

## Burden of Psychiatric Morbidity Among Lesbian, Gay, and Bisexual Individuals in the California Quality of Life Survey

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In recent population-based surveys, minority sexual orientation has been identified as a potential risk indicator for psychiatric morbidity. However, methodological limitations in the studies to date have led to concerns that current estimates are biased due to inadequate measurement of sexual orientation and uncontrolled confounding from prevalent HIV infection. In the present study, the authors investigate associations between sexual orientation and mental health/substance use morbidity using information obtained from 2,272 individuals, including 652 sexual orientation minorities, age 18 to 72 years, interviewed in the California Quality of Life Survey. Results confirm that minority sexual orientation is a risk indicator for psychiatric morbidity. However, levels of increased risk vary within this subpopulation by both gender and patterns of sexual orientation expression. Among gay/bisexual men, much of this greater burden is related to concurrent HIV infection. Reducing excess mental health morbidity risk among sexual orientation minorities could result in possibly a 5% to 11% reduction in the burden of the disorders assessed here among the adult population. Sexual orientation represents an important, but relatively understudied, individual characteristic shaping risk for psychiatric morbidity.

*Keywords:* sexual orientation, depression, anxiety, substance dependency, population attributable risk

Increasingly, research is documenting that lesbians, gay men, bisexual individuals, and homosexually experienced persons, compared to exclusively heterosexual women and men, are at somewhat elevated risk for mental health and substance use-related morbidity. The most convincing evidence to date comes from two sources: (a) general population-based cross-sectional surveys (Burgard, Cochran, & Mays, 2005; Cochran, Keenan, Schober, & Mays, 2000; Cochran & Mays, 2000, 2007; Cochran, Mays, Alegria, Ortega, & Takeuchi, 2007; Cochran, Mays, & Sullivan, 2003; Drabble, Midanik, & Trocki, 2005; Garofalo, Wolf, Wissow, Woods, & Goodman, 1999; Gilman et al., 2001; Remafedi, French, Story, Resnick, & Blum, 1998; Robin et al., 2002; Russell & Joyner, 2001; Sandfort, Bakker, Schellevis, & Vanwesenbeeck, 2006; Sandfort, de Graaf, Bijl, & Schnabel, 2001; Tjepkema, 2008) and longitudinal cohort studies (Corliss, Rosario, Wypij, Fisher, & Austin, 2008; Fergusson, Horwood, Ridder, & Beautrais, 2005; Skegg, Nada-Raja, Dickson, Paul, & Williams, 2003; Wichstrom & Hegna, 2003; Ziyadeh et al., 2007) where respondents were recruited irrespective of their sexual orientation and (b) systematically drawn samples from gay neighborhoods or venues (Diaz, Ayala, Bein, Henne, & Marin, 2001; Meyer, Di-

etrich, & Schwartz, 2008; Mills et al., 2004; Wang, Hausermann, Ajdacic-Gross, Aggleton, & Weiss, 2007). Across both of these study designs, minority sexual orientation has been linked to greater risk for stress-sensitive mental health disorders, such as major depression and generalized anxiety, as well as disorders arising from alcohol and illicit drug use.

Despite the increasingly frequent reporting of these basic findings, much about the greater risk among lesbians, gay men, and bisexual individuals remains unexplained and inadequately characterized. For example, this newly discovered *sexual orientation effect* is not entirely consistent across studies. In some studies (Cochran et al., 2007; Gilman et al., 2001), women who report markers of homosexuality, such as histories of same-gender sexual partners or identification as lesbian or bisexual, show greater risk for past year major depression compared to exclusively heterosexual women, but a similar sexual orientation-related difference is not observed among men. In others, the reverse is seen with men classified as gay or bisexual on the basis of sexual behavior or sexual orientation identity evidencing higher risk for major depression than heterosexual men, but nonsignificant differences are observed among women (Cochran et al., 2000, 2003). Further, within the same study, sometimes one disorder shows differences by sexual orientation, but in a different study the sexual orientation effect is seen with a different disorder.

To some extent, these discrepant observations may simply be due to several well-known methodological challenges that permeate the nascent field (Cochran, 2001), including diverse and imprecise measurements of sexual orientation and the fact that many of these studies were underpowered, making it difficult to consistently detect differences. However, there are also hints in the emergent literature that other, more substantial factors might contribute to the discordant findings observed to date. In recent years, with increasingly thoughtful measurement of sexual orientation

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and larger sample sizes, researchers (Austin, Roberts, Corliss, & Molnar, 2008; Burgard et al., 2005; Cochran & Mays, 2007; Drabble et al., 2005; Gruskin, Greenwood, Matevia, Pollack, & Bye, 2007; Meyer et al., 2008) have discovered an underappreciated heterogeneity of risk within the population of individuals who report markers of minority sexual orientation. For example, there is some evidence to suggest that bisexual individuals, particularly women, may experience highest risk for psychiatric morbidity among those who identify as lesbian, gay, or bisexual or who report same-gender sexual partners (Balsam, Beauchaine, Mickey, & Rothblum, 2005; Burgard et al., 2005; Saewyc et al., 2007). Better characterization of differences in risk across varying patterns of sexual orientation in the population may help to clarify why sexual orientation is linked to differences in risk.

A second critical issue is whether prevalent HIV infection explains the elevation in risk for psychiatric morbidity among men who have sex with men (MSM; Cochran & Mays, 2007). While one population-based survey of MSM recruited primarily from high gay density neighborhoods found that psychological distress (Mills et al., 2004) and drug, but not alcohol, use (Stall et al., 2001) was associated with HIV infection status, this study lacked a heterosexual comparison group. The great majority of general population-based surveys that have included heterosexual controls are unable to investigate HIV-related effects. With few exceptions (Cochran & Mays, 2007) these general population surveys either failed to ascertain HIV status or their samples included too few HIV-infected individuals to be able to make analytic comparisons (Sandfort et al., 2006). Hence, HIV infection status, which presumably increases morbidity risk, is an uncontrolled factor in the majority of studies to date, particularly those from the United States where perhaps 19% of MSM report prevalent HIV infection (Xia et al., 2006). At this point it is unclear to what extent HIV infection underlies the increased morbidity risk seen among MSM.

The current work investigates sexual orientation differences in mental health morbidity using information obtained in the California Quality of Life Survey (Cal-QOL), a population-based mental health survey of 2,272 adult Californians, oversampled for minority sexual orientation. We anticipate that individuals with minority sexual orientation (defined both in terms of identity and sexual behavior), compared to exclusively heterosexual men and women, will evidence higher levels of psychiatric morbidity, consistent with previous studies. However, our interest is in investigating the heterogeneity of risk within this population along key identity and behavioral dimensions of sexual orientation and prevalent HIV status. In addition, we explicitly examine, using estimates of population attributable risk (PAR), the extent to which psychiatric morbidity in the population could be reduced if the greater risk among individuals with minority sexual orientation could be lowered to the levels seen among those of majority sexual orientation.

## Method

### Source of the Data

Data for the current study come from the 2004–2005 California Quality of Life Survey (Cal-QOL), a representative mental health survey of English- and Spanish-speaking adult Californians, age 18 to 72 years (Cochran & Mays, 2007). The Cal-QOL sampling

frame was created from a subset of adults first interviewed in the 2003 California Health Interview Survey (CHIS; California Health Interview Survey, 2005). This parent study, a population-based random-digit-dial telephone interview, surveyed more than 42,000 Californians, age 18 and older, in one of several languages (97% in English or Spanish). Its response rate was 34%, consistent with other recent random-digit-dial telephone interviews (Burgard et al., 2005; National Center for Chronic Disease Prevention and Health Promotion, 2005; Simon, Wold, Cousineau, & Fielding, 2001). During the interview, all respondents were asked their sexual orientation identity and those between 18 and 70 years were asked the genders of their sexual partners in the year prior to interview. One additional question ascertained the respondent's willingness to be recontacted for additional health surveys; 76% of CHIS respondents agreed.

From the 2003 CHIS interviewed sample, the Cal-QOL sampling frame selected eligible individuals (all who were interviewed in English or Spanish, agreed to be recontacted, and were within specified age limits) using stratification methods. In one stratum, sampled with certainty, all eligible respondents, age 18 to 84 years, who classified themselves as gay, lesbian, or bisexual and/or reported any same-gender sexual partners in the year prior to interview were selected ( $n = 1,193$ ). The second stratum included all remaining eligible respondents. From these, an additional 2,972 individuals, age 18 to 70 years, were randomly selected proportional to their demographic and geographic representation in the California population. Of the 4,165 eligible individuals selected for participation in the Cal-QOL survey, 2,322 were successfully interviewed between October 2004 and February 2005 in either English or Spanish, for a response rate of 56%. In order to create an appropriate heterosexual comparison group in the current study, we use information from the 2,272 Cal-QOL participants who were all aged 18 to 70 years at the time of their CHIS interview.

### Structured Interview

A fully structured computer-assisted telephone interview (CATI) was administered by trained interviewers. The following measures were included in the instrument.

*Psychiatric measures.* Respondents were administered several modules from the Composite International Diagnostic Interview Short Form (CIDI-SF; Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998). The CIDI-SF was developed for screening assessments of community samples by trained lay interviewers, especially in the CATI format used in the Cal-QOL. The CIDI-SF instrument uses a conditional approach to measuring pathology in order to quickly assess the possible presence of key diagnostic symptoms in a general population where the great majority of respondents are symptom-free. Respondents are initially asked a screening set of questions, such as whether the individual has experienced a 2-week period of sad mood within the past year. Those who answer in the affirmative are asked additional questions about symptoms essential to receiving a *Diagnostic and Statistical Manual of Mental Disorders (DSM)* diagnosis. At the point at which the respondent cannot meet criteria for a specific diagnosis, the questioning for that disorder is stopped. The CIDI-SF does not assess all features of the disorders it measures. For example, in the case of major depression, it does not exclude individuals who might have a bipolar disorder or whose symptoms

might be better explained by a different diagnosis. Instead, the CIDI-SF identifies individuals who have a high probability of receiving a diagnosis were they to be thoroughly evaluated. Studies have found moderate agreement between CIDI-SF diagnoses and those obtained by face-to-face diagnostic clinical interviews (Aalto-Setälä et al., 2002; Talati, Fyer, & Weissman, 2008). Hence, the CIDI-SF renders probable diagnoses, based on *DSM-III-R* criteria (American Psychiatric Association, 1987), for 1-year prevalence of major depression, generalized anxiety disorder, and panic.

Two additional CIDI-SF modules assessed past year symptoms of drug and alcohol dependency. All who indicated any use of illicit drugs or nonprescribed medications in the previous 12 months were administered the drug module, which assesses seven symptoms from six of the core symptom areas of substance dependency: (a) using larger amounts or for longer periods of time than intended, (b) being under the influence or recovering from use while engaged in social obligations, (c) experiencing emotional or physical problems from use, (d) having an irresistible urge to use, (e) spending a great deal of time using or getting over using, and (f) developing tolerance (physiological withdrawal symptoms are not assessed). Those evidencing three or more symptoms received a positive diagnosis for 1-year prevalence of probable drug dependency disorder consistent with modified *DSM-IV* criteria (American Psychiatric Association, 1994). Seven similar questions were asked concerning alcohol use. In addition, the Cal-QOL measured the occurrence of alcohol-related physiological withdrawal symptoms. A diagnosis of 1-year probable alcohol dependency disorder was made if the respondent reported symptoms in three or more of the seven core areas defining alcohol dependency consistent with *DSM-IV* criteria. This diagnostic screening method was shown to have excellent reliability and validity in identifying individuals with substance use disorders in the National Comorbidity Survey (Epstein & Gfroerer, 1995).

Also included was the 10-item Kessler Psychological Distress Scale (K10; Kessler et al., 2002), an instrument measuring non-specific distress occurring in the 30 days prior to interview. The K10 is particularly good at screening for individuals likely to meet diagnostic criteria for a serious mental illness (Aalto-Setälä et al., 2002; Gill, Butterworth, Rodgers, & Mackinnon, 2007). K10 summary scores range from 0 to 40. From these, we classified respondents into one of two categories: high distress (a score of 15 or above, reflecting moderate to severe distress) versus not (a score of below 15; Andrews & Slade, 2001). In a large Australian population-based community sample (Andrews & Slade, 2001) associations between K10 scores and Composite International Diagnostic Interview (CIDI) diagnoses found that a cut point of 15 or above displayed a sensitivity of 0.41 and specificity of 0.98 in detecting individuals who met criteria for at least one of the several 1-year *DSM-IV* affective or anxiety disorders measured.

**Sexual orientation.** Individuals were asked the genders of their sexual partners since age 18 and in the year prior to interview. An additional question assessed sexual orientation identity. Later, individuals who reported themselves to be lesbian, gay, bisexual, or homosexually experienced were asked a second time about their sexual orientation identity. Using this information, we categorized respondents into one of four groups: lesbian or gay identity ( $n = 415$ ), bisexual identity ( $n = 179$ ), a positive adult lifetime history of same-gender sexual partners with current heterosexual identity

(homosexually experienced heterosexual;  $n = 58$ ), and heterosexual identity with no self-reported history of same-gender sexual partners since age 18 (exclusively heterosexual;  $n = 1,620$ ).

**Individual characteristics.** Several demographic characteristics were also assessed including gender, age, ethnic/racial minority background, educational attainment, foreign birth, family income, and current marital or cohabitation status (with cohabitation defined as “living with a partner in a marriage-like relationship”). Initial coding was as follows: ethnic/racial status was coded into one of three groups reflecting the major ethnic/racial groups in California (non-Hispanic White, Hispanic, and other race), educational attainment into one of four categories (high school degree or less, some college, college degree, and postbaccalaureate education), family income above or below 300% of the federal poverty limit, and two categories of marital/cohabiting status (coupled vs. not coupled).

### Statistical Analysis

We conducted analyses in either SAS 9 (SAS Institute, 2004) or Stata 10 (Stata Corporation, 2007) using trimmed weights to adjust for selection probability and survey nonresponse. In the first set of analyses, we used either multinomial or logistic regression, as appropriate, to evaluate demographic differences among individuals varying in sexual orientation. For analytic purposes, ethnicity/race was recoded into non-Hispanic White versus other ethnic/racial groups, age was recoded into 5-year intervals, and both age and education were centered to have a mean of 0 and a standard deviation of 1. However, for clarity, we report unrecoded values in the text. Where summarization of effects across groups was needed, the contribution of individual demographic characteristics was evaluated by adjusted Wald  $F$  tests. We also used Cramer's  $V$  to briefly describe intercorrelations among the mental health binomial morbidity indicators in the study.

Next, we employed generalized linear model methods using binomial regression with the log-link function (Spiegelman & Hertzmark, 2005) to estimate sexual orientation-associated prevalence risk ratios (RR) and 95% confidence intervals (CIs) for the seven psychiatric morbidity outcomes. Results were adjusted for possible confounding due to gender, age, race/ethnicity, educational attainment, relationship status, foreign birth, and family income (Breslau et al., 2007; Butler, 2000; Cochran et al., 2000, 2003; Cochran & Mays, 2000; Gilman et al., 2001; Kessler et al., 2003; Mays & Cochran, 2001; Sandfort, de Graaf, & Bijl, 2003; Sandfort et al., 2001). We also used a specified levels interaction approach (Van Ness & Allore, 2006) to generate gender-specific estimates of relative risks.

In the third group of analyses, we investigated the possible contributory effects of self-reported HIV infection to mental health morbidity among men. We classified men into one of three groups: exclusively heterosexual men (none of whom reported HIV infection), men who reported any markers of minority sexual orientation but not prevalent HIV infection, and men who reported both minority sexual orientation markers and HIV infection. Again, using log-binomial methods, we estimated differences in relative risk treating exclusively heterosexual men as the referent group, while adjusting for demographic confounding. Further analyses examined HIV-related differences among men with any minority sexual orientation

markers. Across analyses, there were three instances where the models did not converge, always in samples limited to men with minority sexual orientation. Here, we used log-Poisson models to estimate relative risk (Zou, 2004), an approach that yields consistent but somewhat less precise estimates (Deddens & Petersen, 2008; Spiegelman & Hertzmark, 2005).

Finally, we also generated estimates of population attributable risk (PAR; Hildebrandt, Bender, Gehrmann, & Blettner, 2006; Starfield, Hyde, Gervas, & Heath, 2008) for several exposures under study. PAR methods attempt to answer the question: To what extent could the prevalence of a disorder in the population be reduced if risk in the exposed group is reduced to the level of risk in the unexposed group? In all cases, PAR was calculated using study-derived estimates of the population prevalence for the exposure under study ( $p$ ), as well as the estimated adjusted relative risk associated with the exposure (RR) where  $PAR = p(RR - 1)/(p[RR - 1] + 1)$  (Rothman & Greenland, 1998). Throughout the text, we also report weighted point estimates and their standard errors or 95% CIs in parentheses. Negative lower limits of confidence intervals were truncated at zero (Cowen & Ellison, 2006). Significance of study findings was evaluated at the  $p < .05$  level. This research was approved by the institutional review board of the University of California, Los Angeles.

## Results

### Characteristics of the Sample

Approximately 12% (11.8%, CI = 10.6%–13.0%) of the weighted respondents reported any markers of minority sexual orientation, including identifying as lesbian, gay, or bisexual (9.5%, CI = 8.6%–10.5%) or reporting a positive adult history of same-gender sexual partners but currently identifying as hetero-

sexual (2.2%, CI = 1.6%–3.0%). Among these homosexually experienced heterosexual individuals, 87% indicated that their most recent same-gender experience occurred more than 1 year prior to interview. As shown in Table 1, sexual orientation was associated with several demographic characteristics including gender, Wald  $F(3, 2269) = 13.24, p < .001$ ; age, Wald  $F(3, 2269) = 6.47, p < .001$ ; non-Hispanic White race/ethnicity, Wald  $F(3, 2269) = 6.63, p < .001$ ; foreign birth, Wald  $F(3, 2269) = 3.22, p < .05$ ; educational attainment, Wald  $F(3, 2269) = 14.29, p < .001$ ; and marital/cohabiting status, Wald  $F(3, 2269) = 26.66, p < .001$ . Additionally, 28.2% (CI = 20.2%–36.2%) of bisexual and homosexually experienced heterosexuals were heterosexually married versus 0.4% of lesbian/gay-identifying individuals (CI = 0.0%–1.1%).

Prevalent HIV infection was reported by only 1.2% (0.2%) of the weighted Cal-QOL sample but was clearly related to factors associated with male homosexual sexual behavior. Approximately 22% (CI = 16.8%–29.4%) of gay men disclosed that they were HIV infected, as did 6.8% (CI = 2.2%–19.2%) of bisexual men and 7.7% (CI = 1.9%–27.1%) of homosexually experienced heterosexual men, Wald  $\chi^2(3) = 416.83, p < .001$ . Among women, only 2.9% (CI = 0.7%–11.9%) of bisexual women reported a prevalent HIV infection, Wald  $\chi^2(3) = 64.65, p < .001$ . No exclusively heterosexual individuals, lesbian women, or homosexually experienced heterosexual women reported current HIV infection.

### Is Sexual Orientation Associated With Psychological Distress and Probable Psychiatric Disorders?

Overall, 9.4% (CI = 8.0%–10.8%) of respondents were experiencing high levels of current psychological distress and 23%

Table 1  
Characteristics of Respondents in the California Quality of Life Survey by Sexual Orientation

Characteristic	Heterosexual (wt $n = 2,004$ )	Lesbian/Gay (wt $n = 150$ )	Bisexual (wt $n = 67$ )	Homosexually experienced heterosexual (wt $n = 51$ )
Gender***				
Female	52.8%	32.3%	57.0%	54.2%
Male	47.2%	67.7%	43.0%	45.8%
Age, $M$ years ( $SE$ )***	42.5 (0.4)	45.6 (0.6)	39.2 (1.2)	41.1 (1.4)
Race/ethnicity***				
Non-Hispanic White	53.6%	75.8%	72.1%	69.8%
Hispanic	31.3%	13.6%	10.2%	26.1%
Other	15.1%	10.6%	17.7%	4.0%
Foreign born*	30.8%	13.2%	11.7%	27.2%
Educational attainment***				
High school or less	38.5%	15.1%	26.3%	37.3%
Some college	27.4%	27.3%	26.9%	35.4%
College degree	18.7%	28.6%	25.4%	15.5%
Graduate school	15.4%	29.0%	21.4%	11.8%
Family income below 300% of federal poverty level	37.1%	23.1%	33.7%	44.6%
Married/cohabiting***	66.2%	42.3%	38.2%	61.0%
HIV infected***	0.0%	15.2%	4.6%	3.6%

Note. Unweighted sample size is 1,620 exclusively heterosexual individuals, 415 lesbian or gay respondents, 179 bisexual men and women, and 58 individuals who reported sex with a same-gender partner since age 18 but consider themselves heterosexual. Where relevant, percentages sum to 100% except for rounding error. Demographic differences were evaluated by multinomial logistic regression methods where all characteristics (gender, age, race/ethnicity, nativity, education, employment status, family income, and marital/cohabiting status) were considered simultaneously. Differences in HIV status were evaluated by a Wald chi-square test. wt = weighted.

\*  $p < .05$ . \*\*\*  $p < .001$ .

(CI = 21.0%–24.9%) met criteria for at least one of the five psychiatric disorders measured (see Table 2). As might be anticipated, there were significant associations among the seven indicators of psychological morbidity assessed in the survey.

Prevalence of high psychological distress varied by sexual orientation (see Table 3). Results revealed a higher rate of distress among those with a minority sexual orientation, compared to exclusively heterosexual individuals, after adjusting for possible demographic confounding (see Table 4). Sexual orientation-related differences were also present in analyses contrasting effects among men and women separately. In simultaneous individual contrasts of the three subgroups of sexual orientation minorities (lesbian/gay, bisexual, and homosexually experienced heterosexuals) to exclusively heterosexual persons, significantly higher prevalence was observed among lesbian/gay and bisexual individuals in comparison to exclusively heterosexual persons. In within-gender comparisons, these differences generally remained with two exceptions: Bisexual men in contrast to exclusively heterosexual men did not appear to differ in levels of high psychological distress, but homosexually experienced heterosexual men more frequently reported high distress in comparison to exclusively heterosexual men.

Prevalences of past-year probable psychiatric disorders also differed by sexual orientation such that persons reporting any markers of minority sexuality orientation were significantly more likely than exclusively heterosexual respondents to meet criteria for at least one disorder. This difference between individuals with minority sexual orientation and exclusively heterosexual persons was also present for all five disorders when evaluated individually.

In analyses contrasting the lesbian/gay, bisexual, and homosexually experienced heterosexual subgroups separately to exclusively heterosexual persons, the association between minority sexual orientation and psychiatric morbidity varied somewhat among the three sexual minority subgroups studied. Overall, all three sexual minority groups were more likely than exclusively heterosexual persons to meet criteria for at least one of the five disorders,

but the patterns of which disorders were more prevalent differed. Gay men and lesbians were significantly more likely to meet criteria for major depression, generalized anxiety disorder, and panic, but not the substance use-related disorders, when compared to exclusively heterosexual individuals. In contrast, bisexuals as a group were significantly more likely than exclusive heterosexuals to receive a probable diagnosis of major depression, generalized anxiety disorder, panic, and alcohol dependency. Homosexually experienced heterosexuals differed from exclusively heterosexual individuals in their prevalence of alcohol dependency and drug dependency but not in their relative risk for affective or anxiety disorders.

Separate estimates for men show that those with minority sexual orientation, when compared to exclusively heterosexual men, were more likely to meet diagnostic criteria for four of the five disorders measured as well as for the presence of at least one disorder. In comparisons of subgroups, gay men were more likely than exclusively heterosexual men to meet criteria for major depression, generalized anxiety disorder, and panic, whereas bisexual men evidenced greater prevalence of generalized anxiety disorder. Homosexually experienced heterosexual men showed higher risk for major depression, generalized anxiety disorder, alcohol dependency, and drug dependency when compared to exclusively heterosexual men.

Among women, those with minority sexual orientation were more likely to meet criteria for all disorders except drug dependency when compared to exclusively heterosexual women. But this varied by sexual orientation identity. Specifically, lesbians were more likely than exclusively heterosexual women to receive a positive diagnosis only for major depression. In contrast, bisexual women were more likely than exclusively heterosexual women to meet criteria for several disorders, including major depression, generalized anxiety disorder, panic, and alcohol dependency. Homosexually experienced heterosexual women differed from exclusively heterosexual women only in their greater prevalence of alcohol dependency.

Table 2

*Intercorrelations and Prevalences of Psychological Morbidity in the California Quality of Life Survey (Cal-QOL)*

Morbidity indicator	1-year probable psychiatric disorder						
	High 30-day psychological distress	Major depressive disorder	Generalized anxiety disorder	Panic attack	Alcohol dependency	Drug dependency	Any disorder
High 30-day psychological distress	—						
1-year probable psychiatric disorder							
Major depressive disorder	.34***	—					
Generalized anxiety disorder	.42***	.38***	—				
Panic attack	.23***	.25***	.27***	—			
Alcohol dependency	.08***	.11***	.12***	.10***	—		
Drug dependency	.09***	.11***	.15***	.10***	.26***	—	
Any disorder	.33***	.71***	.53***	.45***	.43***	.30***	—
<i>M</i> prevalence ( <i>SE</i> )	9.4% (0.7%)	13.2% (0.8%)	7.8% (0.6%)	5.8% (0.5%)	5.3% (0.5%)	2.7% (0.4%)	23.0% (1.0%)

*Note.* Unweighted sample size is 2,272 individuals. Psychiatric disorders were assessed by the Composite International Diagnostic Interview Short Form (CIDI-SF), with modification of the alcohol dependency disorder to include symptoms of physiological withdrawal. High psychological distress was estimated by Kessler Psychological Distress Scale (K10) scores of 15 or above. Weighted estimates are shown. Intercorrelations were estimated using Cramer's *V*. Bivariate associations were evaluated by chi-square tests.

\*\*\*  $p < .001$ .

Table 3

One-Year Prevalence of Probable Psychiatric Disorders and 30-Day Prevalence of High Psychological Distress by Gender and Sexual Orientation in the California Quality of Life Survey (Cal-QOL)

Morbidity indicator	Minority sexual orientation									
	Lesbian/Gay (wt n = 150)		Bisexual (wt n = 67)		Homosexually experienced heterosexual (wt n = 51)		All sexual orientation minorities (wt n = 268)		Exclusively heterosexual (wt n = 2,004)	
	%	SE	%	SE	%	SE	%	SE	%	SE
High 30-day psychological distress										
Men	11.9	2.7	14.6	5.8	25.1	11.7	14.4	2.8	7.0	1.0
Women	13.9	3.8	26.2	5.9	15.1	7.4	18.3	3.2	9.9	1.1
Total sample	12.6	2.2	21.2	4.3	19.7	6.8	16.1	2.1	8.5	0.8
1-year probable psychiatric disorder										
Major depressive disorder										
Men	21.5	3.2	15.7	6.0	30.7	10.8	21.8	2.9	8.7	1.1
Women	24.7	4.6	35.8	5.8	17.9	6.8	26.8	3.3	14.4	1.3
Total sample	22.5	2.6	27.2	4.2	23.8	6.2	23.9	2.2	11.7	0.8
Generalized anxiety disorder										
Men	15.4	2.9	15.6	5.9	15.8	7.9	15.5	2.5	5.9	0.9
Women	9.2	2.9	20.3	4.8	13.3	6.7	13.9	2.6	7.6	0.9
Total sample	13.4	2.2	18.3	3.7	14.5	5.1	14.8	1.8	6.8	0.6
Panic attack										
Men	8.2	2.2	4.6	3.0	5.5	4.0	7.2	1.7	3.0	0.6
Women	8.1	3.1	21.2	5.1	14.4	7.0	14.0	2.8	7.1	0.9
Total sample	8.2	1.8	14.1	3.3	10.3	4.3	10.1	1.5	5.2	0.6
Alcohol dependency										
Men	8.9	2.2	13.0	6.0	29.2	11.2	12.8	2.6	6.3	0.9
Women	4.7	2.2	12.8	4.0	15.0	6.3	9.9	2.2	2.8	0.6
Total sample	7.6	1.7	12.9	3.4	21.5	6.3	11.6	1.8	4.4	0.6
Drug dependency										
Men	4.1	1.7	5.6	3.8	14.8	10.6	6.0	2.2	2.8	0.6
Women	0.3	0.3	7.5	3.0	6.6	4.6	4.2	1.5	1.9	0.5
Total sample	2.9	1.1	6.7	2.4	10.3	5.6	5.2	1.4	2.3	0.4
Meets criteria for at least one disorder										
Men	36.9	3.7	36.3	7.6	61.8	12.0	40.6	3.5	18.2	1.5
Women	27.8	4.7	56.2	6.0	38.7	9.8	40.0	3.8	22.9	1.5
Total sample	34.0	3.0	47.6	4.8	49.3	8.0	40.3	2.6	20.7	1.1

Note. Weighted (wt) prevalences are shown. Unweighted sample size is 867 exclusively heterosexual women, 152 lesbians, 116 bisexual women, 35 homosexually experienced heterosexual women, 753 exclusively heterosexual men, 263 gay men, 63 bisexual men, and 23 homosexually experienced heterosexual men. Psychiatric disorders were assessed by the Composite International Diagnostic Interview Short Form (CIDI-SF), with modification of the alcohol dependency disorder to include symptoms of physiological withdrawal. High psychological distress was estimated by Kessler Psychological Distress Scale (K10) scores of 15 or above.

### What Is the Excess Morbidity Burden Attributable to Minority Sexual Orientation Status?

Estimates of PAR associated with minority sexual orientation suggest that if the risks for mental health and substance use morbidity among individuals with minority sexual orientation could be reduced to the levels of risk seen among exclusively heterosexual individuals, there would be a general reduction in psychological morbidity among adult Californians. Specifically, we estimate a reduction in morbidity of 10.6% (CI = 6.9%–14.4%) for high psychological distress, 8.5% (CI = 5.1%–11.9%) for major depression, 10.5% (CI = 5.7%–15.2%) for generalized anxiety disorder, 8.6% (CI = 3.5%–13.8%) for panic, 15.4% (CI = 9.0%–21.7%) for alcohol dependency, and 11.8% (CI = 3.4%–20.1%) for drug dependency. Overall, 1-year prevalence of individuals meeting criteria for at least one of these five disorders might be reduced among Californians by approximately 7.9% (CI = 5.5%–10.3%).

Restricting focus to men only, PAR estimates for risk differences associated with sexual orientation among men suggest possible reductions of 14.3% (CI = 7.7%–20.9%) for high psychological distress, 15.0% (CI = 8.3%–21.7%) for major depression, 15.8% (CI = 7.4%–24.2%) for generalized anxiety disorder, 14.6% (CI = 3.0%–26.7%) for panic, 15.8% (CI = 9.0%–22.7%) for alcohol dependency, 17.0% (CI = 6.4%–27.6%) for drug dependency, and 13.6% (CI = 9.6%–17.6%) for meeting criteria for at least one of the five disorders measured in the study. Analyses focusing on women revealed a somewhat smaller potential reduction in women's morbidity, except for alcohol dependency. Specifically, PAR estimates suggest a reduction of 8.0% (CI = 3.5%–12.5%) for high psychological distress, 4.9% (CI = 1.1%–8.6%) for major depression, 6.2% (CI = 1.0%–11.3%) for generalized anxiety disorder, 5.8% (CI = 0.8%–11.5%) for panic, 16.0% (CI = 3.5%–28.4%) for alcohol dependency, 6.5% (CI = 0.0%–19.0%) for drug dependency, and 4.4% (CI = 1.7%–7.2%) for meeting criteria for at least one disorder.

Table 4  
Sexual Orientation Differences in 30-Day Psychological Distress and Probable 1-Year Psychiatric Disorders in the California Quality of Life Survey (Cal-QOL)

Morbidity indicator	Minority sexual orientation subgroup							
	Sexual orientation minority		Gay		Bisexual		Homosexually experienced heterosexual	
	Adj RR	CI	Adj RR	CI	Adj RR	CI	Adj RR	CI
High 30-day psychological distress								
Men	2.19	1.35–3.57	1.98	1.16–3.37	2.07	0.92–4.64	2.78	1.16–6.69
Women	1.89	1.30–2.75	1.67	1.01–2.78	3.06	2.05–4.58	1.23	0.49–3.07
Total sample	2.01	1.48–2.74	1.83	1.26–2.65	2.75	1.85–4.09	1.76	0.93–3.31
1-year probable psychiatric disorder								
Major depressive disorder								
Men	2.26	1.56–3.27	2.23	1.49–3.34	1.51	0.70–3.24	3.58	1.96–6.56
Women	1.52	1.13–2.06	1.62	1.08–2.43	1.83	1.26–2.64	0.95	0.44–2.03
Total sample	1.79	1.41–2.27	1.91	1.43–2.55	1.78	1.27–2.49	1.58	0.95–2.63
Generalized anxiety disorder								
Men	2.34	1.49–3.68	2.28	1.38–3.79	2.32	1.05–5.15	2.58	1.01–6.64
Women	1.67	1.07–2.62	1.19	0.62–2.29	2.54	1.49–4.32	1.38	0.51–3.74
Total sample	1.99	1.45–2.74	1.85	1.25–2.73	2.46	1.58–3.85	1.79	0.90–3.56
Panic attack								
Men	2.22	1.16–4.24	2.66	1.32–5.35	1.23	0.32–4.83	1.85	0.43–8.01
Women	1.63	1.02–2.60	1.03	0.46–2.32	2.36	1.37–4.08	1.52	0.58–3.99
Total sample	1.80	1.22–2.65	1.70	1.04–2.80	2.13	1.26–3.58	1.59	0.70–3.58
Alcohol dependency								
Men	2.34	1.38–3.98	1.68	0.89–3.17	1.85	0.73–4.67	5.72	2.56–12.79
Women	2.95	1.54–5.64	1.73	0.64–4.85	3.02	1.38–6.60	4.05	1.55–10.56
Total sample	2.54	1.66–3.87	1.70	0.97–2.96	2.35	1.31–4.22	4.95	2.65–9.24
Drug dependency								
Men	2.46	0.93–6.49	1.91	0.71–5.12	1.64	0.39–6.84	5.70	1.15–28.17
Women	1.71	0.69–4.24	0.18	0.03–1.00	2.37	0.84–6.68	2.18	0.50–9.40
Total sample	2.13	1.03–4.39	1.38	0.57–3.35	2.08	0.91–4.78	3.67	1.07–12.56
Meets criteria for at least one disorder								
Men	2.13	1.65–2.74	1.94	1.47–2.52	1.68	1.14–2.44	3.33	2.13–5.19
Women	1.48	1.18–1.85	1.14	0.81–1.60	1.93	1.53–2.58	1.37	0.83–2.24
Total sample	1.73	1.44–2.07	1.58	1.26–1.96	1.78	1.45–2.26	1.87	1.37–2.55

Note. Partial results of multivariate analyses are shown. Estimates of sexual orientation-related prevalence risk ratios (RR) were derived using log-binomial regression methods contrasting sexual orientation minorities to exclusive heterosexuals and each of the three sexual orientation minority subgroups to exclusive heterosexuals in separate equations (exclusive heterosexuals were the reference group for all analyses shown). Prevalence risk ratios and their 95% confidence intervals (CI) are adjusted for gender, age, educational attainment, racial/ethnic background, family income, relationship status, and U.S. nativity. To obtain gender-specific estimates, a specified levels approach was employed while adjusting for age, educational attainment, racial/ethnic background, family income, relationship status, and U.S. nativity.

### Can Prevalent HIV Infection Explain the Greater Risk Observed Among Men?

Men reporting prevalent HIV infection evidenced the greatest levels of psychiatric morbidity burden when contrasted with sexual minority men who did not report HIV infection and exclusively heterosexual men (see Table 5). Across measures, the adjusted relative risk for psychiatric morbidity among HIV-infected men was 1.9 to 8.7 times that of exclusively heterosexual men. Although HIV-negative men with minority sexual orientation reported lower levels of burden, they were still more likely than exclusively heterosexual men to meet criteria for psychiatric outcomes measured. With the exception of panic and drug dependency, this elevated risk was statistically significant.

After restricting analyses to men who reported any markers of minority sexual orientation, we estimate that if HIV infection was eliminated from this subpopulation, then levels of high psychological distress might be reduced among men with minority sexual orienta-

tion by 17.4% (CI = 7.1%–27.7%), major depression by 19.8% (CI = 12.4%–27.1%), generalized anxiety disorder by 13.3% (CI = 4.4%–22.2%), and panic by 68.5% (CI = 56.3%–80.8%). The estimate for drug dependency is 42.0% (CI = 30.4%–53.4%), but given that sharing of drug paraphernalia is clearly a risk factor for acquiring HIV infection, the PAR estimate here may be misleading. For alcohol dependency, the adjusted risk estimate was actually somewhat lower (adjusted RR = 0.73, CI = 0.22–2.44). Hence, eliminating HIV infection would appear to have little potential for reducing alcohol-related morbidity among men with minority sexual orientation. Overall, we estimate that elimination of HIV infection in this subpopulation would reduce morbidity for meeting at least one of the five disorders measured by about 8.8% (CI = 4.4%–13.3%).

### Discussion

Assessing sexual orientation in population-based surveys is a relatively recent practice in the history of psychiatric epidemiology

Table 5

Associations of Self-Reported Prevalent HIV Infection and Sexual Orientation With 30-Day Psychological Distress and Probable 1-Year Psychiatric Disorders Among Men in the California Quality of Life Survey (Cal-QOL)

Morbidity indicator	Prevalence						Estimated relative risk <sup>a</sup>			
	Exclusively heterosexual (wt n = 948)		Sexual orientation minority				Sexual orientation minority			
			No HIV infection reported (wt n = 127)		HIV infection reported (wt n = 27)		No HIV infection reported		HIV infection reported	
%	SE	%	SE	%	SE	Adj RR	CI	Adj RR	CI	
High 30-day psychological distress	7.0	1.0	11.6	3.0	27.8	7.2	1.84	1.02–3.34	2.83	1.52–5.28
1-year probable psychiatric disorder										
Major depressive disorder	8.7	1.1	18.0	3.0	40.2	7.7	1.62	1.04–2.55	3.48	2.10–5.78
Generalized anxiety disorder	5.9	0.9	13.2	2.6	26.4	7.1	2.02	1.19–3.42	2.96	1.53–5.73
Panic attack	3.0	0.6	3.5	1.2	24.8	6.9	0.97	0.40–2.34	8.74	3.39–22.54
Alcohol dependency	6.3	0.9	13.5	2.9	9.5	5.0	2.50	1.41–4.45	1.91	0.61–6.05
Drug dependency	2.8	0.6	4.9	2.4	11.4	5.3	1.58	0.41–6.08	4.60	1.35–15.71
Meets criteria for at least one disorder	18.2	1.5	38.8	3.9	49.1	7.8	1.99	1.46–2.75	2.65	1.78–3.95

Note. Weighted (wt) prevalences and partial results of multivariate analyses are shown. Unweighted sample size is 753 exclusively heterosexual men (none reporting HIV infection), 288 men reporting markers of minority sexual orientation but no HIV infection, and 61 reporting both markers and prevalent HIV infection. Psychiatric disorders were assessed by the Composite International Diagnostic Interview Short Form (CIDI-SF), with modification of the alcohol dependency disorder to include symptoms of physiological withdrawal. High psychological distress was estimated by Kessler Psychological Distress Scale (K10) scores of 15 or above. Prevalence risk ratios (RR) and their 95% confidence intervals (CI) are adjusted for age, educational attainment, racial/ethnic background, family income, relationship status, and U.S. nativity.

<sup>a</sup> Referent is exclusively heterosexual men.

(Cochran, 2001). In early studies, most reported less than a decade ago, measurement of sexual orientation was often limited to ascertaining positive reports of same-gender sexual partners over varying time frames. Understandably, this approach generated a great deal of uncertainty as to whether initial observations of elevated risks were actually related to sexual orientation or were somehow confounded with sexual risk taking (Bailey, 1999). The concern was particularly relevant for studies where classification of bisexuality relied on reports of having two or more sexual partners of different genders, often within a 12-month period. The fact that the Cal-QOL both carefully measured sexual orientation and was designed through oversampling to produce stable estimates of sexual orientation minority subgroups provided a unique opportunity to investigate the robustness of the sexual orientation effect. Our findings, using measures of both identity and adult sexual behavior, confirm that minority sexual orientation, broadly defined, is associated with an elevated risk for common affective, anxiety, and substance use disorders for some members of this subpopulation. This greater risk is similar in magnitude to differences attributable to gender or age in national prevalence studies of major depression, anxiety disorders, and substance use disorders (Grant et al., 2008; Grigoriadis & Robinson, 2007; Kessler et al., 2003). Hence sexual orientation, normally unmeasured in psychiatric surveys, represents an important characteristic of individuals that shapes their risk for psychological morbidity. Indeed, we estimate that reducing the excess morbidity risk associated with minority sexual orientation would possibly result in a 5% to 11%

reduction in the current adult population burden of the disorders assessed in this study.

Our findings also demonstrate that the sexual orientation effect is heterogeneous within the subpopulation of individuals classified as having minority sexual orientation. This pattern of heterogeneity, however, is inconsistent with historical views of homosexuality as being, in and of itself, pathological (Terry, 1999). From this disavowed perspective (American Psychological Association, 1997), one might predict that greater degrees of homosexuality as indexed by both behavior and identification should be associated with increasing levels of psychopathology, but this does not appear to be the case. Instead, we observed that heterosexually identified men reporting lifetime histories of sex with other men evidenced greatest risk for psychological morbidity in comparison to exclusively heterosexual men. Also, as anticipated from other recent findings (Austin et al., 2008; Burgard et al., 2005; Drabble et al., 2005), we also found that bisexual women are a particularly vulnerable group for psychological morbidity among women with minority sexual orientation.

Why sexual orientation might be associated with greater risk in this manner is still not entirely clear, although our findings hint that multiple factors may be at work. As anticipated from previous community surveys that have lacked heterosexual comparison groups (Eller, 2006), in the current study HIV infection was strongly associated with psychological morbidity among men with minority sexual orientation, particularly for panic attacks. But at

the same time, HIV infection alone did not fully account for the elevated risk.

One commonly held view is that the greater morbidity risk seen in recent studies is a direct consequence of the harmful effects of antigay stigma, discrimination, and victimization (Austin et al., 2008; Corliss, Cochran, & Mays, 2002; Mays & Cochran, 2001; Mays, Cochran, & Roeder, 2004; Meyer, 2003). But whether social adversity is responsible for increasing risk irrespective of type of disorder is unclear. Elsewhere, research examining the harmful effects of racial discrimination has well documented that higher levels of perceived discrimination are associated with higher risk for psychological distress and internalizing disorders (Gee, Spencer, Chen, Yip, & Takeuchi, 2007; Kessler, Mickelson, & Williams, 1999). Therefore, one might anticipate that the harmful effects of gay-related stigma would be observed in regard to internalizing disorders. Indeed, the current study found fairly convincing evidence of elevated risk for distress, depression, and anxiety disorders among all but homosexually experienced heterosexual women when compared to exclusively heterosexual individuals.

But empirical evidence that perceived racial discrimination increases risk for externalizing disorders, such as substance dependency, is generally weaker (Borrell et al., 2007). Nearly a decade ago, Bailey (1999) suggested an additional basis for the elevation in psychiatric risk associated with minority sexual orientation status in studies that relied on classification of homosexuality by sexual behavior alone. He asserted that risk for some disorders may accrue from factors related to sexual experimentation rather than homosexuality per se. This hypothesis draws on the well-known interrelationships among higher levels of sensation seeking, risk taking, and alcohol and drug use disorders (Dick et al., 2008). In the current study, we find some evidence to support this perspective as well. Despite a higher risk for substance use dependency associated with minority sexual orientation, we observed that this effect was especially clustered among homosexually experienced heterosexuals and bisexual women, the former group perhaps more closely reflecting the risk-taking group identified by Bailey. Although sexual and substance use experimentation is a well-documented phenomenon among men of minority sexual orientation living in high gay density neighborhoods (Stall et al., 2001), our findings suggest that the greatest risk for substance use disorders may be among homosexually experienced individuals who do not identify as gay or lesbian. Indeed, in the current study, lesbians and gay men did not show significant elevation in prevalence of substance use dependency when compared to exclusively heterosexual individuals.

Several study limitations bear consideration in contextualizing the importance of the results reported here. First, the Cal-QOL sample was obtained by recontacting telephone numbers of anonymous respondents who participated in an earlier health surveillance study during which they had agreed to be called for additional health surveys. Thus individuals who were more likely to volunteer for health surveys and who maintained residential stability were more likely to participate in the Cal-QOL survey. Rates of psychiatric conditions may be somewhat biased downward for the total sample by this effect (Kessler et al., 2004). We also conducted this survey exclusively in California, a state with a relatively large gay population in comparison to other states (Carpenter & Gates, 2008). If California is a more benevolent envi-

ronment for lesbian, gay, and bisexual individuals and if the mental health morbidity indicators assessed in this study resulted from the harmful effects of social discrimination, then we may have underestimated the mental health disparities affecting this population. Second, HIV infection was determined by self-report and it is likely that some HIV-infected men were unaware of their infection status (Hays et al., 1997). The effect of this misclassification on rates of psychiatric disorders is unclear, but it is important to note that the HIV status difference reported here is confounded with knowledge of having a life-threatening condition. Third, although the current study did not directly assess reliability of the CIDI-SF measurements, prior research suggests that test-retest reliability of both a self-administered version (Gigantesco & Morosini, 2008) and the parent instrument on which the CIDI-SF is based (Andrews & Peters, 1998) is quite good. Nevertheless, the CIDI-SF does not determine if all symptoms occurring in the past year did so within the same time frame, a requirement for some of the diagnoses of interest here. Nor are individuals assessed on the full range of symptoms that can be used to meet criteria for a clinical diagnosis. Further, alternate, but more appropriate, diagnoses that might account for respondents' symptoms are not evaluated. For all of these reasons, the CIDI-SF renders probable diagnoses and our estimates of the prevalence of morbidity in the population lack the precision of a fully diagnostic interview. Fourth, we have used PAR here as a measure of excess fraction of cases associated with both prevalent HIV infection status and minority sexual orientation (Rothman & Greenland, 1998). To the extent that HIV infection resulted from increased risk associated with either earlier or recent mental health morbidity (Weiser, Wolfe, & Bangsberg, 2004), then the reduction of morbidity achievable by eliminating HIV infection from the population of gay/bisexual men is overestimated. Similarly, estimates of PAR are influenced by the population prevalence of the factor being considered. In the current study, our sample had a somewhat higher prevalence of sexual orientation minority status than what has been typically been observed in many population-based surveys to date (Sell, Wells, & Wypij, 1995), reflecting both our sampling methods and the detailed assessment of markers of sexual orientation identity and sexual behavior. If the true population prevalence of minority of sexual orientation is less than we observed here, then our estimates of PAR overstate the possible reduction in morbidity burden that could be achieved if the greater risk associated with minority sexual orientation were eliminated. In recent years, the prevalence of markers of homosexuality in general population surveys has shown some increase (Anderson & Stall, 2002; Mosher, Chandra, & Jones, 2005), but only further studies can provide definitive guidance on the characteristics and size of this understudied subpopulation.

In conclusion, after measuring sexual orientation with greater precision than the majority of previous studies and with more statistical power, we find confirming evidence that minority sexual orientation is, in fact, a risk indicator for psychiatric morbidity of similar import as other major demographic status characteristics. But at the same time, our findings indicate that the risk associated with minority sexual orientation is not homogeneously experienced within this heterogeneous population. In particular, among men prevalent HIV infection is a potent correlate of psychological morbidity. And the patterns of higher risk associated with minority sexual orientation among both men and women appear to vary by

internalizing versus externalizing disorders. It just may be that the higher morbidity risk seen here and in previous studies represents a summation of the effects of multiple etiologic factors that increase risks for lesbians, gay men, bisexual individuals, and other who have sex with same-gender sexual partners.

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### Correction to Séguin et al. (2004)

In the article “Cognitive-Neuropsychological Function in Chronic Physical Aggression and Hyperactivity,” by Jean R. Séguin, Daniel Nagin, Jean-Marc Assaad, and Richard E. Tremblay (*Journal of Abnormal Psychology*, 2004, Vol. 113, pp. 603–613), use of a weighted procedure within SAS PROC GLM inflated  $F$  statistics and underestimated standard errors that affected only conclusions from secondary analyses that were drawn about the specificity of working memory effects to physical aggression and hyperactivity. Analyses have been corrected through traditional unweighted computation of  $F$  statistics. Although physical aggression and hyperactivity remained negatively, significantly, and additively related to several neurocognitive tests, including working memory, the specific effects of physical aggression and hyperactivity on working memory after controlling for the shared variance between working memory and nonexecutive abilities are no longer significant (Pillai's trace for physical aggression  $< .08$  and for hyperactivity  $< .25$ ). Corrected results, tables, and figures are available from the authors upon request.

The last two sentences of the abstract should therefore read:

“In a second model controlling for IQ, General Memory, and test motivation, none of the three Working Memory tests (relevant to executive function) remained associated with physical aggression or hyperactivity. These results support an additive model but no specificity to executive function.”

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