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Life satisfaction and sexual minorities: Evidence from Australia and the United Kingdom

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Abstract

Very little is known about how the differential treatment of sexual minorities could influence subjective reports of overall well-being. This paper seeks to fill this gap. Data from two large surveys that provide nationally representative samples for two different countries –Australia and the UK – are used to estimate a simultaneous equations model of life satisfaction. The model allows for self-reported sexual identity to influence a measure of life satisfaction both directly and indirectly through seven different channels: (i) income; (ii) employment; (iii) health (iv) marriage and de facto relationships; (v) children; (vi) friendship networks; and (vii) education. Lesbian, gay and bisexual persons are found to be significantly less satisfied with their lives than otherwise comparable heterosexual persons. In both countries this is the result of a combination of direct and indirect effects.

Keywords

Sexual orientation; Sexual minorities; Discrimination; Life satisfaction; HILDA Survey; UKHLS

1. Introduction

There is an emerging new approach to studying the empirical determinants of life satisfaction (and subjective well-being more generally). By applying structural equation modeling techniques on life satisfaction data, researchers have been able to identify and explicate the potential mechanisms that underlie an observed relationship between life satisfaction and its predictors (e.g., Layard et al., 2014; Powdthavee et al., 2015). This paper continues that avenue of research, but in a different sphere. It focuses on the relatively unexplored links, as well as the potential underlying mechanisms, between sexual identity and life satisfaction.

Why should economists care about the existence and the underlying processes of such links? Beginning with the seminal works of Myrdal (1944) and Becker (1957), economists have

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long been interested in the welfare implications of taste-based discrimination, but with most research focused on its consequences for women, racial minorities and older people. Only relatively recently have economists attempted to address whether there exists discrimination based on an individual's sexual preferences, behavior or identity, with most attention focused on wage differentials (Klawitter, 2015). There have also been a small number of relatively small-scale experimental studies showing that sexual minorities face discrimination in domains other than pay, including the probability of getting a call-back for a job interview (e.g., Weichselbaumer, 2003), access to housing (Ahmed and Hammarstedt, 2009), and access to quality health care (Heck et al., 2006). Nevertheless, and despite these recent advances, the implications of someone's sexual orientation for their well-being continues to be imperfectly understood.

In this paper we take a different approach to studying the well-being of sexual minorities. Rather than focusing on a single outcome from one domain of a person's life, we attempt to assess the overall well-being of people with different sexual orientations. Overall well-being is, for example, often measured with a global cognitive evaluation of life satisfaction (Cummins, 2013). Certainly this has been the approach most favored by economists and policy makers who are interested in public policies designed to improve people's overall quality of life (Dolan et al., 2008). However, and despite the vast number of studies that have examined determinants of life satisfaction, we are unaware of any serious research quantifying differences in life satisfaction between the lesbian, gay and bisexual (LGB) population and the heterosexual population. Further, to the best of our knowledge, there have only been two previous studies that have tried to quantify the differences between LGB and heterosexual populations using other global measures of well-being, both of which analyzed a measure of happiness. Using cross-sectional data from the 2007 Adult Psychiatric Morbidity Survey in the UK, Chakraborty et al. (2011) examined associations between sexual orientation and a range of measures of psychological well-being, including a simple binary measure of happiness. They found that homosexuals in the UK were significantly less likely to report being "fairly or very happy" than heterosexuals, with estimated adjusted odds ratios ranging from .67 to .75.¹ This analysis, however, involved the inclusion of very few controls (just gender, ethnicity and education). Very different is the earlier analysis of pooled cross-section data from the US General Social Survey (covering the period 1988–2002) by Blanchflower and Oswald (2004). Using an extensive set of controls they did not find any statistically significant differences in the self-reported happiness of Americans with same-sex partners and those with partners of the opposite sex.

In short, we know relatively little about the quantitative differences in life satisfaction of people with different sexual orientations. Filling this research gap is the principal aim of this study. Specifically, we use data from two large population surveys, which contain similar self-reported measures of both sexual identity and overall life satisfaction, to estimate a structural equations model of the predictors of life satisfaction that distinguishes some of the channels through which life satisfaction might be affected. This is an important contribution and sets our work apart from most previous research into subjective well-being (SWB). We

¹Chakraborty et al. (2011) employed two different measures of sexual orientation; one based on sexual identity and one based on the sex of the respondent's sexual partners. Choice of measure had relatively little influence on the results.

are thus interested in not just whether sexual minorities report being more or less satisfied with their lives, but in identifying the relative importance of the different predictors of well-being (and ill-being) that might contribute to any differential between sexual minorities and the heterosexual population.

The analysis is also distinctive in its use of data providing nationally representative samples for two countries – Australia and the UK – which, while different, have broadly similar contextual characteristics; they share a common language and cultural heritage, and have similar political and legal institutions. We also suspect that the general attitudes of the broad population toward sexual minorities are similar in both countries. The Pew Research Centre (2013), for example, reports cross-country survey evidence from 2013 showing the proportion of persons who agree that society should accept homosexuality was similarly high in both Australia and the UK (79% and 76%, respectively).² Finding results that are consistent across these two country-specific samples would thus provide added confidence that the results obtained are not simply the result of chance.

2. Conceptual framework and related research

To be useful, a model of life satisfaction of sexual minorities should allow life satisfaction to be proximally affected by other outcomes that are potentially related to an individual's sexual orientation. These include, but are not necessarily limited to, those that can be called 'economic' (e.g., income, employment, educational qualifications), those that are 'social' (e.g., family status, children, social networks), and those that are 'personal' (e.g., health) (Layard et al., 2014).

Fig. 1 illustrates the model that underlies our analysis. Life satisfaction is the measure of the overall quality of life of an individual, and is determined partly by intermediate outcomes and partly by the person's sexual orientation (represented here by a measure of sexual identity). But these intermediate outcomes also have to be explained by the sexual orientation of the respondent, with the key issue being the relative importance of the different links in the chain that predict life satisfaction of sexual minorities.³ We select seven intermediate outcomes as potential mediators of sexual orientation. These are: (i) income; (ii) employment; (iii) marriage and other forms of cohabiting partnerships (or de facto relationships); (iv) children; (v) health; (vi) friendship networks; and (vii) education.

We do not pretend that these seven intermediate outcomes is an exhaustive list of all possible mediating influences. Rather this choice reflects in part what the separate literatures on life satisfaction and on sexual minorities suggest are likely to be the most important channels, and in part what is available in the datasets at our disposal. There is, for example, considerable evidence that sexual minorities are at greater risk of being victims of physical and sexual violence and other forms of aggression and abuse (e.g., Moracco et al., 2007; Conron et al., 2010; Rothman et al., 2011), which could then lead to lower levels of well-being independent of any effects through other channels, such as a deterioration in health.

²Governments in the UK, however, appear to have been much more supportive of homosexuality than in Australia. This is reflected in legislation that came into force in March 2014 permitting same-sex marriage.

³For simplicity, we assume that all of the variables in the SEM model are observed rather than latent variables.

We, however, are unable to include any useful measure of victimization in our analysis. Slightly differently, religious activity (as measured by church attendance) has been found to be positively associated with measures of life satisfaction (Dolan et al., 2008), but would generally be expected to be negatively associated with sexual minority status, in large part because most religions disapprove of, if not are outright opposed to, homosexuality (Adamczyk and Pitt, 2009). However, the inclusion of measures of attendance at religious services would result in the loss of a significant proportion of our sample, and hence this potential channel is not explored any further. We now briefly summarize relevant research on the seven intermediate outcomes listed in Fig. 1.

2.1. Income (and wages)

Measures of income, and more specifically family or household income, are routinely included in models of life satisfaction, with the general consensus being that life satisfaction is positively associated with income but the magnitude of the relationship declines with income and, on average, may be quite small (see Clark et al., 2008). Thus one possible source of lower life satisfaction among sexual minorities is discriminatory practices that result in lower incomes.

As already noted, previous research by economists into the discrimination faced by sexual minorities has focused primarily on discrimination in the workplace, and especially on wage differentials. The pioneering work here is Badgett (1995) who used pooled data from the 1989, 1990 and 1991 rounds of the General Social Survey in the US to estimate regression models of the determinants of pre-tax annual employment earnings of full-time workers, with the key variable of interest being a dummy variable constructed from questions about same-sex behavior. She found that behaviorally gay and bisexual men earned between 11% and 27% less than comparable heterosexual men. Lesbian and bisexual women were also found to earn less.

Subsequent research, both in the US and other Western countries, typically confirms the earnings penalty for gay/bisexual men, but in contrast to Badgett mostly reports earnings premiums for lesbian/bisexual women. This is reflected in a meta-analysis of 31 published studies by Klawitter (2015). She reports a mean penalty for gay and bisexual men of 11% and a mean premium for lesbian and bisexual women of 9%. However, this same analysis also shows that the variance in estimates across studies (and especially in the estimated lesbian premium) is large and varies systematically with both the dataset used and the measure used to proxy sexual orientation.

But does it follow that these wage differentials will automatically translate into systematic differences in household incomes? Surprisingly, relatively little research into this question has been conducted. Further, the research that has been undertaken delivers conflicting results. Using data from the 1990 US Census, Klawitter and Flatt (1998) found that despite the presence of a strong pay penalty for men in same-sex couple relationships, the incomes of male same-sex couples, after controlling for a range of demographic characteristics, were little different to married couples, but significantly larger than the incomes of unmarried different-sex couples. Conversely, and despite the presence of a large pay premium for women in same-sex relationships, female same-sex couples had household incomes that

were significantly lower than both married couples and unmarried different-sex couples. In contrast, Carpenter (2004), using data from the US Centers for Disease Control, found that both male and female same-sex couples had significantly lower household incomes than married couples (13% lower in the case of same-sex male couples and 20% lower in the case of female same-sex couples), but not when compared to cohabiting couples of different sex. The findings of Carpenter (2004) suggest that it is marriage that is driving the observed differences in household income, whereas the results of Klawitter and Flatt (1998) suggest that gender wage differentials are a more likely source.

More recently, research reports published by the Williams Institute (Albeda et al., 2009; Badgett et al., 2013), drawing on data from a range of different US data sources, reach the conclusion that LGB-identified persons “are at greater risk for being in poverty and are more likely to receive support from government assistance programs than their heterosexual counterparts” (Badgett et al., 2013, p. 24). Similar conclusions are reached by Uhrig (2014) using population data for the UK. That said, the differences are often small and not always statistically significant, thus making it difficult for us to form strong expectations about the relationship between sexual orientation and income.

2.2. Employment

Previous research consistently demonstrates that unemployment has a large negative effect on life satisfaction (Frey and Stutzer, 2002; Dolan et al., 2008). Thus if sexual minorities face a smaller probability of being hired, life satisfaction should be adversely affected. Again research is limited, but what has been conducted gives rise to strikingly consistent results. Specifically, evidence from experiments consistently demonstrates that homosexuals are discriminated against in the hiring process where there is a disclosure of the potential employee’s sexual identity. Weichselbaumer (2003) sent out fake resumes to a sample of employers in Austria with vacancies for accountants and secretaries (1226 applications were sent in response to 613 advertised job vacancies) and found that women who declared themselves as lesbians on the application form were, other things constant, 12–13% less likely to receive a call-back than heterosexual women. Subsequent research using this same type of correspondence test experiment, and conducted in a range of different countries (Greece, Sweden and the US), reaches similar conclusions, though the size of differentials are often larger (Drydakis, 2009, 2011; Tilscik, 2011; Ahmed et al., 2013).

2.3. Marriage and partnering

It has long been found that marriage is positively associated with life satisfaction (Dolan et al., 2008). This distinction is potentially critical for analyses of differences between heterosexual populations and sexual minorities, with same-sex marriage illegal in most parts of the world. In most Western nations, however, laws now exist that are intended to ensure that persons in same-sex partnerships are entitled to the same rights and responsibilities as married persons. In the UK, for example, this was reflected in the introduction of the Civil Partnership Act of 2004 (and indeed from 29th March 2014 same-sex marriages became legal). In Australia, while same-sex marriage remains proscribed, the federal government together with all state governments passed laws in the 2000s to recognize same-sex de facto partnerships as equal to opposite-sex partnerships. At the federal level, most significant here

are the same-sex reforms introduced in 2008 and 2009 in the wake of a report of the Australian Human Right and Equal Opportunities Commission into discrimination against people in same-sex relationships (HREOC, 2007).

Despite these changes, retrospective history data for a UK sample show that same-sex cohabitations are of much shorter duration than both marriages and different-sex cohabitations (Lau, 2012), while population survey data for Australia indicate that LGB persons are still far less likely to be living in couple relationships than heterosexuals (ABS, 2013).

2.4. Children

The impact of children is one area where the evidence from life satisfaction research is very uncertain, but it is also the dimension where the constraints faced by heterosexual persons and LGB persons are most different. Biological constraints (at least for men), together with the financial and legal obstacles to adoption that are faced by all couples, inevitably mean that same-sex couples will have far fewer children than comparable heterosexual couples (for US evidence, see Black et al., 2007). Whether or not this is a source of life satisfaction differentials remains to be seen.

2.5. Health

The influence that past research has consistently shown to exhibit the strongest relationship with life satisfaction is health. At the same time, there has long been a concern that LGB populations are at much greater risk of health problems, including both physical problems and mental health disorders. King et al. (2008), for example, report results from a meta-analysis of previous studies showing that the risks of depression and anxiety disorders, and of alcohol and substance dependence, are at least 1.5 times higher within LBG populations, and suicide attempts around twice as likely, than in heterosexual populations. Subsequent research mostly confirms this finding of marked difference in mental health disorders (e.g., Cochran and Mays, 2009; Bostwick et al., 2010; Bolton and Sareen, 2011; Chakraborty et al., 2011). Similarly, there is a sizeable literature suggesting that LGB persons are, relative to heterosexuals, at greater risk of suffering a range of poor physical health outcomes. Much of this literature has focused on outcomes related to HIV infection, but there is now considerable evidence that LGB persons are at greater risk of experiencing many adverse health outcomes (e.g., an increased risk of being diagnosed with asthma, cancer, cardiovascular disease, diabetes, and other chronic conditions) that are unconnected to HIV infection (for reviews, see National Research Council, 2011; Lick et al., 2013). Possible explanations here include physiological responses to stress and lesser levels of access to quality health care services.

Very differently, recent research using large population samples in the US, but using measures of self-assessed health, suggest that while same-sex cohabitators report poorer health than opposite-sex married couples, there are no systematic differences between same-sex cohabitators and either opposite-sex cohabitators or single persons (Denney et al., 2013; Liu et al., 2013). A key feature of these studies is the inclusion of controls for socio-economic status. Sizeable differences between same-sex and opposite-sex cohabitants were initially

found, but disappear once controls for variables such as education, employment status, and income/poverty were included. It thus may be that at least some of the differences in health outcomes observed in earlier research were the result of differences in socio-economic status, rather than in sexuality. Alternatively, these findings may reflect the use of subjective assessments as compared with more direct measures of physical health. Sandfort et al. (2006), for example, in their study of a random sample of the Dutch population, could find no significant differences between LGB and heterosexual populations using the self-assessed measure of general physical health from the SF-36, even though LGB persons were more likely to report both chronic health conditions and acute physical symptoms.

2.6. Friendship networks

It is widely accepted that friendship networks (and social networks more generally) promote SWB (e.g., Helliwell and Putnam, 2004; Powdthavee, 2008; Lim and Putnam, 2010), and this will be no less true of LGB populations (e.g., Masini and Barrett, 2008; Keleher et al., 2010). The usual explanations for this positive relationship stem from the role that social networks play in both providing positive experiences and enhancing self-esteem, and in buffering the influence of stress (Cohen and Wills, 1985). The latter route seems especially important to LGB populations given their greater exposure to stress as a result of stigma-related prejudice and discrimination (Kwon, 2013), suggesting that strong social support mechanisms may be even more vital to them. Far less clear is whether LGB populations have relatively lesser or greater access to supportive friendship networks, but what can be expected is that access will be highly variable across individuals.

2.7. Education

Despite evidence of considerable victimization at school, LGB populations, at least in the US (see Black et al., 2007) and the UK (see Arabsheibani et al., 2005), invest much more heavily in education than heterosexual populations. How this might feed into life satisfaction is less clear, with previous research on life satisfaction providing very mixed results; some studies have reported positive effects of an additional year of education or of having a college degree (Stutzer, 2004; Ferrer-i-Carbonell, 2005), while others have reported negative or statistically insignificant effects (Flouri, 2004; Powdthavee, 2008; Shields et al., 2009). One explanation for these differences across studies could be the choice of additional control variables included in the life satisfaction equation (e.g., income and health, both of which are affected by education) (Powdthavee et al., 2015). Another explanation is that the relationship between education and life satisfaction varies across different institutional contexts. For example, using a similar set of control variables in a life satisfaction regression equation, the effect of having a college degree on life satisfaction is found to be positive and statistically significant in the UK (Knies et al., 2014) but negative and statistically significant in Australia (Shields et al., 2009).

3. Data and empirical strategy

3.1. Data

This analysis uses two data sets: wave 3 of the UK Household Longitudinal Study (UKHLS) (see Buck and McFall, 2012), conducted over the two-year period 2011–2012, and wave 12

of the Household, Income and Labour Dynamics in Australia (HILDA) Survey (see Watson and Wooden, 2012), which was mostly conducted during the second half of 2012. Both are panel surveys that commenced with large nationally representative samples of households, and conduct interviews on an annual basis with all adult members of those households. Both are also broad omnibus surveys, but with a focus on income, work, family, and health and well-being. The main focus here on one specific wave of data from each study reflects the fact that it is only in wave 3 of the UKHLS and wave 12 of the HILDA Survey that any measure of sexual orientation or identity is available. However, since we are also interested in the evolution of the relationship between sexual identity and life satisfaction across different periods of time, we also apply the sexual identity variable retrospectively to the data collected in the previous 11 waves of the HILDA Survey.

The responding sample for wave 3 of the UKHLS comprises 49,739 persons aged 16 years or older. This, however, includes 3836 persons interviewed by proxy (that is, another household member answered on their behalf), whom we exclude. In addition, we are forced to exclude any respondent who did not complete the computer-administered self-completion instrument that most interviewees are given, since it is through this instrument that data on both sexual identity and life satisfaction are collected. This resulted in the exclusion of a further 5197 cases. Given employment is one of our intermediate variables, we also exclude all persons aged 65 years or older (thus restricting the sample to persons of working age). Finally, we exclude any further cases with missing data on any of our intermediate outcome or control variables, leaving us with a final sample comprising 32,964 persons.

The responding sample for wave 12 of the HILDA Survey numbers 17,476 persons aged 15 years or over. Again we are forced to exclude persons that did not complete (or return) the self-completion instrument that all interviewees are given ($n = 2096$). Restricting the sample to persons aged 16–64 years reduces the usable sample to 12,682 cases, and after removal of further cases with missing data on relevant outcome or control variables we are left with a final sample for analysis numbering 12,388.

3.2. Measuring sexual orientation/identity

Sexual orientation encompasses at least three dimensions of sexuality: attraction, behavior and identity (Laumann et al., 1994). The measures available in both the UKHLS and HILDA Survey are restricted to just one of these dimensions – sexual identity. The form of the relevant question included in both surveys is guided by a recommendation from the UK Office of National Statistics (ONS) (Haseldon and Joloza, 2009). Further, and as noted earlier, while both surveys rely mainly on face-to-face interviews, both also include a self-completion instrument and it is this instrument in which the sexual identity question was included.

In wave 3 of the UKHLS the relevant question reads: “*Which of the following options best describe how you think of yourself?*” Five alternative response options are provided: (i) Heterosexual or straight; (ii) Gay or lesbian; (iii) Bisexual; (iv) Other; and (v) Prefer not to say. An almost identically worded question was included in wave 12 of the HILDA Survey, but with the notable difference that the HILDA Survey provided for an additional response option: Unsure/Do not know.⁴

Summary statistics describing the incidence of sexual minority groups in the two samples (along with descriptive statistics for most other variables used in the analysis) are reported in Table 1. In proportional terms there are slightly more LGB individuals in the Australian sample than in the UK sample. Approximately 1.4% of the UK sample report being gay or lesbian, compared to 1.6% of the Australian sample, while bisexuals make up another 1.1% of the UK sample and 1.5% of the Australian sample. There are another 1.1% and 0.7% of the UK and Australia samples, respectively, that selected the option “other”. Finally, 2.9% of the UK sample and 2.0% of the Australian sample preferred not to disclose their sexual identity.

The estimated incidence of LGB persons within these samples is broadly consistent with population surveys conducted by the official statistical agencies in these countries. The 2007 National Survey of Mental Health and Well-being conducted by the Australian Bureau of Statistics (ABS), for example, reported (after excluding persons who were undecided or preferred not to answer) that 1.8% of Australians aged between 16 and 85 identified as homosexual or bisexual (ABS, 2008). The comparable population-weighted estimate from the HILDA Survey is 2.6%. The lower estimate in the ABS survey is to be expected given its question on sexual identity was posed in a face-to-face interview and so likely to be associated with greater misreporting. Similarly, the Integrated Household Survey conducted by the UK ONS reported that, in 2012, between 1.5% and 1.6% of persons aged 16 years or older in the UK identified themselves as gay, lesbian or bisexual (ONS, 2013). The comparable estimates from the UKHLS are between 2.3% and 2.4%.

3.3. Outcome variables

Our main dependent variable comes from responses to a single-item question about overall life satisfaction. While single-item measures of life satisfaction are generally regarded as statistically inferior to multi-item scales, they are now routinely included in large national and international surveys, and have formed the basis for a very large number of studies, including within economics.⁵

In the UKHLS, respondents are asked, again as part of the self-completion instrument, to rate, on a 7-point scale, how satisfied they are with their “*life overall*”. All scale points are labeled and range from “completely dissatisfied” to “completely satisfied”. In the HILDA Survey a similar question is asked: “*All things considered, how satisfied are you with your life?*” But unlike the UKHLS, this question is interviewer administered. Respondents are also given an 11-point (0–10) scale with only the extreme points labeled, and those labels are “totally dissatisfied” and “totally satisfied”.

Turning to the potential mediating variables, our income variable in both data sets is represented by the log of gross equivalized annual household income.⁶ Both data sets

⁴In addition, in both surveys there are cases that are missing because respondents elected not to answer this question. Separate indicator variables to represent these don’t know/unsure and missing cases are included in our regression analyses, though we do not report the coefficients and nor do we estimate the indirect effects associated with these cases.

⁵Dolan et al. (2008), in their review of the primarily economics literature, identified 19 major data sets that contained single-item measures of global life satisfaction or happiness.

⁶Equivalized household income is calculated using the following formula: $\text{annual household income}/[1 + 0.5 * (\text{number of adult household members minus } 1) + 0.3 * (\text{number of children aged less than } 15 \text{ in the household})]$.

contain a household income variable that is constructed by summing the personal incomes of all household members, with missing data for any income components imputed. The variable in the HILDA Survey is constructed for the financial year preceding interview (i.e., the year ended 30 June 2012). The household income variable from the UKHLS, on the other hand, is based only on income received during the 30 days prior to interview, which we have multiplied by 12 to obtain an annual estimate. Employment is a binary variable representing whether the person was employed or not during the week preceding interview. Marriage/de facto is also a binary variable, and indicates whether or not the person is either formally registered as married or in a de facto union (i.e., living with someone else in a couple relationship). Health is represented by a self-assessed measure (which in both surveys is included within the self-completion instrument), with possible responses ranging from 1 “poor” to 5 “excellent”. Number of children is the total number of children the respondent has, including children that no longer live at home. Size of friendship networks is measured differently in the two data sets. In the UKHLS it is represented by the number of friends using the question: “*How many close friends would you say you have?*” In the HILDA Survey it is captured using the following subjective question: “*The following statements have been used by many people to describe how much support they get from other people. How much do you agree or disagree with each? . . . I seem to have a lot of friends.*” The potential responses are on a 7-point scale that ranges from “strongly disagree” to “strongly agree”. Finally, education is represented by a dummy variable indicating whether or not the individual had completed a university degree (or equivalent level qualification).⁷

3.4. Empirical strategy

To study the direct and indirect effects of sexual orientation on life satisfaction through our seven selected indirect channels (Fig. 1), we estimate a structural equations model (SEM) that takes the form:

$$\begin{aligned}
 LS_i &= \alpha_0 + \beta_s \sum_{s=1}^7 X'_{si} + \gamma_0 SI_i + Z_i + \varepsilon_0, \\
 X_{1i} &= \alpha_1 + \gamma_1 SI_i + Z_i + \varepsilon_1, \\
 &\vdots \\
 X_{7i} &= \alpha_7 + \gamma_7 SI_i + Z_i + \varepsilon_7
 \end{aligned} \tag{1}$$

where $i = 1, 2, \dots, N$; LS_i denotes respondent i 's life satisfaction; $X_{s,i}$ represents the set of seven potential pathways through which sexual identity influences life satisfaction; SI_i is an indicator of individual i 's sexual identity; and Z_i is a vector of exogenous control variables, including age, age-squared and age-cubed, race dummies (only in the UKHLS sample),

⁷As previously noted, brief consideration was also given to including a measure of religiosity (attending religious services at least once a week), which while not available in the survey waves at the center of this analysis, were included in wave 1 of the UKHLS and wave 10 of the HILDA Survey. Inclusion of this measure leads to a substantial reduction in sample size (from 32,964 to 21,469 in the case of the UKHLS, and from 12,388 to 7980 in the case of the HILDA Survey). Furthermore, when included as a simple control variable, this religious attendance variable, while positively signed, was statistically insignificantly different from zero in both samples. We thus decided to omit religiosity from the estimation.

country of origin dummies (only in the HILDA Survey sample), a variable representing how long the person has been in the panel (and its squared value), a dummy representing whether there were other people present during the interview (only in the HILDA Survey),⁸ and regional dummies. The error terms e_0, e_1, \dots, e_7 are assumed to be randomly distributed, as well as allowed to be correlated across all eight regression equations. Note that while our measure of life satisfaction is only an ordinal variable, we treat it as if it is cardinal. Other research (Ferrer-i-Carbonell and Frijters, 2004) suggests that this assumption of cardinality makes little qualitative difference when analyzing data on subjective well-being.

To derive the indirect effects of sexual identity on life satisfaction, we adopt the multiple mediation method originally developed by Baron and Kenny (1986). The key idea of the multiple mediation method is that there are many different paths through which life satisfaction can be influenced by sexual identity, some of which are explicitly estimated by SEM. For example, sexual identity may influence both the income and health of a person, which in turn shapes the way life satisfaction is rated in a survey. The multiple mediation method thus allows us to estimate how much of this indirect relationship between sexual identity and life satisfaction is channeled through income, and how much of it is channeled through health.

More specifically, based on the equations above, the indirect effect of SI_i on LS_i through X_{sj} for each s is given by $\beta_s \times \gamma_s$ (Baron and Kenny, 1986). As recommended by Hayes (2009), bootstrapping (with 200 replications) is used to estimate the standard errors for all of the estimated indirect effects. The model is estimated using the *sem* command in STATA 13. Note that all of the outcome variables are standardized, and thus have a mean of 0 and a standard deviation of 1.

4. Results

4.1. Main samples

Are sexual minorities more or less satisfied with life compared to heterosexuals? To make a first pass at this question, Fig. 2 summarizes the average standardized life satisfaction, in both the UK and Australia, for different groups of persons categorized according to their sexual identity. We can see here that there is a remarkable consistency in the relationship between sexual identity and life satisfaction in the two countries. Heterosexuals are typically the most satisfied with life, with bisexuals in both the UK and Australia reporting to be the least satisfied. It is also worth noting that those who “prefer not to say” are also significantly less satisfied with life than heterosexuals, suggesting that people who put themselves in this category in an anonymous survey are systematically different (at least in terms of how they respond to life satisfaction questions) from the heterosexual population.

In Tables 2 and 3 we report the SEM estimates for the UK and Australian samples, respectively. Each column represents each different regression equation, starting from life satisfaction as the dependent variable in the first column, then log of equivalized household

⁸Following Shields et al. (2009), this variable controls for the social desirability biases that might arise when life satisfaction is collected in an interview where there is no guarantee that other members of the household will not be present. A similar control is deemed unnecessary for the analysis of UKHLS data given its life satisfaction question is self-administered.

income, whether in employment, whether married or living in a de facto union, self-assessed health, number of children, number of friends, and whether completed a university degree.

Column 1 of Table 2 shows that, in the UK, LGB individuals, as well as individuals reporting “other” sexual identities and those who prefer not to disclose their sexual identity, are *ceteris paribus* significantly less satisfied with their life overall. Bisexuals are the least satisfied ($\beta = -.286$), followed by those reporting having an “other” sexual identity ($\beta = -.231$), then gays and lesbians ($\beta = -.160$), and finally those who “prefer not to say” ($\beta = -.053$, which is not significant). Consistent with previous studies on the determinants of life satisfaction (Dolan et al., 2008; Powdthavee, 2010), the log of equivalized household income, employment, marriage and de facto unions, self-assessed health, the number of close friends, and possessing a university degree, all enter the life satisfaction equation in a positive and statistically significant manner. The coefficient on the number of children, on the other hand, is effectively zero, which is broadly in line with most previous research (which has usually reported either a negative or insignificant relationship). A one standard deviation increase in self-assessed health is associated with the largest increase in life satisfaction ($\beta = .284$), followed by marriage/de facto unions ($\beta = .110$), the log of equivalized household income ($\beta = .054$), friends ($\beta = .052$), employment ($\beta = .039$), and completion of a degree ($\beta = .026$).

What about the relationships between different sexual identities and life satisfaction in Australia? Looking at column 1 of Table 3, we observe that, by comparison with individuals in the UK, differences in life satisfaction between heterosexuals and sexual minorities are mostly smaller and, with the exception of bisexuals are, not significantly significant. With respect to the potential mediating factors, we find all but two coefficients to be both positive and statistically significant at the 5% level. In order of magnitude, these are: self-assessed health ($\beta = .292$), friends ($\beta = .200$), marriage/de facto unions ($\beta = .162$), the log of equivalized household income ($\beta = .044$) and employment ($\beta = .027$). An obvious difference with the UK results is the size of the coefficient on the variable measuring friends, which is four times larger in the Australian results. This almost certainly reflects the different measures used to capture the effects of friends; the subjective measure of friends available in the HILDA Survey data may be more subject to reporting bias and thus causing the association between friends and SWB to be overstated. The Australian results also differ in finding a positive effect of children, though the magnitude of this coefficient is quite small, and only weakly significant. Finally, we find that education (i.e., completing a degree) in Australia is, in contrast to the UK results, negatively and significantly associated with life satisfaction ($\beta = -.027$), which is consistent with the results found by Shields et al. (2009) using the same Australian data.

Columns 2–8 in each of these tables report estimates of the extent to which individuals with different sexual identities perform better or worse with respect to each of our intermediate outcome variables. Thus we can see from Table 2 that sexual minority adults in the UK tend to be from lower income households and tend to be less likely to be employed than an average heterosexual. These differentials, however, are neither large nor statistically significant for gay or lesbian individuals. As might be expected, gay men and lesbian women, as well as bisexuals and individuals who preferred not to state their sexual identity, are much more likely to be single. Also as expected, gay men and lesbian women, as well as

bisexuals, are much less likely than others to have children, and report relatively worse health on average. Gay men and lesbian women do not report having fewer or more friends than an average heterosexual. Finally, while being gay or lesbian does not seem to have prevented individuals from completing a university degree (in fact, gay and lesbian individuals are more likely to have completed a university degree), persons who report either having an “other” sexual identity or a preference not to state their sexual identity are less likely to have completed a higher education qualification.

Comparing columns 2–8 in Table 3 with those in Table 2, we can see that there are many similarities in the regression equation results for the two samples. For example, as in the UK sample, there is no evidence to suggest that, in 2012, gay men or lesbian women in Australia received lower gross equivalized household income than otherwise comparable heterosexual individuals, but there is strong statistical evidence that bisexual adults, as well as individuals reporting an “other” sexual identity or who “prefer not to say”, tend to be from lower income households on average. Gay or lesbian individuals in Australia are also both significantly less likely to be living in a formal relationship with a partner and to have many children. And like gay or lesbian persons in the UK, they are much more likely to have completed a university degree. One difference from the UK sample, however, is that gay and lesbian Australians are not significantly more likely to report poorer health than heterosexuals.

We next calculated the ‘indirect effects’ on life satisfaction that are associated with membership of different sexual minority groups.⁹ This is done by multiplying, for example, the coefficient on (standardized) log of equivalized household income in the (standardized) life satisfaction equation by the coefficient on “gay or lesbian” in the (standardized) log of equivalized household income equation to obtain the indirect effect of being gay or lesbian on life satisfaction through the income channel. The indirect effect for each of the seven hypothesized channels can then be summed to obtain a total indirect effect.

A summary of these indirect effects (together with the direct effects) is presented in Table 4 for the UK and in Table 5 for Australia. Thus we can see that the lower probabilities of being in a couple relationship (be it a registered marriage or a de facto union) and of having high levels of self-assessed health (as reported in Table 2) contribute significantly to lower life satisfaction among lesbian women and gay men in the UK sample. In contrast, only couple relationship is statistically important in contributing to the lower life satisfaction of gay men and lesbian women in Australia. There are also small negative, but significant, indirect effects that operate in Australia, but not in the UK, through the relatively high incidence of university education and the lesser likelihood of having children.

The total indirect effects and direct effects, as well as the combined effects (the sum of the direct and indirect effects), are presented in the last three rows of the two tables. The direct effect, which represents the correlation between sexual orientation and life satisfaction when other things are held fixed, is unexplained by definition and could therefore encompass the

⁹Although we are calling the product of two coefficients the ‘indirect effect’, it is nothing more than just a simple indirect association between sexual identity and life satisfaction via a mediating variable of interest. It does not imply causality. However, the term is used here for the sake of consistency with previous research on mediation analysis (Baron and Kenny, 1986).

effects that arise from social stigmatization and other forms of taste-based discrimination against sexual minorities that are not related to the variables included in the regression model.

In both countries, the total indirect effect is negative and significant for all four sexual minority groups. As a result, the combined effects for all four groups, and in both samples, are considerably larger than the estimated direct effects. This implies that single-equation regressions will underestimate the association between being a member of a sexual minority group and life satisfaction.

There are also obvious differences in the results across the two population samples we use. While the combined effects associated with sexual minority identity are broadly similar in both countries, with the negative differential largest among bisexuals, followed by persons who selected the “other” response, and then gay or lesbian individuals, the relative importance of indirect and direct effects are different. The indirect effects are mostly more important, both relatively and absolutely, in the Australian sample. For example, the size of the estimated total indirect effect of being a bisexual in Australia is 25% of one standard deviation in life satisfaction, which is more than twice the size of the estimated total indirect effect of being a bisexual in the UK. The exception to this is gay and lesbian individuals. For this group the differential with the heterosexual majority is relatively modest in both samples, and close to identical in magnitude. Further, the direct effects are typically much smaller in Australia and, with the exception of bisexuals, are insignificant. A possible implication of this is that social stigma effects associated with homosexuality are much weaker (if not entirely absent) in Australia.

One potential concern is that our results are based on the assumption that what matters for life satisfaction does not vary in a systematic way with sexual identity. Although there are no reasons to believe that an LGB person would, for example, derive more or less satisfaction from being employed than an average heterosexual person, it is worth checking whether this is confirmed empirically. We thus estimated a fully interactive model of life satisfaction, where sexual identity is interacted with all of the mediating factors. The estimates are reported in Table A1 in the online appendix. With only few exceptions, most of the interaction terms are, as anticipated, statistically insignificantly different from zero at conventional statistical levels. This leads us to reject the hypothesis that the magnitudes of the determinants of life satisfaction vary systematically and significantly across people of different sexual identities.

4.2. Sub-sample analyses

To this point we have been conducting our analysis based on the assumption that there are no gender differences in the associations between sexual identity and life satisfaction. This might be an unrealistic assumption, especially given that previous studies have found significant evidence of negative pay discrimination for gay workers but a pay premium for lesbian workers. Hence the same technique we used to calculate the indirect effects is applied to gender sub-samples. Tables 6 and 7 report the set of implied indirect effects, together with the direct effects, of different sexual identities on life satisfaction by gender for the UK and Australia, respectively.

A number of important gender differences are suggested by this analysis. Most obviously, there is relatively little evidence that lesbian women in the UK have lower levels of life satisfaction than heterosexual women; there is no direct effect and only a very modest negative net indirect effect. This stands in marked contrast to both gay men in the UK and lesbian women in Australia. In the UK both indirect and direct effects contribute to a very sizeable differential in the life satisfaction of gay and heterosexual men, equal to more than one third of a standard deviation in the life satisfaction score. The direct effect, however, accounts for the majority (69%) of this gap. In Australia, both gay men and lesbian women have significantly lower levels of life satisfaction of roughly similar magnitudes. The route by which this is achieved, however, is very different, with indirect effects (mainly via lower rates of partnering and fewer children) accounting for the entire differential for lesbian women, but accounting for none of it for gay men.

The relative size of direct and indirect effects for bisexuals and those that chose the “other” category mostly do not differ much with gender, though the relative importance of the indirect channels does. Finally, among those that preferred not to reveal their identity the relative size of indirect and direct effects is similar for men and women in the UK data but not in the Australian data. Notably, there is a very large negative direct effect for Australian men in this category, but not for Australian women.

Another question of interest is whether the implications of being gay, lesbian or bisexual for life satisfaction vary with age. The proportions of people reporting to be gay, lesbian, bisexual or others are smaller among older cohorts,¹⁰ which might reflect the possibility that older respondents are less likely than younger respondents to admit their true sexual orientation. To address this issue, Tables 8 and 9 present the set of implied indirect effects, together with the direct effects, of different sexual identities on life satisfaction for two broad age groups – 16–39 years and 40–64 years – for the UK and Australia, respectively.

Looking across the columns of both tables, we can see that much of the previously observed negative effects – both direct and indirect – are statistically more robust for the young than the old. For example, the combined effects of being an LGB person in Australia when young are negative, sizeable, and statistically significant, while the equivalent effects are insignificantly different from zero for the older respondents. A similar pattern of results can also be observed for LGB individuals in the UK. Taken at face value, these results might imply that older LGB populations face lesser degrees of hardships than younger LGB persons. It might also imply that older LGB persons have had more time to learn to cope with and adjust to any stigma and discrimination associated with their sexual identity. Alternatively, older LGB persons may be more likely to misreport their true sexual orientation, thus placing downward bias on our estimated coefficients.

4.3. Time-profiles of the direct and indirect effects in Australia

We also applied the sexual identity variable retrospectively to the previous 11 waves in HILDA in order to study the time-profiles of both the direct and indirect associations between sexual orientation and life satisfaction over time.¹¹ This involved a re-estimation of

¹⁰For descriptive statistics of LGB individuals by age, see Table A2 in the online appendix.

the SEM equations presented in Tables 2 and 3 for each of the twelve survey waves in HILDA. Note also that by applying the sexual identity variable retrospectively to previous waves, the samples used in earlier waves will inevitably be smaller than that used in Wave 12 where the question on sexual identity is asked.¹² Given that the re-estimation of SEM for each wave of the HILDA Survey produces a large number of coefficients, for ease of interpretation we have produced graphs (Figs. 3 and 4) displaying the time-profiles of direct and total indirect effects of sexual identity on life satisfaction between the years 2001 and 2012 in Australia.

Fig. 3 reveals a degree of fluctuation above and below zero in the estimated direct effects of being LGB on life satisfaction over time. In the case of the lesbian/gay population, however, these variances are all insignificantly different from zero. In other words, there is no clear evidence to suggest that the lesbian and gay minorities have always been less satisfied with life in Australia when a selected set of economic, social and personal factors are taken into account. In contrast, the total indirect effects (Fig. 4) have almost always been negative. Nevertheless, among the gay and lesbian population the magnitude of this negative indirect effect has clearly declined over time. This is consistent with other survey evidence showing that attitudes toward homosexuality have become more liberal over time (including over the period covered by this panel). More importantly, it suggests that this change in attitudes has been associated with a substantive improvement in the well-being of lesbian and gay Australians.

On the other hand, for other groups in Australia – bisexuals, those who classify themselves as falling into the “other” category, and those that “prefer not to say” – little has changed. The total indirect effect has been substantially negative throughout the entire period covered by the HILDA Survey, suggesting a persistent difference in terms of the economic, social and personal factors that affect the life satisfaction of these groups.

5. Conclusions

This paper uses a measure of life satisfaction to empirically investigate the overall well-being of sexual minorities in the UK and Australia. By estimating a structural equation model, the direct association between being a member of an LGB group and life satisfaction is separated from the set of indirect effects resulting from different observable individual characteristics, thereby adding extra information to what has been lacking in the estimation of single-equation models.

Overall, we find evidence of significantly lower levels of life satisfaction (other things held constant) among sexual minorities in both the UK and Australia. Further, being a member of a sexual minority, which also includes those who preferred not to reveal their sexual identity, is indirectly associated with lower levels of well-being through a set of economic, social and personal factors that also predict life satisfaction. An important implication of our results is that single-equation models of life satisfaction will almost certainly underestimate the total

¹¹We did not do the same for the UKHLS given the short length of the available panel – just three waves (i.e., years).

¹²In addition, in wave 11 a major sample expansion was introduced. See Table A3 in the online appendix for the numbers and percentages of respondents with different sexual orientations by survey wave/year.

effect of being a member of a sexual minority on the overall life satisfaction of these individuals. The importance of this insight is highlighted by the results for Australia. With the exception of bisexuals, the direct differences between sexual minorities and heterosexuals in the Australian sample were statistically insignificant. Once we were able to decompose the links into direct and indirect effects, however, the differences with all four sexual minority groups considered here became considerably larger and statistically significant.

A feature of our analysis is the use of data collected using similar methods and containing comparable measures that are representative of populations for two countries. We have thus been able to test the extent to which our results are replicable across different data sets covering different populations and sub-groups of populations, and while important differences are found, it is the similarities that are most striking. Of course, it is true that Australia and the UK have many features in common, including a common language and similar legal institutions. It remains to be seen whether our results would extend to other nations with very different socio-economic customs and institutions.

Perhaps the most important difference between the two countries was the lack of any sizeable or significant direct effect of being gay or lesbian in Australia. This finding suggests that stigma effects, which would mostly be expected to have been captured within the ‘unexplained’ direct effect, are now largely absent in Australia. If so, this almost certainly represents a major change from the past.

The analyses presented here are also not without limitations. Most obviously the measure of sexual orientation used is based on self-identification, which can be problematic given the stigma that has traditionally been associated with sexual minority status and hence the incentive for some respondents to not reveal their sexual preferences. If this means some LGB respondents deliberately misclassify themselves as heterosexual, then our estimates will be biased. Such biases are expected to be less prominent in our results given the measures of sexual identity used explicitly allow for respondents to not disclose their identity by providing a “prefer not to say” option, but nevertheless are not entirely eliminated. The direction of such bias is also difficult to predict a priori, and depends on whether the persons who are most likely not to reveal their sexual identity are also those most dissatisfied with their lives. If they are, then our estimates will be biased toward zero. On the other hand, if the persons who do not reveal their sexual identities to researchers are also those most likely to not reveal their identity to others, then the bias may run in the opposite direction given it is difficult to discriminate against sexual minorities when their sexual identity cannot be observed. Another possible scenario is when an individual reveals their true sexual identity to others but not to the researcher. In such cases, our estimates will likely be biased toward zero if the decision to reveal their identity leads them to be discriminated against by others.

Ultimately it is extremely difficult, if not impossible, to counter such biases. Alternative approaches to the measurement of sexual orientation, for example, are not obviously superior. Some studies use same-sex cohabitation as their indicator of sexual minority status, which has the consequence of restricting the sample for analysis to persons living in couple

relationships. This seems a major weakness given the evidence presented here that the lesser propensity of LGB persons to form couple relationships is a major contributor to lower life satisfaction. And in any case, such measures still rely on respondents revealing that they are in a same-sex relationship.

A further criticism of our paper is that the associations between sexual identity, intermediate outcomes and life satisfaction are subject to a variety of other endogeneity biases, including, but not limited to, potential selection bias (e.g., LGB persons may select themselves into environments that are not the typical choices for heterosexuals), and as a result no causal inferences can be drawn. This is a fair objection. Ideally what policy makers need is a fully causal model. This, however, is no simple task given sexual preferences is not amenable to experimental manipulation, and finding an instrumental variable for sexual orientation will, in our opinion, be particularly difficult. Nevertheless, the current study is the first to empirically identify candidate areas for development when it comes to the possible channels through which life satisfaction of an LGB person might be most affected by pre-existing differences in economic, social and personal factors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.jebo.2015.04.012>.

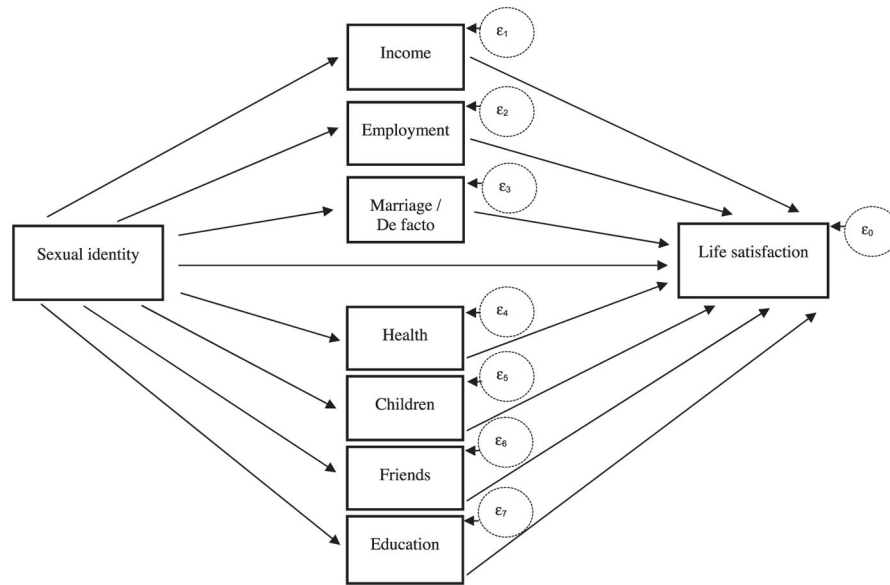


Fig. 1.
A structural equation model of sexual identity and life satisfaction.

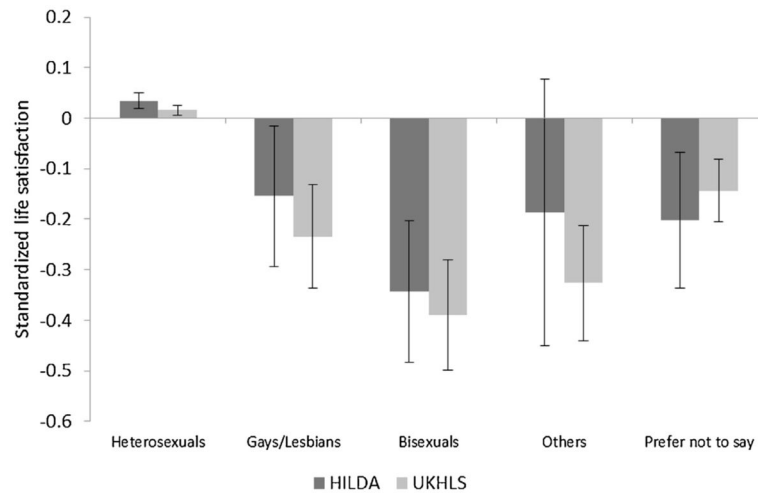


Fig. 2. Average (standardized) life satisfaction by sexual identity. 4-standard-error bands (95% C.I.) are reported: two s.e. above and two below.

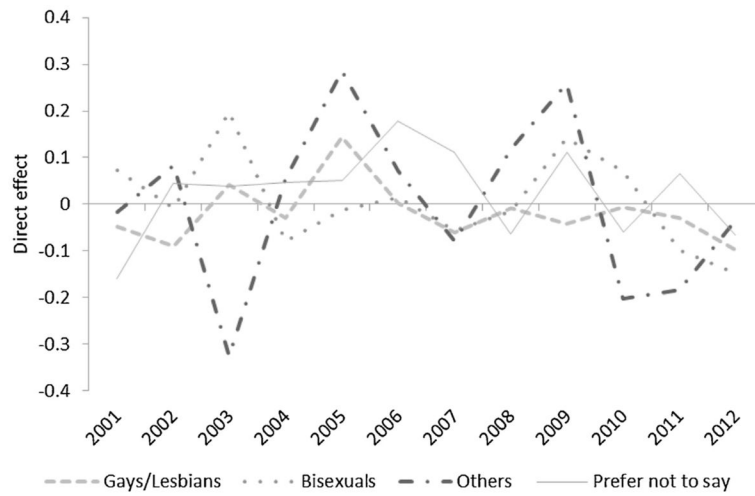


Fig. 3. Direct effect of sexual identity on life satisfaction by year, HILDA Survey 2001–2012.

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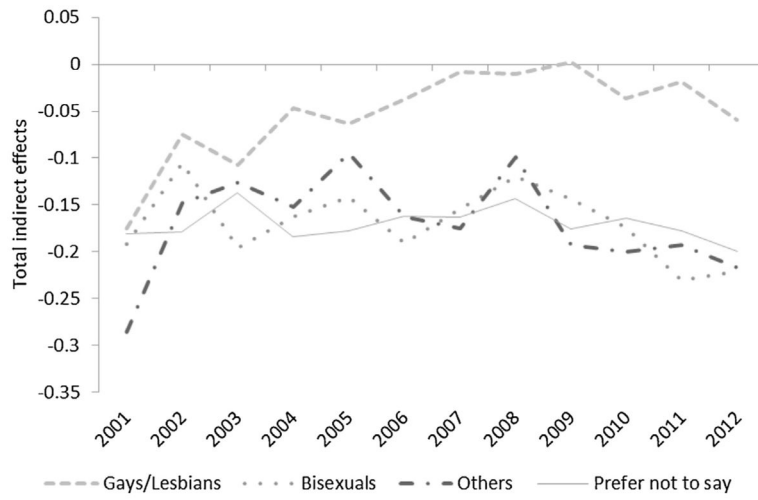


Fig. 4. Total indirect effect of sexual identity on life satisfaction by year, HILDA Survey 2001–2012.

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Table 1

Descriptive statistics: means and standard deviations (in parentheses).

Variables	UKHLS			HILDA Survey		
	Persons	Men	Women	Persons	Men	Women
Life satisfaction	5.041 (1.525)	5.039 (1.503)	5.043 (1.542)	7.849 (1.436)	7.837 (1.420)	7.861 (1.450)
<i>Sexual identity</i>						
Gay or lesbian	.014 (.116)	.018 (.133)	.010 (.102)	.016 (.125)	.018 (.133)	.014 (.117)
Bisexual	.011 (.106)	.011 (.103)	.012 (.107)	.015 (.122)	.009 (.098)	.019 (.139)
Other	.011 (.102)	.010 (.099)	.011 (.103)	.007 (.083)	.007 (.081)	.007 (.085)
Prefer not to say	.029 (.167)	.028 (.164)	.029 (.169)	.020 (.141)	.018 (.134)	.022 (.146)
Don't know/Unsure/Missing	.001 (.038)	.002 (.041)	.001 (.033)	.016 (.125)	.014 (.119)	.017 (.130)
<i>Mediating variables</i>						
Log of equivalized household income	9.978 (.813)	10.042 (.852)	9.928 (.777)	10.862 (.694)	10.889 (.696)	10.837 (.692)
Employed	.697 (.459)	.747 (.434)	.659 (.474)	.733 (.442)	.794 (.404)	.677 (.467)
Married/De facto	.639 (.481)	.656 (.475)	.627 (.484)	.623 (.484)	.621 (.485)	.625 (.484)
Self-assessed health	3.535 (1.097)	3.568 (1.089)	3.508 (1.104)	3.496 (.933)	3.514 (.939)	3.480 (.927)
Number of children	.945 (1.316)	.802 (1.256)	1.056 (1.350)	1.361 (1.432)	1.271 (1.422)	1.442 (1.436)
Number of friends ^a	5.148 (5.007)	5.356 (5.637)	4.988 (4.454)	4.502 (1.656)	4.432 (1.647)	4.564 (1.661)
Completed a university degree	.255	.259	.252	.251	.225	.274

Variables	UKHLS			HILDA Survey		
	Persons	Men	Women	Persons	Men	Women
<i>Socio-demographic variables</i>						
Female	.543 (.498)			.523 (.499)		
Age	40.350 (13.798)	40.347 (13.926)	40.353 (13.689)	38.291 (14.22)	38.071 (14.238)	38.492 (14.205)
<i>N</i>	32,964	14,222	18,472	12,388	5777	6561

Samples restricted to persons aged 16–64 years. Included in the regression equations but not reported here are controls for race (only in the UKHLS), country of origin (only in the HILDA Survey), region, length of time in panel, and the presence of others in interview (only in the HILDA Survey).

^aIn the HILDA Survey the “number of friends” is measured using a subjective question (“I seem to have a lot of friends”), which is scored on a 7-point disagree-agree scale.

Table 2
Structural equation model of the effects of sexual identity on life satisfaction, UKHLS 2011–2012.

	Life satisfaction (1)	Log of equivalized household income (2)	Employed (3)	Married/De facto (4)	Self-assessed health (5)	Number of children (6)	Number of friends (7)	Completed a university degree (8)
Gay or lesbian	-.160*** (.049)	-.017 (.051)	.031 (.040)	-.313*** (.045)	-.136*** (.046)	-.545*** (.032)	.051 (.035)	.199*** (.053)
Bisexual	-.286*** (.055)	-.187*** (.062)	-.133*** (.047)	-.190*** (.047)	-.292*** (.052)	-.066 (.041)	-.019 (.042)	.031 (.052)
Other	-.231*** (.062)	-.289*** (.048)	-.281*** (.052)	-.076 (.049)	-.266*** (.054)	.169*** (.054)	.069 (.081)	-.379*** (.043)
Prefer not to say	-.053 (.036)	-.245*** (.038)	-.230*** (.032)	-.156*** (.031)	-.211*** (.033)	.082*** (.032)	-.018 (.039)	-.197*** (.032)
<i>Mediating factors</i>								
Log of equivalized household income	.054*** (.006)							
Employed	.039*** (.007)							
Married/De facto	.110*** (.006)							
Self-assessed health	.284*** (.006)							
Number of children	.001 (.006)							
Number of friends	.052*** (.005)							
Completed a university degree	.026*** (.005)							
<i>Socio-demographic controls</i>								
Female	.042***	-.143***	-.193***	-.069***	-.040***	.164***	-.060***	-.027**

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	Life satisfaction (1)	Log of equivalized household income (2)	Employed (3)	Married/De facto (4)	Self-assessed health (5)	Number of children (6)	Number of friends (7)	Completed a university degree (8)
Age	(.011) -.043***	(.011) .006	(.009) .111***	(.009) .461***	(.010) .019*	(.009) -.076***	(.011) .000	(.011) .344***
Age-squared/100	(.030) .030	(.029) .067**	(.027) -.098***	(.025) -.970***	(.028) -.066**	(.024) .306***	(.028) -.026	(.029) -.801***
Age-cubed/100	(.000) .000	(.000) -.001***	(.000) -.001***	(.000) .007***	(.000) .000*	(.000) -.003***	(.000) .000*	(.000) .006***
Var(e)	(.008) .887***	(.037) .932***	(.005) .735***	(.005) .739***	(.006) .865***	(.010) .696***	(.045) .875***	(.006) 1.039***

***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Robust standard errors are in parentheses. While not reported, also included are controls for race, number of years in the panel (and its squared value), and region.

$N = 32,964$.

Table 3
Structural equation model of the effects of sexual identity on life satisfaction, HILDA Survey 2012.

	Life satisfaction (1)	Log of equivalized household income (2)	Employed (3)	Married/De facto (4)	Self-assessed health (5)	Number of children (6)	Number of friends (7)	Completed a university degree (8)
Gay or lesbian	-.107 (.067)	.024 (.080)	.004 (.058)	-.295*** (.066)	-.037 (.070)	-.676*** (.043)	.055 (.068)	.235*** (.078)
Bisexual	-.166** (.073)	-.337*** (.088)	-.229*** (.069)	-.133* (.069)	-.416*** (.079)	-.053 (.059)	-.446*** (.076)	-.159*** (.061)
Other	-.045 (.139)	-.637*** (.086)	-.472*** (.110)	-.416*** (.102)	-.333*** (.115)	-.025 (.097)	-.151 (.127)	-.266*** (.091)
Prefer not to say	-.078 (.073)	-.438*** (.053)	-.355*** (.064)	-.369*** (.062)	-.342*** (.067)	-.119** (.057)	-.120* (.072)	-.314*** (.055)
<i>Mediating factors</i>								
Log of equivalized household income	.044*** (.011)							
Employed	.027*** (.011)							
Married/De facto	.162*** (.011)							
Self-assessed health	.292*** (.010)							
Number of children	.022* (.012)							
Number of friends	.200*** (.009)							
Completed a university degree	-.027*** (.008)							
<i>Socio-demographic controls</i>								
Female	.023	-.068***	-.236***	-.012	-.032*	.091***	.088***	.095***

	Life satisfaction (1)	Log of equivalized household income (2)	Employed (3)	Married/De facto (4)	Self-assessed health (5)	Number of children (6)	Number of friends (7)	Completed a university degree (8)
Age	(.016) -.091***	(.016) .006	(.015) .124***	(.015) .416***	(.017) -.025	(.013) .003	(.018) -.068***	(.018) .275***
Age-squared/100	(.016) .142***	(.015) .057	(.016) -.188***	(.013) -.887***	(.016) .024	(.011) .191***	(.017) .115**	(.015) -.616***
Age-cubed/100	(.043) -.000	(.041) -.001***	(.043) .000	(.036) .006***	(.044) -.000	(.031) -.002***	(.045) -.001	(.042) .004***
Var(e)	(.000) .738***	(.000) .771***	(.000) .740***	(.000) .688***	(.000) .881***	(.000) .552***	(.000) .959***	(.000) .963***
	(.014)	(.021)	(.008)	(.008)	(.011)	(.013)	(.010)	(.010)

***, ** and * denote significance at the 1%, 5% and 10% levels respectively. Robust standard errors are in parentheses. While not reported, also included are controls for country of origin, number of years in the panel (and its squared value), region, and whether there were other people present during the interview.

$N = 12,388$.

Table 4

Estimated indirect and direct effects of sexual identity on life satisfaction, UKHLS 2011–2012.

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
Log of equivalized household income	-.001 (.003)	-.010 *** (.003)	-.016 *** (.003)	-.013 *** (.003)
Employed	.001 (.002)	-.005 *** (.002)	-.011 *** (.003)	-.009 *** (.002)
Married/De facto	-.034 *** (.005)	-.021 *** (.005)	-.008 (.006)	-.017 *** (.003)
Self-assessed health	-.039 *** (.013)	-.083 *** (.014)	-.076 *** (.015)	-.060 *** (.009)
Number of children	-.001 (.003)	-.000 (.000)	.000 (.001)	.000 (.001)
Number of friends	.003 (.002)	-.001 (.002)	.004 (.004)	-.001 (.002)
Completed a university degree	.005 *** (.002)	.001 (.001)	-.010 *** (.002)	-.005 *** (.001)
Total indirect effect	-.066 *** (.017)	-.119 *** (.018)	-.116 *** (.018)	-.105 *** (.011)
Direct effect	-.160 *** (.049)	-.286 *** (.057)	-.231 *** (.069)	-.053 (.035)
Combined effect (total indirect effect + direct effect)	-.226 *** (.056)	-.405 *** (.059)	-.347 *** (.070)	-.158 *** (.036)

***, ** and * denote significance at the 1%, 5% and 10% levels respectively. Bootstrapped standard errors (200 repetitions) are in parentheses.

Table 5

Estimated indirect and direct effects of sexual identity on life satisfaction, HILDA Survey 2012.

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
Log of equivalized household income	.001 (.004)	-.015 ** (.006)	-.028 *** (.008)	-.019 *** (.005)
Employed	.000 (.002)	-.006 ** (.003)	-.013 ** (.006)	-.010 ** (.004)
Married/De facto	-.048 *** (.011)	-.021 * (.011)	-.067 *** (.017)	-.060 *** (.010)
Self-assessed health	-.010 (.022)	-.121 *** (.020)	-.097 ** (.038)	-.100 *** (.019)
Number of children	-.015 * (.008)	-.001 (.002)	-.001 (.002)	-.003 (.002)
Number of friends	.011 (.014)	-.086 *** (.015)	-.030 (.026)	-.024 (.015)
Completed a university degree	-.006 ** (.003)	.004 ** (.002)	.007 ** (.003)	.009 *** (.003)
Total indirect effect	-.068 ** (.029)	-.250 *** (.034)	-.229 *** (.054)	-.207 *** (.031)
Direct effect	-.107 (.073)	-.166 ** (.075)	-.045 (.147)	-.078 (.069)
Combined effect (total indirect effect + direct effect)	-.175 *** (.073)	-.416 *** (.080)	-.274 * (.165)	-.285 *** (.076)

***, ** and * denote significance at the 1%, 5% and 10% levels respectively. Bootstrapped standard errors (200 repetitions) are in parentheses.

Table 6

Estimated indirect and direct effects of sexual identity on life satisfaction by gender, UKHLS 2011–2012.

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
<i>(A) Men (N = 14,222)</i>				
Log of equivalized household income	-.006 (.004)	-.013 ** (.006)	-.012 *** (.004)	-.020 *** (.005)
Employed	-.002 (.004)	-.010 ** (.005)	-.021 *** (.006)	-.013 *** (.004)
Married/De facto	-.045 *** (.008)	-.030 *** (.008)	-.010 (.007)	-.020 *** (.005)
Self-assessed health	-.054 *** (.017)	-.039 * (.020)	-.071 *** (.023)	-.052 *** (.014)
Number of children	.001 (.005)	.000 (.001)	-.000 (.002)	-.000 (.001)
Number of friends	.001 (.002)	-.002 (.004)	.003 (.006)	-.006 ** (.002)
Completed a university degree	.004 * (.002)	.001 (.002)	-.007 ** (.003)	-.004 * (.002)
Total indirect effect	-.101 *** (.024)	-.093 *** (.027)	-.119 *** (.030)	-.114 *** (.018)
Direct effect	-.257 *** (.066)	-.325 *** (.092)	-.269 *** (.100)	-.010 (.057)
Combined effect (total indirect effect + direct effect)	-.358 *** (.071)	-.418 *** (.092)	-.388 *** (.102)	-.124 ** (.060)
<i>(B) Women (N = 18,472)</i>				
Log of equivalized household income	.005 (.004)	-.007 * (.004)	-.017 *** (.005)	-.008 *** (.002)
Employed	.003 (.002)	-.003 * (.002)	-.006 ** (.003)	-.006 ** (.002)
Married/De facto	-.016 ** (.007)	-.015 ** (.007)	-.006 (.008)	-.014 *** (.005)
Self-assessed health	-.018 (.018)	-.112 *** (.020)	-.080 *** (.021)	-.065 *** (.012)
Number of children	-.000 (.005)	-.000 (.001)	.000 (.002)	.000 (.001)
Number of friends	.004 (.004)	.000 (.003)	.004 (.006)	.002 (.003)
Completed a university degree	.006 ** (.002)	.000 (.002)	-.012 *** (.003)	-.006 *** (.002)

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
	(.003)	(.002)	(.003)	(.002)
Total indirect effect	-.017	-.137 ^{***}	-.118 ^{***}	-.096 ^{***}
	(.026)	(.025)	(.025)	(.014)
Direct effect	-.036	-.247 ^{***}	-.204 ^{***}	-.091 ^{**}
	(.072)	(.065)	(.073)	(.046)
Combined effect (total indirect effect + direct effect)	-.052	-.385 ^{***}	-.322 ^{***}	-.188 ^{***}
	(.078)	(.069)	(.078)	(.048)

^{***}, ^{**} and ^{*} denote significance at the 1%, 5% and 10% levels respectively. Bootstrapped standard errors (200 repetitions) are in parentheses.

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Table 7

Estimated indirect and direct effects of sexual identity on life satisfaction by gender, HILDA Survey 2012.

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
<i>(A) Men (N= 5777)</i>				
Log of equivalized household income	.001 (.005)	-.018* (.011)	-.020*** (.009)	-.015** (.007)
Employed	-.007 (.006)	-.009 (.008)	-.024*** (.012)	-.025*** (.009)
Married/De facto	-.049*** (.017)	-.041*** (.017)	-.045** (.022)	-.067*** (.014)
Self-assessed health	-.031 (.027)	-.118*** (.042)	-.133*** (.050)	-.066*** (.025)
Number of children	-.011 (.012)	-.000 (.004)	.002 (.004)	-.003 (.004)
Number of friends	.047*** (.017)	-.087*** (.028)	-.062* (.036)	-.017 (.023)
Completed a university degree	-.003 (.003)	.004 (.003)	.004 (.003)	.005 (.003)
Total indirect effect	.013 (.038)	-.263*** (.062)	-.275*** (.071)	-.190*** (.038)
Direct effect	-.178** (.087)	-.068 (.142)	-.012 (.149)	-.271** (.106)
Combined effect (total indirect effect + direct effect)	-.165* (.090)	-.331** (.148)	-.287 (.179)	-.461*** (.106)
<i>(B) Women (N= 6561)</i>				
Log of equivalized household income	.000 (.006)	-.014** (.006)	-.033** (.013)	-.021** (.009)
Employed	.001 (.002)	-.003 (.004)	-.005 (.007)	-.003 (.004)
Married/De facto	-.040*** (.015)	-.016 (.016)	-.080*** (.024)	-.048*** (.015)
Self-assessed health	-.062** (.030)	-.122*** (.031)	-.070* (.024)	-.125*** (.029)
Number of children	-.015 (.012)	-.002 (.002)	-.003 (.004)	-.002 (.003)
Number of friends	-.028 (.020)	-.084*** (.020)	-.011 (.033)	-.030 (.018)
Completed a university degree	-.009* (.009)	.005* (.009)	.009 (.011)	.011** (.011)

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
	(.005)	(.003)	(.006)	(.004)
Total indirect effect	-.146 ^{***}	-.228 ^{***}	-.193 ^{***}	-.216 ^{***}
	(.047)	(.039)	(.068)	(.046)
Direct effect	-.029	-.210 ^{**}	-.059	.074
	(.103)	(.092)	(.213)	(.095)
Combined effect (total indirect effect + direct effect)	-.175	-.438 ^{***}	-.253	-.141
	(.111)	(.096)	(.226)	(.107)

^{***}, ^{**} and ^{*} denote significance at the 1%, 5% and 10% levels respectively. Bootstrapped standard errors (200 repetitions) are in parentheses.

Table 8

Estimated indirect and direct effects of sexual identity on life satisfaction by age, UKHLS 2011–2012.

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
<i>(A) Age < 40 (N = 1,4988)</i>				
Log of equivalized household income	-.003 (.004)	-.013*** (.005)	-.016*** (.004)	-.012*** (.003)
Employed	.004* (.002)	-.006** (.003)	-.012*** (.004)	-.009*** (.003)
Married/De facto	-.025*** (.006)	-.017*** (.005)	-.003 (.007)	-.003 (.004)
Self-assessed health	-.040** (.017)	-.104*** (.017)	-.073*** (.020)	-.071*** (.013)
Number of children	-.001 (.003)	-.000 (.000)	.001 (.002)	.000 (.001)
Number of friends	.001 (.003)	-.002 (.002)	-.000 (.004)	-.002 (.002)
Completed a university degree	.006** (.003)	-.002 (.002)	-.015*** (.004)	-.010*** (.003)
Total indirect effect	-.058*** (.019)	-.144*** (.019)	-.119*** (.024)	-.106*** (.015)
Direct effect	-.272*** (.077)	-.291*** (.067)	-.260*** (.086)	-.094* (.056)
Combined effect (total indirect effect + direct effect)	-.331*** (.081)	-.435*** (.072)	-.379*** (.085)	-.200*** (.057)
<i>(B) 40 Age 64 (N = 17,706)</i>				
Log of equivalized household income	.002 (.003)	-.000 (.004)	-.012*** (.004)	-.013*** (.004)
Employed	-.004 (.003)	-.004 (.004)	-.011*** (.004)	-.010*** (.003)
Married/De facto	-.042*** (.009)	-.031*** (.011)	-.013 (.009)	-.032*** (.006)
Self-assessed health	-.038* (.020)	-.029 (.027)	-.076*** (.023)	-.049*** (.013)
Number of children	.007 (.006)	.001 (.002)	-.001 (.001)	-.000 (.001)
Number of friends	.004 (.003)	.001 (.004)	.008 (.008)	.000 (.004)
Completed a university degree	.004** (.004)	.004 (.004)	-.006** (.008)	-.002** (.004)

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
	(.002)	(.003)	(.003)	(.001)
Total indirect effect	-.067 ***	-.058 *	-.112 ***	-.106 ***
	(.027)	(.032)	(.033)	(.018)
Direct effect	-.038	-.286 ***	-.185 **	-.018
	(.060)	(.108)	(.086)	(.049)
Combined effect (total indirect effect + direct effect)	-.105	-.344 ***	-.297 ***	-.124 **
	(.071)	(.105)	(.095)	(.051)

***, ** and * denote significance at the 1%, 5% and 10% levels respectively. Bootstrapped standard errors (200 repetitions) are in parentheses.

Table 9

Estimated indirect and direct effects of sexual identity on life satisfaction by age, HILDA Survey 2012.

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
<i>(A) Age < 40 (N= 6245)</i>				
Log of equivalized household income	.003 (.003)	-.012** (.006)	-.014* (.008)	-.013** (.006)
Employed	-.000 (.003)	-.010* (.005)	-.011 (.007)	-.015** (.007)
Married/De facto	-.025* (.014)	-.002 (.013)	-.044** (.020)	-.032** (.014)
Self-assessed health	-.018 (.025)	-.133*** (.026)	-.089* (.047)	-.100*** (.027)
Number of children	-.007 (.008)	-.000 (.001)	.000 (.003)	.000 (.002)
Number of friends	-.006 (.015)	-.073*** (.017)	-.041 (.034)	-.028 (.020)
Completed a university degree	-.001 (.002)	.002 (.003)	.001 (.002)	.002 (.003)
Total indirect effect	-.054 (.041)	-.228*** (.035)	-.198*** (.062)	-.186*** (.042)
Direct effect	-.177** (.076)	-.307*** (.092)	-.127 (.173)	-.147 (.116)
Combined effect (total indirect effect + direct effect)	-.231** (.092)	-.536*** (.094)	-.325* (.193)	-.333*** (.120)
<i>(B) 40 Age 64 (N= 6093)</i>				
Log of equivalized household income	-.002 (.007)	-.017 (.011)	-.042*** (.015)	-.023*** (.009)
Employed	.000 (.002)	-.003 (.003)	-.013 (.010)	-.006 (.005)
Married/De facto	-.070*** (.020)	-.077*** (.022)	-.084*** (.027)	-.079*** (.016)
Self-assessed health	.001 (.032)	-.060 (.046)	-.098** (.044)	-.102*** (.025)
Number of children	-.023 (.015)	-.003 (.004)	-.001 (.005)	-.004 (.003)
Number of friends	.037 (.027)	-.101*** (.033)	-.019 (.041)	-.024 (.020)
Completed a university degree	-.019** (.007)	.001 (.003)	.016** (.005)	.014*** (.003)

Mediating variable	Sexual identity			
	Gay or lesbian	Bisexual	Other	Prefer not to say
	(.008)	(.006)	(.007)	(.005)
Total indirect effect	-.076	-.259***	-.241***	-.224***
	(.055)	(.071)	(.078)	(.043)
Direct effect	-.006	.124	.031	-.029
	(.123)	(.113)	(.240)	(.102)
Combined effect (total indirect effect + direct effect)	-.082	-.135	-.209	-.253**
	(.117)	(.134)	(.259)	(.121)

***, ** and * denote significance at the 1%, 5% and 10% levels respectively. Bootstrapped standard errors (200 repetitions) are in parentheses.