Problem gambling severity and the incidence of Axis I psychopathology among older adults in the general population

Corey E. Pilver, Ph.D., **Daniel J. Libby, Ph.D.**, **Rani A. Hoff, Ph.D.**, and **Marc N. Potenza, M.D., Ph.D.**

Department of Biostatistics, Yale School of Public Health, New Haven, CT (Dr. Pilver). Stonington Institute, North Stonington, CT (Dr. Libby). VA CT Healthcare System, West Haven, CT (Drs. Libby and Hoff). Departments of Psychiatry (Drs. Hoff and Potenza), Neurobiology (Dr. Potenza) and Yale Child Study Center (Dr. Potenza), Yale University School of Medicine, New Haven, CT.

Abstract

To examine the longitudinal relationship between past-year problem-gambling severity and incident Axis I psychopathology among older adults (aged 55 to 90), analyses were conducted on data from the National Epidemiologic Study of Alcohol and Related Conditions (NESARC). This nationally-representative population-based survey was conducted in two waves (Wave 1, 2000-2001; and Wave 2, 2004-2005). Past-year problem-gambling severity at Wave 1 and incident Axis I psychopathology at Wave 2 were evaluated with the Alcohol Use Disorder and Associated Disabilities Interview Schedule—Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition. Multivariate logistic regression modeling was conducted on groups categorized into low-frequency gambling/non-gambling (LFG/NG), low-risk gambling (LRG), and at-risk/problem/pathological gambling (ARPG) based on DSM-IV criteria for pathological gambling. Relative to LFG/NG, ARPG at Wave 1 was positively associated with the incidence of generalized anxiety disorder (OR=2.51; p=.011) and any substance use disorder (OR=2.61; p=.0036); LRG was negatively associated with the incidence of hypomania (OR=0.33; p=.017). Models were adjusted for demographic characteristics, psychiatric comorbidity, health behaviors, physical health, and stressful life events assessed at baseline. While gambling may represent a positive activity for some older adults, data suggest that risky/problematic gambling behavior may be associated with the development of psychiatric problems in this population. Older-adult gamblers, as well as their clinicians, friends, and family, should be aware of potential risks associated with gambling, adopt strategies to prevent the onset of secondary disorders, and monitor themselves and others for signs of problems.

Keywords

pathological gambling; older adults; mental health; incidence; epidemiology; substance abuse

Introduction

Older adults are anticipated to comprise a greater proportion of the population over the next several decades (Shrestha & Heisler, 2009). Given this demographic trend and the increases in anticipated life expectancies (Harper, Rushani, & Kaufman, 2012), research to promote 'successful aging' has become increasingly important. Successful aging has been defined by the avoidance of disease and disability, the maintenance of cognitive and physical

Corresponding Author: Marc N. Potenza Connecticut Mental Health Center, Room S-104 34 Park St. New Haven, CT 06519 Tel: 203-974-7356 Fax: 203-974-7366 Marc.Potenza@yale.edu.

functioning, and participation in social and productive activities (Rowe & Kahn, 1997). Gambling may promote successful aging in older adults by forging and maintaining social ties or represent a cognitively-demanding activity. Correspondingly, older adults who gamble recreationally have reported greater well-being relative to non-gamblers (Desai, Maciejewski, Dausey, Caldarone, & Potenza, 2004; Foottit & Anderson, 2012).

Although gambling is popular among older adults, some older-adult gamblers may gamble at risky or problematic levels, with the most severely affected experiencing pathological gambling (PG). PG is an impulse-control disorder characterized by "persistent and recurrent maladaptive gambling behavior" with deleterious effects on individuals' personal, home, and work lives (American Psychiatric Association, 2000). The impact of PG may be particularly substantial for older adults. First, many older adults subsist on small, fixed incomes following retirement, and thus have limited capacities to recover from the legal and financial sequelae of risky/problematic gambling (Desai, 2004; Levens, Dyer, Zubritsky, Knott, & Oslin, 2005). Second, older adults are generally less healthy than younger adults, and mental and physical illness frequently co-occur with PG (Desai et al., 2004). Consequently, older adults with PG may be particularly likely to experience disruptions in multiple life domains (Desai, 2004). Given these circumstances, risky/problematic gambling in older adults warrants attention.

Multiple studies suggest that problem-gambling severity is associated with co-occurring psychopathology and adverse measures of well-being (for review, see: Tse, Hong, Wang, & Cunningham-Williams, 2012). For example, older-adult (aged 55 years and older) problem gamblers frequently reported gambling-related anxiety and depression, suicidality, and alcohol-use problems (Potenza, Steinberg, Wu, Rounsaville, & O'malley, 2006). Among adults aged 55 years and older with lifetime PG, high rates of comorbidity were observed with respect mood disorders (82.5%), anxiety disorders (47.5%) and alcohol dependence (32.5%) (Kerber, Black, & Buckwalter, 2008). Among African-American elderly, heavy and pathological gamblers reported less subjective well-being and greater anxiety, relative to light/moderate or non/occasional-gamblers (Bazargan, Bazargan, & Akanda, 2001). Canadian adults aged 55 years and older with gambling problems were more likely than older adults without gambling problems to report substance (particularly alcohol) dependence (McCready, Mann, Zhao, & Eves, 2008). Among adults aged 65 years and older, those who engaged in past-year 'recreational gambling' (i.e. non-problem/ pathological gambling) were more likely than past-year non-gamblers to report past-year alcohol use (Desai et al., 2004). In a similarly-aged cohort, past-year recreational gamblers and past-year problem/pathological gamblers (PPG; individuals acknowledging 3 or more PG criteria) were more likely than past-year low-frequency gamblers/non-gamblers to have past-year nicotine dependence and alcohol abuse/dependence (Desai, Desai, & Potenza, 2007). Among adults aged 60 years and older and relative to a non-gambling group, individuals with lifetime PPG and recreational gambling had elevated odds for lifetime nicotine dependence, any alcohol-use disorder, any mood disorder, and any anxiety disorder, with lifetime PPG also associated with drug-use disorders (Pietrzak, Morasco, Blanco, Grant, & Petry, 2007). While these cross-sectional studies indicate that at-risk and problematic gambling is variably associated with adverse psychiatric correlates, the directionality of these associations cannot be determined. Data suggest that: (1) mental illness may contribute to the development of gambling problems, and, (2) gambling problems may contribute to the development of mental illness. In the former instance, a pathways model (Blaszczynski & Nower, 2002) hypothesizes this progression may be particularly relevant for older adults. In this model, a subset of problem gamblers are 'emotionally vulnerable' and have psychological and personality profiles marked by pre-morbid depression, poor coping skills, and negative life events. In this group, gambling ameliorates negative affective states or enhances arousal and through conditioning may lead

to dependence (Blaszczynski et al., 2002). Across several studies, older adults commonly report motivations for gambling that include escaping from negative affective states or stress relief (Martin, Lichtenberg, & Templin, 2011; Wiebe & Cox, 2005). Furthermore, older adult heavy and pathological gamblers reported experiencing a greater number of recent stressful life events and higher levels of anxiety, relative to older adults with less severe gambling behaviors (Bazargan et al., 2001). The life events common among older adults— the death of a spouse/partner, increasing social isolation, role confusion following retirement, relocation to assisted living facility or retirement community, financial strain, and onset of chronic illness— may place older adults at risk for depression, anxiety, and other mental illness (Godfrey, Townsend, Sur, Boyle, & Brooker, 2005). The pathways model suggests that emotionally vulnerable older adults who gamble to cope with these feelings may be at particular risk for the development of gambling problems. Consistent with this model, a study of older-adult users of electronic gaming machines (EGMs) found that individuals who reported using EGMs to alleviate boredom or to forget about their problems when feeling stressed or depressed were more likely to demonstrate moderate-risk/ problem gambling rather than low-risk/non-problem gambling (Southwell, Boreham, & Laffan, 2008).

In considering the second alternative, data suggest that gambling problems may predate the onset of psychopathology; however, these findings are not specific to older adults. In one study, past-year PPG was associated with elevated odds for incident generalized anxiety disorder in a general adult population sample (Chou & Afifi, 2011a). In a cross-sectional study where the age of onset for disorders was self-reported, problem gambling was associated with the subsequent onset of bipolar disorder, PTSD, alcohol or drug dependence, and nicotine dependence (Kessler et al., 2008). Such associations may be particularly relevant to older adults, who have been found to be at risk for late-onset mood, anxiety, and substance use disorders (Chou, Mackenzie, Liang, & Sareen, 2011b; Kessler et al., 2005a). Some older-adult gamblers report feeling guilty about their gambling, spending more on gambling that they had intended, and experiencing less control over gambling (McNeilly & Burke, 2000; Southwell et al., 2008). Furthermore, older adults who incur large gambling debts may experience higher levels of stress and shame (Argo & Black, 2004; Yi & Kanetkar, 2011) and detrimental effects on interpersonal relationships (Grant & Kim, 2001), compared to older adults without gambling debts. These factors may contribute to the development of anxiety and depressive disorders among older adults with gambling problems. Finally, gambling has been associated with elevated consumption of substances such as alcohol and tobacco (Petry, Stinson, & Grant, 2005). While these substances may be more accessible or socially acceptable in gambling venues, it is also possible that older adults increase their consumption of these substances to cope with gambling-associated guilt or anxiety (consistent with previously reported gambling-related motivations in older adults (McNeilly et al., 2000; Southwell et al., 2008)), which may lead to the development of substance-use disorders. Longitudinal studies examining this possibility are warranted to better understand gambling-related drinking motives and the temporal progression of substance consumption related to gambling.

Because some studies suggest that older-adult recreational and/or problem gambling represents a health concern (Desai et al., 2007; Erickson, Molina, Ladd, Pietrzak, & Petry, 2005; Pietrzak, Molina, Ladd, Kerins, & Petry, 2005; Pietrzak et al., 2007), whereas others suggest health-neutral or potential health benefits of older-adult recreational gambling (Desai et al., 2004; Foottit et al., 2012), we examined associations between past-year problem-gambling severity and incident psychopathology among older adults. The current study extends prior cross-sectional research that demonstrated positive relationships between at-risk and problematic levels of gambling and psychopathology (Desai et al., 2007; Pietrzak et al., 2007). We hypothesized that older adults with PG features, but not older-adult

gamblers without PG features, would be more likely than non-gamblers/low frequency gamblers to develop incident psychopathology. Specifically, based on data described above, we hypothesized an increased incidence of generalized-anxiety disorder and substance-use disorders, particularly relating to tobacco and alcohol use. Furthermore, these associations would be found following control for measures of socio-demographic characteristics, physical health, stressful life events, and health-risk behaviors that are cross-sectionally associated with gambling behaviors and/or psychopathology.

METHODS

NESARC sample

A secondary analysis was performed on data from the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC). Detailed methodology of the NESARC has been described elsewhere (Grant & Kaplan, 2005; Grant, Moore, Shepard, & Kaplan, 2003b). Data were collected in 2001-2002 (Wave 1) and 2004-2005 (Wave 2). Of the 34,653 individuals who completed both waves, we excluded 647 participants without valid data for the Wave-1 gambling module. We defined older adults as individuals who were 55 years or older at Wave 1 for comparability with prior work (Kerber et al., 2008; McCready et al., 2008; Petry, 2002; Potenza et al., 2006), and excluded 23,775 participants aged 18 to 54.. The resulting sample included 10,231 participants. To prospectively examine *incident* cases, we excluded individuals with a lifetime history of the disorder(s) of interest (assessed at Wave 1) from the baseline at-risk population. Thus, the analytical sample varied as function of incident disorder under study. This approach is standard for examining incidence with NESARC data (Chou et al., 2011a; Chou et al., 2011b; Grant et al., 2012; Martins et al., 2012; Schepis & Hakes, 2011).

Survey Instrument

The NESARC utilized the Alcohol Use Disorder and Associated Disabilities Interview Schedule—Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition (AUDADIS-IV) to assess Axis I and Axis II mental disorders (Grant et al., 2003a). The NESARC study received full ethical review and approval (Grant & Dawson). Data are de-identified and publicly available, and therefore exempted from further Institutional-Review-Board review.

Measures

Dependent variables—Variables were binary, coded to denote the presence or absence of an incident Axis I disorder in the interval between Wave 1 and Wave 2, a period that averaged 36.6 months (Grant et al., 2005; Grant et al., 2003b). Dependent variables included the combined categories of any Axis 1 disorder (including any mood, anxiety, or substance-use disorder), any mood disorder (including major depressive disorder, dysthymia, mania, and hypomania), any anxiety disorder (including panic disorder with or without agoraphobia, agoraphobia, social phobia, specific phobia, and generalized-anxiety disorder), and any substance-use disorder (including alcohol abuse/dependence, nicotine dependence, and drug abuse/dependence), as well as each individual disorder. Drug abuse/dependence included the following drug classes: sedatives, tranquilizers, opiates (other than heroin or methadone), stimulants, hallucinogens, cannabis, cocaine, inhalants/solvents, heroin, and other drugs.

Independent variables—Past-year problem-gambling severity was assessed at Wave 1 with the AUDADIS-IV gambling module, which probed the ten inclusionary criteria for PG (American Psychiatric Association, 1994. Because we were interested in the effects of problem-gambling severity from a public health perspective, we segregated participants

based on the number of past-year PG inclusionary criteria they endorsed, in a manner that we and other groups have done previously (Cunningham-Williams, Cottler, Compton, & Spitznagel, 1998; Kessler et al., 2008; Potenza et al., 2011; Rahman et al., 2012; Slutske et al., 2000). We defined low-frequency gambling/non-gambling (LFG/NG) as not having gambled more than five times in any one year in one's lifetime. Low-risk gambling (LRG) was defined as having gambled more than five times in a given year and acknowledging no past-year criteria for PG. At-risk/problem/pathological gambling (ARPG) was defined as having gambled more than five times in a given year and acknowledging one to ten inclusionary criteria for PG.

Covariates—All covariates were assessed at Wave 1 and operationalized according to prior NESARC work (Desai & Potenza, 2008; Martins et al., 2012; Petry et al., 2005). A description of covariates is included in supplemental materials.

Analytic approach

We first evaluated whether problem-gambling severity was associated with study covariates in the full sample using PROC CROSSTAB and PROC DESCRIPT. Statistical significance was determined with the Wald Chi-Square test. Using PROC CROSSTAB, we calculated the three-year incidence of each outcome according to problem-gambling severity, found by dividing the number of new cases of the disorder of interest (presented as unweighted *i)* by the baseline population at risk (i.e., those individuals without a lifetime history of the disorder at baseline, presented as unweighted *n*) and multiplying this value by 100 (presented as weighted %). To evaluate whether problem-gambling severity was significantly associated with incident psychopathology, we constructed three sets of binary logistic regression models using PROC RLOGIST. Model one was unadjusted for Wave 1 covariates, and included only problem-gambling severity. Model two included problem-gambling severity, demographic covariates (gender, age, race, education, marital status, household income) and relevant past-year Wave - psychiatric comorbidity (for incident mood disorders, we adjusted for baseline anxiety and substance-use disorders; for incident anxiety disorders, we adjusted for baseline mood and substance-use disorders; for incident substance-use disorders, we adjusted for baseline mood and anxiety disorders). Model three included model-2 covariates and additional adjustment for SF-12 physical health scores, medical conditions, stressful life events, and health-risk behaviors. We present multivariate-adjusted odds ratios (ORs) and their associated 95% confidence intervals (95% CIs). Statistical significance was determined with the Wald F-test for the overall effect of the variable and the *t*-test for individual contrasts.

RESULTS

Descriptive analysis

Baseline prevalence of problem-gambling severity—The prevalence of LFG/NG, LRG, and ARPG at Wave 1 was 67.3% (n=7,045), 29.9% (n=2,917), and 2.8% (n=269), respectively. Among those with ARPG, 84.7% endorsed 1 to 2 features of PG (at-risk gambling, n= 231), 13.3% endorsed 3 to 4 features of PG (problem gambling, n=30) and 2.0% endorsed 5 or more features of PG (pathological gambling, n=8).

Bivariate analysis of baseline study characteristics and past-year problem-gambling severity (Table 1)—In bivariate analysis, Wave-1 problem-gambling severity was associated with age, gender, marital status, education, employment, income, any mood disorder, any anxiety disorder, and any substance-use disorder, tobacco-use status, alcohol-consumption status, drug-use status, stressful life events, and the SF-12 physical health score (all p<.02).

Problem- gambling severity and incident psychopathology (Table 2)—In unadjusted analyses, Wave-1 problem-gambling severity was associated with the incidence of any Axis-1 disorder, agoraphobia, any substance-use disorder, alcohol abuse/dependence, nicotine dependence, and drug abuse/dependence at Wave 2 (all p<.05).

Unadjusted and multivariate modeling (Table 3)

Any incident Axis-I disorder—In line with our hypotheses, the incidence of any Axis-I disorder was elevated among individuals with ARPG (OR=2.09; p=.033), independently of socio-demographic characteristics (model 2). After further adjustment for model-3 covariates, this association was no longer significant.

Incident mood disorders—In model 1, ARPG was positively associated with the incidence of mania (OR=3.43; p=.015), relative to LFG/NG; however this association was no longer significant following adjustment for covariates in models 2 and 3. In model 3, LRG was negatively associated with the incidence of hypomania (OR=0.33; p=.017), relative to LFG/NG.

Incident anxiety disorders—In model 1, ARPG was positively associated with the incidence of panic disorder (OR=2.51; p=.048), relative to LFG/NG; however this association was no longer significant following adjustment for covariates in models 2 and 3. Across models, ARPG was positively associated with incident generalized anxiety disorder (e.g., Model 3: OR=2.51; p=.011),relative to LFG/NG.

Incident substance use disorders—In model 1, LRG and ARPG were significantly associated with incidence of any substance-use disorder, alcohol abuse/dependence, and nicotine dependence, relative to LFG/NG. In model 2, LRG remained associated with incident nicotine dependence (but not other substance-use disorders), and ARPG remained associated with the incidence of any substance use, alcohol abuse/dependence, and nicotine dependence, relative to LFG/NG. In model 3, ARPG was positively associated with the incidence of any substance-use disorder (OR=2.61; p=.0036) relative to LFG/NG; however, the associations between ARPG and incident nicotine dependence and alcohol abuse/ dependence were no longer statistically significant.

Complete information for incident hypomania, generalized-anxiety disorder, and any substance-use disorder in model 3 are tabulated (Supplemental Table 1).

DISCUSSION

This study examined for the first time the prospective relationship between past-year problem-gambling severity and incident psychopathology among a nationally representative sample of older adults. Compared to older adults exhibiting no/low-frequency gambling, those acknowledging one or more inclusionary criteria for PG were more likely to develop mental illness. The relationship between recreational gambling (in the absence of PG criteria) and incident psychopathology appeared relatively benign. Adjustment for physical health, stress, and health-risk behaviors accounted for some of the variance in the associations observed between problem-gambling severity and incident substance-use disorders (individually and in aggregate), but not for generalized-anxiety disorder. These findings suggest distinct mechanisms in the gambling-related development of specific forms of psychopathology in older adults.

ARPG was associated with incident generalized-anxiety disorder and substance-use disorders. Multiple factors may contribute to these relationships. Older adults with ARPG

may incur financial hardships as a result of their gambling and experience difficulties in interpersonal relationships or functioning in other life domains. Such life stresses could contribute to the development of generalized-anxiety disorder (Beekman et al., 1998). Furthermore, older adults with ARPG may consume alcohol, drugs, or tobacco to cope with stress (Wills & Hirky, 1996). Such maladaptive coping strategies may contribute to the development of substance abuse/dependence among ARPGs. The environmental context of gambling also warrants consideration. Casinos may offer free alcoholic beverages to gamblers and many casinos permit smoking. Thus, individuals who spend more time gambling at casinos may have greater exposure to and opportunities to use substances. Alcohol problems and smoking appear more prevalent among casino employees compared to the general population, and secondhand smoke exposure has been reported by most non-smoking casino employees (Shaffer, Vander Bilt, & Hall, 1999). The environmental permissiveness to smoke within gambling venues may contribute to the incidence of nicotine dependence amongst both LRG and ARPG groups. Other factors that link substance use disorders and PG (e.g., individual differences in impulse control, see (Leeman & Potenza, 2012)) also warrant consideration in the development of substance-use disorders associated with ARPG.

The findings have multiple implications. First, they highlight the relevance of inquiring about gambling behaviors amongst older adults. Brief screening instruments regarding gambling behaviors and gambling-related problems exist and should be used in clinical settings (Potenza, Fiellin, Heninger, Rounsaville, & Mazure, 2002; Sullivan, 1999). If gambling is identified, careful mental health inquiries about and assessments of generalized anxiety and tobacco and alcohol use may be warranted. Second, they indicate that additional research should investigate how gambling behaviors influence mental health, particularly as the current gambling environment includes accessible and socially acceptable gambling opportunities for older adults (e.g., bus trips to casinos). Third, other clinically relevant features related to mental health and gambling amongst older adults warrant consideration. For example, gambling problems and other mental health conditions have been noted in Parkinson's disease, a condition typically affecting older adults, and an improved understanding of the factors influencing the incidence of these conditions is needed (Leeman, Billingsley, & Potenza, in press; Leeman et al., 2012). Fourth, it will be important to understand better the gambling contexts under which mental health conditions may emerge. Compared to other surveys (e.g., the Gambling Impact and Behavior Survey (Gerstein et al., 1999)), the NESARC contained relatively limited information on gambling motivations and behaviors beyond DSM criteria; future studies are needed to investigate how gambling motivations and behavior may relate to incident psychopathology among NG/LFG, LRG, and ARPG groups.

While this study is characterized by a number of strengths, there are limitations. First, the definition of problem-gambling severity was derived from both the structure of the NESARC survey and the convention of prior work, rather than empirically validated definitions. Specifically, the categories of non-gamblers and low-frequency gamblers were combined because the NESARC survey questionnaire does not differentiate between these groups, and thus they could not be segregated in analyses. Second, other studies have distinguished among at-risk, problem, and pathological gamblers (Desai et al., 2008). However, small sample sizes necessitated grouping these individuals into a single category. Although this is an acceptable method of categorizing problem-gambling behavior and has been done previously (Cunningham-Williams et al., 1998; Kessler et al., 2008; Slutske et al., 2000), particularly for potentially vulnerable groups (e.g., adolescents (Potenza et al., 2011; Rahman et al., 2012)), future large studies of older adults should investigate specific groups based on more and less severe problem-gambling severity. In this way, we may more precisely understand the degree to which features of PG *and* the diagnosis of PG may

differentially contribute to incident psychopathology. A third limitation was that problem-gambling severity was not assessed at Wave 2 of the NESARC survey. Thus, we could not assess whether psychopathology associated with incident ARPG. A fourth limitation is that 20.5% (n=2,862) of the 13,093 of older adults with valid Wave-1 data did not complete Wave 2. In addition to non-response, participants were excluded from participation at Wave 2 due to death, deportation, mental or physical impairment, or being on active duty in the military during the follow-up period (Grant et al., 2009). Exploratory analyses demonstrated that non-participation at Wave 2 was positively associated with older age, being male, being unmarried; drop-out was negatively associated with working part-time, physical health, and stressful life events (Supplemental Table 2). Since several factors (i.e., being male, being unmarried, poor physical health) are cross-sectionally associated with problem-gambling severity and psychiatric morbidity (Compton, Thomas, Stinson, & Grant, 2007; Hasin, Stinson, Ogburn, & Grant, 2007; Kessler, Chiu, Demler, Merikangas, & Walters, 2005b; Petry et al., 2005), it is possible that attrition results in an underestimation of incident cases. Therefore, in our analyses, it is likely that associations between problem-gambling severity and incident psychopathology are biased toward the null. A final limitation is that the sample included individuals aged 55 to 90 years. Although the minimum age of 55 years may be a liberal definition for "older adults", this cut-off has been used in prior gambling studies (Kerber et al., 2008; McCready et al., 2008; Petry, 2002; Potenza et al., 2006), thus permitting comparability across studies. Furthermore, sociologists consider age 55 to be "young-old" (Suzman, Willis, & Manton, 1992). Additionally, age 55 was chosen as the minimum age in order to maximize the sample size and thus increase the power of our study. A larger concern is that clustering these individuals as "older adults" does not consider potential heterogeneity among this population. Ideally, stratification of this sample into the young-old, old, and oldest-old (Suzman et al., 1992) would enable an understanding that better accounts for cohort and age effects. However, the small size of the analytic samples, which are a consequence of examining incidence rather than prevalence, precluded this approach. Future studies should address this issue by sampling a larger population of older adults.

Despite these limitations, this study has multiple strengths. First, this is the first investigation of the prospective relationships between problem-gambling severity and incident psychopathology in older adults. Second, the AUDADIS-IV diagnostic module is valid and reliable for diagnosing psychopathology (Ruan et al., 2008). Third, analyses account for potential demographic confounders, psychiatric comorbidity, and measures of physical health, stress, and health-risk behaviors. Finally, the older adults are drawn from a large, nationally representative population sample. Unlike clinical samples, which are inherently biased toward sicker individuals, this study presents a more accurate picture of the relationship between problem-gambling severity and incident older-adult psychopathology in general, not only amongst those seeking clinical care.

In conclusion, we have demonstrated that ARPG is associated with incident generalized-anxiety substance-use disorders among older adults. In that the substance-use-disorder but not the generalized-anxiety-disorder findings appear partially accounted for by physical health, stress and health-risk factors (e.g., tobacco consumption), it highlights the possibility of distinct mechanisms relating to the types of ARPG-related incident psychiatric disorders. The findings have multiple public health and clinical implications. First, they suggest that individuals endorsing any features of PG should be monitored by clinicians, friends, or family for suggestive features of psychiatric disorders, particularly generalized-anxiety and tobacco- and alcohol-related substance-use disorders. In order to prevent this progression, clinicians might instruct patients to adopt healthier ways of coping, such as reducing stress through meditation and exercise. Second, efforts to educate the public on the potential risks of gambling among older adults might also incorporate this study's findings, so that older

adults who gamble (as well as their friends and family) might have a better understanding and awareness of the potential psychiatric risks associated with problem-gambling behavior.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed.. Washington, DC: 1994.

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. DSM-IV-TR. 4th ed.. American Psychiatric Association; Washington, DC: 2000. [text revision]

Argo, TR.; Black, DW. Clinical Characteristics.. In: Grant, JE.; Potenza, MN., editors. Pathological Gambling: a clinical guide to treatment. American Psychiatric Publishing, Inc.; Arlington, VA: 2004. p. 39-54.

Bazargan M, Bazargan S, Akanda A. Gambling habits among aged African Americans. Clinical Gerontologist: Journal of Aging and Mental Health. 2001; 22:51–62.

Beekman AT, Bremmer MA, Deeg DJ, van Balkom AJ, Smit JH, de Beurs E, van Dyck R, van Tilburg W. Anxiety disorders in later life: a report from the Longitudinal Aging Study Amsterdam. Int J Geriatr Psychiatry. 1998; 13:717–726.

Blaszczynski A, Nower L. A pathways model of problem and pathological gambling. Addiction. 2002; 97:487–499.

Chou KL, Afifi TO. Disordered (pathologic or problem) gambling and axis I psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Am J Epidemiol. 2011a; 173:1289–1297.

Chou KL, Mackenzie CS, Liang K, Sareen J. Three-year incidence and predictors of first-onset of DSM-IV mood, anxiety, and substance use disorders in older adults: results from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. J Clin Psychiatry. 2011b; 72:144–155.

Compton WM, Thomas YF, Stinson FS, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV drug abuse and dependence in the United States: results from the national epidemiologic survey on alcohol and related conditions. Arch Gen Psychiatry. 2007; 64:566–576.

Cunningham-Williams RM, Cottler LB, Compton WM, Spitznagel EL. Taking chances: Problem gamblers and mental health disorders - results from the St. Louis Epidemiologic Catchment Area Study. Am J Public Health. 1998; 88:1093–1096.

Desai, R. Older Adults.. In: Grant, JE.; Potenza, MN., editors. Pathological Gambling. A clinical guide to treatment. American Psychiatric Publishing, Inc.; Washington, DC.: 2004. p. 83-96.

Desai RA, Desai MM, Potenza MN. Gambling, health and age: data from the National Epidemiologic Survey on Alcohol and Related Conditions. Psychol Addict Behav. 2007; 21:431–440.

Desai RA, Maciejewski PK, Dausey DJ, Caldarone BJ, Potenza MN. Health correlates of recreational gambling in older adults. Am J Psychiatry. 2004; 161:1672–1679.

Desai RA, Potenza MN. Gender differences in the associations between past-year gambling problems and psychiatric disorders. Soc Psychiatry Psychiatr Epidemiol. 2008; 43:173–183.

Erickson L, Molina CA, Ladd GT, Pietrzak RH, Petry NM. Problem and pathological gambling are associated with poorer mental and physical health in older adults. Int J Geriatr Psychiatry. 2005; 20:754–759.

Foottit J, Anderson D. Associations between perception of wellness and health-related quality of life, comorbidities, modifiable lifestyle factors and demographics in older Australians. Australas J Ageing. 2012; 31:22–27.

Gerstein, D.; Murphy, S.; Toce, M.; Hoffman, J.; Palmer, A.; Johnson, R.; Larison, C.; Chuchro, L.; Bard, A.; Engelman, L.; Hill, MA.; Buie, T.; Volberg, R.; Harwood, H.; Tucker, A.; Christiansen, E.; Cummings, W.; Sinclair, S. Gambling impact and behavior study: Report to the national gambling impact study commission. Chicago: 1999.

Godfrey, M.; Townsend, J.; Sur, rC; Boyle, G.; Brooker, D. Prevention and Service Provision: Mental Health Problems in Later Life: Final Report. Leeds Institute of Health Sciences, Leeds University; 2005.

Grant B, Dawson D, Stinson F, Chou P, Kay W, Pickering R. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. Drug Alcohol Depend. 2003a; 71:7–16.

Grant, BF.; Dawson, DA. Introduction to the National Epidemiologic Survey of Alcohol and Related Conditions. National Institute on Alcohol Abuse and Alcoholism;

Grant BF, Goldstein RB, Chou SP, Huang B, Stinson FS, Dawson DA, Saha TD, Smith SM, Pulay AJ, Pickering RP, Ruan WJ, Compton WM. Sociodemographic and psychopathologic predictors of first incidence of DSM-IV substance use, mood and anxiety disorders: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. Mol Psychiatry. 2009; 14:1051–1066.

Grant, BF.; Kaplan, KD. Source and accuracy statement: The wave 2 national epidemiologic survey on alcohol and related conditions (NESARC). Rockville, MD: 2005.

Grant, BF.; Moore, TC.; Shepard, J.; Kaplan, K. Source and accuracy statement for wave 1 of the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). Bethesda, MD: 2003b.

Grant JD, Vergés A, Jackson KM, Trull TJ, Sher KJ, Bucholz KK. Age and ethnic differences in the onset, persistence and recurrence of alcohol use disorder. Addiction. 2012; 107:756–765.

Grant JE, Kim SW. Demographic and clinical features of 131 adult pathological gamblers. J Clin Psychiatry. 2001; 62:957–962.

Harper S, Rushani D, Kaufman JS. Trends in the black-white life expectancy gap, 2003-2008. JAMA. 2012; 307:2257–2259.

Hasin D, Stinson F, Ogburn E, Grant B. Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Arch Gen Psychiatry. 2007; 64:830–842.

Kerber CS, Black DW, Buckwalter K. Comorbid psychiatric disorders among older adult recovering pathological gamblers. Issues Ment Health Nurs. 2008; 29:1018–1028.

Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005a; 62:593–602.

Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005b; 62:617–627.

Kessler RC, Hwang I, LaBrie R, Petukhova M, Sampson NA, Winters KC, Shaffer HJ. DSM-IV pathological gambling in the National Comorbidity Survey Replication. Psychol Med. 2008; 38:1351–1360.

Leeman RF, Billingsley BE, Potenza MN. Impulse control disorders in Parkinson's disease: background and update on prevention and management. Neurodegenerative Disease Management. 2:1–12. in press.

Leeman RF, Potenza MN. Similarities and differences between pathological gambling and substance use disorders: a focus on impulsivity and compulsivity. Psychopharmacology (Berl). 2012; 219:469–490.

Levens S, Dyer AM, Zubritsky C, Knott K, Oslin DW. Gambling among older, primary-care patients: an important public health concern. Am J Geriatr Psychiatry. 2005; 13:69–76.

Martin F, Lichtenberg PA, Templin TN. A longitudinal study: casino gambling attitudes, motivations, and gambling patterns among urban elders. J Gambl Stud. 2011; 27:287–297.

Martins SS, Fenton MC, Keyes KM, Blanco C, Zhu H, Storr CL. Mood and anxiety disorders and their association with non-medical prescription opioid use and prescription opioid-use disorder: longitudinal evidence from the National Epidemiologic Study on Alcohol and Related Conditions. Psychol Med. 2012; 42:1261–1272.

McCready J, Mann RE, Zhao J, Eves R. Correlates of gambling-related problems among older adults in Ontario. Journal of Gambling Issues. 2008; 22:174–194.

McNeilly D, Burke W. Late life gambling: the attitudes and behaviors of older adults. J Gambl Stud. 2000; 16:393–415.

Petry NM. A comparison of young, middle-aged, and older adult treatment-seeking pathological gamblers. Gerontologist. 2002; 42:92–99.

Petry NM, Stinson FS, Grant BF. Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. J Clin Psychiatry. 2005; 66:564–574.

Pietrzak RH, Molina CA, Ladd GT, Kerins GJ, Petry NM. Health and psychosocial correlates of disordered gambling in older adults. Am J Geriatr Psychiatry. 2005; 13:510–519.

Pietrzak RH, Morasco BJ, Blanco C, Grant BF, Petry NM. Gambling level and psychiatric and medical disorders in older adults: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Am J Geriatr Psychiatry. 2007; 15:301–313.

Potenza MN, Fiellin DA, Heninger GR, Rounsaville BJ, Mazure CM. Gambling: an addictive behavior with health and primary care implications. J Gen Intern Med. 2002; 17:721–732.

Potenza MN, Steinberg MA, Wu R, Rounsaville BJ, O'malley SS. Characteristics of Older Adult Problem Gamblers Calling a Gambling Helpline. J Gambl Stud. 2006

Potenza MN, Wareham JD, Steinberg MA, Rugle L, Cavallo DA, Krishnan-Sarin S, Desai RA. Correlates of at-risk/problem internet gambling in adolescents. J Am Acad Child Adolesc Psychiatry. 2011; 50:150–159. e153.

Rahman AS, Pilver CE, Desai RA, Steinberg MA, Rugle L, Krishnan-Sarin S, Potenza MN. The relationship between age of gambling onset and adolescent problematic gambling severity. J Psychiatr Res. 2012; 46:675–683.

Rowe JW, Kahn RL. Successful aging. Gerontologist. 1997; 37:433–440.

Ruan WJ, Goldstein RB, Chou SP, Smith SM, Saha TD, Pickering RP, Dawson DA, Huang B, Stinson FS, Grant BF. The alcohol use disorder and associated disabilities interview schedule-IV (AUDADIS-IV): reliability of new psychiatric diagnostic modules and risk factors in a general population sample. Drug Alcohol Depend. 2008; 92:27–36.

Schepis TS, Hakes JK. Non-medical prescription use increases the risk for the onset and recurrence of psychopathology: results from the National Epidemiological Survey on Alcohol and Related Conditions. Addiction. 2011; 106:2146–2155.

Shaffer HJ, Vander Bilt J, Hall MN. Gambling, drinking, smoking and other health risk activities among casino employees. Am J Ind Med. 1999; 36:365–378.

Shrestha, LB.; Heisler, EJ. The changing demographic profile of the United States. Congressional Research Service; 2009. p. 1-35.

Slutske WS, Eisen S, True WR, Lyons MJ, Goldberg J, Tsuang M. Common genetic vulnerability for pathological gambling and alcohol dependence in men. Arch Gen Psychiatry. 2000; 57:666–673.

Southwell J, Boreham P, Laffan W. Problem gambling and the circumstances facing older people : a study of gaming machine players aged 60+ in licensed clubs. J Gambl Stud. 2008; 24:151–174.

Sullivan, S. Development of the "EIGHT" Problem Gambling Screen. Auckland Medical School; Auckland, New Zealand: 1999.

Suzman, RM.; Willis, DP.; Manton, KG., editors. The Oldest Old. Oxford University Press; New York: 1992.

Tse S, Hong SI, Wang CW, Cunningham-Williams RM. Gambling behavior and problems among older adults: a systematic review of empirical studies. J Gerontol B Psychol Sci Soc Sci. 2012; 67:639–652.

Wiebe JM, Cox BJ. Problem and probable pathological gambling among older adults assessed by the SOGS-R. J Gambl Stud. 2005; 21:205–221.

Wills, TA.; Hirky, AE. Coping and substance abuse: A theoretical model and review of the evidence.. In: Zeichnec, M.; Eudle, NS., editors. Handbook of coping theory, research, and applications. Wiley; New York: 1996. p. 279-302.

Yi S, Kanetkar V. Coping with guilt and shame after gambling loss. J Gambl Stud. 2011; 27:371–387.

Table 1

Baseline Demographics of Study Sample of Older Adults (n=10,231).

Study variable	Total		LFG/NG N=7,045; 67.3%		LRG N=2,917; 29.9%		ARPG N=269; 2.8%		p
	N	%	N	%	N	%	N	%	
Gender									<.0001
Male	4,065	44.45	2,422	39.08	1,512	55.51	130	55.45	
Female	6,167	55.55	4,623	60.92	1,405	44.49	139	44.55	
Race									.1524
White	6,860	80.21	4,647	79.87	2,034	81.39	179	75.63	
Black	1,814	8.47	1,247	8.31	514	8.67	53	10.23	
Other	340	5.13	235	5.11	91	4.77	14	9.63	
Hispanic	1,217	6.19	916	6.70	278	5.17	23	4.50	
Marital status									.0001
Married	5,286	66.68	3,506	64.92	1,639	70.52	141	68.23	
Formerly married	4,371	29.38	3,136	31.00	1,123	25.90	112	27.41	
Never	574	3.94	403	4.08	155	3.58	16	4.36	
Education									.0002
Less than high school	2,582	21.30	1,905	22.61	612	18.11	65	24.05	
High school	3,250	33.10	2,196	32.60	965	34.02	89	35.32	
Some college	2,344	23.46	1,515	22.26	757	26.33	72	21.70	
College and above	2,055	22.13	1,429	22.53	583	21.54	43	18.92	
Employment									.0001
Full time	2,353	24.10	1,510	22.43	765	27.38	78	29.25	
Part time	904	9.21	581	8.48	290	10.57	33	12.17	
Other	6,974	66.69	4,954	69.09	1,862	62.05	158	58.58	
Income									<.0001
<$20,000	3,910	29.45	2,947	32.63	882	23.00	81	21.79	
$20,000 to <$35,000	2,322	22.81	1,565	22.59	694	23.37	63	22.02	
$35,000 to <$70,000	2,607	29.38	1,667	27.82	860	32.46	80	33.96	
$70,000	1,392	18.37	866	16.96	481	21.17	45	22.23	

Study variable	Total		LFG/NG N=7,045; 67.3%		LRG N=2,917; 29.9%		ARPG N=269; 2.8%		p
	N	%	N	%	N	%	N	%	
Any Mood Disorder									.0190
Yes	569	4.87	375	4.82	164	4.56	30	9.40	
No	9,662	95.13	6,670	95.18	2,753	95.44	239	90.60	
Any Anxiety Disorder									.0086
Yes	909	8.32	564	7.59	310	9.50	35	13.15	
No	9,322	91.68	6,481	92.41	2,607	90.50	234	86.85	
Any Substance Use Disorder									<.0001
Yes	874	8.50	428	6.01	374	12.53	72	25.38	
No	9,357	91.50	6,617	93.99	2,543	87.47	197	74.72	
Tobacco use									<.0001
Current user	1,858	18.56	1,054	15.06	686	24.01	118	44.69	
Former user	3,536	36.33	2,093	31.68	1,355	47.24	88	31.65	
Lifetime non-user	4,837	45.11	3,898	53.26	876	28.75	63	23.66	
Alcohol consumption									<.0001
Current drinker	5,135	53.78	3,045	46.69	1,909	68.26	181	69.99	
Former drinker	2,722	24.85	1,898	25.66	755	23.44	69	20.46	
Lifetime abstainer	2,374	21.36	2,102	27.64	253	8.30	19	9.55	
Drug use									<.0001
Current user	169	1.56	94	1.31	66	2.02	9	2.65	
Former user	590	5.74	306	4.42	251	8.21	33	11.13	
Lifetime non-user	9,472	92.69	6,645	94.26	2,600	89.77	227	86.22	

	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
Current age, years	67.43	0.11	68.01	0.13	66.36	0.19	64.66	0.57	**<.0001**
Medical conditions	1.18	0.02	1.18	0.02	1.16	0.03	1.30	0.10	.3738
Stressful life events	1.13	0.02	1.07	0.02	1.22	0.03	1.63	0.11	**<.0001**
SF-12 Physical Health score	45.51	0.18	45.19	0.22	46.24	0.27	45.47	0.92	**.0093**

LFG/NG= Low-frequency gambling/Non-gambling; LRG= Low-risk gambling; ARPG= At-risk/problem gambling; SF-12 = Short-Form-12

Bold values indicate statistically significant results (p<.05)

Table 2

Unadjusted (Bivariate) Analyses Examining the Relationships between Problem-Gambling Severity and Incident Axis 1 Psychopathology Amongst Older Adults

	LFG/NG N=7,045; 67.3%			LRG N=2,917; 29.9%			ARPG N=269; 2.8%			p
	n	i	%	n	i	%	n	i	%	
Any Axis 1 Disorder	4,578	580	12.23	1,379	187	14.33	75	18	23.43	**.0332**
Mood Disorders	6,051	303	4.67	2,452	119	4.56	188	12	6.19	.7277
Depression	6,177	269	4.04	2,543	112	4.13	207	11	5.55	.7163
Dysthymia	6,790	56	0.70	2,792	19	0.56	253	1	0.24	.2378
Mania	6,951	57	0.65	2,855	27	0.97	253	6	2.18	.1514
Hypomania	6,991	53	0.60	2,878	12	0.26	262	3	0.74	.0597
Anxiety Disorders	6,103	423	6.38	2,388	158	6.41	199	19	8.54	.6258
Panic disorder	6,808	78	1.05	2,783	36	1.31	237	7	2.60	.2707
Agoraphobia	7,036	7	0.08	2,915	3	0.19	268	0	0.00	**.0329**
Social Phobia	6,792	78	1.02	2,787	22	0.82	249	6	1.47	.6218
Specific phobia	6,553	308	4.10	2,622	126	4.69	236	8	2.70	.2553
Generalized Anxiety Disorder	6,801	151	2.09	2,796	61	2.09	253	13	5.19	.1422
Substance-Use Disorders	5,649	268	4.69	1,745	107	6.37	117	20	15.80	**.0021**
Alcohol abuse/dependence	6,036	81	1.42	1,964	43	2.46	157	7	5.09	**.0375**
Nicotine dependence	6,411	234	3.65	2,403	123	5.61	168	20	10.78	**.0016**
Drug abuse/dependence	6,951	26	0.38	2,829	12	0.34	252	0	0.00	**.0007**

LFG/NG= Low-frequency gambling/Non-gambling; LRG= Low-risk gambling; ARPG=At-risk/problem gambling; p=p-value from Wald Chi-Square test; n=Baseline population at risk (unweighted); i=
Number of incident cases (unweighted); %=Incidence (weighted)

Bold values indicate statistically significant results (p<.05)

Table 3

Adjusted (Regression Model) Results Relating Problem-Gambling Severity to Incident Axis 1 Psychopathology Amongst Older Adults

Incident Disorder	Model 1[a]				Model 2[b]				Model 3[c]			
	LRG vs. LFG/NG		ARPG vs. LFG/NG		LRG vs. LFG/NG		ARPG vs. LFG/NG		LRG vs. LFG/NG		ARPG vs. LFG/NG	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Any Axis 1 Disorder	1.20	0.98-1.46	**2.20**	**1.14-4.25**	1.19	0.97-1.46	**2.09**	**1.06-4.09**	1.02	0.81-1.29	1.76	0.91-3.40
Any Mood Disorder[a]	0.98	0.74-1.28	1.35	0.67-2.71	1.03	0.77-1.37	1.29	0.62-2.69	0.97	0.72-1.31	1.21	0.58-2.54
Depression	1.02	0.78-1.34	1.40	0.68-2.88	1.08	0.81-1.44	1.30	0.60-2.82	1.01	0.74-1.37	1.18	0.52-2.65
Dysthymia	0.80	0.43-1.48	0.34	0.04-2.59	0.78	0.42-1.44	0.31	0.04-2.48	0.87	0.47-1.61	0.30	0.04-2.54
Mania	1.50	0.84-2.69	**3.43**	**1.28-9.19**	1.34	0.71-2.54	2.61	0.80-8.58	1.30	0.69-2.46	2.20	0.65-7.47
Hypomania	0.43	0.18-1.00	1.23	0.29-5.28	**0.38**	**0.16-0.92**	0.90	0.22-3.78	**0.33**	**0.13-0.81**	0.66	0.16-2.67
Any Anxiety Disorder[b]	1.00	0.80-1.26	1.37	0.76-2.46	1.09	0.86-1.38	1.16	0.61-2.19	1.07	0.84-1.35	1.12	0.58-2.16
Panic disorder	1.25	0.79-1.98	**2.51**	**1.01-6.24**	1.35	0.83-2.22	2.07	0.73-5.86	1.26	0.76-2.06	1.78	0.59-5.35
Agoraphobia	2.25	0.50-10.14	_--_[d]	--	1.59	0.37-6.75	_--_[d]	--	0.98	0.28-3.45	_--_[d]	--
Social Phobia	0.80	0.43-1.48	1.45	0.43-4.82	0.73	0.39-1.36	0.97	0.30-3.08	0.73	0.40-1.35	0.86	0.25-2.94
Specific phobia	1.15	0.89-1.48	0.65	0.28-1.52	1.22	0.93-1.60	0.56	0.24-1.34	1.23	0.93-1.62	0.54	0.23-1.30
Generalized Anxiety Disorder	1.00	0.69-1.45	**2.56**	**1.32-4.96**	1.20	0.82-1.76	**2.56**	**1.27-5.16**	1.19	0.82-1.75	**2.51**	**1.24-5.06**
Any Substance-Use Disorder[c]	**1.38**	**1.06-1.80**	**3.81**	**2.15-6.75**	1.24	0.93-1.65	**3.09**	**1.68-5.67**	0.92	0.66-1.29	**2.61**	**1.38-4.94**
Alcohol abuse/dependence	**1.75**	**1.10-2.77**	**3.72**	**1.54-9.02**	1.39	0.86-2.25	**2.74**	**1.20-6.24**	1.08	0.67-1.75	1.94	0.83-4.57
Nicotine dependence	**1.57**	**1.19-2.08**	**3.19**	**1.73-5.91**	**1.39**	**1.04-1.87**	**2.45**	**1.27-4.70**	1.12	0.81-1.55	1.81	0.86-3.78
Drug abuse/dependence	0.89	0.37-2.18	_--_[d]	--	0.70	0.26-1.87	_--_[d]	--	0.71	0.29-1.73	_--_[d]	--

LFG/NG= Low-frequency gambling/Non-gambling; LRG= Low-risk gambling; ARPG=At-risk/problem gambling

OR=odds ratio; CI=confidence interval

Bold values indicate statistically significant results (p<.05)

[a] Model 1 was unadjusted for study covariates

[b] Model 2 was adjusted for the following study covariates: gender, current age, race, education, marital status, employment status, and income. For all mood disorders, there was additional adjustment for wave 1 past-year diagnosis of any substance-use disorder and wave 1 past-year diagnosis of any anxiety disorder. For all anxiety disorders, there was additional adjustment for wave 1 past-year diagnosis of any mood disorder, and wave 1 past-year diagnosis of any substance-use disorder. For all substance-use disorders, there was additional adjustment for wave 1 past-year diagnosis of any mood disorder, and wave 1 past-year diagnosis of any anxiety disorder.

[c] Model 3 included model-2 covariates as well as the following: stressful life events, tobacco use status, alcohol consumption status, drug use status, medical conditions, and the SF-12 physical functioning score.

[d] Empty cell prevented estimate of OR