

**The mental health of lesbian, gay and bisexual adults compared with heterosexual adults: results of two nationally representative English household probability samples**

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## Abstract

**Background:** Evidence on inequalities in mental health in lesbian, gay and bisexual people arises primarily from non-random samples.

**Aims:** To use a probability sample to study change in mental health inequalities between two survey points, seven years apart; the contribution of minority stress; and whether associations vary by age, gender, childhood sexual abuse, and religious identification.

**Methods:** We analysed data from 10,443 people, in two English population-based surveys (2007 and 2014), on common mental disorder (CMD), hazardous alcohol use, and illicit drug use. Multivariable models were adjusted for age, gender, and economic factors, adding interaction terms for survey year, age, gender, childhood sexual abuse, and religious identification. We explored bullying and discrimination as mediators.

**Results:** Inequalities in risks of CMD or substance misuse were unchanged between 2007 and 2014. Compared to heterosexuals, bisexual and lesbian/gay people were more likely to have CMD, particularly bisexual people (adjusted odds ratio [AOR]=2.86; 95% CI: 1.83, 4.46), and to report alcohol misuse and illicit drug use. When adjusted for bullying, odds of CMD remained elevated only for bisexual people (AOR=3.21; 95% CI: 1.64, 6.30), whilst odds of alcohol and drug misuse were unchanged. When adjusted for discrimination, odds of CMD and alcohol misuse remained elevated only for bisexual people (AOR=2.91; 95% CI=1.80, 4.72; and AOR=1.63; 95% CI=1.03, 2.57 respectively), whilst odds of illicit drug use remained unchanged. There were no interactions with age, gender, childhood sexual abuse, or religious identification.

**Conclusions:** Mental health inequalities in non-heterosexuals have not narrowed, despite increasing societal acceptance. Bullying and discrimination may help explain the elevated rate of CMD in lesbian women and gay men but not in bisexual people.

## Key words:

mental health; inequalities; sexual minorities; minority stress; discrimination; LGB

## Background

There is consistent evidence from a range of high-income countries that people who identify as lesbian, gay or bisexual (LGB) report poorer psychological health than heterosexuals (Blosnich *et al.* 2014; King *et al.* 2008; Lucassen *et al.* 2017; Ploderl and Tremblay, 2015; Semlyen *et al.* 2016; Shahab *et al.* 2017; Spittlehouse *et al.* 2020; Westefeld *et al.* 2001). This is apparent in all sexual minority groups (Ploderl and Tremblay, 2015), and particularly in the bisexual population (Ploderl and Tremblay, 2015; Ross *et al.* 2018; Semlyen *et al.* 2016) and in those who identify as another unspecified sexual minority identity (Semlyen *et al.* 2016). Disparities in risk of self-reported depressive symptoms and self-harm between LGB and heterosexual youth appear early in adolescence (Amos *et al.* 2019; Irish *et al.* 2019), and increase throughout the school years (Irish *et al.* 2019). Whilst studies from outside the UK describe an excess of depressive symptoms in sexual minority adolescent girls compared with sexual minority adolescent boys (Lucassen *et al.* 2017), no such gender differences are observed in adolescents in British cohort studies (Amos *et al.* 2019; Irish *et al.* 2019). This is in the context of an excess of depression in adolescent girls compared to adolescent boys regardless of sexuality (Patalay and Gage, 2019). Sexual minority inequalities in mental health also persist into young adulthood (Irish *et al.* 2019) and beyond, and are most apparent in people aged under 35 and over 55 years (Semlyen *et al.* 2016).

Sexual minority groups also report higher levels of psychological, physical, and sexual abuse in childhood and adulthood than their heterosexual counterparts (Balsam *et al.* 2005), and are more likely to have experienced bullying and victimisation than heterosexual peers (Amos *et al.* 2019). An excess risk of suicidal ideation (King *et al.* 2008) and of self-harm- has been

found for LGB groups of all ages compared with heterosexual peers (Amos *et al.* 2019; Capistrant and Nakash, 2019; King *et al.* 2008; Miranda-Mendizabal *et al.* 2017), including an increased risk of suicide (Erlangsen *et al.* 2019). From an early age, sexual minority youth are more likely to have tried alcohol, cannabis or tobacco than their heterosexual peers (Amos *et al.* 2019). Across the life span, sexual minorities have a greater risk of substance use disorder or substance dependence than heterosexuals (King *et al.* 2008).

The reasons for worse mental health in minority sexual groups are not well understood, but candidate contributors include substance misuse (Blosnich *et al.* 2014), parental disapproval (Bouris *et al.* 2010; Russell and Fish, 2016), loneliness (Gallagher *et al.* 2014; Westefeld *et al.* 2001), and discrimination (Government Equalities Office, 2018). Although sexuality is a protected characteristic under the Equality Act in the UK, people who identify as LGB face prejudice and discrimination throughout their life. This is evident as bullying, homophobia and hate crime (Government Equalities Office, 2018; Stonewall, 2017a), as well as marginalisation in school (Stonewall, 2017b), university (Westefeld *et al.* 2001), work (Ewing *et al.* 2003; Pride in Diversity, 2016), religious institutions (Government Equalities Office, 2018), social care (Carr, 2014; Ward *et al.* 2010), and healthcare (Bristowe *et al.* 2018; Elliott *et al.* 2015; Ward *et al.* 2010). Experiences of homophobia and heterosexism are common in the day-to-day lives of LGB people (Maycock *et al.* 2009; McManus *et al.* 2019c), and persist into old age (Orel, 2014). Perceived discrimination is associated with worse quality of life and mental wellbeing (Mays and Cochran, 2001), while lifetime discrimination is associated with depression in later life (Fredriksen-Goldsen *et al.* 2013).

Experiences of discrimination, victimisation, or stigma, and their impact on the self-esteem through internalised homophobia, are factors central to minority stress theory (Meyer, 2003). Such experiences worsen mental health as well as creating a suspicion that psychological services are prejudiced (Government Equalities Office, 2018; Meader and Chan, 2017). Since

the 1980s there has been a liberalisation in attitudes to same-sex relationships (NatCen, 2019), which may improve the psychological health of LGB people. In the US, legislative changes that protect sexual minorities are associated with improvements in their mental health (Hatzenbuehler *et al.* 2011; Hatzenbuehler, 2017), with the converse also true (Raifman *et al.* 2018).

Despite this evidence on mental health disparities (Hudson-Sharp and Metcalf, 2016), populations studied are often not representative, lack a heterosexual control group, or have insufficient power to compare outcomes by individual sexual minority group, and the origins of any disparities are not always clear. Most are cross-sectional, obscuring whether inequalities in distress narrow or widen as societal attitudes to same-sex couples become more or less accepting of same-sex relationships over time. In order to inform interventions, the potential role of minority stress on the causal pathway between sexual identity and poor mental health needs elucidation. It is also important to understand whether greater societal acceptance is associated with higher wellbeing.

The 2007 Adult Psychiatric Morbidity Survey (APMS) was the first government survey of national health in the UK to include questions on sexual orientation (Chakraborty *et al.* 2011) and to combine this with a detailed assessment of mental health, alcohol and drug misuse, bullying, discrimination, and abuse. Building on our previous analyses of APMS 2007 (Chakraborty *et al.* 2011), we aimed to combine data from the 2007 and 2014 surveys, to explore whether mental health disparities have persisted over this period using a probability sample. The larger sample size also allowed us to compare specific sexual minority groups with heterosexuals. We aimed to investigate:

- whether inequalities in mental health between specific sexual minority groups and heterosexuals in the English general population have persisted over time

- whether minority stress indicators (exposure to bullying and discrimination) could potentially explain these associations
- whether age, gender, childhood sexual abuse (CSA), and religious identification modify these associations.

## **Methods**

### Sample

We conducted secondary analysis of data from the 2007 (McManus *et al.* 2009) and 2014 (McManus *et al.* 2016) Adult Psychiatric Morbidity Surveys, which used a similar stratified random probability sampling design suitable to produce a sample representative of the population aged 16 and over living in private households in England. Sampling procedures have been published (Chakraborty *et al.* 2011; McManus *et al.* 2019a). Interviews included structured diagnostic assessments and screening instruments for mental disorders as well as questions on socio-demographic information, sexuality, general health, risk factors, and service use. For sensitive questions on sexual identity, experiences of discrimination, sexual abuse, alcohol and drug use, respondents answered questions privately using a computer to enhance disclosure.

We included in our analysis individuals specified their sexuality and were aged 64 or below (n=10,443). This was because people aged 65 and over were not asked about sexuality in the 2014 survey due to perceived question burden.

### Ethical approval

Ethical approval for APMS 2007 was obtained from the Royal Free Hospital and Medical School Research Ethics Committee (reference number 06/Q0501/71). Ethical approval for APMS 2014 was obtained from the West London National Research Ethics Committee (reference number 14/LO/0411).

## Exposure

The wording of the 2007 APMS question about sexual identity had input from the two senior authors (MK and SM). In 2007 respondents were randomised (50:50) to one of two versions of the question, derived from American (Remafedi *et al.* 1992) or New Zealand (Fergusson DM. *et al.* 2005) instruments. The first version asked participants “*Which statement best describes your current sexual orientation? This means sexual feelings, whether or not you have had any sexual partners.*” It presented the following six options: completely heterosexual; mainly heterosexual; bisexual; mainly gay or lesbian; completely gay or lesbian; other. The second version presented these six options: entirely heterosexual (attracted to persons of the opposite of sex); mostly heterosexual, some homosexual feelings; bisexual (equally attracted to men and women); mostly homosexual, some heterosexual feelings; entirely homosexual (attracted to persons of the same sex); other. The question using ‘gay or lesbian’ elicited higher reporting of non-heterosexual orientation than the question using ‘homosexual’, confirming that reporting is sensitive to question wording (Hayes *et al.* 2012). Wording was amended in 2014 to align with the Office for National Statistics (ONS) national harmonised standard: heterosexual or straight; gay or lesbian; bisexual; other (ONS, 2014). Data were collected using computer-assisted self-interviewing (CASI).

In order to analyse the two datasets as a whole, we first combined data from 2007 across the two options to form six categories: heterosexual; mainly heterosexual; bisexual; mainly homosexual; homosexual; other. We then combined the 2007 ‘mainly heterosexual’ respondents with ‘heterosexual’ respondents, and the ‘mainly homosexual’ respondents with the ‘lesbian/gay’ respondents; judging this to provide the most valid comparison across the datasets from 2007 and 2014. The final combined dataset contained four categories: heterosexual and mainly heterosexual (reference group); bisexual; lesbian/gay and mainly homosexual; and other.

## Outcomes

Our three binary outcomes were:

- CMD as defined by the Revised Clinical Interview Schedule (CIS-R). This is an interviewer-administered structured interview schedule covering the presence of non-psychotic CMD symptoms in the week prior to interview (Lewis *et al.* 1992). A score of 12 or more meets the CIS-R threshold for a level of CMD symptoms that warrant primary care recognition, which we defined as the presence of CMD.
- current hazardous alcohol use, using the Alcohol Use Disorders Identification Test (AUDIT), a ten question screening tool developed by the World Health Organisation (WHO) and modified for use in the UK (Baboor *et al.* 2001). Scores of 0-7 indicate low risk, 8-15 increasing risk, 16-19 higher risk, and 20 or more possible dependence. We applied the accepted threshold of eight or more to denote hazardous alcohol use, based on the validation literature (Berner *et al.* 2007).
- past- year illicit drug use, defined as a positive response to any screening question on use of cannabis, amphetamines, cocaine, crack, ecstasy, heroin, methadone, tranquillisers, amyl nitrite, anabolic steroids, glues, acid, or magic mushrooms in the previous 12 months. As with hazardous alcohol use, data on illicit drug use were collected using CASI.

## Covariates

We added the following covariates to models as a set of potential confounders:

- year of survey, to take into account differences in sexual orientation data collection and change over time
- gender, self-identified as male or female
- age



- area-level deprivation using the Index of Multiple Deprivation (IMD); a composite index of relative deprivation at small area level, based on seven indicators of deprivation: income; employment; health deprivation and disability; education, skills and training; barriers to housing and services; crime and disorder; and living environment (Ministry of Housing Communities and Local Government, 2014). Each respondent's postcode was used to link to the corresponding deprivation quintile; quintile 1 being least deprived.
- educational attainment, based on eliciting highest educational qualification.

#### Mediator and moderator variables

We measured two minority stress variables as potential mediators:

- past year discrimination due to sexual orientation, using a binary measure based on CASI responses to the question: "*Have you been unfairly treated in the last 12 months, that is since (date), because of your sexual orientation?*"
- lifetime history of being bullied, using a binary measure based on responses to questions in the Stressful Life Events section of APMS, with wording drawn from that of the List of Threatening Life Experiences (LTE) (Brugha and Cragg, 1990).

We also analysed four likely modifiers of the adjusted associations:

- age in years
- gender
- history of CSA, using a binary measure based on a positive response to either of two CASI questions "*Before the age of 16, did anyone touch you, or get you to touch them, in a sexual way without your consent?*"; "*Before the age of 16, did anyone have sexual intercourse with you without your consent?*" (Bebbington et al. 2011).

- religious identification, using a binary measure of any affiliation to a recognised religion or none.

### **Statistical analysis**

We compared the prevalence of each sexuality group in the population in 2007 and 2014. We then compared the prevalence of CMD, alcohol misuse, and drug misuse in each sexuality category combining both years, reporting prevalence estimates with confidence intervals, and odds ratios with confidence intervals.

Using a dataset that combined the 2007 and 2014 samples, we used univariable logistic regression models to test the association of sexual minority status (four category variable, with heterosexual as the reference) with CMD, alcohol use and illicit drug use. Multivariable logistic regression models were adjusted for covariates identified *a priori* on the basis of the literature, adding year of sampling, age, gender, and social and economic factors (IMD quintile, and educational attainment) as a block adjustment (model 2).

We tested for an effect modification of survey year on adjusted associations with CMD, alcohol use, and illicit drug use, to test whether inequalities had persisted between 2007 and 2014.

Then, as putative mediators, we added: discrimination on grounds of sexual orientation (model 3), and lifetime history of being bullied (model 4), to see if either of these attenuated associations.

To conduct exploratory tests for the modifying effect of age, gender, CSA, and religious identification we added each of these as an interaction term to our main adjusted models (model 2). If there was evidence of interaction, interaction terms were included in this model.

All analyses were performed using data weighted to take account of the complex survey design and of non-response in order to ensure that the results are representative of the household population in England. We used new weightings for the 2007 survey, as provided in 2018. For

this we used the relevant ‘survey’ (*svy*) commands in Stata 15, which allow for the use of clustered data modified by probability weights and provide robust estimates of variance.

## Results

### Sample characteristics

We analysed data for 10,443 people aged 16 to 64 years who provided data on sexual orientation: 5,386 from 2007 and 5,057 from 2014 (Table 1). In the 2007 survey 96.3% identified as heterosexual (or mainly heterosexual), 0.8% as bisexual, 1.2% as lesbian/gay (or mainly homosexual), and 1.8% as other. In the 2014 survey these proportions were 95.6%, 1.5%, 1.8% and 1.2% respectively (Table 1). Overall, 96% identified as heterosexual, 1.1% as bisexual, 1.5% as lesbian/gay and 1.5% as other.

<TABLE 1 HERE>

Weighted estimates of the socio-demographic, mental health and related characteristics of the sample (generalisable to the English population) are presented in **Table 2**. The lowest proportion of men was in the bisexual group (27.5%), and the highest in the lesbian/gay group (69.6%). A greater proportion of the heterosexual group lived in the least deprived areas (18.9%). The bisexual group were most likely to identify as white (87.3%), and to have experienced CSA (28.9%). Those identifying as lesbian or gay were most likely to be educated to degree level (35.9%), to have been bullied (51.7%), and to have experienced discrimination due to sexual orientation (23.2%). Those defining themselves as other were most likely to identify with a religion (61.2%) and to have no qualifications (29.9%).

<TABLE 2 HERE>

### Prevalence of adverse health outcomes

The prevalence of CMD among heterosexuals (Table 3) was 16.3% (95% CI 15.5, 17.1), which was significantly lower than that for the bisexual group (40.4%; 95% CI 31.0, 50.5), the

lesbian/gay group (23.8%; 95% CI 17.4, 31.7) and those identifying as other (24.8%; 95% CI 17.6, 33.6).

The prevalence of alcohol misuse among heterosexuals was 23.8%; 95% CI 22.9, 24.8), lower than that for the bisexual group (31.0%; 95% CI 22.3, 41.4) and the lesbian/gay group (37.4%; 95% CI 28.6, 47.1) but not those identifying as other (21.0%; 95% CI 13.6, 30.8).

The prevalence of last-year illicit drug use among heterosexuals was 10.5% (95% CI 9.8, 11.4), lower than that for the bisexual group (37.0%; 95% CI 27.6, 47.5) and the lesbian/gay group (25.3%; 95% CI 18.4, 33.7) but not those identifying as other (8.5%; 95% CI 3.9, 17.5).

There were no significant changes in these outcomes between the two surveys in 2007 and 2014 (**Supplementary Table 1**).

#### Associations of sexuality with CMD

In our unadjusted model (**Table 3**), we found evidence that all sexual minorities were more likely than the heterosexual group to have CMD symptoms above threshold, particularly the bisexual group (OR=3.48; 95% CI: 2.30, 5.25). When adjusting for year of sampling and socio-demographic factors (Model 2), these associations were attenuated but remained for the bisexual and the lesbian/gay group, but were no different for those who identified as other. When adjusting our final model for bullying, evidence of the associations remained only for bisexual people. The same was true when adjusting our final model separately for discrimination.

<TABLE 3 HERE>

When testing for an interaction (data not shown) with year of sampling (2007 *versus* 2014), we found no evidence for change in these inequalities over time (p-value for interaction 0.295). We also found no evidence for an interaction with age (p=0.610), gender (p=0.317), CSA history (p=0.708), or religious identification (p=0.826).

### Associations of sexuality with hazardous alcohol use

In our unadjusted model (**Table 3**), only individuals who identified as lesbian or gay were more likely than heterosexuals to report current hazardous alcohol use. When adjusted for year of sampling and socio-demographic factors (Model 2), probability of alcohol misuse was greater both in the bisexual and the lesbian/gay group. When adjusting our final model for bullying, these estimates attenuated marginally, but remained. When adjusting it for discrimination, they were attenuated to a greater degree, remaining only for the bisexual group.

There was no evidence for an interaction of alcohol misuse with year of sampling ( $p=0.188$ ), gender ( $p=0.869$ ), age ( $p=0.748$ ), CSA history ( $p=0.285$ ), or religious identification ( $p=0.731$ ).

### Associations of sexuality with illicit drug use

Probability of past year illicit drug use was significantly greater in the bisexual and the lesbian/gay group in unadjusted models (**Table 3**) but no different for those identifying as other. Adjusting for year and socio-demographic factors (Model 2) had a positive (attenuating) confounding effect for the lesbian/gay group but a negative (amplifying) effect in the bisexual group. Adjusting our final model for bullying attenuated adjusted estimates for the bisexual and the lesbian/gay group, whilst adjusting it for discrimination had an amplifying effect for both groups, in all cases remaining significant. There was therefore no clear relationship between bullying and discrimination and sexual minority groups' risk of drug misuse.

There was no evidence for an interaction of illicit drug use with year of sampling ( $p=0.140$ ), gender ( $p=0.818$ ), CSA history ( $p=0.133$ ), or religious identification ( $p=0.142$ ). However, we found an interaction with age ( $p<0.001$ ). Stratum-specific analyses for those aged 40 years and under *versus* those aged over 41 (**Supplementary Table 2**) showed that the association of sexuality with illicit drug use applied to lesbian or gay people aged 41 and over but not to those who were younger.

Although there were no interactions with gender, we present the associations between sexuality and our three outcomes separated out by gender for reference (**Supplementary Tables 3 to 5**).

## Discussion

### Main findings

Rates of CMD and substance misuse remained elevated in sexual minority groups compared to heterosexuals between the two surveys in 2007 and 2014, despite social attitudes becoming more accepting of same-sex relations. Bisexual respondents had the poorest mental health. This group was primarily female and younger than the other groups, and is therefore likely be subject to the same trends observed for young women generally with regard to CMD (McManus *et al.* 2016) as well as self-harm (McManus *et al.* 2019b) over the same period. We found no evidence to support a modifying effect of religious affiliation, gender, age, or childhood sexual abuse in the association between sexuality and mental health, whilst acknowledging the limited power of interaction tests. The lack of an interaction with religious affiliation suggests that LGB people may keep their identities private in this setting.

We also found evidence to suggest that discrimination on the basis of sexuality and bullying reduced the magnitude of the association between sexual orientation and CMD for the lesbian/gay group. Thus, minority stress variables seemed to account in part for the association between sexual orientation and CMD in lesbian and gay people, suggesting they might be pathways for the development of mental health symptoms. Being older, the lesbian/gay group may have reported bullying that was experienced some years ago, so it is possible that increases in social acceptance in the last decade will have had less impact on their mental health. Where bisexual people again differed was that minority stress variables did not appear to explain their elevated risk of CMD, and further research is needed to explore potential pathways in this group. This may be because bisexual individuals are more likely to conceal their identity than

lesbian/gay people, reducing exposure to discrimination (Feinstein and Dyar, 2017). We lacked APMS variables capturing the strain of non-disclosure, or the nuances of biphobia, bi-erasure, and sense of thwarted belongingness within the LGB community described by bisexual people (Dunlop *et al.* 2020). Further qualitative work is required to inform the wording of future survey questions on these aspects of minority stress, and to explore other possible causal mechanisms further.

The 1.5% of the APMS sample who identified as another unspecified sexual minority identity were distinct in their characteristics. They were more likely to be non-white and identify with a religion, and less likely to be educated to degree level. They were less likely than LGB people to have been bullied or discriminated against, but had a similar prevalence of CMD to that group. Thus it is possible that at least a proportion of this group is non-heterosexual but, for reasons such as religious identification, are less likely to report this.

#### Findings in the context of other studies

Our results from this large national sample confirm an excess of mental health problems in minority sexual groups (Amos *et al.* 2019; King *et al.* 2008; Lucassen *et al.* 2017; Ploderl and Tremblay, 2015; Westefeld *et al.* 2001). However, our study goes beyond those making binary comparisons between all sexual minorities and heterosexuals. Our study was able to specify which sexual minority subgroups have the greatest burden of mental ill-health; namely bisexual people. These findings match those of meta-analyses, in which bisexual adults are found to have a higher prevalence of depression and anxiety than lesbian/gay people (Ploderl and Tremblay, 2015; Ross *et al.* 2018; Semlyen *et al.* 2016). Our finding of no evidence to support changes in mental health disparities in adults aged 16 and above over a seven year period is also reflected in the inequalities observed in contemporary adolescents; findings from the Millennium Cohort Study demonstrate substantial inequalities in mental and physical health and social outcomes between 14 year olds in sexual minority groups and their

heterosexual peers (Amos *et al.* 2019). Of note, whilst our study measured sexuality using the labels applied to specific minority groups, our findings are consistent with those using the terminology of ‘same-sex’ or ‘opposite-sex’ attraction, thus avoiding those labels (Amos *et al.* 2019).

We note that the bisexual group in our sample was predominantly female and significantly younger than all other groups, and this may reflect a trend in the UK for younger people to describe themselves bisexual, particularly women (Office for National Statistics (ONS), 2020), and for them to newly identify as a sexual minority over time (MacCarthy *et al.* 2020). We would suggest that likely explanations for the characteristics of the APMS sample’s bisexual group to include: a transition in sexual identity over the life course as a natural developmental phenomenon, related to societal and individual influences (MacCarthy *et al.* 2020); sexual fluidity (flexibility in sexuality) (Diamond, 2015); an increasing acceptability amongst young people of self-identifying as bisexual; or a preference for young people to self-identify as bisexual rather than as gay or straight in such absolute terms.

In line with minority stress theory, our study found that experiences of discrimination and bullying may lie on pathways to the development of mental health symptoms for lesbian and gay adults, but did not support this theory for bisexual people. This contradicts assertions elsewhere that stigma and discrimination contribute to the excess risk of depression and anxiety in bisexual people (Feinstein and Dyar, 2017). However, it is consistent with empirical studies supporting minority stress theory when using binary comparisons between all sexual minorities and heterosexuals (Baams *et al.* 2015; El-Khoury *et al.* 2020; Hatzenbuehler, 2009; Oginni *et al.* 2019; Robinson *et al.* 2013), or between gay men and heterosexuals (Meyer, 1995). Our analysis is the only one to suggest that pathways to psychopathology may differ for bisexual people from other sexual minority groups.



## Strengths and limitations

We used a large population-based survey database by combining representative survey data from two probability samples, seven years apart. This allowed us to examine if inequalities had persisted over time and to compare bisexual, lesbian/gay and other groups separately and more robustly than was possible in smaller samples. Use of a probability sample meant that it was more representative than similar studies using convenience samples, and included a heterosexual comparison group. We used validated measures of sexuality, alcohol misuse, and mental health. Computer-assisted self-completion of sensitive questions is likely to have enhanced disclosure on variables such as CSA, sexuality, discrimination, and substance use, although we do not have data on test-retest reliability of these measures in each sample.

As for all cross-sectional analyses, we cannot infer causality from this study and the measure of sexuality used may not have captured all dimensions of this construct. We categorised the 22 individuals who described themselves in 2007 as "mainly heterosexual" group into the "heterosexual and mainly heterosexual" group, as we judged this to be the most valid way of comparing groups across the datasets from 2007 to 2014, but acknowledge that this group may have a higher risk of CMD where struggling with their sexual identify, whilst also being relatively protected from discrimination. Our use of binary outcomes was justified on the basis of providing more clinically-interpretable findings, whilst acknowledging that using continuous measures would have retained more information. Adding minority stress variables to final models explored whether findings suggested that these might mediate associations, but we could not establish the direction of associations between mediators and outcomes, and this test was only suggestive of a mediation effect. We therefore identified a hypothesis for specific testing using formal mediation analysis of longitudinal data.

Data collection on gender for APMS 2007 and 2014 involved the household member being asked about sex as a binary gender option rather than an inclusive range of gender choice,

separating out sex assigned at birth and gender identity. This meant that we were unable to investigate gender identity. Despite our large sample size, we were unable to examine lesbian and gay respondents separately for reasons of power, so could not explore the interaction of pre-existing sex-related mental health differences with sexuality. For the same reasons we could not explore the effects of other intersectional aspects of lesbian, gay, bisexual and other (LGBO) identity in relation to ethnicity or class. Where we did conduct interaction tests we acknowledge their limited statistical power. Our finding of an interaction between age and illicit drug use may have been a chance finding in the context of twelve interaction tests and a secondary analysis of data. Our measure of religious identification was binary, and did not reflect degree of religiosity.

### Clinical and policy recommendations

Sexual minority groups appear to be at risk of poorer mental health and greater substance misuse than heterosexuals, even in contemporary samples. Research indicates that they may be invisible within health systems, with a perceived and actual lack of awareness among health professionals of their health needs (Hudson-Sharp and Metcalf, 2016; Parameshwaran *et al.* 2017). Consequently LGB people may be reluctant to disclose sexual orientation in a health context, which can exacerbate problems in securing timely and appropriate treatment (Brooks *et al.* 2018; Hudson-Sharp and Metcalf, 2016). Suggestions for improvements include using positive images of LGB people in health service marketing material, displaying equal opportunities statements on the grounds of sexual orientation (Hudson-Sharp and Metcalf, 2016), and taking a LGB-affirmative stance in psychotherapy (Proujansky and Pachankis, 2014). Training professionals to not assume heterosexuality would help reduce feelings of invisibility and difficulties over disclosure (Hudson-Sharp and Metcalf, 2016). When routine monitoring of sexuality in mental health services becomes mandatory in the UK in 2020 (House of Commons: Women and Equalities Committee: 2019) this will allow audit of equitable

service provision and the study of sexual orientation identity change over time. As well as addressing equity in health and social care services, the most powerful interventions are likely to lie in societal change in wider attitudes to sexual minorities.

Addressing discrimination against and bullying of adolescent sexual minorities is a priority during this vulnerable period for the onset of mental health problems. There is evidence that schools using practices that create supportive environments for sexual minority students (e.g. identifying a minorities contact person; having a gay-straight alliance) have a positive impact on social exclusion, physical bullying, and harassment due to sexual orientation (Gower *et al.* 2018). However, schools are not the only environments where LGBO people experience discrimination, and anti-discrimination policies are needed across a range of institutions, covering all age groups.

## **Conclusions**

We found that mental health inequalities between minority sexual groups and the heterosexual majority have persisted between 2007 and 2014 in a large representative English sample, and that people who identify as bisexual experience poorer mental health than other sexual identity groups. We also found evidence to suggest that discrimination due to sexual orientation and a lifetime history of being bullied are putative mediators of risk in lesbian women and gay men, but not bisexual people. There was no evidence to suggest that risk is modified by age, religious identification, or childhood sexual abuse. More longitudinal research is needed to understand the mechanisms of action of risk factors in different sexual minority groups, subject to future datasets including measures of sexuality.

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## Conflicts of interest

None.

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