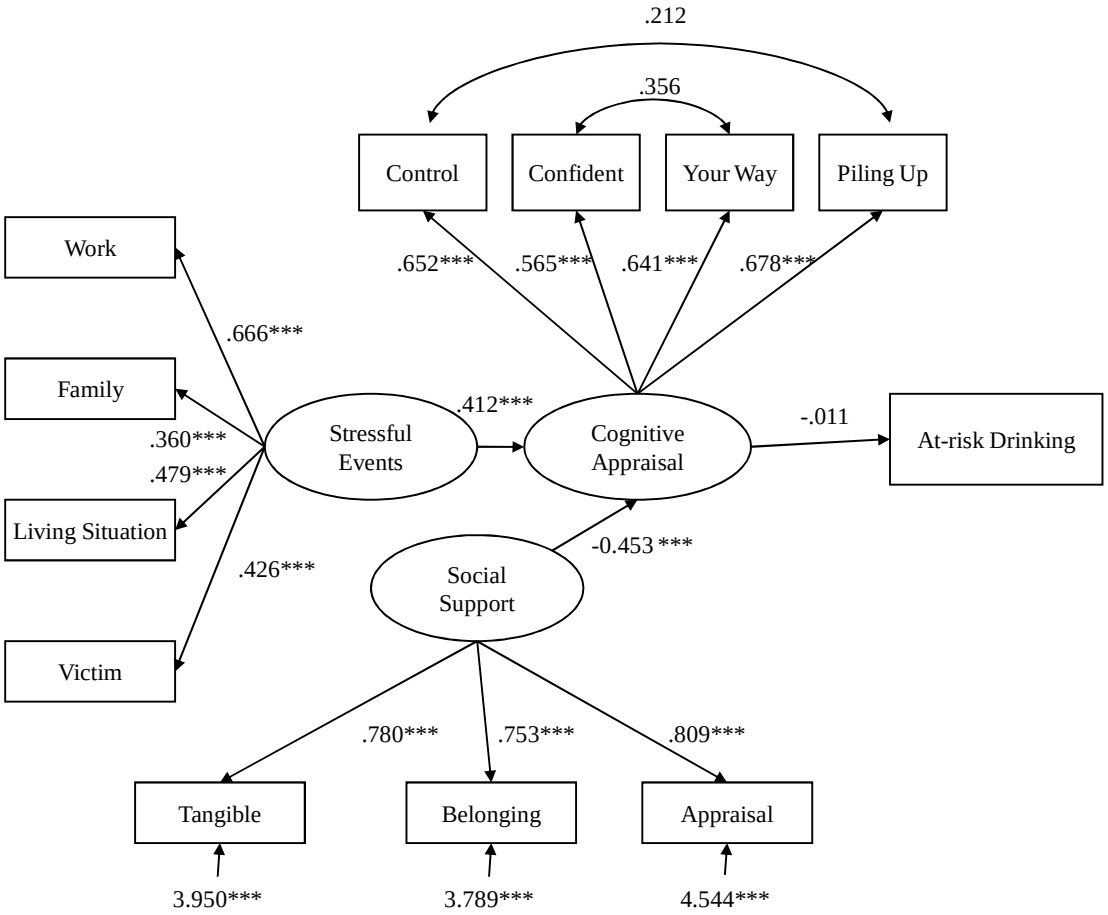


Table 20: Covariate standardized estimates for the middle-aged adult (40-59) structural model for at-risk drinking (Covariates not shown but were included in model)

Covariate	Stressful Events	Social Support	Cognitive Appraisal	At-Risk Drinking
Married	-0.301***	0.188***	0.171***	-0.206***
High School Education	0.002	0.077	0.016	-0.111
College Ed.	0.169	0.072	-0.062	-0.307***
Income	-0.197***	0.106***	-0.045*	0.043*
History of alcohol problems	0.239***	-0.075***	-0.004	0.521***
African American	0.251***	0.043	-0.054	-0.122
Native American	0.380**	0.031	-0.153	-0.141
Asian American	-0.100	-0.133	0.027	-0.465
Latino	0.103	-0.073	-0.067	0.065
Female	0.025	0.205***	0.259***	-0.180***
Age(years)	-0.031***	-0.008**	-0.002	-0.023***
Physical Health	-0.015***	0.007***	-0.012***	0.007**
Major Depression - PY	0.682***	-0.298***	0.653***	0.046
Generalized Anxiety – PY	0.407***	-0.411***	0.651***	0.005

*p<.05; **p<.01; ***p<.001

SEM model of Alcohol Consumption – Middle aged adults

The SEM model was estimated focusing on alcohol consumption. The model was configured identically to the previous models. As such, model fit indices were similar to those in the previous models discussed (See Table 21 and Figure 10 for details). This model displayed factor loadings nearly equal to previous models and structural relationships between stressful events, social support, and cognitive appraisal in the same strength and directions of previous models. The relationship of cognitive appraisal to alcohol consumption was nonsignificant (b=-.093; z=-1.633; β=-.061). This was contrary to the hypothesis that higher levels of cognitive appraisal would be associated with greater average daily use of alcohol. Sociodemographic variables associated with increased alcohol consumption included higher income levels, a history of alcohol problems, African American race, and better physical health (See Table 22). Conversely, being currently married, Native American ethnicity and female gender were associated with lower levels of consumption.

Middle-aged adult SEM model: interaction tests

Synonymous with the older adult subsample, a latent variable interaction test was conducted to test whether social support buffers or moderates the relationship of stressful events and cognitive appraisal. Alcohol problems was used as a dichotomous outcome variable, because this variable was significant in the middle aged SEM model. The models were estimated using the MLR estimator with numerical integration. In one model, a latent variable interaction of stressful events and social support on cognitive appraisal was included. In the second model, the moderation path was not included. The

models were then compared using AIC, BIC and -2loglikelihood values. Additionally, a latent variable interaction term was estimated to determine the direction and strength of the interaction.

For the moderation model, all comparative measures of fit (AIC, BIC, AIC, -2LL) were improved with the interaction term included (See Table 15). Additionally, nested model testing indicated that the model including an interaction term was a better fit to the data. Still, the actual parameter estimate for the interaction term was nonsignificant, suggesting that social support does not moderate the relationship between stressful events and cognitive appraisal in middle aged adults.

Middle-aged adults – Findings related to hypotheses

The hypothesized relationships between stressful events and cognitive appraisal were supported in the middle –aged adult subsample. Social support was also associated with differences lower levels of cognitive appraisal of stress. Only alcohol related problems were associated cognitive appraisal of stress; alcohol consumption and at-risk drinking were not associated with cognitive appraisal (See Table 23 for summary table). In middle aged individuals, being currently married, female and older was associated with lower consumption, and likelihood of at-risk use, and alcohol problems. Better physical health and a history of alcohol problems were associated with increased risk of alcohol problems, at-risk use and greater average daily consumption. African American race was associated with greater consumption and likelihood of alcohol problems, but no greater likelihood of at-risk drinking.

Table 21: Middle-aged adult structural model for alcohol consumption

Measurement Parameters	λ (se)	z	standardized	E or δ	z	
Stressful Events						
Work-related	1	N/A	.665			
Victimization	.638(.058)	11.014***	.424			
Living Situation	.722(.052)	13.775***	.480			
Family-related	.541(.045)	12.116***	.360			
Cognitive Appraisal						
Control (PSS-1)	1	N/A	. 653			
Confident (PSS-2)	.864(.040)	21.550***	. 564			
Your Way (PSS-3)	.979(.041)	23.801***	. 640			
Piling Up (PSS-4)	1.038(.029)	35.386***	. 678			
PSS-1/PSS-4			.211	.212(.015)	14.685***	
PSS-2/PSS-3			.357	.356(.013)	27.652***	
Social Support						
Belonging	1	N/A	.753	3.789(.156)	24.343***	
Tangible	1.113(.025)	44.697***	.780	3.950(.174)	22.642***	
Appraisal	1.320(.036)	36.771***	.809	4.544(.242)	18.783**	

Structural Model Parameters	b (se)	Z	β
Stressful Events→Cognitive Appraisal	.407(.042)	9.688***	.414
Social Support→Cognitive Appraisal	-.133(.006)	-23.171***	-.453
Cognitive Appraisal→Average Daily Use	-.093(.057)	-1.633	-.061

Note: $\chi^2(65)=453.467$; p<.001; TLI=.941; CFI=.947; RMSEA=.013;WRMR=1.815; n=9196; *p<.05; **p<.01; p<.001

Figure 10: Middle aged adult (40-59) structural model – Average daily use

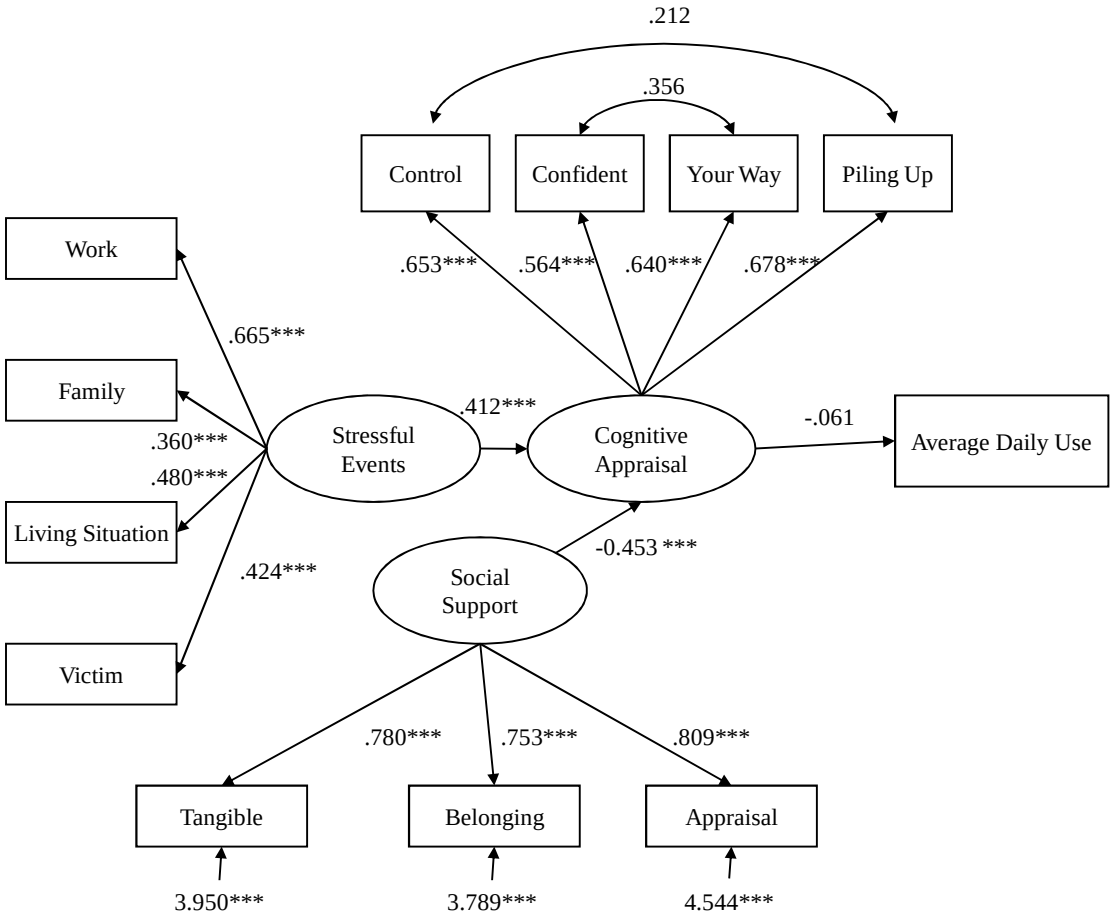


Table 22: Covariate standardized estimates for the middle-aged adult structural model for alcohol consumption (Covariates not shown but were included in model)

Covariate	Stressful Events	Social Support	Cognitive Appraisal	Average Daily Use
Married	-0.302***	0.189***	0.173***	-0.304***
High School Education	0.007	0.077	0.013	-0.023
College Ed.	0.171*	0.072	-0.064	-0.079
Income	-0.197***	0.106***	-0.045*	0.175***
History of alcohol problems	0.239***	-0.075***	-0.005	0.766***
African American	0.251***	0.042	-0.055	0.176**
Native American	0.377**	0.031	-0.155	-0.335*
Asian American	-0.100	-0.131	0.028	-0.345
Latino	0.103	-0.072	-0.066	-0.110
Female	0.025	0.206***	0.260***	-0.923***
Age(years)	-0.031***	-0.008**	-0.002	0.000
Physical Health	-0.015***	0.007***	-0.012***	0.018***
Major Depression - PY	0.686***	-0.298***	0.649***	0.029
Generalized Anxiety – PY	0.409***	-0.410***	0.650***	0.028

Table 23: Summary of standardized estimates for SEM models, Middle-aged adults (40-59)

	Average Daily Consumption	NIAAA at-risk use	Alcohol Problems
Cognitive Appraisal	-.061	-.011	.193***
Covariates			
Married	-0.304***	-0.206***	-0.232***
High School Education	-0.023	-0.111	0.115
College Ed.	-0.079	-0.307***	-0.224**
Income	0.175***	0.043*	0.034
History of alcohol problems	0.766***	0.521***	0.589***
African American	0.176**	-0.122	0.359***
Native American	-0.335*	-0.141	-0.131
Asian American	-0.345	-0.465	-0.173
Latino	-0.110	0.065	-0.114
Female	-0.923***	-0.180***	-0.332***
Age(years)	0.000	-0.023***	-0.013***
Physical Health	0.018***	0.007**	0.009***
Major Depression - PY	0.029	0.046	-0.050
Generalized Anxiety – PY	0.028	0.005	0.135

*p<.05; **p<.01; ***p<.001

Structural Equation Models: Young Adults

The identical structural equation model was applied to data for current drinkers ages 18-39; the SEM model was fit to the data using the same configuration and method of estimation (WLSMV –Weighted Least Squares, Means and Variance Adjusted). The model was estimated three times using the different alcohol related variables: alcohol problems, at-risk use, and alcohol consumption. The full model of alcohol related problems will be presented first as this model had a significant structural path for an alcohol related construct. Because of nonsignificant parameter estimates on alcohol variables (at-risk use and alcohol consumption) these models will be discussed in reference to null findings and covariates.

SEM model of alcohol related problems – Young adults

The model focused on alcohol problems showed acceptable fit to the data. The chi-square was significant for the model ($\chi^2(64)=411.564$; $p<.001$), but comparative fit indices suggested that the model fit the data well (TLI=.937; CFI=.946; RMSEA=.013). These were all at or near the cutoffs identified as good through simulation studies. As with the earlier models, the WRMR (1.763) statistic was over the recommended value of .90, but the performance of this statistical index has not been extensively studied. The standardized factor loadings for the stressful events latent variable were fair. The strongest loading was for work related stressors (.693), and other loadings ranged between .40 and .50. (See Table 24 & Figure 11 for details.) Cognitive appraisal items also loaded well on the latent construct as did the social support subscales. All factor loadings and error covariances were statistically significant.

The relationship between the stress related constructs and alcohol related problems was similar to that found for middle-aged adults. In the young adult subgroup, stressful events were associated with cognitive appraisal of stress (b=.410; z=10.050; p<.001; β=.463); social support was negatively associated with cognitive appraisal (b=-.130; z=19.564; p<.001; β=-.478). Additionally, in this model, cognitive appraisal of stress was associated with a greater likelihood of endorsing alcohol related problems (b=.186; z=3.859; p<.001; β=.112). See Figure 11 for a path model showing these relationships.

In addition to the structural paths shown in Figure 11, all of the latent and alcohol related variables were regressed on the same sociodemographic and health covariates that were included in the other age groups. For the stressful events latent variable, significant sociodemographic covariates included a history of alcohol related problems, and African American race (Table 25). Higher levels of income, older age and better physical health were associated with lower levels of stressful events. Past-year Major Depression and Generalized Anxiety Disorder were associated with higher levels of stressful events, and better physical health was associated with lower levels of the stressful events latent variable. In terms of social support, those who endorsed Major Depression or Generalized Anxiety Disorder showed lower levels of social support, but better physical health was associated with more social support. Women endorsed higher levels of social support. Among sociodemographic covariates, being married, having a high school education, attending college, higher income level, and female gender were associated with higher levels of social support. Asian American and Latino race/ethnicity was associated with lower levels of social support in this age group. For cognitive appraisal,

older age and female gender was associated with higher cognitive appraisal of stress. As expected with the clinical presentation of these conditions, Major Depression and Generalized Anxiety Disorder were strongly associated with cognitive appraisal. In terms of alcohol problems, being currently married, older age, female gender, and having college education were associated with lower risk of alcohol problems; a history of alcohol problems was associated with increased risk.

Table 24: Young adult (20-39) structural model for alcohol problems

Measurement Parameters	λ (se)	z	standardized	E or δ	z		
Stressful Events							
Victimization	.686(.053)	12.946***	.476				
Work-related	1	N/A	.693				
System Change	.580(.042)	13.668***	.402				
Family/Support	.667(.044)	15.115***	.462				
Cognitive Appraisal							
Control (PSS-1)	1	N/A	.600				
Confident (PSS-2)	.876(.048)	18.302***	.526				
Your Way (PSS-3)	1.011(.048)	21.180***	.607				
Piling Up (PSS-4)	1.104(.034)	32.107***	.663				
PSS-1/PSS-4			.207	.204(.012)	13.190***		
PSS-2/PSS-3			.362	.364(.016)	29.259***		
Social Support							
Belonging	1	N/A	.727	4.321(.157)	27.608***		
Tangible	1.116(.028)	40.270***	.759	4.441(.221)	20.124***		
Appraisal	1.428(.038)	37.308***	.829	4.490(.306)	14.676***		
Structural Model Parameters					b (se)	z	β
Stressful Events→Cognitive Appraisal					.410(.040)	10.050***	.463
Social Support→Cognitive Appraisal					-.130(.007)	-19.564***	-.478
Cognitive Appraisal→Alcohol Problems					.186(.005)	3.859***	.112

Note: $\chi^2(64)=411.564$; p<.001; TLI=.937; CFI=.946; RMSEA=.013;WRMR=1.763; n=8600; *p<.05; **p<.01; p<.001

Figure 11: Young adult (20-39) structural model - alcohol problems

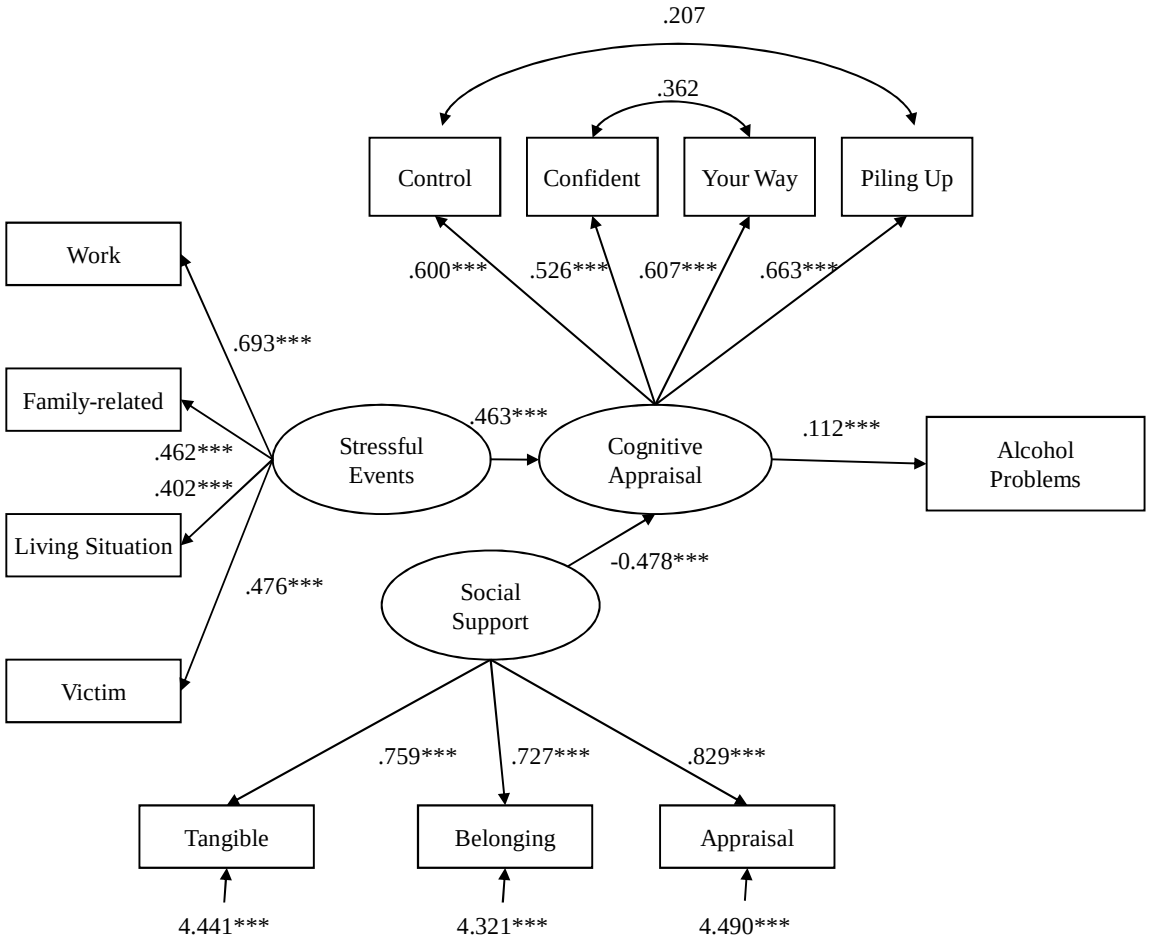


Table 25: Covariate standardized estimates for the young adult (20-39) structural model for alcohol problems (Covariates not shown but were included in model)

Covariate	Stressful Events	Social Support	Cognitive Appraisal	Alcohol Problems
Married	-.088*	.149***	.011	-.318***
High School Education	-.025	.231***	-.020	-.080
College Education	-.103	.324***	-.056	-.153**
Income	-.188***	.155***	-.011	.071**
History of alcohol problems	.241***	-.018	.024	.574***
African American	.395***	-.071	.000	.088
Native American	.297*	-.097	-.258	.003
Asian American	-.046	-.336***	.184	.044
Latino	.004	-.190***	-.032	.027
Female	.063	.167***	.230***	-.322***
Age(years)	-.047***	-.015***	.020***	-.033***
Physical Health	-.011***	.008***	-.003	.004
Major Depression - PY	.718***	-.514***	.687***	.119
Generalized Anxiety – PY	.710***	-.352***	.390***	.075

*p<.05; **p<.01; ***p<.001

SEM model of At-risk Drinking – Young adults

The same model tested for problem drinking in young adults was run for the outcome of at-risk drinking. The overall model fit was good based on comparative and residual based statistics ($\chi^2(64)=399.174$; $p<.001$; TLI=.939; CFI=.946; RMSEA=.012). Consistent with other models presented the chi-square value was significant, but this may be a function of sample size. Comparative fit statistics and residual based measures suggest that the model fits the data well. This model displayed analogous estimates on measurement parameters, and structural parameters (Table 26 & Figure 12). Standardized factor loadings for the stressful events, cognitive appraisal and social support indicators were fair to good. In terms of structural relationships, stressful events were associated with higher levels of cognitive appraisal as espoused by theory. Social support was associated with lower levels of perceived stress, but cognitive appraisal was not associated with greater likelihood of at-risk drinking.

At-risk drinking was associated with a number of sociodemographic covariates in the model (Table 27). Currently married persons, Asian American and African American young adults, women, and older "young adults" were less likely to report at-risk drinking. Those with a history of alcohol problems, and those with higher income levels were more likely to endorse at-risk drinking.

Table 26: Young adult (20-39) structural model for at-risk drinking

Measurement Parameters	λ (se)	z	standardized	E or δ	z		
Stressful Events							
Work-related	1	N/A	.695				
Victimization	.685(.053)	12.913***	.476				
Living situation	.577(.042)	13.622***	.401				
Family-related	.662(.044)	15.015***	.460				
Cognitive Appraisal							
Control (PSS-1)	1	N/A	.600				
Confident (PSS-2)	.879(.048)	18.169***	.528				
Your Way (PSS-3)	1.013(.048)	21.038***	.608				
Piling Up (PSS-4)	1.099(.034)	31.989***	.660				
PSS-1/PSS-4			.208	.208(.012)	13.189***		
PSS-2/PSS-3			.361	.361(.016)	28.916***		
Social Support							
Belonging	1	N/A	.728	4.321(.157)	27.608***		
Tangible	1.114(.028)	40.299***	.759	4.441(.221)	20.124***		
Appraisal	1.426(.038)	37.201***	.829	4.490(.306)	14.676***		
Structural Model Parameters					b (se)	z	β
Stressful Events→Cognitive Appraisal					.392(.040)	9.920***	.454
Social Support→Cognitive Appraisal					-.131(.007)	-19.637***	-.478
Cognitive Appraisal→At-risk drinking					.065(.050)	1.280	.039

Note: $\chi^2(64)=399.174$; p<.001; TLI=.939; CFI=.946; RMSEA=.012;WRMR=1.735; n=8600; *p<.05; **p<.01; p<.001

Figure 12: Young adult (20-39) structural model - at-risk drinking

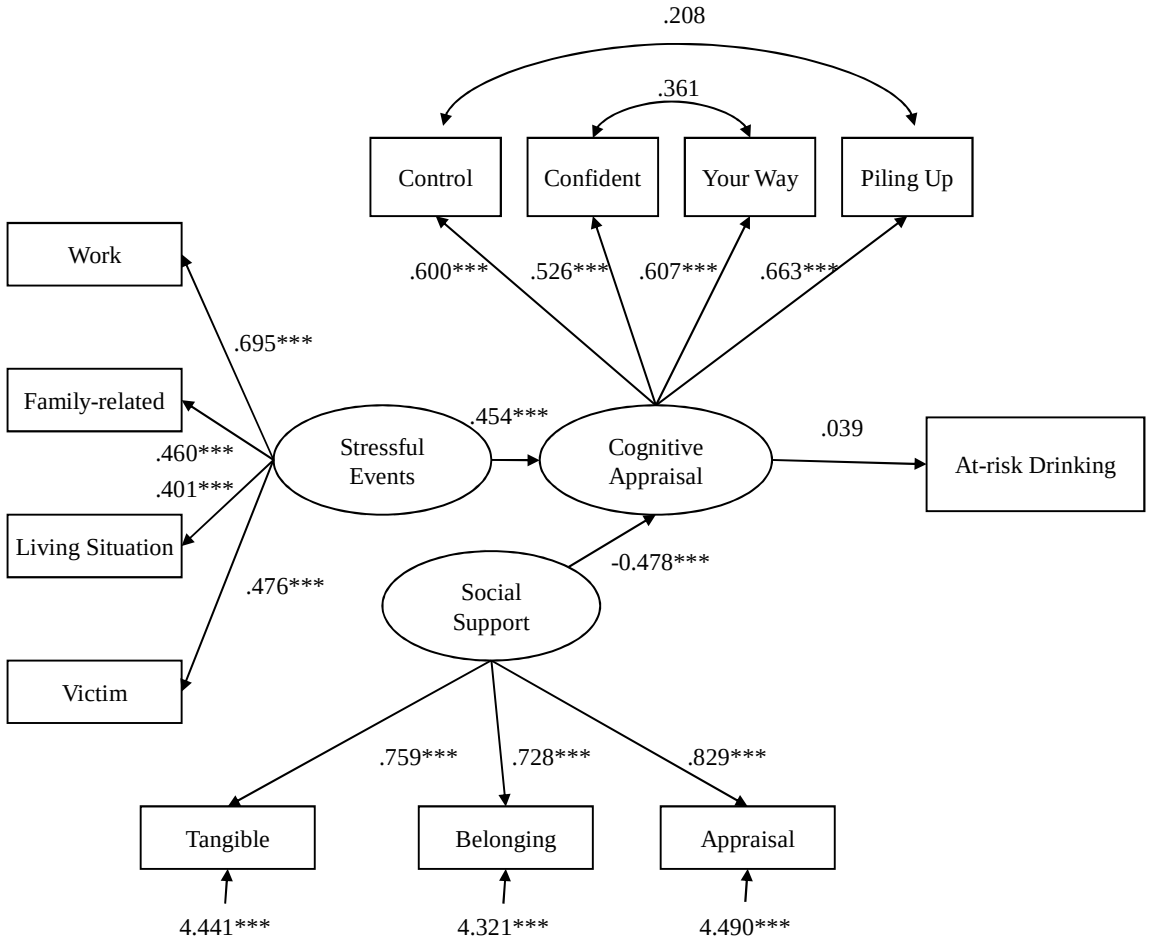


Table 27: Covariate standardized estimates for the young adult (20-39) structural model for at-risk drinking (Covariates not shown but were included in model)

Covariate	Stressful Events	Social Support	Cognitive Appraisal	At-Risk Drinking
Married	-0.088*	0.150***	0.011	-0.293***
High School Education	-0.026	0.231***	-0.019	-0.077
College Education	-0.105	0.324***	-0.056	-0.127
Income	-0.188***	0.155***	-0.013	0.084***
History of alcohol problems	0.241***	-0.018	0.026	0.515***
African American	0.395***	-0.071	0.004	-0.286***
Native American	0.298*	-0.097	-0.258	-0.050
Asian American	-0.043	-0.336***	0.188*	-0.469***
Latino	0.006	-0.190***	-0.033	-0.101
Female	0.063	0.166***	0.230***	-0.319***
Age(years)	-0.047***	-0.015***	0.020***	-0.033***
Physical Health	-0.011***	0.008***	-0.004	0.005
Major Depression - PY	0.718***	-0.514***	0.693***	0.076
Generalized Anxiety – PY	0.709***	-0.352***	0.394***	-0.114

*p<.05; **p<.01; ***p<.001

SEM model of Alcohol Consumption – Young adults

The same SEM model tested to see if alcohol consumption (average daily use) was associated with other model constructs (See Table 28 & Figure 13). Model fit to the data approximated that of the other young adult models. The chi-square value was again significant ($\chi^2(64)=392.831$; $p<.001$), but comparative fit indices suggested acceptable model fit. The TLI was .942; the CFI was .950, and the RMSEA was .012. Like other models, the WRMR (1.717) exceeded guidelines based on simulation studies, but it is unclear whether these values are meaningful with large samples and models containing both categorical and continuous variables. Standardized factor loadings ranged from acceptable to good, suggesting that the indicators were an acceptable reflection of the underlying construct.

Per the other young adult models, structural relationships were the same. Stressful events were associated with cognitive appraisal (β=.450) and social support was negatively associated with cognitive appraisal (β=-.480). There was a nonsignificant relationship between cognitive appraisal and alcohol consumption (b=.064; z=-.974; β=.038). This finding is did not support the hypothesis that cognitive appraisal would be associated with alcohol consumption (average daily use) in young adults.

Adjusting for cognitive appraisal, a number of sociodemographic variables were associated with alcohol consumption in this age group (Table 29). Individuals with higher incomes, those with a history of alcohol problems, and those reporting better health consumed alcohol at higher levels. Women, Asian American and Latino individuals, and "older" young adults consumed lower levels of alcohol on average.

Young adult SEM model: interaction tests

To assess for a moderation or buffering effect of social support on the relationship of stressful events and cognitive appraisal, nested model tests were completed using the young adult drinker subsample. Two SEM models were estimated; one without a latent interaction, and then the interaction term was included. Social support was hypothesized to moderate the relationship of stressful events and cognitive appraisal.

For this model, estimated error covariances were removed from the model due to computational burden. Each error covariance is estimated using a latent variable; the indicators with the correlated errors are loaded on the latent variable which signifies the error of the two indicators. Because an integration algorithm is necessary to estimate the latent interaction term, a dimension of integration is necessary for each latent variable in the model. With the error variances included in this model there were 5 dimensions of integration; although the computational burden of this model is very heavy (Muthén & Muthén, 1998-2008, p. 386). Although the models for older adults and middle-aged adults were estimated with 5 dimensions of integration, the young adult model was run with 3 dimensions (by removing two error covariances). This enabled the model to converge, and did not affect model comparisons because both models omitted the error covariances.

Model fit was slightly improved in the interaction model compared to the model without the stressful events/support interaction, as evidenced by lower values on AIC, BIC and -2LL values (See Table 15). Although the inclusion of the parameter improved fit, the interaction was nonsignificant (b=.017; p=.863) suggesting that social support does not buffer the effects of stressful events.

Young adults – Findings related to hypotheses

The relationships between stressful events, social support and cognitive appraisal were all significant in a pattern similar to that of middle-aged adults. Stressful events were associated with cognitive appraisal of stress, and social support was associated with lower levels of cognitive appraisal. Social support did not moderate the relationship of stressful events and cognitive appraisal of stress. Alcohol problems were associated with cognitive appraisal of stress, but at-risk drinking and alcohol consumption were not associated with cognitive appraisal (see Table 30). Across the three alcohol related outcomes, being married, being older, and female gender were associated with decreased risk. Similarly, having a history of Alcohol Abuse or Dependence was associated with increased consumption and risk of at-risk drinking and alcohol problems. Asian American and African American race/ethnicity were associated with a decreased likelihood of at-risk drinking in this age group (20-39).

Table 28: Young adult (20-39) structural model for alcohol consumption

Measurement Parameters	λ (se)	z	standardized	E or δ	z		
Stressful Events							
Victimization	.684(.053)	12.915***	.476				
Work-related	1	N/A	.693				
Living Situation	.578(.042)	13.646***	.402				
Family/Support	.662(.044)	15.054***	.462				
Cognitive Appraisal							
Control (PSS-1)	1	N/A	.601				
Confident (PSS-2)	.88(.049)	16.647***	.529				
Your Way (PSS-3)	1.011(.048)	15.115***	.607				
Piling Up (PSS-4)	1.097(.034)	12.946***	.659				
PSS-1/PSS-4			.208	.208(.012)	13.137***		
PSS-2/PSS-3			.362	.361(.016)	28.905***		
Social Support							
Belonging	1	N/A	.727	4.333(.157)	27.656***		
Tangible	1.118(.028)	40.217***	.759	4.375(.222)	19.716***		
Appraisal	1.425(.038)	37.194***	.829	4.588(.308)	14.894***		

Structural Model Parameters	b (se)	z	β
Stressful Events→Cognitive Appraisal	.389(.040)	9.845***	.450
Social Support→Cognitive Appraisal	-.131(.007)	-19.675***	-.481
Cognitive Appraisal→Average Daily Use	.064(.065)	-.974	-.038

Note: $\chi^2(64)=392.831$; p<.001; TLI=.942; CFI=.950; RMSEA=.012;WRMR=1.717; n=8600; *p<.05; **p<.01; p<.001

Figure 13: Young adult (20-39) structural model – Alcohol Consumption

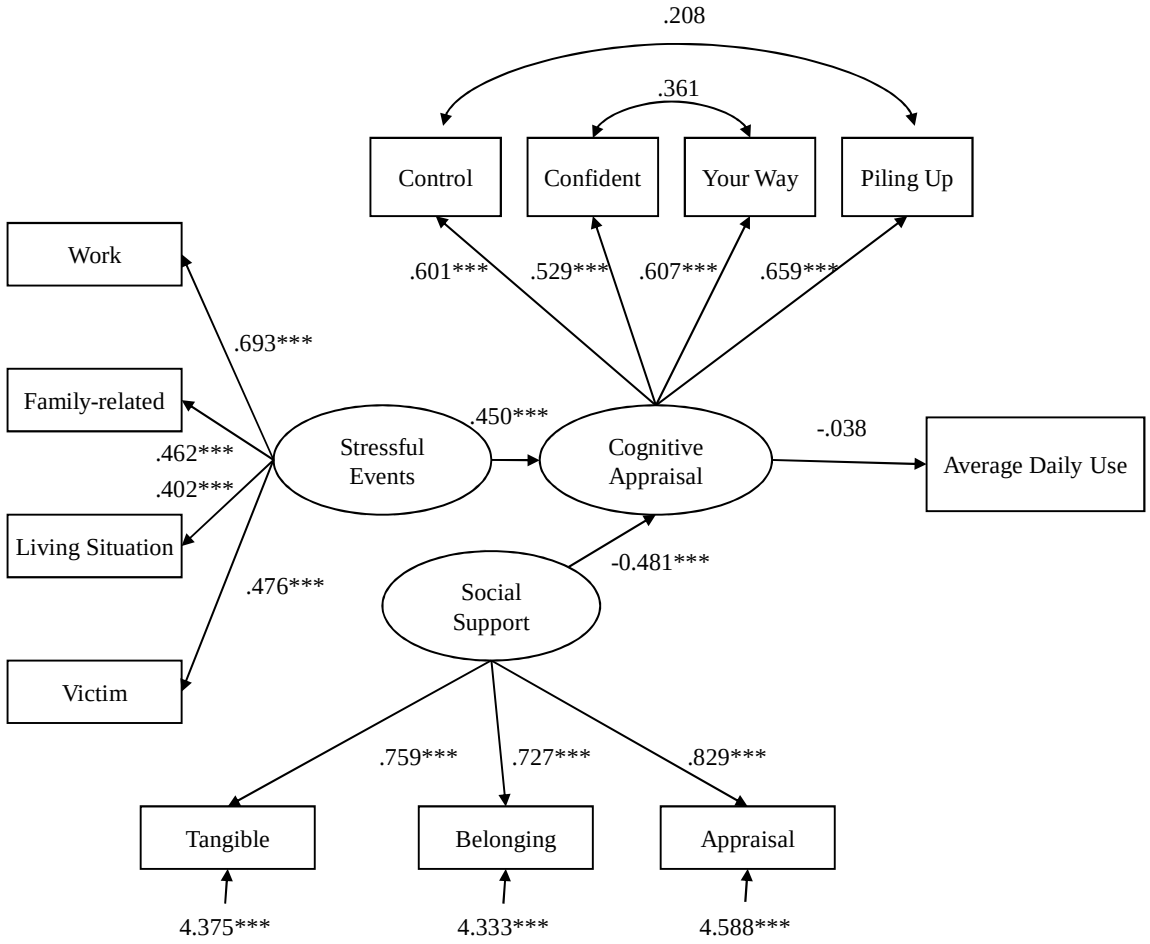


Table 29: Covariate standardized estimates for the young adult (20-39) structural model for alcohol consumption (Covariates not shown but were included in model)

Covariate	Stressful Events	Social Support	Cognitive Appraisal	Average Daily Use
Married	-0.088*	0.151***	0.012	-0.622***
High School Education	-0.025	0.225***	-0.023	-0.191*
College Education	-0.103	0.324***	-0.058	-0.157*
Income	-0.188***	0.155***	-0.013	0.168***
History of alcohol problems	0.241***	-0.018	0.027	0.853***
African American	0.393***	-0.070	0.007	0.044
Native American	0.312*	-0.095	-0.261	0.001
Asian American	-0.041	-0.334***	0.186*	-0.348**
Latino	0.005	-0.191***	-0.034	-0.258**
Female	0.063	0.166***	0.230***	-0.984***
Age(years)	-0.047***	-0.015***	0.020***	-0.025***
Physical Health	-0.011***	0.008***	-0.004	0.009**
Major Depression - PY	0.718***	-0.515***	0.695***	0.114
Generalized Anxiety – PY	0.720***	-0.344***	0.393***	-0.109

*p<.05; **p<.01; ***p<.001

Table 30: Summary of standardized estimates for SEM models, Young adults (20-39)

	Average Daily Consumption	NIAAA at-risk use	Alcohol Problems
Cognitive Appraisal	-.038	.039	.112***
Covariates			
Married	-0.622***	-0.293***	-.318***
High School Education	-0.191*	-0.077	-.080
College Ed.	-0.157*	-0.127	-.153**
Income	0.168***	0.084***	.071**
History of alcohol problems	0.853***	0.515***	.574***
African American	0.044	-0.286***	.088
Native American	0.001	-0.050	.003
Asian American	-0.348**	-0.469***	.044
Latino	-0.258**	-0.101	.027
Female	-0.984***	-0.319***	-.322***
Age(years)	-0.025***	-0.033***	-.033***
Physical Health	0.009**	0.005	.004
Major Depression - PY	0.114	0.076	.119
Generalized Anxiety – PY	-0.109	-0.114	.075

*p<.05; **p<.01; ***p<.001

Multiple Group Modeling – Assessing measurement differences in latent constructs

Up to this point, SEM models have been tested separately within each of the three age groups (older adults; 60+, middle aged adults; 40-59 and young adults; 20-39); as noted, there were differences in the structural relationships, but those may be a function of measurement differences in the latent constructs. In order to compare across groups, the measurement properties of the latent constructs were assessed for invariance. Structural differences in the relationships of different latent variables can only be compared in the presence of measurement invariance across the three age groups. Differences in the relationship of social support and cognitive appraisal may be reviewed only if these constructs have the same measurement properties in each group. This is accomplished through a series of nested model comparisons where different measurement parameters are constrained to be equal across the groups. Because age-based models revealed different relationships with alcohol related constructs, the multiple group models will focus on the measurement model. If the strong measurement invariance is manifested, then structural parameters will be added.

As a starting point, the measurement model tested for older adults (Figure 4) was fit to the complete sample (see Model I in Table 31) of current drinkers from the NESARC sample (n=22,174). Global model Fit statistics for the model suggested that the measurement model fit the overall sample well ($\chi^2(23)=626.604$; $p<.001$; TLI=.974; CFI=.973; RMSEA=.028). In the large sample (n=22,174), both chi-square and WRMR were very high, and other fit statistics were acceptable (See Table 31). This suggests that

these fit statistics were affected by sample size. All factor loadings were significant, and ranged from fair to strong.

Once the overall fit of the model using all current drinker was established, a baseline multiple group model (Model II in Table 31) was run. Both factor loadings and thresholds were allowed to vary between the three age groups. The model fit was approximately the same as Model I, although these models were not directly compared. TLI, CFI and RMSEA values suggested good fit to the data as shown in Table 27. After estimating the baseline model (Model II in Table 29), all factor loadings in the model were constrained to be equal across the three groups (Model III in Table 31). Adding these constraints improved model fit ($\blacktriangle\chi^2$=40.879; p<.001), suggesting that these latent variables display metric or "weak" invariance. Strong invariance was then tested by fixing all the intercepts and thresholds (for categorical variables) to be equal across the groups (Model IV in Table 29). The fit of Model IV significantly worsened with these constraints ($\blacktriangle\chi^2$=281.218; p<.001) as chi-square and other values were much lower in the model with invariant loadings and thresholds (See Table 29).

Unstandardized factor loadings and threshold/intercept values for the metric invariance model (Model III) show differences across the three groups (Table 32). As noted, the loadings were fixed to be equal across the groups. Intercepts and thresholds were allowed to vary. Differences in intercepts and thresholds suggest that the latent constructs have different measurement properties across the three age groups. Older adults display lower endorsement of stressful events, cognitive appraisal and social support; this may be a function of true group differences (e.g. older adults are lower in stressful events, cognitive appraisal, and social support) in the latent construct or

differential item functioning (e.g. test bias) (This may be tested in an SEM framework, but is beyond the purview of this dissertation).

Table 31: Multiple group invariance tests of Measurement Model

Model	χ^2	*df*	*p*	RMSEA	TLI	CFI	WRMR	▲χ^2	*p*
Model I: Single Model	626.604	23	<.001	.028	.974	.973	3.921	N/A	N/A
Model II: Baseline	528.703	71	<.001	.030	.983	.982	2.667	N/A	N/A
Model III: Invariant λ	463.607	72	<.001	.027	.985	.985	2.834	40.879	<.001
Model IV: Invariant λ, τ	726.509	81	<.001	.033	.978	.975	3.476	281.218	<.001

λ=factor loading; τ=factor thresholds/intercepts

Table 32: Multiple Group Model – factor loadings intercepts and threshold for metric invariance model

Latent Variable/ Indicator	Λ - lambda	Threshold/Intercepts											
	Invariant	Young Adult				Middle-aged				Older Adult			
Threshold number		1	2	3	4	1	2	3	4	1	2	3	4
Stressful Events													
Victimization	.708	.86				1.09				1.41			
Work-related	1	-.10				.36				1.26			
Living Situation	.603	.26				.88				1.28			
Family/Support	.600	.25				.32				.22			
Cognitive Appraisal													
PSS-1	.921	-.09	.63	1.56	2.01	-.15	.55	1.51	2.02	.18	.86	1.62	1.99
PSS-2	.869	.09	.89	1.37	1.55	.17	.89	1.33	1.54	.30	.83	1.14	1.33
PSS-3	1	-.67	.43	1.39	1.71	-.55	.57	1.41	1.70	-.32	.68	1.41	1.65
PSS-4	1.005	-.41	.52	1.48	2.05	-.27	.66	1.58	2.13	.19	1.03	1.79	2.34
Social Support													
Belonging	.780	14.95				14.42				14.12			
Tangible	.846	15.72				15.57				15.50			
Appraisal	1	16.69				16.12				15.21			

Note: $\chi^2(64)=463.607$; $p<.001$; TLI=.985; CFI=.985; RMSEA=.027; WRMR=2.834

Chapter 6: Discussion

Aim 1: Older Adult Structural Equation Models

The findings of the modeling process suggest that stressful life events are associated with cognitive appraisal of stress but do not support the hypothesis that cognitive appraisal of stress leads to increased alcohol consumption, increased likelihood of at-risk drinking or alcohol problems in older adults. Interaction model tests found no evidence of a moderating effect of social support on the relationship between stressful events and cognitive appraisal of stress.

Cognitive appraisal and social support among older adults

Older adults endorsed each stressful event in lower proportions than did the younger groups, with the exception of loss of a friend or loved one (37.13% for older adults compared with 32.75% for middle aged individuals and 32.60% for young adults) (Table 1). These analyses are in agreement with findings that suggest older adults identify fewer stressful life events than younger groups (Aldwin et al., 1996; Hatch & Dohrenwend, 2007; Lazarus & DeLongis, 1983; Zautra, Finch, Reich, & Guarnaccia, 1991). Additionally, in these reports the most commonly endorsed stressor by older adults was the death of a family member or friend. Brim and Ryff (1980) theorized that some stressful events that occur in old age such as retirement and other life events are not age related. Older adulthood is also a period of role loss (Moody, 2006, p. 21); because of changes in roles, older adults may be exposed to fewer events. Certain stressful events questions asked in the NESARC focused on work related stresses that may not be pertinent to retired older adults, also contributing to lower levels of endorsement of these stressors.

In bivariate analyses, older adults in the sample endorsed lower levels of cognitive appraisal of stress than their younger counterparts. This could be a result of item level bias or true differences between older adults and younger age groups (This will be discussed more fully in the discussion of Aim 2). Numerous studies have found that older adults endorse lower levels of cognitive appraisal of stress than younger age groups (Cohen & Williamson, 1988; Hamarat et al., 2001). One potential method of dealing with stress in later life is the use of downward social comparisons (Johnson & Barer, 1993) in which stress is decreased by comparison to those worse off. Research suggests that downward social comparison is more commonly used by older adults than by younger groups as a means of fostering well-being in late life (George, 2006). Levels of social support were also the lowest in the older adult sample. Again, the most direct explanation of this would be increased mortality in late life; older adults are more likely to experience the death of their partners and peers. These findings may also be a function of socioemotional selectivity in old age (Carstensen, Fung, & Charles, 2003). This theory posits that late life is associated with cutting back one's social ties. Instead of having a wide range of acquaintances, older adults have smaller networks but closer ones, such as family members and close friends. Although overall support decreased across the age groups, the significant decreases occurred for the "belonging" and "appraisal" subscales, but not for "tangible" support. Longitudinal research on social support among older adults suggests that tangible support increases over time even as other forms of support such as contact with friends and perceived support may decrease (Shaw, Krause, Liang, & Bennett, 2007). This is consistent with the findings reported here. Older adults endorsed the lowest levels of appraisal and belonging, but tangible support was nearly the

same across the three groups. Subgroups of older adults may require greater tangible support because they are coping with greater disability. The "tangible" subscale focuses on material aid/help, while the other subscales focus on people to do things with and talk to about problems. Conversely, "appraisal" and "belonging" are more dependent on a peer social network, which gets smaller as people age.

Alcohol and older adults

Findings for all measures of alcohol use and problems were consistent with previous general population studies of older adults. Older adults drink less, and display lower percentages of at-risk drinking and of alcohol related problems (Dawson, Grant, Chou, & Pickering, 1995; Grant et al., 2004). Older adults were less likely to have a history alcohol abuse of dependence, but this may be function of recall bias (Simon & VonKorff, 1995) or differential mortality rather than true group differences across the three cohorts. Although data on Alcohol Abuse and Dependence history was collected at Wave 1, older adults would still be recalling history from perhaps 20-40 years earlier; this is based on the notion that alcohol abuse and dependence are most common in late adolescence and early adulthood (Grant et al., 2004) even as treatment need among older adults increases.

Stressful events and cognitive appraisal

As hypothesized there was a strong relationship between stressful events and the cognitive appraisal of stress. Past-year occurrence of stressful events leads to increases in past month cognitive appraisal of stress. This finding is consistent with the research by Cohen (Cohen et al., 1983), the developer of the Perceived Stress Scale (PSS) that was used to model cognitive appraisal. He found that the PSS was correlated with a count of

stressful events. Recent research by Stawski et al. (2008) has identified associations between daily stressful events and global perceived stress in older adults, a finding consistent with this study; SEM models found that a latent variable of stressful events in the past-year was associated with cognitive appraisal in older adults.

Cognitive appraisal and the three alcohol related measures

Unlike the stressful events and cognitive appraisal path, cognitive appraisal was not associated with two of the three alcohol related constructs. Cognitive appraisal was associated with lower levels of consumption in the older adult sample, but only at a marginally significant level (<.05). Moreover, the relationship of cognitive appraisal to average daily use was in the opposite of the hypothesized direction. Given the size of the sample and the use of techniques to reduce random error, these findings question the link in the hypothesized model between stress and alcohol use in older adults.

The reasons for this finding may reflect the use of a general population sample of older adults. Much of the research on older adults, stress and drinking has focused on problem or heavy drinkers. It is possible that the effects of alcohol use are markedly different for at-risk individuals versus the general population. The use of cross-sectional data to model the dynamic relationship of life events, appraisal and alcohol related outcomes means that within person variation in theses constructs was unobserved.

Much of the research on the effect of stress on alcohol use has used stressful events as a proxy for the subjective experience of stress. The inclusion of a path from stressful events to the perception of global stress (even if not directly paired to the event) is an advance of this analysis. Stressful events, such as work related problems, may be associated with alcohol use for other reasons than the stress that they produce. Perreira

and Sloane (2001), researching different types of stressors, found that patterns of marriage and divorce were associated with both increases and decreases in consumption levels. The authors speculated that changes in marital status could encourage treatment, but also could alter social networks leading to increased consumption. Both of these influences may take place independent of the stresses they produce.

Other factors may also explain the relationship between cognitive appraisal and decreased alcohol consumption. Higher cognitive appraisal of stress was associated with decreased social support. Research has found that social support is highly correlated with social contact (Peirce, Frone, Russell, Cooper, & Mudar, 2000). Among older adults, social involvement may encourage alcohol use rather suppress it among people whose social networks drink. Potentially, lower levels of social support disconnect people from social networks where they consumed alcohol, and may challenge behavioral patterns from earlier adulthood (e.g. family withholds material or emotional support). Specifically, social support (or lack thereof) of drinking behavior may precipitate change or persistence of drinking patterns. In clinical practice this has often been defined as enabling the alcoholic (e.g. Thomas, Yoshioka, & Ager, 1996). In a longitudinal study of late-life problem drinkers, the researchers found that less support for drinking from spouse and peers was associated with remission of drinking problems (Schutte et al., 1994; Schutte et al., 2001). The lack of support for drinking that problem drinkers receive in particular, may lead to cognitive appraisal of stress that precipitates decreases in alcohol use.

Important covariates in older adulthood

Life course theory asserts that behavior in old age should be considered in light of the complete life course. In all the older adult models, a history of alcohol related problems was associated with all alcohol related outcomes, even when controlling for sociodemographic covariates and cognitive appraisal. Moreover, alcohol problems were associated with lower levels of social support and greater past-year Major Depression. For older adults, a history of alcohol related problems is a strong indicator of current risk and is important in screening for this population.

Gender was also an important covariate which may help explain nonsignificant findings for cognitive appraisal and drinking. In each of the older adult models gender was associated with higher cognitive appraisal of stress, but gender was associated with decreased risk of alcohol problems and less average consumption; at-risk drinking was nonsignificant. In older adulthood, men drink more and have higher risk of problem use, but women endorse higher levels of cognitive appraisal. It is possible that gender differences in model constructs (cognitive appraisal and alcohol related outcomes) were responsible for the lack of significant findings, even though gender was included in the model as a covariate.

There are a number of potential explanations for these gender differences. Research on the perceived stress scale (whose items are used for the cognitive appraisal latent variable) suggests that women endorse higher levels of perceived stress (Robinson-Whelen & Kiecolt-Glaser, 1997). Other research has found associations between biological measures of stress (e.g. salivary cortisol) and PSS-4 scales (Simpson et al., 2008; van Eck, Nicolson, & Berkhof, 1998) although research on sex differences in biomedical indicators of stress is inconclusive (Kudielka & Kirschbaum, 2005). Based

on this body of research, there is some evidence that women have higher levels of perceived stress than men, and that this stress (as measured by the PSS-4) may be associated with biochemical indicators of stress. There is also the possibility that non-stress related factors such as social desirability play a role in gender differences in the cognitive appraisal of stress. Welte and Russell (1993), in a general population study of alcohol and stress found little evidence of gender differences in social desirability, but did find higher levels of social desirability with increased age. They determined that social desirability was associated with lower reports of alcohol use, but that this did not affect estimates of the relationship between stress and alcohol.

Although potentially influenced by social desirability, age was also an important covariate of alcohol related variables. It was associated with decreased alcohol consumption and lower risk at-risk drinking, and alcohol related problems. This finding is consistent with longitudinal research on older adults. Levels of consumption and alcohol related problems decrease and rates of abstinence go up with increasing age (Moos, Schutte, Brennan, & Moos, 2004). For screening purposes, this finding points to the importance of alcohol screening for young-old individuals who have a history of alcohol related problems. In older adults, it is less important to screen for stress-related problems unless these events are directly related to alcohol.

Marital status was associated with lower likelihood of at-risk use and alcohol related problems. In a cross-sectional analysis it is unclear whether being currently married protects against alcohol pathology or that at-risk alcohol use and problems decrease the likelihood of maintaining a marriage. Research by Dick and colleagues (2006) found that being unmarried or divorced was associated with the development of

alcohol dependence, even when adjusting for the risk associated with the high-risk genotype.

Similarly, better health (measured through the SF-12) was associated with alcohol higher consumption levels. Research suggests that health related stresses in older adults encourage decreases in alcohol consumption (Moos et al., 2005) including research on Wave 1 of the NESARC survey itself (Balsa, Homer, Fleming, & French, 2008). Health problems may lead people to change drinking habits, or their medical providers may encourage them to decrease their alcohol use. Although poor health may decrease consumption it may exacerbate alcohol related problems. Moos and colleagues found that increased health problems were associated with decreased consumption but increased problems (Moos et al., 2005) among problem drinkers.

Among middle-aged and older adults, African Americans were at higher risk of alcohol problems but African Americans were at lower risk of at-risk drinking in the young adult subsample. Research suggests that older African-American alcoholics may also suffer greater medical and psychosocial consequences as a result of their drinking (Gomberg and Nelson, 1995) which may increase their likelihood of endorsing DSM-IV alcohol problems in midlife and older adulthood. These differences have been theorized to result from psychosocial factors such as the impact of structural oppression (Jackson et al., 1998), and may also indicate greater persistence of drinking problems in African Americans (Caetano, 1984; Caetano, 1997; Galvan and Caetano, 2003).

This analysis suggests that middle aged and older African American current drinkers are at higher risk of alcohol problems. Nonetheless, African Americans have lower rates of current drinking in the NESARC (Wave 2) sample. Among older adults

(60+), 31.92% of African Americans endorsed current drinking compared with 50.83% of Caucasian older adults. In the middle aged subsample, the rates are 53.84% of African Americans are current drinkers compared with 73.24% of Caucasians. Because of higher rates of abstinence, African American middle aged and older adults may be at lower risk of alcohol problems even though African American current drinkers are at higher risk. Research by Krause has suggested that lower rates of current drinking in African American older adults are an outgrowth of religious belief and practice (Krause, 2003).

Stress buffering by social support and older adults

Contrary to hypothesis, findings did not identify a stress buffering effect of social support in older adults. When a latent variable interaction (between stressful events and cognitive appraisal) was included in the model, the moderation path was nonsignificant. In their seminal review of the stress buffering hypothesis, Cohen and Wills (1985) found some evidence for both the direct effect of support on cognitive appraisal and for the moderating or "stress buffering" effects, although this analysis was not conducted specifically on older adults.

They asserted that differences in study findings were the result of whether social supports or social networks are measured. According to Cohen and Wills, measures of social integration were associated with direct effects on stress, while social support measures were associated with buffering. Nonetheless, the items used for the present analyses were developed by Cohen and directly measure the three elements of support. Moreover, the relatively large sample size, use of SEM methods to reduce random error, and multiple covariates added statistical power; even so, there was no significant buffering effect.

In analysis conducted, social support was measured globally as was cognitive appraisal, that is, measures of support were not paired with specific stressful events. This may have affected findings. Krause (1986) found that social support did not buffer the effects of global stress, but did buffer the effects of specific stressors among older adults. It is possible that social support may be important for certain types of stressors, analyses that is beyond the scope of work conducted herein.

Recent research on women in poverty also did not identify stress buffering effects of social support (Mulia, Schmidt, Bond, Jacobs, & Korcha, 2008). The authors measured various types of stress, including neighborhood disorder, stressful life events, and economic hardship. For social support, the researchers used a scale which quantified support in multiple domains including financial, practical and emotional support. They found that distress was positively related to alcohol use, but surmised that the social supports did not buffer distress because levels of social support are insufficient to offset the chronic severe stressors in this population. Similar to women in poverty, it is possible that lower levels of social support among older adults cannot buffer the effects of stressful events in their lives.

The hypothesized buffering of the stressful event/cognitive appraisal relationship is based on a causal relationship where events lead to distress. The analyses did find this relationship, but there may be other factors that influence both one's experience of stressful events and one's appraisal of them as stressful, for example familial and genetic influences. In the Swedish Adoption/Twin Study of Aging, researchers found that heritability accounted for 40% of the variance of stressful events (Plomin, Lichtenstein, Pedersen, McClearn, & Nesselroade, 1990). Associations were strongest for controllable

events like financial problems, conflict, divorce, and other relationship-based experiences. Estimated levels of heritability of social support have been found to range between 17% and 38% and heritability of the PSS-4 (used to estimate the latent variable cognitive appraisal) has been estimated to be 30% (Kendler & Baker, 2007). Based on this body of work, genetics may partially influence various elements of stress-coping theory as a shared cause. As such, social support may not be a buffer of the direct effect of stressful events on cognitive appraisal; instead, these model constructs may covary (in part) as a result of genetic or personality differences or both. In commentary on stress and mortality, theorists have considered the idea that such "'upstream' variables" increase the risk of stress, depression and mortality (Hotopf, Henderson, & Kuh, 2008).

Aim 2: Age group differences in the Stress and Coping Model

Two differences were identified in testing the stress coping model across the three age groups. First, for older adults, cognitive appraisal weakly protected against consumption (average daily use) but not at-risk drinking or alcohol problems, while in both younger groups there was a strong relationship between the perceived stress and alcohol-related problems, but not in consumption or at-risk drinking. Among the three groups, there were measurement related differences in the latent variables, limiting the ability to compare across relationships across the three age groups.

Measures of stress and coping varied across the three age groups (20-39, 40-59, 60+). Others have found that stress related constructs like events, and perceived stress peak in early life stages and are lower at later life stages. These differences may arise from changes in activity at different life stages. Young adults are entering and establishing their work and home lives; middle-aged individuals are in the midst of the

careers and family responsibilities, and older adults are beginning to scale back responsibilities and social ties.

The trend of stress at different points in the life course mirrors that of alcohol use and problems. Onset of Alcohol use disorders typically begins in adolescence and early adulthood and later decrease as people move into middle and later adulthood (Grant et al., 2004; Kessler et al., 2007). Young adulthood is a period of greater risk of alcohol related disorders. In this study, it is not possible to disentangle age, period and cohort effects, but research suggests that all these factors influence drinking in complex ways (Levenson, Aldwin, & Spiro, 1998). Still, findings from this study are consistent with both longitudinal studies of stress and alcohol related constructs that show decreases in consumption and problems at different life stages.

Differences in stress related variables may be in part a function of age related differences in the meaning of the questions. As discussed, older adults may judge their level of stress differently than younger groups, and may define stressful events differently. Some of the variation in responses may reflect item bias in measure itself rather than true group differences. In multiple group models, the item thresholds and intercepts were lower in the older adult sample may indicate an actual difference on the level latent constructs of stressful events, perceived stress, and social support. Although untested, these differences could also arise from psychometric differences in groups. Simply put, the groups may answer the questions differently for reasons unrelated to their actual stress. Instead of being a measurement artifact, the congruence of these dissertation findings with research on stressful events, social support, and cognitive

appraisal (Aldwin et al., 1996), it is likely that true differences exist in the different age groups.

Because of measurement invariance in the models, it was not possible to consider group mean differences for stressful events, cognitive appraisal and social support. Nonetheless, the fit of the model for the three age groups suggests that the items themselves apply equally well in each group. Factor loadings for the family/social stressful event indicator were lower in the older adult models than for the younger age groups (20-39; 40-59) reflecting differences in the types of stresses that older adults' experience. Differences in the loading values suggest that stresses like death of a loved one commonly experienced by older adults do not correlate with other stressful events in older adults, but are correlated with other stressful events in the two younger age groups.

Importantly, in the sample of younger current drinkers, cognitive appraisal was associated with alcohol related problems, but not with consumption measures like average daily use and at-risk drinking. Variations in the level and types of stressful events may help to explain the importance of alcohol problems in the middle-aged and young adult groups as opposed to the older adults. Stresses more commonly experienced by middle aged and young adults (and appraised as stressful by them) may be more connected to alcohol problems. Among domains such as job-related stresses, alcohol may be implicated. Drinking may bring on new stressors, rather than being a means of medicating against them.

In a study using the first wave of the NESARC survey, Dawson and colleagues (Dawson et al., 2007) found stronger associations between stressful events and alcohol consumption among individuals who began drinking early versus individuals who began

drinking later. When the potential alcohol related stressors were removed from the analyses, the relationship between stress and alcohol consumption was no longer present in the early drinkers.

Similarly, alcohol related problems resemble stressful events themselves. DSM-IV alcohol criteria (Appendix E) include family, legal, and social problems that are related to alcohol. Individuals may endorse both alcohol related legal or social problems and also endorse past-year stressful events if they recognize that these events are alcohol related. SEM has the advantage of considering the mediating role of cognitive appraisal of stress. If alcohol problems are brought on by stress, then the cognitive and affective manifestations of stress on the individual should predict drinking, not simply the event.

Although limited in the SEM context, it is possible that stress and drinking function as a vicious cycle. In essence, those with alcohol problems likely experience stressors as a result of their drinking patterns which may in turn increase their cognitive appraisal of stress encouraging more drinking behavior. This in turn causes greater misery in the form of legal, social and work-related problems which contributes to greater drinking. Unfortunately, the cross-sectional nature of this data limits exploration of cyclical stress-drinking patterns.

Alternative designs, such as Ecological Momentary Assessment (EMA) (Collins, Kashdan, & Gollnisch, 2003) may help to disentangle these relationships. A recent review identified 40 studies using EMA focused older adults over age 50 since 1990 (Cain, Depp, & Jeste, In Press). The authors concluded that EMA was feasible in older adults, but noted that the majority of studies utilized paper-and-pencil diary methods. In this manuscript, the authors advocated for increased use of computerized methods of

EMA. They cited research countering the belief that older adults prefer paper diaries (Shiffman, Stone, & Hufford, 2008). The authors did suggest modifications to the technology to account for "sensory and motor deficits among older people (e.g. touch screens, larger font, or clearly labeled push buttons) (p. 9)."

In thinking of these relationships, numerous factors may account for why some individuals fall into this pattern. Individuals who have high positive expectancies for alcohol to reduce tension may be more likely to drink to deal with stress; one has to think that drinking will help them relax to consider drinking as a good option. A number of studies have found that alcohol expectancies moderate the stress-drinking relationship. Specifically, those with high expectancies are more likely to drink due to stress while those with low expectancies would be less likely to consume alcohol in response to stress (Armeli, Todd, & Mohr, 2005; Cooper et al., 1992; Veenstra et al., 2006). Other important covariates of the stress and drinking relationship may be gender (Dawson et al., 2005; Hussong, 2003; Perkins, 1999; Rutledge & Sher, 2001), with most studies finding that stress related drinking is more prominent in men. Coping styles may also be important. Specifically, emotion focused or avoidant coping may mediate the relationship between stressful events and alcohol use (Brennan & Moos, 1996; Brennan et al., 1994; Veenstra et al., 2007)

Limitations

Cross-Sectional Design

In understanding the relationship of stress and alcohol use, this research relied on retrospective reports of stressful events, perceived stress, social support and alcohol related variables. Although often described as a means of testing causal models,

structural equation modeling has no advantages over regression techniques in determining causality (Hoyle, 1995). In cross-sectional SEM modeling, it is impossible to determine whether stress causes alcohol problems, or alcohol problems cause stress. In the Moos Model (Moos & Schaefer, 1993), the relationships between perceived stress and stressful events are hypothesized to be reciprocal in nature. Ideally, testing such a model would require the measurement of both stress related constructs and alcohol at multiple time points.

Time lag and recursive relationships

For this dissertation, both perceived stress and social support were considered measured statically. Each measure utilized a slightly different time frame, and was not designed to measure within person variation over time frames in which relevant constructs would be expected to change. Ideally, to understand the relationship of event related stresses to appraisal and subsequent alcohol use, shorter time frames and methods that measure dynamic change are important.

For instance, a person's cognitive appraisal of stress changes over the course of days and weeks based on immediate events in their social environment. The latest approaches measurement to take the dynamic nature of stress and alcohol use into account is Ecological Momentary Assessment (EMA) (Collins et al., 2003) and/or paper and pencil self monitoring, such as daily diaries. These methods offer the advantage of measuring change in stress and the relationship of these changes to alcohol consumption that occur within a theoretical meaningful time frame, such as hours and days rather than months or years. Still, these methods may be problematic in older adults who may not be as technologically savvy,

The potentially reciprocal relationship of alcohol use and problems to stress related variables was also not captured in this analysis. It may be that some stressors, such as job loss, family conflict and legal problems are a by-product of drinking. Cognitive appraisal may also change as a result of drinking behavior in that drinking itself may create stress precipitated by stressful events. The theoretical model of Moos addresses bidirectional relationships, but identification rules in SEM make statistical analyses of multiple nonrecursive relationships difficult. Some research has been done to attempt to understand reciprocal relationships. In a three year longitudinal study, Brennan, Schutte and Moos (1999) found that higher levels of alcohol consumption led to fewer health and financial stressors among middle-aged and older adults, but that stressors did affect the presence of alcohol related problems.

Stressful events as a latent variable

In the latent variable framework, standardized factor loadings were very weak for certain domains in the older adult model, specifically, victimization, system change, and family/support. The inclusion of covariates made loadings worse. For the family/system indicator, the loading went from .249 in the measurement model (Table 8) to .150 in the full SEM model (Table 9). Among older adults, the nature of the stressful events latent varied significantly based on important covariates such as age, marital status, race, health and mental health.

These differences may affect the domains of stress one experiences. As older adults age, they might experience fewer work related stresses and greater likelihood of losing a loved one. For so-called "young-old" individuals, the nature of stressful events may be substantively similar to the other ages, but this might differ significantly among

eldest adults in the sample. Many of these differences may have been obscured in the preliminary EFA model which was conducted on the full sample. Newer capabilities in the M*plus* include multiple group EFA modeling, but this study did not explore differences group differences in factor loadings. Moreover, these age differences may have lead to the combining of stressful events into domains that fit well in the full sample, but were problematic in the older adult subsample. This is apparent when looking at the endorsement of the 14 stressful events. In the family/social domain, all of the items were more commonly endorsed in the younger groups except the death of a loved one. In the younger groups, death/loss is associated with a common latent variable of stressful events. Among older adults, death and loss may be a more common event, unrelated to other life stressors, and could potentially be modeled as a single indicator latent variable.

Alternatively, the stressful events latent variable could have been measured using formative indicators. Using a formative or causal indicator approach, the stressful events latent variable would be a linear composite of the stressful event items. The downside of this approach would be the inability to model error in the latent variable, as well as challenges to model identification (MacCallum & Browne, 1993).

In addition to challenges in modeling stressful events, the scope of events were limited. Specifically, a variety of age specific stressors were not explored in the NESARC survey, such as caregiving or a recent change in health status (e.g. Stroke or other health event). Although measured in the NESARC survey, models did not include traumatic stressors (e.g. life threatening car accident, natural disaster, violent crime

victimization). These stresses may correlate highly with various latent constructs in the model. Their omission is a limitation.

Alcohol and population heterogeneity

In these analyses herein, the assumption was made that the relationships among stressful events, cognitive appraisal and alcohol use indicators are the same across each age group. This assumption is challenged by research in genetics, cognitive psychology, personality and developmental psychology that points to potential differences in alcohol response among at-risk individuals. Using daily process approaches, Armeli and colleagues (2005) found evidence that alcohol outcome expectancies moderated the relationship between alcohol use and stress. Among those with low alcohol expectancies, there was a tendency to drink less in reaction to stress, while among those with high expectancies, alcohol use was weakly associated with stress. Sher and Levinson (1982) identified differences in the "stress response dampening" effects of alcohol among at-risk non-alcoholics compared with healthy controls (compared based on MacAndrew Alcoholism Scale scores of the Minnesota Multiphasic Personality Inventory). Other studies have found higher levels of stress and consumption among individuals with a family history of alcoholism compared with those without a family history of alcoholism (Johnson & Pandina, 1993). Using NESARC survey data, Dawson and colleagues (2007) found that early-onset drinking "may increase stress-reactive alcohol consumption." Recent research on women in poverty found a link between various types of stress, including event related stress, distress, and subsequent alcohol related problems (Mulia et al., 2008). These studies point to differences in associations between stress and drinking based on other risk factors which were not measured in this research.

Measurement of alcohol related variables

Compromises were made to facilitate model fit across the three age groups. Initially, the research plan involved measuring alcohol problems using a latent variable represented by the 11 DSM-IV alcohol abuse and dependence criteria (American Psychiatric Association, 1994). Because endorsement of alcohol problems among older adults was quite low, a dichotomous variable was used to measure alcohol problems. Even though the cutoff for at-risk drinking is lower for older adults (Blow, 1998), the general population cutoff values (Appendix E) were used to facilitate comparisons across the groups. Since the older adult at-risk consumption guidelines are lower, some older adults may display risky drinking patterns that were not captured in this analysis. From the standpoint of sampling, only current drinkers were included in the analyses; this was based on the notion that current users are at risk for drinking in the past year while nondrinkers represent a separate population; it is possible that this assumption is not tenable. Nonetheless, it is notable that other research on stress using the NESARC has also used only current drinkers (Dawson et al., 2007; Dawson et al., 2005). To adjust for a history of alcoholism, a 3-level ordinal variable was created that was based on a hierarchy of no disorder, Alcohol Abuse, and Alcohol Dependence (with or without Alcohol Abuse). It is possible that alternative variables such as consumption at Wave 1 would have adjusted for drinking history more appropriately.

Among older adults, alcohol use may be problematic at lower levels due to comorbidities (i.e. Major Depression, liver disease, etc.) and medication interactions (Moore, Beck, Babor, Hays, & Reuben, 2002; Moore et al., 1999). This research did not measure these indicators of at-risk use. Additionally, at-risk consumption was measured

using guidelines for the general population, (not guidelines for older adults), in order to make comparisons across age groups. By not addressing age differences in alcohol risk among older adults, this dissertation likely missed older drinkers who have alcohol problems due to these comorbidities.

Normality Assumptions

The primary SEM models in these analyses used the WLSMV (Weighted Least Squares, Means and Variance adjusted) estimator as a means of estimating models containing categorical data. An underlying assumption of the WLSMV estimation is the presence of an underlying continuous variable that is normally distributed in the population. This assumption was not formally tested in these analyses.

Assumptions about using alcohol to cope with stress

The SEM models used in these analyses focused on the effect of perceived stress on alcohol use under the belief that alcohol was being used as a coping strategy. The relationships identified, especially in middle aged and younger adults are potentially spurious. That is, problem users may simply have higher levels of stress due to an unmeasured third factor such as a shared predisposition, or stressful environment that also promotes problem alcohol use. Similarly, there is an underlying assumption in this dissertation about the reasons why people drink. Stress may be one of many drinking motives, even among individuals who experience high levels of stress. In the NESARC survey, individuals were not asked about their drinking motivations, which may be unique to each drinking episode. Additionally, individuals may have different reasons for consuming alcohol during a single drinking episode.

In this research, the role of alcohol use in people's overall coping repertoire was not measured. Extensive investigation has focused on the ways in which individual coping styles impact drinking behavior and alcohol problems. For example Veenstra et al. (2007) found that emotion focused coping behaviors mediated the relationship between stressful life events and alcohol consumption. Those who used emotion focused coping to deal with a stressful life event increased their drinking, while those who did not use emotion focused coping decreased their drinking.

Implications for research, policy and practice

Stress in context

Stress is not a single direct cause of alcohol consumption or problems. It must be seen in the context of individual and social factors such as family history, alcohol expectancies, and the social context of stressful events. Changes across the adult life course need to be considered as stresses and coping strategies evolve over time. From the standpoint of alcohol screening, older adults should be assessed for a history of alcohol related problems, and current drinking patterns consistent with current practices. There is little evidence from the findings reported here that assessment of stress as a risk factor for drinking is warranted.

This dissertation highlighted the challenges of studying dynamic processes using epidemiologic samples. As noted in the limitations, it is problematic to study stress and coping models using a cross-sectional design. The hypothesized time lag between a stressor and drinking needs to be studied over hours and days. Many studies have considered the role of specific events. This approach may be more useful than grouping

daily stresses and drinking. Used extensively in college student samples, the feasibility of EMA and diary methods should be explored in older adults.

Rethinking buffering

In this research, social support did not moderate the relationship between stressful events and perceived stress for any of the age groups. In social work and related disciplines, professionals see social support as a means of offsetting stressful events. The relationship of social support and stress is likely more complex. Research suggests that social support may be an indicator of overall well-being, but not a general buffer against stress. It is possible that buffering depends on the type of stress being experienced and the social support being offered. For instance, Krause (2006) recently reported that church based social support buffered the effects of financial strain on health, but secular support did not. Notably, Krause did not find a direct effect of social support on health. In thinking of social support interventions, program developers need to consider the type of stressor, the nature of the social support, and the outcome of interest.

Lifecourse development and alcohol

Alcohol use and problems decline in later life. Stressful life events decline, and stress appraisal is lower. At the same time, risk of alcohol related problems is lower among older adults. This dissertation did not find evidence for causal relationships between cognitive appraisal stress and drinking, but stratified analyses suggest that aging is a protective factor for alcohol related disorders in particular and distress in general. Older adulthood is a period of increased well-being compared to other life stages; in light of dire predictions of the mental health needs of older adults (Jeste et al., 1999), this is important to note.

The role of alcohol history is an important, if unsurprising, finding in this dissertation. Among older adults, knowing about a history of alcohol pathology can aid in screening for current problems. In terms of theory, it reinforces the concept that alcoholism as a chronic disorder susceptible to relapse (McLellan, Lewis, O'Brien, & Kleber, 2000). Unlike many chronic diseases, alcoholism decreases in severity and may remit in late-life. From a developmental systems perspective, contextual factors may be important in light of a history of alcohol related problems. As such, a history of alcohol problems can be assessed in combination with current biopsychosocial risk factors.

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Appendices

Appendix A: Stressful Events Questions

1. Did you move or anyone new come live with you in the past year?
2. Were you fired or laid off from a job in past year?
3. Unemployed and looking for a job longer than a month in past year?
4. Have you had trouble with a boss or coworker in the past year?
5. Did you change jobs, job responsibilities or work hours in the past year?
6. Did you get divorced, separated or break off a steady relationship in the past year?
7. Have you had serious problems with a neighbor, friend or relative in the past year?
8. Have you experienced major financial crisis, declared bankruptcy, or more than once been unable to pay bills on time in the past year?
9. Did you have serious trouble with the police or the law in the past year?
10. Was something stolen from you (wallet, things inside or outside of your home) in the past year?
11. Has anyone intentionally damaged or destroyed property owned by you or someone else in your house in the past year?
12. Any family members of close friends died in the past year?
13. Any family members or close friends physically assaulted, attacked, or mugged in the past year?
14. Any family members or close friends have serious trouble with the police or law in the last year?

Appendix B: Perceived Stress Scale (PSS-4) Questions

1. In the last month, how often have you felt that you were unable to control the important things in your life? (Control)

2. In the last month, how often have you felt confident about your ability to handle your personal problems? (Confident)

3. In the last month, how often have you felt that things were going your way? (Your Way)

4. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
(Piling Up)

Response Options:
0=never; 1=almost never; 2=sometimes; 3=fairly often; 4=very often

Appendix C: Interpersonal Support Evaluation List

1. If I wanted to go on a trip for a day (for example, to the country or mountains), I would have a hard time finding someone to go with me. *Belonging*

2. I feel that there is no one I can share my most private worries and fears with. *Appraisal*

3. If I were sick, I could easily find someone to help me with my daily chores. *Tangible*

4. There is someone I can turn to for advice about handling problems with my family. *Appraisal*

5. If I decide one afternoon that I would like to go to a movie that evening, I could easily find someone to go with me. *Belonging*

6. When I need suggestions on how to deal with a personal problem, I know someone I can turn to. *Appraisal*

7. I don't often get invited to do things with others. *Belonging*

8. If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my house or apartment (the plants, pets, garden, etc.). *Tangible*

9. If I wanted to have lunch with someone, I could easily find someone to join me. *Belonging*

10. If I was stranded 10 miles from home, there is someone I could call who could come and get me. *Tangible*

11. If a family crisis arose, it would be difficult to find someone who could give me good advice about how to handle it. *Appraisal*

12. If I needed some help in moving to a new house or apartment, I would have a hard time finding someone to help me. *Tangible*

Response Options:
1. Definitely false; 2. Probably false; 3. Probably true; 4. Definitely true

Appendix D: Average Daily Volume of Alcohol

"For respondents whose largest quantity of drinks was five or fewer, average daily volume of ethanol intake had two components:
1) The usual quantity times the frequency of drinking that quantity: QU x FU, where FU = the overall frequency of drinking minus the frequency of drinking the largest quantity, and
2) The largest quantity times the frequency of drinking the largest quantity: QL x FL. The sum of these two products, representing the total number of drinks consumed per year, was then multiplied by the ethanol content of the drink in ounces, derived by multiplying the size of drink times the ethanol content by volume. The resulting annual volume of ethanol intake was divided by 365 to yield average daily ethanol intake of the beverage in question. These volumes were then summed across beverages to yield the overall average daily volume of ethanol intake."

Appendix E: DSM-IV Diagnostic Criteria & NIAAA At-Risk Use Definition

Dependence

1. Tolerance, as defined by either of the following:
    a. a need for markedly increased amounts of the substance to achieve intoxication or desired effect
    b. markedly diminished effect with continued use of the same amount of the substance
2. Withdrawal, as manifested by either of the following:
    a. a characteristic withdrawal syndrome for the substance

b. the same or closely related substance is taken to relieve or avoid withdrawal symptoms

3. The substance is often taken in larger amounts over a longer period than was intended
4. There is a persistent desire and unsuccessful efforts to cut down or control substance use
5. A great deal of time is spent in activities necessary to obtain substances, use the substance or recover from use effects.
6. Important social, occupational, or recreational activities given up or reduced because of substance use.
7. The substance use is continued despite knowledge of having a persistent or recurrent psychological problem that is likely to have been caused by or exacerbated by the substance

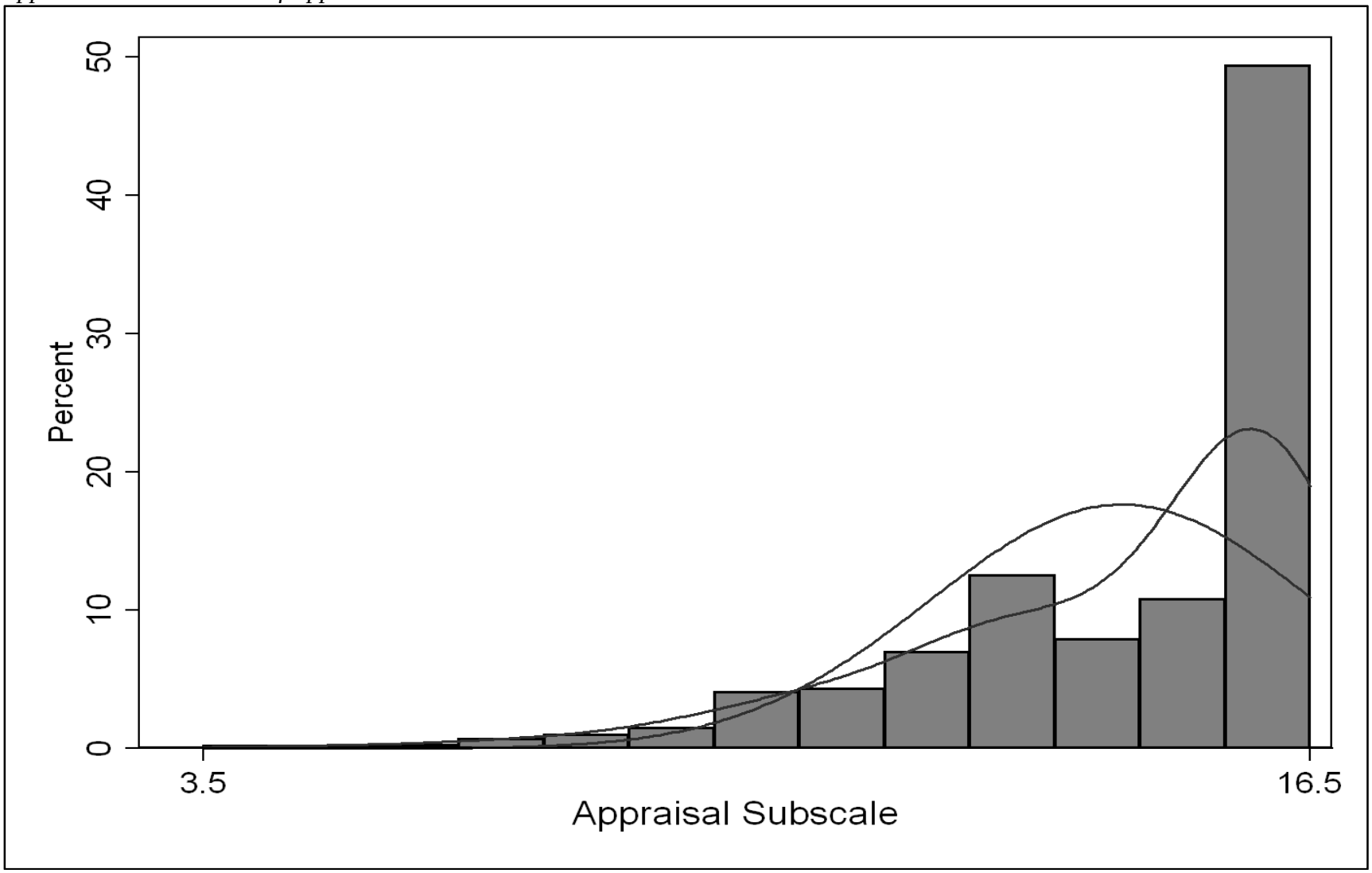
Abuse

1. Recurrent substance abuse resulting in a failure to fulfill major role obligations at work, school, or home
2. Recurrent substance use in situations in which it is physically hazardous
3. Recurrent substance-related legal problems
4. Continued substance use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance

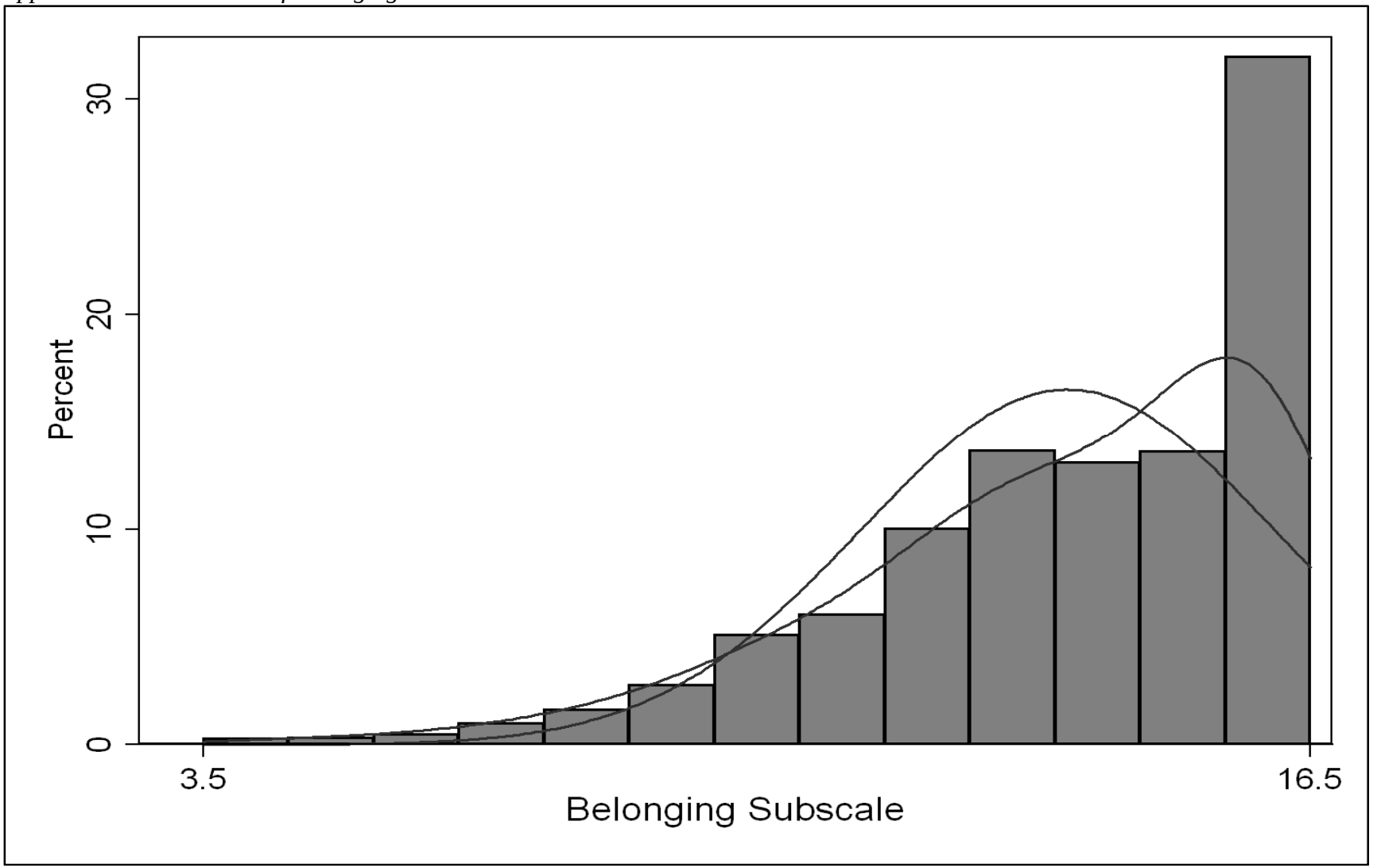
NIAAA Physician Guidelines (taken from the NESARC Wave 2 data notes)

"The Wave 2 data set contains a number of variables that indicate whether the respondent exceeds the drinking guidelines recommended in NIAAA's Physician Guidelines. These guidelines are gender specific: a) For men, no more than 14 standard drinks per week AND no more 4 standard drinks on any day, and b) For women, no more than 7 standard drinks per week AND no more 4 standard drinks on any day."

Appendix F: Distribution of Appraisal Subscale



Appendix G: Distribution of Belonging Subscale



Appendix H: Distribution of Tangible Subscale