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Title:

Psychiatric disorders, suicidality, and personality among young men by sexual orientation

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ABSTRACT

Personality and its potential role in mediating risk of psychiatric disorders and suicidality are assessed by sexual orientation, using data collected among young Swiss men (n=5875) recruited while presenting for mandatory military conscription. Mental health outcomes were analyzed by sexual attraction using logistic regression, controlling for five factor model personality traits and socio-demographics. Homo/bisexual men demonstrated the highest scores for neuroticism-anxiety but the lowest for sociability and sensation seeking, with no differences for aggression-hostility. Among homo/bisexual men, 10.2% fulfilled diagnostic criteria for major depression in the past 2 weeks, 10.8% for ADHD in the past 12 months, 13.8% for lifetime anti-social personality disorder (ASPD), and 6.0% attempted suicide in the past 12 months. Upon adjusting (AOR) for personality traits, their odds ratios (OR) for major depression (OR=4.78, 95% CI 2.81-8.14; AOR=1.46, 95% CI 0.80-2.65) and ADHD (OR=2.17, 95% CI=1.31-3.58; AOR=1.00, 95% CI 0.58-1.75) lost statistical significance, and the odds ratio for suicide attempt was halved (OR=5.10, 95% CI 2.57-10.1; AOR=2.42, 95% CI 1.16-5.02). There are noteworthy differences in personality traits by sexual orientation, and much of the increased mental morbidity appears to be accounted for by such underlying differences, with important implications for etiology and treatment.

Keywords: depression, ADHD, anti-social personality disorder, suicidality, personality, homosexuality

INTRODUCTION

There is a growing body of evidence pointing to higher prevalences and risk of mood disorders, anxiety disorders, and suicidality among sexual minorities when compared to heterosexuals in the general population [Plöderl et al., 2006; King et al., 2008]. The discrepancy is especially pronounced among men. Meta-analyses of psychiatric epidemiological surveys among the general population yield odds ratios (OR) of 2.5-3.0 for lifetime major depression, 12-month major depression, and 12-month suicide attempt and OR=4.3-5.0 for lifetime suicide attempt among gay/bisexual men.

Youth health studies have shown that the increased risk of suicidality and depression symptoms among sexual minorities is already evident during adolescence [Marshall et al., 2011]. Surveys in gay community samples have indicated that both homosexual developmental milestones—e.g., coming out—and psychiatric disorders / suicidality debut across childhood, adolescence, and young adulthood for most gay men [Wang et al., 2007; Wang et al., 2012], lending support to the timing hypothesis that the circumstances surrounding the former may provoke the latter in some people [Remafedi et al., 1991; Wichstrøm and Hegna, 2003]. Since adolescent health surveys tend to assess symptomology rather than actual psychiatric disorders, actual evidence of different risk by sexual orientation for the latter remains limited.

Comprehensive reviews of the scientific literature in depression [Corboz et al., 2008] and suicidality [Haas et al., 2011] list various socio-demographic, family/peer, and adverse life event factors which account for greater risk among sexual minorities. However, the potential role of personality and personality disorders is not mentioned. Among the general population, the scientific literature has pointed to links between personality traits and personality disorders [Costa and McCrae, 1990; Saulsman and Page, 2004; Trull, 2012] on the one hand and between both of them and Axis I clinical disorders and suicidality [Krueger, 2005; Savitz et al., 2006; Weinstock and Whisman, 2006; Huang et al., 2009; Kotov et al., 2010] on the other. Studies have quantified the relative influence of genetic and environmental factors in both personality traits and psychiatric disorders [Bouchard and McGue, 2003]. Recently, twin studies have suggested common genetic factors between sexual orientation and psychiatric disorders [Zietsch et al., 2012] on the one hand and personality [Zietsch et al., 2011] on the other, suggesting underlying vulnerability. In light of such findings, assessing the extent to which the

latter may help account for the former among sexual minorities may be particularly informative. With its robust framework of broad higher order traits spanning both normal and abnormal psychology as well as positive and negative emotionality, personality may help shed further light on the causes of psychiatric disorders and suicidality among gay men, with important implications for onset, course, and treatment [Savitz et al., 2006; Klein et al., 2011].

This paper addresses three psychiatric disorders in three different classes and suicide attempt as well as broad personality traits by sexual orientation. In addition to presenting 1) updated prevalences of major depression, suicide attempt, and ADHD by sexual orientation, it contributes novel findings to the scientific literature by presenting 2) prevalences and risk of anti-social personality disorder by sexual orientation and 3) population norms for five factor model personality traits by sexual orientation, and 4) by assessing the potential mediating role of personality traits on increased risk of psychiatric disorders and suicide attempt among homo/bisexual men.

METHODS

Sample

The Cohort Study on Substance Use Risk Factors (C-SURF) [Baggio et al., 2013] is a cohort study of Swiss male nationals recruited when presenting for evaluation of fitness for compulsory military or civil service. Besides using three of the six army recruitment centers to recruit a representative population sample covering 21 of the country's 26 cantons, the study team and data collection bear no connection with the armed forces. C-SURF was approved by the Ethics Committee for Clinical Research of the Lausanne University Medical School (Protocol No. 15/07). During baseline recruitment between August 2010 and November 2011, 13,245 men were informed about the study, 7,563 (57.1%) agreed to participate with written consent, and 5,990 (45.2% of those informed or 79.2% of those consenting) actually completed the baseline questionnaire.

Measures

The baseline questionnaire contains sections on socio-demographics, health, social context, substance use, personality and leisure activities, and sexuality. Within the sexuality section,

sexual orientation was assessed by one question on sexual attraction: “People feel different about sexual preferences. How do you feel yourself? Do you feel attracted A) only by women, B) mostly by women, C) equally by both women and men, D) mostly by men, or E) only by men?” 106 respondents (1.8%) did not complete the last part of the section on personality and leisure activities nor the subsequent final section on sexuality. Among those who completed the entire questionnaire, only 9 men (0.2%) did not respond to the question on sexual attraction, leaving a final sample of 5,875 men (98.1%) for these analyses.

The health and personality sections included the following mental health outcomes: quality of life, major depression, attention deficit hyperactivity disorder (ADHD), anti-social personality disorder (ASPD), and suicide attempt. The Medical Outcomes Study 12-Item Short Form Health Survey (MOS SF-12) [Ware et al., 1996] yields the mental health component summary (MCS) score, a measure of mental health status in the past 4 weeks, which is composed mainly of 6 items from 4 original sub-scales of the MOS SF-36: mental health, role-emotional, vitality, and social functioning. Major depression in the past 2 weeks was assessed using the 10-item Major Depression Inventory (MDI) [Bech et al., 2001]. Two scoring algorithms were used and reported here: 1) DSM-IV and 2) ICD-10 categories with mild, moderate, severe depression. ADHD in the past 12 months was assessed using the 6-item Adult ADHD Self-Report Scale Screener (ASRS-V1.1) [Kessler et al., 2005] from the WHO Composite International Diagnostic Interview (CIDI) [Kessler and Ustun, 2005]. Two scoring algorithms were used and reported here: 1) 0-6 scoring approach according to the Screener and 2) 0-24 scoring approach with four strata [Kessler et al., 2007]. Lifetime anti-social personality disorder (ASPD) was assessed with a 12-item instrument from the Mini International Psychiatric Interview (M.I.N.I.) [Sheehan et al., 1998]. Suicide attempt in the past 12 months was assessed with a single question adapted from the European School Survey Project on Alcohol and Other Drugs (ESPAD) [Kokkevi et al., 2012].

The personality and leisure activities section included items pertaining to four personality traits. In accordance with the alternative five-factorial model of personality [Zuckerman, 2002], neuroticism-anxiety, aggression-hostility, and sociability were each assessed with 10-item scales from the shortened Zuckerman-Kuhlman Personality Questionnaire (ZKPQ-50-cc) [Aluja et al., 2006]. Sensation seeking was measured using the 8-item Brief Sensation Seeking Scale

(BSSS) [Hoyle et al., 2002] which includes all 4 main facets: experience seeking, boredom susceptibility, thrill and adventure seeking, and disinhibition.

Statistical analysis

Data analysis was performed using IBM SPSS Statistics for Macintosh version 19.0 (Chicago, IL, USA). In initial analyses, all 5 original categories of sexual attraction were used in order to examine potential between-group differences. Contingency tables and the chi-square test were used to analyze nominal and ordinal variables. If any of the cells is less than 5, the Fisher's exact test is used. Continuous variables were analyzed using ANOVA with Tukey's test to correct for multiple pairwise comparisons at $p < 0.05$. Cohen's d are calculated using means and standard deviations (SD). According to Cohen [1988], 0.10 indicates a small effect size, 0.30 a medium effect size, and 0.50 a large effect size. Crude and adjusted odds ratios (OR/AOR) and 95% confidence intervals (CI) were calculated using logistic regression models for each of the main mental health outcomes separately, taking men who reported being attracted only to women as the reference category. In the first-stage models, sexual orientation was entered alone with a mental health outcome. In the second-stage models, sexual orientation was entered with a mental health outcome, whilst controlling for all socio-demographic variables. In the third-stage models, sexual orientation was entered with a mental health outcome, whilst controlling for all four personality traits. Nagelkerke r^2 are reported in the text.

Given interesting patterns between the 5 categories of sexual orientation for both mental health and personality, the findings are reported in the tables at this level. However, the pattern of statistical differences suggests the presence of three distinct groups: A) men who reported being attracted only to women, B) men who reported being attracted mostly to women, and C-E) men who reported being attracted equally, mostly, or only to men. As such, all analyses were repeated with the independent variable sexual orientation in 3 categories. These findings are also reported in the results section.

RESULTS

In this sample of young Swiss men, 91.4% of the respondents reported being attracted only to women (A). The remainder 8.6% reported any same-sex attraction: 5.6% reported being

attracted mostly to women (B), 1.1% equally to both women and men (C), 0.7% mostly to men (D), and 1.1% only to men (E). All told, 3% fall into the homo/bisexually attracted group—hereafter "homo/bisexual men"—consisting of the three lattermost groups (C, D, E).

Table 1 shows the socio-demographic characteristics of the sample by sexual orientation. Men who reported being attracted only to men were significantly more likely to have completed secondary education or higher (73.8%) and to be currently pursuing university studies (19.4%) than all other groups. Men from German-speaking Switzerland are somewhat over-represented among men who reported being attracted equally to both men and women and under-represented among men attracted mostly or only to men.

Personality by sexual orientation

Table 2 lists mean personality scores by sexual orientation, with a summary of statistically significant differences in pair-wise comparisons. The four personality traits exhibit different patterns along sexual orientation. Not only does neuroticism-anxiety increase along exclusivity of same-sex orientation, but the mean score for the homo/bisexual groups combined is a full standard deviation higher than that of the men who reported being attracted only to women (3.90 vs. 1.87, $p < 0.001$, Cohen's $d = -1.05$). There are no significant differences between any of the groups for aggression-hostility. Men who reported being attracted only to women demonstrate the highest scores on sociability. Men who reported being attracted only or mostly to women demonstrate significantly higher sensation seeking than the two main homo/bisexual groups, due to differences in the facets of 1) thrill and adventure seeking and 2) disinhibition. The mean scores for the homo/bisexual groups combined are: neuroticism-anxiety ($A < B < 3.90$, $p < 0.001$), aggression-hostility (4.23, ns), sociability ($A > 4.99$, $p < 0.001$), and sensation seeking ($AB > 2.83$, $p < 0.01$).

Mental health status by sexual orientation

In Table 3, the SF-12 mental health component summary score (MCS) and individual facet scores decrease along exclusivity of same-sex orientation. The MCS is calculated to have a mean of 50, and the mean scores of groups B and C are nearly half a standard deviation from the mean of group A (Cohen's $d = 0.36-0.46$) whereas those of groups D and E are almost one full standard deviation from the mean of group A (Cohen's $d = 0.66-0.80$). Men who reported

being attracted only to women demonstrate significantly better scores than all same-sex attracted groups. In turn, men who reported being attracted mostly to women demonstrate significantly higher scores (with the exception of vitality) than the homo/bisexual groups (C-E) combined: mental health status ($A > B > 44.9$, $p < 0.01$), mental health ($A > B > 63.2$, $p < 0.01$), role emotional ($A > B > 73.0$, $p < 0.01$), vitality ($A > 59.6$, $p < 0.001$), and social functioning ($A > B > 72.2$, $p < 0.01$).

Psychiatric disorders and suicide attempts by sexual orientation

Table 3 also shows mean scores for major depression in the past 2 weeks and ADHD in the past 12 months. Men who reported being attracted only to women demonstrate significantly lower mean scores for major depression than all other groups. In turn, men who reported being attracted mostly to women demonstrate significantly lower mean scores than the homo/bisexual groups (C-E) combined (9 vs. 12, $p < 0.001$, Cohen's $d = -0.32$). Men who reported being attracted only to women also demonstrate the lowest mean score for ADHD ($A < 6.64$, $p = 0.001$).

The prevalences of the three psychiatric disorders and suicide attempt are shown in Table 4. For major depression in the past 2 weeks, the results from two scoring algorithms are shown: 1) DSM-IV and 2) ICD-10. In both instances, men who reported being attracted only to women demonstrate the lowest prevalence (2.3% according to DSM-IV or 6.4% according to ICD-10), and men who reported being attracted mostly to men demonstrate the highest prevalence (17.1%) according to DSM-IV and men who reported being attracted only to men the highest prevalence (23.2%) according to ICD-10. The homo/bisexual groups (C-E) have a combined prevalence of 10.2% (95% CI=5.6-14.8%) according to DSM-IV and 20.4% (95% CI=14.3-26.5%) according to ICD-10.

Similarly, the results from two scoring algorithms are shown for ADHD in the past 12 months: 1) the 0-6 scoring approach and 2) the 0-24 scoring approach with four strata. In both instances, men who reported being attracted only to women demonstrate the lowest prevalence (5.3% according to the 0-6 scoring approach or 3.7% according to the 0-24 scoring approach). Men who reported being attracted only to men demonstrate the highest prevalence (16.1%) according to the 0-24 scoring approach, and men who reported being attracted mostly to men the highest prevalence (12.2%) according to the 0-6 scoring approach. The homo/bisexual

groups (C-E) have a combined prevalence of 10.8% (95% CI=6.1-15.5%) according to the 0-6 scoring approach and 9% (95% CI=4.7-13.3%) according to the 0-24 scoring approach.

Men who reported being attracted mostly to women demonstrate the highest prevalence of lifetime anti-social personality disorder (ASPD), significantly higher than those of men attracted only to women and the homo/bisexual groups (C-E) combined 13.8% (95% CI=8.6-19.0%).

All told, 6% (95% CI=2.4-9.6%) of the men in the homo/bisexual groups (C-E) attempted suicide in the past 12 months, with the highest percentage among men who reported being attracted equally to both men and women.

Table 5 shows the crude and adjusted odds ratios (OR/AOR) for each of the three psychiatric disorders and suicide attempt, with and without controlling for the four personality traits. While different socio-demographic variables were associated independently with each of the four outcomes, controlling for them in the models did not alter the odds ratios (results not shown). In contrast, controlling for personality traits had a large impact on three of the four mental health outcomes. The Hosmer-Lemeshow test for all the models are well above 0.05, suggesting that the estimates fit the data and that the models work. Various tests (tolerance and Variance Inflation Factor (VIF)) reveal no suggestion of any collinearity between mental health outcomes and personality traits.

For major depression in the past 2 weeks (according to DSM-IV), the homo/bisexual groups (C-E) have significant crude odds ratios ranging from 2.81-8.69, but upon controlling for personality, the AOR fall towards parity for all groups, and increased risk remained only among men who reported being attracted mostly to men (AOR=3.31, 95% CI=1.26-8.28). Taken together, the homo/bisexual groups (C-E) have a crude OR of 4.78 (95% CI=2.81-8.14) which loses significance upon controlling for personality (AOR=1.46, 95% CI=0.80-2.65). Neuroticism-anxiety is the only significant personality variable in the model ($\exp(B)=1.65$, $p<0.001$), with r^2 of 0.20.

For ADHD in the past 12 months (according to the 0-6 scoring approach), men who reported being attracted mostly to women and men who reported being attracted only to men have

significantly higher crude OR for ADHD than the reference group. Upon inclusion, all four personality traits are significant in the model—the strongest being sensation seeking ($\exp(B)=1.59$, $p<0.001$)—and the AOR for sexual orientation lose statistical significance. The homo/bisexual groups (C-E) combined have a crude OR of 2.17 (95% CI=1.31-3.58) which loses significance upon controlling for personality (AOR=1.00, 95% CI=0.58-1.75).

Lifetime anti-social personality disorder (ASPD) is unique in several ways. First, it is the only condition whereby some of the homo/bisexual groups demonstrate lower (but not statistically significant) crude OR than the reference group. The homo/bisexual groups (C-E) combined have a crude OR of 0.84 (95% CI=0.54-1.32) and an AOR of 0.82 (95% CI=0.50-1.34). Second, although all four personality traits are significant in the adjusted model—the strongest being sensation seeking ($\exp(B)=2.33$, $p<0.001$), with r^2 of 0.20—the AOR remain largely unchanged. Men who reported being attracted mostly to women demonstrate significantly greater risk of ASPD with crude and adjusted OR of 1.87.

For suicide attempt in the past 12 months, the crude odds ratios resemble those for major depression in the past 2 weeks, except that the eightfold risk is found among men who reported being attracted equally to men and women. After introducing personality traits into the model, both neuroticism-anxiety and aggression-hostility remain significant, and all the AOR lose statistical significance, except for men who reported being attracted equally to both men and women (AOR=4.35, 95% CI=1.72-11.0). Together, the homo/bisexual groups (C-E) have a crude OR of 5.10 (95% CI=2.57-10.1) and an AOR of 2.42 (95% CI=1.16-5.02).

DISCUSSION

Men who reported same-sex attraction demonstrate poorer mental health. Indeed, the findings from C-SURF baseline data confirm the higher prevalences and risk of major depression, suicide attempt, and ADHD among gay/bisexual men in Switzerland and elsewhere. Population prevalences of anti-social personality disorder have been presented for the first time by sexual orientation, with evidence of higher risk in a group reporting some same-sex attraction. There are also striking differences in three out of the four personality traits examined. Importantly,

much of the increased risk for mental morbidity among sexual minorities may be accounted for by underlying differences in personality traits.

Psychiatric disorders and suicide attempts

The mean scores for mental health status in the past 4 weeks are consistent with those found among a community sample of gay men in the 2011 Geneva Gay Men's Health Survey (GGMHS) [Wang et al., 2013]. This suggests that recent mental health status reported by gay men are evidenced already among young homo/bisexual men, at levels meaningfully different from their heterosexual counterparts, and for all facets measured—i.e., young homo/bisexual men experience higher psychological distress and lower levels of vitality and psycho-social functioning.

The 2-week prevalence of major depression in the three homo/bisexual groups cannot be compared directly to the 12-month prevalence rates reported in most surveys, but the crude odds ratios in this sample are higher than those found in general population studies [Plöderl et al., 2006; King et al., 2008; Chakraborty et al., 2011]. Findings from GGMHS suggest that this age group is particularly affected, since the onset of depression occurs during adolescence for most men [Wang et al., 2007], and 12-month prevalence (33%) peaks in the 16-20 year old age group [Wang et al., 2013].

Three different probabilistic surveys in Switzerland from 2002 yielded 12-month percentages of suicide attempts ranging widely from 3.1-17.1% but consistent OR of 2 for most forms of suicidality among homo/bisexual men aged 16-20 years [Wang et al., 2012]. In 2011, 7% of the 16-20 year old age group in both GGMHS and C-SURF reported a suicide attempt in the past 12 months [Wang et al., 2012; Wang et al., 2013]. But as with major depression, the crude OR found in this sample is twice those seen in the scientific literature to date, resembling the OR of 5 for lifetime suicide attempt in Switzerland [Wang et al., 2012] and elsewhere [Plöderl et al., 2006; King et al., 2008].

Whereas much of the existing evidence to date shows that gay men have higher risk of internalizing disorders such as mood and anxiety disorders [Sandfort et al., 2001; Chakraborty et al., 2011], our findings show that some groups of men reporting same-sex attraction also

demonstrate higher risk of ADHD [Frisell et al., 2010] and ASPD, externalizing conditions which are much more common among men than women.

Recently, studies have begun reporting differences in mental health outcomes within homo/bisexual groups among both adults [Bostwick et al., 2010] and adolescents [Robinson and Espelage, 2011], and there has been a growing tendency to report findings for same-sex attraction groups individually [Lindley et al., 2012]. For mental health and personality, the C-SURF data support three distinct categories of sexual attraction, including a “mostly heterosexual” category. In fact, the creation a single group with any same-sex attraction (B-E) would dilute more pronounced differences between heterosexual men (A) and the three homo/bisexual groups (C-E). There is a 10-point span in prevalence estimates between the three homo/bisexual groups for each of the mental health outcomes examined. Although these differences are not statistically significant (perhaps due to sample size limitations), it is noteworthy that the highest prevalences do not cluster in a single group, but are spread across each of the same-sex attracted groups. Of note, such large discrepancies were not apparent in the 2002 Swiss adolescent surveys for suicidality [Wang et al., 2012]. As such, a decade’s worth of Swiss findings cannot support the conclusion that intermediate categories (B-D) present the highest mental morbidity [Loosier and Dittus, 2010].

Furthermore, the implications of such group differences remain unclear. Although one tendency has been to solidify the existence of the bisexual, mostly heterosexual, and mostly homosexual groups [Vrangalova and Savin-Williams, 2012], evidence from cohort studies shows that the intermediate categories are particularly fluid in late adolescence and young adulthood, with more than 50% attrition between waves [Ott et al., 2011; Savin-Williams et al., 2012]. As such, these intermediate groups may be subject to changes in coming to terms with and comfort reporting stigmatized homosexuality as much as actual changes in attraction. Birth cohort data have shown that the percentage of men reporting either any or exclusively same-sex attraction and identity increases significantly with age [Dickson et al., 2013]. New evidence suggests that the actual process of changing towards—but not away from—(reporting) same-sex attraction is associated with the greatest health risks [Everett, 2012], lending further support to the importance of stigma and homosexual developmental milestones such as coming out and the psycho-social conditions accompanying them [Remafedi et al., 1991; Wichstrøm and Hegna,

2003; Wang et al., 2014]. Future waves of C-SURF may permit corroboration using European cohort data.

Personality

C-SURF has collected the first personality profile for a representative sample of men in Switzerland and has also provided the first population norms for five factor model personality traits by sexual orientation anywhere in the world. Although assessments from the early 1960s already suggested higher neuroticism among homosexual men [Wells and Schofield, 1972], the intersection between personality and sexual orientation has not been widely researched in recent decades. Lippa has repeatedly demonstrated somewhat higher neuroticism (akin to neuroticism-anxiety), somewhat higher agreeableness (akin to aggression-hostility), and no differences along extraversion (akin to sociability) among adult gay men [Lippa, 2005; Lippa, 2008] in multiple convenience samples, whereas our findings show large differences in neuroticism-anxiety (Cohen's $d=-0.86$ for all three homo/bisexual groups combined vs. the reference group), moderate differences in sociability (Cohen's $d=0.43$ for all three homo/bisexual groups combined vs. the reference group) by sexual orientation, and no differences in aggression-hostility.

As such, these findings can only confirm the directionality of higher neuroticism, but not Lippa's over-arching conclusion of gender shift among homo/bisexual men—i.e., heterosexual-homosexual differences in personality traits mirror male-female differences with homo/bisexual men shifted towards a female personality profile [Lippa, 2005; Lippa, 2008]. A twin study also failed to support gender shift, finding higher neuroticism and psychoticism among both non-heterosexual men and women [Zietsch et al., 2011]. With the exception of men who reported being predominantly attracted to women, our findings confirm that personality factor scores are largely indistinguishable between gay men and bisexual men [Lippa, 2005; Lippa, 2008]. Still, just as education and cultural/linguistic region both appear to play some role in the declaration of one's sexual attraction in this age group, personality traits may also play a role in how sexual orientation is expressed—e.g., higher experience seeking among men who reported being predominantly attracted to women compared to their exclusively heterosexual counterparts.

Just as personality traits have been shown to differ consistently by sex [Costa et al., 2002; Schmitt et al., 2008] and country [Schmitt et al., 2007], this study further underscores important differences by sexual orientation which merit further investigation. Just as personality has been posited as a possible explanation for sex and national differences in mental morbidity, these findings demonstrate that controlling for personality traits slashes risks by half, with most associations of increased risk among homo/bisexual groups losing statistical significance. Indeed, personality has been linked to depression [Klein et al., 2011], ADHD [Nigg et al., 2002; Parker et al., 2004], personality disorders [Saulsman and Page, 2004; Trull, 2012], and suicidality [Savitz et al., 2006]. Even with sexual orientation in the models, personality traits continue to demonstrate a large effect on major depression and ASPD and a medium effect on ADHD and suicide attempt, with individual traits demonstrating different impact for different conditions as demonstrated or surmised in the literature.

The interpretation of these findings must be viewed against open questions in the scientific field of personality at large. In terms of the literature linking personality and psychiatric disorders, three basic mechanisms have been posited—1) traits influence disorders (vulnerability and pathoplasty models), 2) disorders influence traits (scar and complication models), and 3) common cause model for traits and disorders—all of which have some empirical support even though the actual mechanisms still need to be elucidated [Kotov et al., 2010]. Consistent with most work to date, our analyses take the first mechanism of traits influencing disorders as its theoretical underpinning even though it must be noted that the analysis of baseline data precludes actual inferences of causality. If traits influence the onset and/or progression of disorders, controlling for that effect may help explain the discrepancies in mental morbidity by sexual orientation. Indeed, the present findings suggest that this mechanism may account for most of the increased risk associated with sexual orientation for 3 out of the 4 mental health outcomes examined, constituting evidence that a vulnerable personality profile contributes to actual psychiatric morbidity among sexual minorities [Zietsch et al., 2011].

However, can personality traits be measured free of current state? Actual measurements of personality traits have been shown to vary with mood state [Katz and McGuffin, 1987], so as in the second mechanism, high levels of current depressive mood, for example, may be responsible in part for high scores in neuroticism-anxiety among homo/bisexual men. By

extension, can adverse life events influence personality traits? The research here is equivocal, but findings suggest a feedback loop whereby life events can influence personality traits which in turn influence life events [Middledorp et al., 2008; Cobb-Clark and Schurer, 2012]. For this sample, it would mean that stressful life events around inter-personal conflict due to stigma/discrimination and homosexual developmental milestones [Wang et al., 2014] may indeed shape personality but also how subsequent life events are experienced—e.g., as adverse or not.

As for the third mechanism of common cause, family and twin studies suggest an important genetic component in both personality traits and psychiatric disorders [Bouchard and McGue, 2003], and a recent meta-analysis suggests that some of the genetic and/or environmental factors are likely shared [Kotov et al., 2010]. Such findings may spur new models of personality and psychopathology which would better account for phenomena such as high psychiatric comorbidity [Krueger, 2005]. Twin studies have also suggested shared familial factors—both genetic and environmental—between sexual orientation and psychiatric disorders [Frisell et al., 2010; Zietsch et al., 2012] as well as overlapping genetic factors between sexual orientation and personality [Zietsch et al., 2011]. Such findings may similarly spur new thinking in the field of sexual minority health, at the very least underscoring the relevance of familial/genetic factors and personality which have largely been ignored to date. While there are some plausible psychobiological mechanisms [Zietsch, 2011], it is unclear 1) whether there is in fact a three-way overlap between sexual orientation, psychiatric disorders, and personality, 2) what those precise genetic factors are, and 3) what the specific mechanisms of causation would be. It must be noted that these findings on genetic factors are accompanied by findings which show that environmental factors account for just over half of the variation between sexual orientation and psychiatric disorders [Zietsch et al., 2012] and between sexual orientation and personality [Zietsch et al., 2011].

Limitations

As for sampling, a mini-questionnaire among 94% of young men informed about the study permitted quantification of non-response bias by socio-demographics and substance use [Studer et al., 2013], with heaviest users least likely to participate in the full study at baseline. Since such users are more likely to be comorbid with mental disorders and demonstrate a specific

personality profile, the values presented here should be considered conservative. The sampling procedure recruited men as they presented for fitness assessment, thereby including most men subsequently declared unfit for military service and all men opting for civil service. While this increases the chances of including homosexual men in this sample, the extent to which actual self-reporting of health status may be influenced by sexual orientation remains unknown.

A conscious effort was made to limit the number of variables, and while the number of distinct variables included in this paper cannot be considered high, there may be Type 1 error due to multiple comparisons. A conscious effort was also made to limit the number of bivariable statistical tests, and findings with ANOVA are corrected for multiple comparisons. While a Bonferroni correction across all analyses would correct for Type 1 error, such a conservative approach may also mask associations worthy of consideration.

There are also noteworthy limitations in the questionnaire. First, the selection of the mental health outcomes and personality traits was determined in large part by interests in substance use. As such, some disorders of general and particular interest in sexual orientation were not assessed. Even so, prevalence estimates for anti-social personality disorder could be presented by sexual orientation for the very first time. Second, even though valid instruments were chosen for assessment of possible caseness, the time frames of the mental health outcomes were not consistent. Third, only four factors in a five factor model of personality were included. The only factor not assessed directly is activity which has been shown to load onto a single factor with sociability [Aluja et al., 2004]. While such five factor models offer the broadest and empirically robust coverage of general personality functioning [Krueger, 2005; Kotov et al., 2010], they do not cover the entire spectrum of personality models or traits.

Along these lines, the assessment of suicidality was very limited in the baseline assessment. Given the salience of suicidality among young men, it would be valuable to have data on both lifetime and 12-month suicide attempt and suicidal ideation as well as follow-up questions on help-seeking and severity. Sexual orientation was assessed by a single question on sexual attraction, albeit with negligible non-response. Similar longitudinal surveys assess all three main dimensions of sexual orientation: sexual attraction, sexual behavior, and sexual identity [Fergusson et al., 2005; Bostwick et al., 2010; Savin-Williams et al., 2012; Dickson et al., 2013].

As such, it is possible to assess the developments and changes in sexual orientation and their relationship to health outcomes. Given the age of C-SURF respondents, it is particularly appropriate to include additional questions on sexual identity and coming out.

Conclusions

Consistent with self-reported age of onset [Wang et al., 2007; Wang et al., 2012], these findings present clear evidence of increased psychiatric morbidity among homo/bisexual men already in late adolescence and early adulthood. In fact, anti-social personality disorder can be added to the long list of psychiatric disorders whereby sexual orientation appears to be relevant. These findings also reveal that differences in specific psychiatric syndromes are accompanied by differences in underlying personality traits along sexual orientation. Although various interpretations are possible given current understanding, psychiatric disorders alone do not and cannot present the whole picture of mental health nor account for the increased risk evidenced among sexual minorities. Rather, it may be informative to also take a deeper level of psychology—e.g., general personality functioning—into account. Consistent with self-reported causes of major depression [Wang et al., 2014] and suicide attempt [Wang et al., submitted] among gay men, recent evidence from twin studies [Frisell et al., 2010; Zietsch et al., 2012], and general theories of personality [Costa and McCrae, 1994], environmental factors appear to interact with “basic tendencies” of personality to render some individuals more/less prone to mental disorder [Duggan et al., 2003]. Although largely ignored in the sexual minority health literature to date, personality may help explain why some gay/bisexual men succumb to mental morbidity whereas others do not in the face of challenging environmental stressors. As such, personality may merit greater attention in the study of psychiatric morbidity and suicidality among sexual minorities as potential factors accounting not only in part for the higher prevalence and risk but perhaps also for early onset, chronicity, and co-morbidity evidenced in this population. Personality also points to the potential relevance of personality disorders which have not been studied systematically among sexual minorities. Both personality and personality disorders suggest that clinical treatment of specific Axis I disorders in such populations may need to be accompanied by assessment and treatment of underlying and long-standing psychological vulnerability for improved therapeutic outcomes.

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CONFLICTS OF INTEREST

None.

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Table 1. Socio-demographic characteristics among young Swiss men by sexual orientation (attraction), C-SURF 2010-11

	A only attracted to women (n=5371)		B predominantly attracted to women (n=337)		C attracted to both men and women (n=64)		D predominantly attracted to men (n=41)		E only attracted to men (n=62)	
	% or M	n or SD	% or M	n or SD	% or M	n or SD	% or M	n or SD	% or M	n or SD
Age (mean/SD)	20.0	1.22	20.1	1.31	19.8	1.05	19.6	1.00	20.4	1.37
Education (highest completed)										
Primary (ISCED 1-2)	50.5	2658	48.5	159	58.1	36	51.2	21	26.2	16
Secondary (ISCED 3-4)	47.9	2522	50.3	165	41.9	26	46.3	19	67.2	41
Tertiary (ISCED 5-6)	1.6	82	1.2	4	0.0	0	2.4	1	6.6	4
Education (current)										
University	7.3	390	10.1	34	9.4	6	7.3	3	19.4	12
Family income										
Below average	14.3	765	17.0	57	18.8	12	14.6	6	16.1	10
Average	41.4	2216	36.9	124	39.1	25	46.3	19	33.9	21
Above average	44.3	2367	46.1	155	42.2	27	39.0	16	50.0	31
Linguistic region										
German-speaking Switzerland	45.4	2436	46.0	155	53.1	34	39.0	16	30.6	19
French-speaking Switzerland	54.6	2935	54.0	182	46.9	30	61.0	25	69.4	43
Urbanicity										
Rural	32.8	1749	32.5	108	28.6	18	30.0	12	25.8	16
Agglomeration	45.8	2443	45.2	150	49.2	31	42.5	17	50.0	31
City	21.4	1140	22.3	74	22.2	14	27.5	11	24.2	15

mean (M) and standard deviation (SD)
International Standard Classification of Education (ISCED)

Table 2. Personality trait scores among young Swiss men by sexual orientation (attraction), C-SURF 2010-11

Personality	A only attracted to women (n=5371)		B predominantly attracted to women (n=337)		C attracted to both men and women (n=64)		D predominantly attracted to men (n=41)		E only attracted to men (n=62)		Statistical significance
	M	SD	M	SD	M	SD	M	SD	M	SD	
Neuroticism-anxiety (0-10)	1.87	1.90	2.69	2.13	3.64	2.60	3.66	2.97	4.34	2.73	A<B<CDE*
Aggression-hostility (0-10)	4.19	2.23	3.99	2.12	4.25	2.27	4.41	2.49	4.10	2.12	ns
Sociability (0-10)	5.95	2.20	5.11	2.34	4.97	2.47	5.17	2.19	4.89	2.31	A>BCE**
Sensation seeking (1-5)	3.05	0.87	3.16	0.92	2.76	0.94	3.11	0.92	2.72	0.90	AB>E*, B>C**
Experience seeking (1-5)	3.40	1.16	3.61	1.19	3.18	1.37	3.63	1.27	3.24	1.15	A<B*
Boredom susceptibility (1-5)	2.90	1.02	3.03	1.09	2.85	1.01	3.15	0.94	2.85	1.12	ns
Thrill and adventure seeking (1-5)	2.97	1.19	2.94	1.16	2.26	1.23	2.80	1.20	2.24	1.17	AB>CE***
Disinhibition (1-5)	2.95	1.07	3.06	1.14	2.75	1.11	2.87	1.11	2.55	1.08	AB>E*

mean (M) and standard deviation (SD)

NB: multiple pair-wise comparisons with Tukey's test correction in ANOVA, with highest significant p value indicated—i.e., * p<0.05, ** p<0.01, *** p<0.001, ns = not significant

Table 3. Mental health status and psychiatric disorder scores among young Swiss men by sexual orientation (attraction), C-SURF 2010-11

	A only attracted to women (n=5371)		B predominantly attracted to women (n=337)		C attracted to both men and women (n=64)		D predominantly attracted to men (n=41)		E only attracted to men (n=62)		Statistical significance
	M	SD	M	SD	M	SD	M	SD	M	SD	
Mental health status (in the past 4 weeks; 0-100)	49.9	8.44	46.6	9.63	46.1	8.14	43.1	11.2	42.4	10.2	A>BCDE**, B>E**
Mental health (0-100)	73.9	16.0	68.1	17.9	65.5	16.1	61.9	19.6	61.7	16.5	A>BCDE***, B>E*
Role-emotional (0-100)	85.8	20.1	79.3	21.5	77.3	21.6	69.5	30.5	70.8	25.1	A>BCDE**, B>DE*
Vitality (0-100)	65.4	20.0	60.1	20.9	61.3	20.4	59.1	20.0	58.1	20.6	A>BE*
Social functioning (0-100)	85.0	20.8	79.1	23.2	75.4	22.9	70.7	29.5	69.8	26.8	A>BCDE**, B>E*
Major depression (in the past 2 weeks; 0-60)	6.75	6.89	9.00	7.77	10.8	9.39	13.4	12.9	12.2	10.5	A<BCDE***, B<DE*
ADHD (in the past 12 months; 0-24)	5.48	4.25	6.75	4.67	5.97	4.66	6.76	5.32	7.26	4.59	A<BE*

mean (M) and standard deviation (SD)

NB: multiple pair-wise comparisons with Tukey's test correction in ANOVA, with highest significant p value indicated—i.e., * p<0.05, ** p<0.01, *** p<0.001

Table 4. Prevalence of psychiatric disorders and suicide attempts among young Swiss men by sexual orientation (attraction), C-SURF 2010-11

	A only attracted to women (n=5371)		B predominantly attracted to women (n=337)		C attracted to both men and women (n=64)		D predominantly attracted to men (n=41)		E only attracted to men (n=62)		Statistical significance
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	
Major depression (in the past 2 weeks, DSM-IV)	2.3	(1.9-2.7)	3.6	(1.6-5.6)	6.3	(0.3-12.3)	17.1	(5.6-28.6)	9.7	(2.3-17.1)	$\chi^2(4, 5860)=52.3^{***}$
Major depression (in the past 2 weeks, CD-10)	2.3	(1.9-2.7)	3.0	(1.2-4.8)	6.3	(0.3-12.3)	2.4	(-2.3-7.1)	12.9	(4.6-21.2)	$\chi^2(12, 5859)=100.6^{***}$
Mild depression	1.2	(0.9-1.5)	3.0	(1.2-4.8)	4.7	(-0.5-9.9)	2.4	(-2.3-7.1)	1.6	(-1.5-4.7)	
Moderate depression	1.9	(1.5-2.3)	3.0	(1.2-4.8)	6.3	(0.3-12.3)	14.6	(3.8-25.4)	9.7	(2.3-17.1)	
Severe depression											
ADHD (in the past 12 months, 0-6 scoring algorithm)	5.3	(4.7-5.9)	10.1	(6.9-13.3)	6.3	(0.3-12.3)	9.8	(0.7-18.9)	16.1	(7.0-25.2)	$\chi^2(4, 5858)=27.7^{***}$
ADHD (in the past 12 months, 0-24 scoring algorithm)											
ADHD score 14-17	3.1	(2.6-3.6)	7.4	(4.6-10.2)	3.1	(-1.1-7.3)	9.8	(0.7-18.9)	8.1	(1.3-14.9)	$\chi^2(12, 5858)=56.0^{***}$
ADHD score 18-24	0.6	(0.4-0.8)	0.3	(-0.3-0.9)	3.1	(-1.1-7.3)	2.4	(-2.3-7.1)	1.6	(-1.5-4.7)	
Anti-social personality disorder (lifetime)	15.9	(14.9-16.9)	26.2	(21.5-30.9)	14.1	(5.6-22.6)	19.5	(7.4-31.6)	9.7	(2.3-17.1)	$\chi^2(4, 5860)=26.9^{***}$
Suicide attempt (in the past 12 months)	1.2	(0.9-1.5)	2.7	(1.0-4.4)	9.4	(2.3-16.5)	2.4	(-2.3-7.1)	4.8	(-0.5-10.1)	$\chi^2(4, 5854)=38.6^{***}$

confidence interval (CI)

*** p<0.001

Table 5. Risk of psychiatric disorders and suicide attempts among young Swiss men by sexual orientation (attraction) with and without controlling for personality traits, C-SURF 2010-11

	Major depression (in the past 2 weeks)		ADHD (in the past 12 months)		Anti-social personality disorder (lifetime)		Suicide attempt (in the past 12 months)	
	OR	AOR	OR	AOR	OR	AOR	OR	AOR
only attracted to women	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
predominantly attracted to women	1.56 (0.85-2.85)	1.03 (0.55-1.95)	2.02 (1.39-2.93)***	1.36 (0.91-2.03)	1.87 (1.45-2.42)***	1.87 (1.41-2.48)***	2.20 (1.09-4.45)*	1.84 (0.89-3.78)
attracted to both men and women	2.81 (1.01-7.86)*	0.90 (0.29-2.77)	1.20 (0.43-3.31)	0.56 (0.18-1.73)	0.86 (0.43-1.76)	0.90 (0.41-1.97)	8.28 (3.45-19.9)***	4.35 (1.72-11.0)**
predominantly attracted to men	8.69 (3.78-20.0)***	3.31 (1.26-8.68)*	1.94 (0.69-5.47)	0.79 (0.26-2.40)	1.28 (0.59-2.78)	1.01 (0.42-2.41)	2.00 (0.27-14.8)	0.95 (0.12-7.31)
only attracted to men	4.52 (1.91-10.7)**	1.14 (0.44-2.92)	3.45 (1.73-6.85)***	1.62 (0.77-3.42)	0.57 (0.24-1.32)	0.61 (0.25-1.49)	4.07 (1.24-13.3)*	1.72 (0.50-5.92)

crude odds ratio (OR), adjusted odds ratio (AOR) adjusted for neuroticism-anxiety, aggression-hostility, sociability, and sensation seeking

* p<0.05, ** p<0.01, *** p<0.001