Sex discrimination and mental health in women: A prospective analysis

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Word count: 5519

Number of tables: 5

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Funding: This research was funded by the Economic and Social Research Council (https://esrc.ukri.org/), grant number ES/R005990/1. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Declarations of interest: None

Abstract

Objective: To examine cross-sectional and prospective associations between perceived sex discrimination and health and wellbeing in a sample from the United Kingdom (UK).

Methods: Data were from 2956 women aged ≥16 years who participated in the UK Household Longitudinal Study. Perceived discrimination was reported in 2009-2010. Psychological distress, mental functioning, life satisfaction and self-rated health were assessed in 2009-2010 and 2013-2014. Depression was assessed in 2009-2010. Linear and logistic regression analyses adjusted for age, income, education and ethnicity. Prospective analyses adjusted for baseline wellbeing.

Results: Perceived sex discrimination was reported by 576 (19.5%) participants. Younger, wealthier, better educated, white women reported more discrimination ($p < 0.001$). Cross-sectionally, perceived discrimination was associated with increased depression (Odds ratio (OR) = 3.16, 95% Confidence Interval (CI) 2.10; 4.79) psychological distress (*B*= 1.26, 95% CI 0.95; 1.56), poorer mental functioning (*B*= -5.39, 95% CI -6.33; -4.46), lower life satisfaction (*B*=-0.52, 95% CI -0.69; -0.36) and a greater odds of poor self-rated health (OR= 1.89, 95% CI 1.47; 2.41). Prospectively, perceived sex discrimination was associated with increased psychological distress (*B*= 0.66, 95% CI 0.07; 1.24), poorer mental functioning (*B*= -1.37, 95% CI -2.71;-0.03) and lower life satisfaction (*B*= -0.32, 95% CI -0.58; -0.05) over four-year follow-up.

Conclusions: Women who perceive that they have been discriminated against on the basis of their sex report poorer mental health and wellbeing than those who do not perceive discrimination. These results provide cross-sectional and prospective evidence of associations between perceived sex discrimination and mental wellbeing outcomes in UK women.

Key words: discrimination; prejudice; stigma; sexism

Introduction

In the majority of countries worldwide, men are more likely than women to hold positions of social, political and economic power (U. N. Women, 2015). In the United Kingdom (UK), there have been numerous societal and legislative attempts to increase equality between the sexes (Fawcett Society, 2016). These efforts have included securing the right to vote (Parliament (Qualification of Women) Act, 1918), the right to equal pay (The Sex Discrimination Act, 1975), as well as the inclusion of sex as a protected characteristic under equality legislation (The Equality Act, 2010), among others. However, women's legal equality does not necessarily translate to equal experiences, and gaps remain between the sexes both economically (Office for National Statistics, 2018; U. N. Women, 2015) and socially (Fawcett Society, 2016).

Discrimination is the differential treatment of an individual based on a socially ascribed characteristic (Alvarez-Galvez & Salvador-Carulla, 2013), and data from the Eurobarometer survey indicates that sex discrimination is perceived to be common (European Union, 2015). In this survey of 27,718 European adults, sex discrimination was the third most frequently reported discrimination attribution, after of ethnicity and sexual orientation (European Union, 2015). Participants also perceived sex discrimination to be on the rise, with 37% reporting it to be widespread in their country, a 6% increase on 2012 data.

In recent years, an increasing body of research has examined discrimination as a determinant of mental health and wellbeing (Goto, Couto, & Bastos, 2013; Pascoe & Smart Richman, 2009; Schmitt, Branscombe, Postmes, & Garcia, 2014). The theory underpinning this work suggests that discrimination may be conceptualised as a social stressor, which could directly affect health via direct biological pathways or through negative health behaviours. Frequent exposure to discrimination (in addition to other life stressors such as adverse childhood experiences) and corresponding activation of the stress response systems could lead

to biological ‘wear and tear’ causing dysregulation in multiple biological systems, in line with the theory of allostatic load (McEwen, 1998). Indirectly, discrimination could impact health through poor health behaviours, acting as a barrier to a healthy lifestyle or a means of coping with the distress discrimination may evoke (Ro & Choi, 2010; Zucker & Landry, 2007).

A 2009 meta-analysis of 110 studies found that perceived discrimination was associated with poorer mental health and wellbeing outcomes, including increased depressive symptoms and psychological distress and decreased life satisfaction and self-rated health (Pascoe & Smart Richman, 2009). However, of the studies included in the meta-analysis, only 17% assessed sex discrimination, with the majority focusing on racism and wellbeing outcomes in the United States (US). Further, the sex discrimination studies included were all cross-sectional in nature, dominated by small convenience samples of university staff and students (Pascoe & Smart Richman, 2009). More recent evidence on general discrimination has remained cross-sectional for the most part (Goto et al., 2013; Schmitt et al., 2014), albeit with larger, more representative samples (Alvarez-Galvez, 2016; Borrell et al., 2010). A 2014 pooled-analysis of 328 studies detected a significant association between discrimination and mental wellbeing, with an independent analysis of 23 studies linking perceived sex discrimination with poorer wellbeing outcomes cross-sectionally (Schmitt et al., 2014).

Reviews on sex discrimination alone have tended to focus on workplace sex discrimination and sexual harassment (McDonald, 2012; Sojo, Wood, & Genat, 2016), documenting a link between perceived sex discrimination and occupation-related metrics including job satisfaction, absenteeism and job performance, as well as effects on broader indicators of mental wellbeing (National Academies of Sciences, Engineering, and Medicine, 2018). The narrow focus on one setting where perceived sex discrimination can occur limits the generalisability of these findings. Indeed, perceived sex discrimination against females has been described on public transport (Gekoski et al., 2015), on the street (Blewer et al., 2018;

Macmillan, Nierobisz, & Welsh, 2000) and in healthcare settings (Travis, Howerton, & Szymanski, 2012) amongst others.

Few studies to date have been able to draw conclusions about the temporal relationship between perceived sex discrimination and mental wellbeing because of the cross-sectional designs of most of the research. However, prospective relationships between sexual harassment and later psychological distress (Chiodo, Wolfe, Crooks, Hughes, & Jaffe, 2009; Nielsen & Einarsen, 2012) and depression have been observed in females (McGinley, Wolff, Rospenda, Liu, & Richman, 2016; Wolff, Rospenda, & Colaneri, 2017) in student (Chiodo et al., 2009; McGinley et al., 2016; Wolff et al., 2017) and working samples (Nielsen & Einarsen, 2012) that included both male and female participants.

In terms of perceived sex discrimination reported across multiple settings and mental wellbeing, one US-based study has assessed both cross-sectional and prospective relationships (Sutin, Stephan, Carretta, & Terracciano, 2015). In this sample of over 6000 older men and women (mean age 67 years), perceived sex discrimination was associated with increased loneliness, poorer mental wellbeing and lower self-rated health cross-sectionally. Perceived sex discrimination was not predictive of a change in these measures over 4-year follow-up. No significant association between perceived sex discrimination and life satisfaction was detected in this ageing sample.

The current study

Overall, studies of perceived sex discrimination have tended to draw on small convenience samples, with many studies focusing on sexual harassment rather than perceived sex discrimination more broadly. To address this gap in the literature, the present study set out to assess cross-sectional and prospective associations between perceived sex discrimination and mental wellbeing in large community-dwelling UK population cohort of women.

Specifically, we were interested in depression, psychological distress, mental functioning, satisfaction with life, and self-rated health.

Materials and methods

Study data

The study data were drawn from Understanding Society: The UK Household Longitudinal Study (UKHLS) (University of Essex. Institute for Social and Economic Research, NatCen Social Research, Kantar Public., 2017). Data collection started in 2009-2010 (wave 1) and is repeated annually. The UKHLS consists of a general population sample that is representative of the UK, as well as an ethnic minority boost sample of over 4,000 households with individuals from an ethnic minority background (Knies, 2017; McFall, Nandi, & Platt, 2017).

The participants in the current study come from the 'extra 5 minutes sample' of 8843 individuals who were allocated an additional 5 minutes of questions on issues relevant to ethnicity research, such as discrimination, and immigration. The extra 5 minutes sample consists of the ethnic minorities from the ethnicity minority boost (from high concentration ethnic minority areas where 80% of the UK's five major ethnic minorities live), along with a smaller comparison group of white UK adults from 500 households randomly selected from the general population sample, as well as ethnic minorities from the general population sample who were living in low ethnic minority concentration areas (McFall et al., 2017). The response rates for the general population sample and the ethnic minority boost at wave 1 were 81.8% and 72.4% respectively (McFall et al., 2017). The response rate for the extra 5 minutes sample was 42.5%.

The current study uses data from the extra 5 minutes sample collected in wave 1 (2009-2010) and wave 5 (2013-2014) of the UKHLS. The data was gathered through face-to-face interview via computer aided personal interview and self-completion paper questionnaires and

from wave 3 via computer administered self-interview. Of the 8843 participants in the extra 5 minutes sample, 5285 responded to the questions on perceived sex discrimination (see Figure in Supplement for a flowchart depicting the construction. Those who did not respond to the questions were significantly younger on average ($p = 0.026$), more likely to hold a university degree ($p = 0.010$), and were more likely to be white ethnic background ($p < 0.001$). There was no difference in monthly household income ($p = 0.520$) between those who did and did not answer the questions on perceived sex discrimination (see Table in Supplement).

Few men reported sex discrimination (n=30) in UKHLS and it is likely sex discrimination would have different associations with mental health and wellbeing outcomes in men compared with women (Hogh, Conway, Clausen, Madsen, & Burr, 2016). Therefore we removed male participants from our analysis (n=2329). This left us with a final sample size of 2956 women. As sex was measured by self-report (with response options of male/female) these participants represent those who self-identify as female. The University of Essex Ethics Committee approved all data collection for the UKHLS main study and participants provided fully informed written consent.

Perceived sex discrimination

Participants in the extra 5 minutes sample were asked whether in the past 12 months they have (a) felt unsafe, (b) avoided going to or being in, (c) been insulted, called names, threatened or shouted at, or (d) been physically attacked, in a number of different settings. The settings were: 1) At school/college/work, 2) On public transport, 3) At or around a bus or train station, 4) In a taxi, 5) Public buildings such as shopping centres or shops, 6) Outside on the street, in parks or other public places, or 7) At home. If they responded yes, a follow-up question asked them to choose a reason from a list of legally protected categories including sex, age, ethnicity, sexual orientation, disability and others. Participants could choose multiple places and multiple attributions for the perceived discrimination. Those who attributed any

experience of discrimination to their sex are treated in our study as cases of perceived sex discrimination

Outcome variables

Depression

Doctor-diagnosed clinical depression was self-reported at wave 1 (2009-2010) with responses coded as binary (yes/no). Psychological distress, mental functioning, life satisfaction and self-rated health were measured at both waves 1 (2009-2010) and 5 (2013-2014).

Psychological distress

Psychological distress was assessed using the General Health Questionnaire (GHQ)-12 (Goldberg & Williams, 1988). Items included ratings of whether the participant had "*Been able to enjoy your normal day to day activities*" or whether they "*Felt constantly under strain*". The total score from this 12-item scale ranges from 0 (the least distressed) to 12 (the most distressed). The Cronbach's alpha for this scale was 0.99.

Mental functioning

The 12-item short-form health survey (SF-12) mental component summary score, a measure of limitations caused by emotional issues, social functioning and mental health, was also used in the study (Ware, Kosinski, & Keller, 1996). Overall scores were derived using standard methods ranging from 0 (low functioning) to 100 (high functioning), with a mean of 50 and standard deviation of 10 (Ware, 2002). Items included ratings of feelings experienced over the previous 4 weeks such as "*Have you felt downhearted or blue*?" or *"Accomplished less than you would like"*. Higher scores indicate better functioning in terms of emotional, social and mental health. The Cronbach's alpha for the scale was 0.98.

Life satisfaction

Life satisfaction was assessed with a single-item asking participants how they were satisfied with their "life overall" (Lucas & Donnellan, 2012). Scores ranged from 1 (completely

dissatisfied) to 7 (completely satisfied). We also included a measure of self-rated health in the study.

Self-rated health

A separate measure was used to assess self-rated health using a single item: "*Would you say your health is…poor/fair/good/very good/excellent?"* We analysed this data as a binary variable with 0 meaning "good/very good/excellent" and 1 being "poor/fair", as has been done in other investigations (DeSalvo, Bloser, Reynolds, He, & Muntner, 2006; Steptoe & Jackson, 2018).

Covariates

We included several covariates in our analyses that are potentially relevant to the experience of sex discrimination and our outcomes of interest. Age in years was entered as a continuous variable. Equivalised monthly household income was calculated as an indicator of socioeconomic resources by dividing total household net income by the modified Organisation for Economic Co-operation and Development (OECD) equivalence scale to adjust for the effects of household size and composition (OECD, 2005). Education was included as a 3 level variable: 1 "university degree", 2 "high school qualification" and 3 "no qualification". As one of the aims of UKHLS is to assess questions related to ethnicity and immigration (McFall et al., 2017), our sample was ethnically diverse. We included self-reported ethnicity as a 4 level variable with 1 being "white" including those of white British, white Irish and any other white background, 2 being "south Asian" including Indian, Pakistani and Bangladeshi participants, 3 being "black" including black African and black Caribbean individuals and 4 being "other" including participants from Chinese and mixed backgrounds. All covariates were assessed at wave 1.

Statistical analyses

Descriptive characteristics of the sample at wave 1 were compared for those who did and those who did not report perceived sex discrimination. Categorical variables were assessed using chi-squared tests and continuous variables were assessed using independent samples t-tests. Associations between perceived sex discrimination and wellbeing outcomes were assessed using linear regression for continuous outcomes and logistic regression for categorical outcomes. For cross-sectional associations, clinical depression, psychological distress (GHQ-12), SF-12 mental functioning score, life satisfaction and self-rated health at wave 1 (2009-2010) were the outcome variables. For prospective associations, psychological distress (GHQ-12), SF-12 mental functioning score, life satisfaction and self-rated health at wave 5 (2013-2014) were the outcome measures. Age, household income, education and ethnicity at wave 1 were included as covariates in all analyses. Prospective analyses were additionally adjusted for baseline (wave 1) scores/status on the relevant wellbeing variable. In order to address the issue of missing data at follow-up caused by attrition between waves and maximize the available sample for analysis, we used multiple imputation to impute missing values for wellbeing outcomes at wave 5 based on all other available variables for those who provided data on covariates and baseline wellbeing but were lost to follow-up. Twenty imputed data sets were created, each was analysed separately, and the results were combined to produce pooled estimates of effects; allowing the analyses to account for uncertainty caused by estimating missing data. Pooled estimates are reported throughout the paper. We tested whether there were interactions between perceived sex discrimination and age, ethnicity or income on wellbeing at wave 5 in the imputed dataset. No significant effects were detected, therefore interaction terms were not included in the final models. Results from linear regression analyses are presented as unstandardized B and 95% confidence intervals (95% CI). Results from logistic regression analyses are presented as odds ratios (ORs) and 95% CI. All analyses were conducted using SPSS version 24.

Sensitivity analyses

We conducted 3 sets of sensitivity analyses to test the robustness of our results. Our prospective analyses used imputed outcome variables to account for loss to follow-up. Therefore, we firstly assessed the results from the cross-sectional analyses (wave 1) including only those who provided follow-up data at wave 5. Following this we present the results from the prospective analyses in those who participated at wave 1 and provided follow-up data at wave 5 (complete cases). In our second sensitivity analysis, we test whether a certain type of discriminatory behaviour (e.g. feeling unsafe, avoiding somewhere, being insulted or attacked) contributing to the measure of perceived sex discrimination was primarily responsible for the results. We present this analysis using the imputed sample at wave 5 removing each type of discriminatory behaviour in turn. Finally, we assessed whether adding depression at baseline as an additional covariate to our analyses on psychological distress, mental functioning, life satisfaction and self-rated would alter our findings.

Results

Participant characteristics

A total of 2,956 women were included in the study and of these 576 (19.5% of the sample) reported perceived sex discrimination. Of the types of discrimination assessed, the most commonly reported was feeing unsafe (93.9%; 95% CI 91.8-95.9), followed by avoiding somewhere (38.1%; 95% CI 33.84-42.35), being insulted (18.1%; 95% CI 14.51-21.61) and being physically attacked (2.6%; 95% CI 1.30-3.92). The most common settings in which perceived sex discrimination was reported were outside in the street (77.0%; 95% CI 74.51-81.31), on public transport (39.9%; 95% CI 35.84-43.88) and at or around bus or train stations (38.9%; 95% CI 34.85-42.85). Perceived sex discrimination was less frequently reported in school or workplace settings (12.0%; 95% CI 9.37-14.71) or in the home environment (10.5%; 95% CI 7.97%-13.01%). The demographic characteristics of the sample at wave 1 (2009/10)

are presented in Table 1. The group who reported perceived sex discrimination and the group who did not report perceived sex discrimination differed significantly on all characteristics (all $p < 0.001$). Those who reported perceived sex discrimination were younger on average (34.80 ± 13.05 years) than those who did not report discrimination (39.62 ± 15.96 years). They were also more likely to be white (23.8% vs. 16.3%), wealthier based on monthly household income (£1425.79 ± 1084.87 and £1207.89 ± 945.44) and better educated than those who did not report perceived discrimination, with a greater proportion holding university degrees (48.1% vs 32.2%).

Cross-sectional associations between perceived sex discrimination and wellbeing

Cross-sectional analyses (first panel Table 2) showed that after adjustment for covariates, women who reported perceived sex discrimination were significantly more likely to report a diagnosis of clinical depression (OR=3.16; 95% CI 2.10; 4.79, p <0.001) and were more likely to rate their health as fair/poor (OR=1.89; 95% CI 1.47; 2.41, p <0.001) than those who did not report perceived sex discrimination. They also had significantly greater levels of psychological distress, (B = 1.26, 95% CI 0.95; 1.56, p <0.001) poorer mental functioning (B = -5.39; 95% CI -6.33; -4.46, p <0.001) and lower life satisfaction (B = -0.52, 95% CI -0.69; -0.36, p <0.001).

Prospective associations between perceived sex discrimination and wellbeing

In prospective analyses (second panel Table 2) women who reported perceived sex discrimination had greater levels of psychological distress 4 years later than women who did not report perceived sex discrimination, independent of covariates (B = 0.66, 95% CI 0.07; 1.24, p =0.029). There were also significant prospective associations between experiences of perceived sex discrimination and poorer mental functioning (B = -1.37; 95% CI -2.71; -0.03, p =0.046) and lower life satisfaction (B = -0.32; 95% CI -0.58; -0.05, p =0.021). A greater proportion of women who reported perceived sex discrimination rated their health as fair/poor

(25.2%), than those who did not report perceived sex discrimination (22.4%). However, this finding did not reach statistical significance (OR=1.39; 95% CI 0.94; 2.05, $p = 0.101$).

Sensitivity analyses

We conducted three sets of sensitivity analyses. In the first sensitivity analysis, cross-sectional findings for those who provided complete data at wave 5 were similar to the full-sample at wave 1 (data not shown; *p's* <0.001). We also conducted a complete cases analysis, excluding participants who were lost to follow-up (Table 3). All cross-sectional associations remained significant. Prospective associations with psychological distress, satisfaction with life and self-rated health also remained unchanged. However, the association between perceived sex discrimination and mental functioning was no longer statistically significant in the complete case analysis ($B = -1.31$; 95% CI -2.71- 0.97, $p = 0.068$).

In the second sensitivity analysis, removing each of the discriminatory behaviours from the measure of discrimination in turn (Table 4) did not influence the cross-sectional findings. Prospectively, the associations between perceived sex discrimination and increased psychological distress and poorer mental functioning were fairly consistent, with a slight attenuation when "being insulted" was removed from the measure ($p = 0.052$). For life satisfaction and self-rated health, the prospective associations were fairly robust to the type of discriminatory behaviour but were attenuated when "feeling unsafe" was removed from the discrimination variable ($p = 0.094$ and $p = 0.036$, respectively).

In the final set of sensitivity analyses we added depression as an additional covariate to our cross-sectional and prospective models on psychological distress, mental functioning, life satisfaction and self-rated health (Table 5). All cross-sectional and prospective associations remained significant.

Conclusions

In this large prospective sample of UK women aged 16 and over, we detected associations between perceived sex discrimination and poorer mental health and wellbeing. Cross-sectionally, perceived sex discrimination was associated with higher prevalence of depression, increased psychological distress, poorer mental functioning, life satisfaction and self-rated health. Prospectively, perceived sex discrimination was associated with greater levels of psychological distress, poorer mental functioning and lower life satisfaction over a four-year follow-up period. We had no data on clinical depression at follow-up, however this does not necessarily imply effects are absent. No significant prospective association with self-rated health was detected. These results were robust to adjustment for participants' age, ethnicity and socioeconomic position and were not unique to any specific type of discriminatory behaviour.

Findings in the context of previous work

To our knowledge, this is the first UK-based study to investigate prospective relationships between perceived sex discrimination and mental health and wellbeing outcomes. There is a dearth of evidence concerning these prospective associations because of the dominance of cross-sectional research designs in this area. Just one other study that we are aware of has explored the prospective link between perceived sex discrimination and wellbeing outcomes. In this US sample, no significant relationships between sex discrimination and loneliness, mental wellbeing and life satisfaction at four-year follow-up were observed (Sutin et al., 2015). This contrasts with the findings of the present analysis, whereby perceived sex discrimination was associated with raised psychological distress, poorer mental functioning and lower life satisfaction. The reason for the divergence in the findings is unclear, as both studies had large samples sizes with a four-year follow-up period. It is possible that the age differences in the study populations could have played a role, with our sample consisting of younger (mean age 38.68 years), rather than older adults (mean age 67 years). There was a higher prevalence of perceived sex discrimination in the current sample (19.5% vs 13%), likely

because we limited our analyses to female participants. Our study may offer more precision in the assessment of the relationship between sex discrimination and mental health and wellbeing outcomes, by directly comparing women who did and did not perceive discrimination. Additionally, it is plausible that other forms of discrimination may be more relevant to health in older age groups accounting for the null associations in the Sutin et al., study. For example, perceived age discrimination has been prospectively linked with mental health outcomes (Yuan, 2007).

Our cross-sectional findings linking perceived sex discrimination with poorer mental wellbeing are in keeping with prior work (Pascoe & Smart Richman, 2009; Schmitt et al., 2014). Associations between perceived sex discrimination and depression (Klonoff, Landrine, & Campbell, 2000; Schmitt, Branscombe, & Postmes, 2003), psychological distress (Bond, Punnett, Pyle, Cazeca, & Cooperman, 2004; Borrell et al., 2010; Moradi & Mezydlo Subich, 2002), poorer life satisfaction (Foster & Tsarfati, 2005; Schmitt et al., 2003) and worse mental functioning (Fischer & Holz, 2010; Sutin et al., 2015) have been reported previously. Consistent with earlier work, we found that discrimination was more strongly associated with negative outcomes such as depression and psychological distress than with positive outcomes such as life satisfaction (Schmitt et al., 2014; Sojo et al., 2016). The current study adds to the cross-sectional literature by demonstrating these relationships in a large UK sample, as previous work was dominated by small, convenience samples of university students and employees in the US. Cross-sectional analyses cannot determine whether perceived sex discrimination stimulates mental ill-health, or whether perceptions of discrimination are a manifestation of psychological distress. Our longitudinal results therefore add to the literature in establishing that perceived sex discrimination predicts mental ill-health prospectively, net of baseline associations, so has adverse consequences for future wellbeing

We detected a significant association between perceived sex discrimination and poorer self-rated health cross-sectionally. However, the evidence linking sex discrimination and self-rated health has been mixed with some (Borrell et al., 2010; Sutin et al., 2015) but not all studies (Alvarez-Galvez, 2016) observing a cross-sectional association. Our study and the works of Borrell et al. (2010) and Sutin et al. (2015) focused on a single country, whereas Alvarez-Galvez (2016) conducted a pooled analysis of 28 European studies. Within Europe, reports of sex discrimination vary widely between countries (European Union, 2015), which may contribute the mixed findings, however more work is required to test this assertion. We failed to detect a prospective association between perceived sex discrimination and poorer self-rated health, although participants who reported discrimination had poorer self-rated health prospectively than those who did not report discrimination, this difference did not reach the conventional level of statistical significance. This null finding is in keeping with earlier work (Sutin et al., 2015) and may indicate that the impact of ongoing sex discrimination on self-rated health had already become evident at the time of the baseline survey, limiting the scope for further significant decline. Poorer self-rated health has been linked with perceived age, weight, appearance and physical disability discrimination (Sutin et al., 2015). It may be that the impact of discrimination on self-rated health over time is only apparent for characteristics that can deteriorate over time (i.e. getting older, changes in weight, appearance and ability) rather than characteristics such as sex which are fixed (Sutin et al., 2015).

Potential pathways linking perceived sex discrimination and wellbeing

With regard to mechanisms linking perceived sex discrimination and negative mental health and wellbeing outcomes, several possibilities could help explain our findings. Poor health behaviours could link perceived sex discrimination and poor mental health and wellbeing, either as a barrier to a healthy lifestyle (e.g. a woman avoiding exercising in a setting she perceives to be unsafe) or as a method of coping with the negative psychological effect of

experiencing discrimination. Cross-sectionally, perceived sex discrimination has been linked with binge drinking and smoking (Zucker & Landry, 2007), as well as hard drug use (Ro & Choi, 2010). Prospective work has associated perceived sex discrimination with restless sleep (Vaghela & Sutin, 2016), while sexual harassment in a school setting has been related with later increases in binge drinking (Wolff et al., 2017). Health behaviours including substance use were not assessed in the current study. Therefore, more work is required to ascertain whether health behaviours are a pathway through which perceived sex discrimination may operate to influence mental health and wellbeing.

Another pathway linking sex discrimination and health may be via disturbed stress-related biological processes. Frequent activation of the stress responses system as a result of perceived chronic discrimination could lead to 'wear and tear' on the body resulting in dysregulation across multiple biological systems in keeping with the theory of allostatic load (McEwen, 1998). The literature investigating these biological pathways is again dominated by research on racism (Korous, Causadias, & Casper, 2017; Lockwood, Marsland, Matthews, & Gianaros, 2018; Pascoe & Smart Richman, 2009). Meta-analytic and systematic review evidence suggests perceived discrimination is associated with increased cardiovascular reactivity to stress (Lockwood et al., 2018; Pascoe & Smart Richman, 2009). However, none of the studies included in these reviews focused exclusively on perceived sex discrimination. In studies of cardiovascular processes in everyday life, one analysis of 1202 participants detected an association between sexual harassment and raised systolic blood pressure (Krieger et al., 2008). Activation of the hypothalamic-pituitary-adrenal (HPA) axis is another potential biological pathways linking discrimination and health. Race (Busse, Yim, Campos, & Marshburn, 2017; Korous et al., 2017; Lockwood et al., 2018) and weight discrimination (Jackson, Kirschbaum, & Steptoe, 2016) have been associated with alterations in various cortisol parameters. We are unaware of any observational evidence investigating the

relationship between perceived sex discrimination and changes in cortisol. However, experimental exposure to a sexist event has been linked with cortisol reactivity in two studies (Matheson, Gill, Kelly, & Anisman, 2008; Townsend, Major, Gangi, & Mendes, 2011).

Strengths

The results of the current study need to be assessed in terms of strengths and limitations. There is a lack of prospective evidence linking perceived sex discrimination and mental health and wellbeing, and prospective work has focused on sexual harassment rather than perceived sex discrimination more broadly (Chiodo et al., 2009; McGinley et al., 2016; Nielsen & Einarsen, 2012; Wolff et al., 2017). Our large sample of community-dwelling women allowed us to examine changes in mental health and wellbeing over 4 years, and demonstrated both cross-sectional and prospective associations. Our measure of discrimination took into account multiple situations where perceived sex discrimination may be encountered moving beyond studies of workplace sexual harassment alone. We also adjusted statistically for factors that potentially confound associations, including age, socioeconomic resources, education and ethnicity.

Limitations

Our study was not without limitations. Sex discrimination was determined by self-reports of experiences in the past 12 months and was therefore subject to recall bias. Our results reflect the perceived subjective interpretation of sex discrimination rather than objective encounters with sex discrimination. It is possible that objective encounters with sexism and perceiving one's self as the target of sex discrimination might have different consequences for health outcomes. Experimental studies with exposure to discriminatory scenarios rather than observational studies can be used to investigate the health impact of objective exposures to sex discrimination. Nevertheless, objective encounters with discrimination may not represent the gold standard in terms of impact on mental health, as meta-analytic work suggests that exposure

to a single negative event in a laboratory setting does not negatively influence wellbeing (Schmitt et al., 2014). Additionally, we had no information on the geographically location where the discrimination took place and therefore cannot ascertain whether the objective safety of the location influenced reports of discrimination. Data in UKHLS was collected via computer assisted- and computed aided- interview, as well as via paper self-completion questionnaire. The varying modes of data collection could have influenced our results but we had no information available that would have allowed us to examine this. The response rate for the extra five minutes sample was relatively low, and a comparison of those who did and did not respond was not possible. Therefore, our sample may not be representative of the population from which they were drawn and our results must be interpreted with caution. The measure we used to assess perceived discrimination was not tailored for sex discrimination and participants were able to attribute multiple reasons for their experience of discrimination, which may have helped avoid participant priming or bias. Other tools such as the Schedule of Sexist Event scale (Landrine & Klonoff, 1997) with more specific items on sexist degradation and experiences of sexism by close family and co-workers may have garnered different results. More research is required to understand how perceived sex discrimination interacts with other types of discrimination to influence health. We limited our analysis to female participants, as women are more likely to experience sex-related discrimination (Sojo et al., 2016). However, women are also more likely than men to report mental health concerns (Albert, 2015) and there is some evidence to suggested unwanted sexual attention and harassment at work has a greater impact on men than women (Hogh et al., 2016). Few men in UKHLS reported perceived sex discrimination (n=30), therefore we would have been underpowered to investigate any potential associations. Women who were younger, wealthier, better educated and of white ethnicity were more likely to report sex discrimination in this study. Further research is required

to understand why participants in positions of social privilege may be more likely to perceive sex discrimination and in turn experience its negative impact on mental health.

We only assessed perceived sex discrimination at baseline, meaning it was not possible to determine whether experiences were persistent or modified over time. Attributions for a single point in time do not necessarily reflect pervasive discrimination. However, evidence from other studies suggests that initial reports of sexual harassment are strongly predictive of later sexual harassment (Chiodo et al., 2009; Nielsen & Einarsen, 2012). Our findings support a relationship between perceived sex discrimination and poorer mental wellbeing four years later, although the effect sizes detected in the study were small and we had no information on whether participants were receiving treatment for mental health-related concerns. Previous work suggests that people with poorer mental wellbeing may be more likely to perceive discrimination (Phinney, Madden, & Santos, 1998) and a bidirectional relationship between sexual harassment and mental health has been reported (Wolff et al., 2017). Future work testing reciprocal prospective associations between perceived sex discrimination and health could help to clarify this issue.

Summary and future directions

Overall, this research adds to the literature by demonstrating prospective associations between perceived sex discrimination reported across multiple settings and mental health and wellbeing outcomes. Our results highlight the need to reduce the pervasiveness of sex discrimination in society, with the benefit of not only promoting equality between the sexes, but with plausible benefits for mental health too. Perceptions of discrimination are necessary for building collective movements that have historically brought about legislative and social change. Indeed, women who live in more gender equal societies have been shown to have lower rates of depression (Chen, Subramanian, Acevedo-Garcia, & Kawachi, 2005; McLaughlin, Xuan, Subramanian, & Koenen, 2011; Van de Velde, Huijts, Bracke, & Bambra, 2013) and

post-traumatic stress (McLaughlin et al., 2011). As well as wider societal benefits, participating in collective actions such speaking out on social media about sexism have been shown in small studies to enhance individual feelings of wellbeing (Foster, 2015, 2018). The MeToo campaign(O'Neil, Sojo, Fileborn, Scovelle, & Milner, 2018) is an example of a recent social media movement which has drawn attention to the issue of sex discrimination. However, eliminating sexism completely is likely very difficult considering entrenched historical discrimination against women (U. N. Women, 2015). Research into the mechanisms underlying sex discrimination is necessary to develop policy and to appropriately target more widespread interventions in this area.

References

Albert, P. R. (2015). Why is depression more prevalent in women? *Journal of Psychiatry & Neuroscience : JPN*, *40*(4), 219–221. https://doi.org/10.1503/jpn.150205

Alvarez-Galvez, J. (2016). Measuring the effect of ethnic and non-ethnic discrimination on Europeans' self-rated health. *International Journal of Public Health*, *61*(3), 367–374. https://doi.org/10.1007/s00038-015-0728-1

Alvarez-Galvez, J., & Salvador-Carulla, L. (2013). Perceived discrimination and self-rated health in Europe: evidence from the European Social Survey (2010). *PloS One*, *8*(9), e74252. https://doi.org/10.1371/journal.pone.0074252

Blewer, A. L., McGovern, S. K., Schmicker, R. H., May, S., Morrison, Aufderheide, T. P., … Abella, B. S. (2018). Gender Disparities Among Adult Recipients of Bystander Cardiopulmonary Resuscitation in the Public. *Circulation: Cardiovascular Quality and Outcomes*, *11*(8), e004710. https://doi.org/10.1161/CIRCOUTCOMES.118.004710

Bond, M. A., Punnett, L., Pyle, J. L., Cazeca, D., & Cooperman, M. (2004). Gendered work conditions, health, and work outcomes. *Journal of Occupational Health Psychology*, *9*(1), 28–45. https://doi.org/10.1037/1076-8998.9.1.28

Borrell, C., Artazcoz, L., Gil-González, D., Pérez, G., Rohlfs, I., & Pérez, K. (2010). Perceived Sexism as a Health Determinant in Spain. *Journal of Women's Health*, *19*(4), 741–750. https://doi.org/10.1089/jwh.2009.1594

Busse, D., Yim, I. S., Campos, B., & Marshburn, C. K. (2017). Discrimination and the HPA axis: current evidence and future directions. *Journal of Behavioral Medicine*, *40*(4), 539–552. https://doi.org/10.1007/s10865-017-9830-6

Chen, Y.-Y., Subramanian, S. V., Acevedo-Garcia, D., & Kawachi, I. (2005). Women's status and depressive symptoms: a multilevel analysis. *Social Science & Medicine (1982)*, *60*(1), 49–60. https://doi.org/10.1016/j.socscimed.2004.04.030

Chiodo, D., Wolfe, D. A., Crooks, C., Hughes, R., & Jaffe, P. (2009). Impact of sexual harassment victimization by peers on subsequent adolescent victimization and adjustment: a longitudinal study. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine*, *45*(3), 246–252. https://doi.org/10.1016/j.jadohealth.2009.01.006

DeSalvo, K. B., Bloser, N., Reynolds, K., He, J., & Muntner, P. (2006). Mortality prediction with a single general self-rated health question. A meta-analysis. *Journal of General Internal Medicine*, *21*(3), 267–275. https://doi.org/10.1111/j.1525-1497.2005.00291.x

European Union. (2015). *Discrimination in the EU in 2015*.

Fawcett Society. (2016). *Equality- It's about time: Timeline of women's rights1866-2016*. Retrieved from https://www.fawcettsociety.org.uk/equality-its-about-time-timeline-of-womens-rights-1866-2016

Fischer, A. R., & Holz, K. B. (2010). Testing a Model of Women's Personal Sense of Justice, Control, Well-Being, and Distress in the Context of Sexist Discrimination. *Psychology of Women Quarterly*, *34*(3), 297–310. https://doi.org/10.1111/j.1471-6402.2010.01576.x

Foster, M. D. (2015). Tweeting about sexism: The well-being benefits of a social media collective action. *British Journal of Social Psychology*, *54*(4), 629–647. https://doi.org/10.1111/bjso.12101

Foster, M. D. (2018). "Use it or lose it": How online activism moderates the protective properties of gender identity for well-being. *Computers in Human Behavior*. https://doi.org/10.1016/j.chb.2018.11.044

Foster, M. D., & Tsarfati, E. M. (2005). The Effects of Meritocracy Beliefs on Women's Well-Being After First-Time Gender Discrimination. *Personality and Social Psychology Bulletin*, *31*(12), 1730–1738. https://doi.org/10.1177/0146167205278709

Gekoski, A., Gray, J. M., Horvath, M. A. H., Edwards, S., Emirali, A., & Adler, J. R. (2015). *'What works' in reducing sexual harassment and sexual offences on public transport nationally and internationally: a rapid evidence assessment*. Retrieved from Middlesex University, British Transport Police and the Department for Transport website: http://eprints.mdx.ac.uk/15219/

Goldberg, D., & Williams, P. (1988). *A user's guide to the General Health Questionnaire.* Basingstoke: NFER-Nelson.

Goto, J. B., Couto, P. F. M., & Bastos, J. L. (2013). [Systematic review of epidemiological studies on interpersonal discrimination and mental health]. *Cadernos De Saude Publica*, *29*(3), 445–459.

Hogh, A., Conway, P. M., Clausen, T., Madsen, I. E. H., & Burr, H. (2016). Unwanted sexual attention at work and long-term sickness absence: a follow-up register-based study. *BMC Public Health*, *16*(1), 678. https://doi.org/10.1186/s12889-016-3336-y

Jackson, S. E., Kirschbaum, C., & Steptoe, A. (2016). Perceived weight discrimination and chronic biochemical stress: A population-based study using cortisol in scalp hair. *Obesity (Silver Spring, Md.)*, *24*(12), 2515–2521. https://doi.org/10.1002/oby.21657

Klonoff, E. A., Landrine, H., & Campbell, R. (2000). Sexist Discrimination May Account for Well-Known Gender Differences in Psychiatric Symptoms. *Psychology of Women Quarterly*, *24*(1), 93–99. https://doi.org/10.1111/j.1471-6402.2000.tb01025.x

Knies, G. (2017). *Understanding society: The UK household longitudinal study, Waves 1–7 (User Guide)*. University of Essex: Colchester: Institute for Social and Economic Research.

Korous, K. M., Causadias, J. M., & Casper, D. M. (2017). Racial discrimination and cortisol output: A meta-analysis. *Social Science & Medicine (1982), 193*, 90–100. https://doi.org/10.1016/j.socscimed.2017.09.042

Krieger, N., Chen, J. T., Waterman, P. D., Hartman, C., Stoddard, A. M., Quinn, M. M., … Barbeau, E. M. (2008). The inverse hazard law: blood pressure, sexual harassment, racial discrimination, workplace abuse and occupational exposures in US low-income black, white and Latino workers. *Social Science & Medicine (1982), 67*(12), 1970–1981. https://doi.org/10.1016/j.socscimed.2008.09.039

Landrine, H., & Klonoff, E. A. (1997). *Discrimination against women: Prevalence, consequences, remedies.* Thousand Oaks, California: Sage.

Lockwood, K. G., Marsland, A. L., Matthews, K. A., & Gianaros, P. J. (2018). Perceived discrimination and cardiovascular health disparities: a multisystem review and health neuroscience perspective. *Annals of the New York Academy of Sciences*, *1428*(1), 170–207. https://doi.org/10.1111/nyas.13939

Lucas, R. E., & Donnellan, M. B. (2012). Estimating the Reliability of Single-Item Life Satisfaction Measures: Results from Four National Panel Studies. *Social Indicators Research*, *105*(3), 323–331. https://doi.org/10.1007/s11205-011-9783-z

Macmillan, R., Nierobisz, A., & Welsh, S. (2000). Experiencing the Streets: Harassment and Perceptions of Safety among Women. *Journal of Research in Crime and Delinquency*, *37*(3), 306–322. https://doi.org/10.1177/0022427800037003003

Matheson, K., Gill, R., Kelly, O., & Anisman, H. (2008). Cortisol and Cardiac Reactivity in the Context of Sex Discrimination: The Moderating Effects of Mood and Perceived Control. *The Open Psychology Journal*, *1*(1). Retrieved from https://benthamopen.com/ABSTRACT/TOPSYJ-1-1

McDonald, P. (2012). Workplace Sexual Harassment 30 Years on: A Review of the Literature. *International Journal of Management Reviews*, *14*(1), 1–17. https://doi.org/10.1111/j.1468-2370.2011.00300.x

McEwen, B. S. (1998). Stress, adaptation, and disease. Allostasis and allostatic load. *Annals of the New York Academy of Sciences*, *840*, 33–44.

McFall, S., Nandi, A., & Platt, L. (2017). *Understanding Society: UK Household Longitudinal Study: User Guide to Ethnicity and Immigration Research* (4th ed.). Colchester: University of Essex.

McGinley, M., Wolff, J. M., Rospenda, K. M., Liu, L., & Richman, J. A. (2016). Risk factors and outcomes of chronic sexual harassment during the transition to college: Examination of a two-part growth mixture model. *Social Science Research*, *60*, 297–310. https://doi.org/10.1016/j.ssresearch.2016.04.002

McLaughlin, K. A., Xuan, Z., Subramanian, S. V., & Koenen, K. C. (2011). State-level women's status and psychiatric disorders among US women. *Social Psychiatry and Psychiatric Epidemiology*, *46*(11), 1161–1171. https://doi.org/10.1007/s00127-010-0286-z

Moradi, B., & Mezydlo Subich, L. (2002). Perceived sexist events and feminist identity development attitudes: Links to women's psychological distress. *The Counseling Psychologist*, *30*(1), 44–65. https://doi.org/10.1177/0011000002301003

National Academies of Sciences, Engineering, and Medicine. (2018). *Sexual harassment of women: climate, culture, and consequences in academic sciences, engineering, and medicine*. National Academies Press.

Nielsen, M. B., & Einarsen, S. (2012). Prospective relationships between workplace sexual harassment and psychological distress. *Occupational Medicine*, *62*(3), 226–228. https://doi.org/10.1093/occmed/kqs010

OECD. (2005). *What are equivalence scales?*

Office for National Statistics. (2018). *Gender pay gap in the UK: 2018*. Retrieved from https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/genderpaygapintheuk/2018

O'Neil, A., Sojo, V., Fileborn, B., Scovelle, A. J., & Milner, A. (2018). The #MeToo movement: an opportunity in public health? *The Lancet*, *391*(10140), 2587–2589. https://doi.org/10.1016/S0140-6736(18)30991-7

Parliament (Qualification of Women) Act. , (1918).

Pascoe, E. A., & Smart Richman, L. (2009). Perceived discrimination and health: a meta-analytic review. *Psychological Bulletin*, *135*(4), 531–554. https://doi.org/10.1037/a0016059

Phinney, J. S., Madden, T., & Santos, L. J. (1998). Psychological Variables as Predictors of Perceived Ethnic Discrimination Among Minority and Immigrant Adolescents1. *Journal of Applied Social Psychology*, *28*(11), 937–953. https://doi.org/10.1111/j.1559-1816.1998.tb01661.x

Ro, A., & Choi, K.-H. (2010). Effects of Gender Discrimination and Reported Stress on Drug Use among Racially/Ethnically Diverse Women in Northern California. *Women's Health Issues : Official Publication of the Jacobs Institute of Women's Health*, *20*(3), 211–218. https://doi.org/10.1016/j.whi.2010.02.002

Schmitt, M. T., Branscombe, N. R., & Postmes, T. (2003). Women's emotional responses to the pervasiveness of gender discrimination. *European Journal of Social Psychology*, *33*(3), 297–312. https://doi.org/10.1002/ejsp.147

Schmitt, M. T., Branscombe, N. R., Postmes, T., & Garcia, A. (2014). The consequences of perceived discrimination for psychological well-being: a meta-analytic review. -. *Psychological Bulletin*, *140*(4), 921–948.

Sojo, V. E., Wood, R. E., & Genat, A. E. (2016). Harmful Workplace Experiences and Women's Occupational Well-Being: A Meta-Analysis. *Psychology of Women Quarterly*, 10–40.

Steptoe, A., & Jackson, S. E. (2018). The Life Skills of Older Americans: Association with Economic, Psychological, Social, and Health Outcomes. *Scientific Reports*, *8*(1), 9669. https://doi.org/10.1038/s41598-018-27909-w

Sutin, A. R., Stephan, Y., Carretta, H., & Terracciano, A. (2015). Perceived discrimination and physical, cognitive, and emotional health in older adulthood. *The American Journal of Geriatric Psychiatry: Official Journal of the American Association for Geriatric Psychiatry*, *23*(2), 171–179. https://doi.org/10.1016/j.jagp.2014.03.007

The Equality Act. , (2010).

The Sex Discrimination Act. , (1975).

Townsend, S. S. M., Major, B., Gangi, C. E., & Mendes, W. B. (2011). From "In the Air" to "Under the Skin": Cortisol Responses to Social Identity Threat. *Personality & Social Psychology Bulletin*, *37*(2), 151–164. https://doi.org/10.1177/0146167210392384

Travis, C. B., Howerton, D. M., & Szymanski, D. M. (2012). Risk, Uncertainty, and Gender Stereotypes in Healthcare Decisions. *Women & Therapy*, *35*(3–4), 207–220. https://doi.org/10.1080/02703149.2012.684589

U. N. Women. (2015). *Facts and figures: Economic Empowerment*. New York: U.N. Women.

University of Essex. Institute for Social and Economic Research, NatCen Social Research, Kantar Public. (2017). *Understanding Society: Waves 1-7, 2009-2016 and Harmonised BHPS: Waves 1-18, 1991-2009.* (9th Edition). UK data service.

Vaghela, P., & Sutin, A. R. (2016). Discrimination and sleep quality among older US adults: the mediating role of psychological distress. *Sleep Health: Journal of the National Sleep Foundation*, *2*(2), 100–108. https://doi.org/10.1016/j.sleh.2016.02.003

Van de Velde, S., Huijts, T., Bracke, P., & Bambra, C. (2013). Macro-level gender equality and depression in men and women in Europe. *Sociology of Health & Illness*, *35*(5), 682–698. https://doi.org/10.1111/j.1467-9566.2012.01521.x

Ware, J. E. (2002). *How to score version 2 of the SF-12 health survey (with a supplement documenting version 1) Edition: first*. Lincoln, RI: Health Assessment Lab.

Ware, J., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Medical Care*, *34*(3), 220–233.

Wolff, J. M., Rospenda, K. M., & Colaneri, A. S. (2017). Sexual Harassment, Psychological Distress, and Problematic Drinking Behavior Among College Students: An Examination of Reciprocal Causal Relations. *The Journal of Sex Research*, *54*(3), 362–373. https://doi.org/10.1080/00224499.2016.1143439

Yuan, A. S. V. (2007). Perceived Age Discrimination and Mental Health. *Social Forces*, *86*(1), 291–311. Retrieved from JSTOR.

Zucker, A. N., & Landry, L. J. (2007). Embodied discrimination: The relation of sexism and distress to women's drinking and smoking behaviors. *Sex Roles: A Journal of Research*, *56*(3–4), 193–203. https://doi.org/10.1007/s11199-006-9163-3

Table 1: Associations between perceived sex discrimination and sociodemographic factors at wave 1 (2009/10).

	No perceived sex discrimination (*n* = 2380)	**Perceived sex discrimination (*n* = 576)**	***p***
Age (years)	39.62 (15.96)	34.80 (13.05)	< 0.001
16-24	426 (17.9%)	139 (24.1%)	
25-34	619 (26.0%)	180 (31.3%)	
35-44	544 (22.9%)	139 (24.1%)	
45-54	367 (15.4%)	72 (12.5%)	
55+	424 (17.8%)	46 (8.0%)	
Household income (£)	1207.89 (945.44)	1425.79 (1084.87)	< 0.001
£0-499	320 (13.4%)	60 (10.4%)	
£500-999	900 (37.8%)	161 (28.0%)	
£1000-1499	572 (24.0%)	149 (25.9%)	
£1500-1999	290 (12.2%)	97 (16.8%)	
£2000+	298 (12.5%)	109 (18.9%)	
Education (% yes)			< 0.001
University Degree	767 (32.2%)	277 (48.1%)	-
School qualification	1066 (44.8%)	262 (45.5%)	-
No qualification	547 (23.0%)	37 (6.4%)	-
Ethnicity			< 0.001
White	389 (16.3%)	137 (23.8%)	-
South Asian	956 (40.2%)	143 (24.8%)	-
Black	593 (24.9%)	141 (24.5%)	-
Other	442 (18.6%)	155 (26.9%)	-

Data are presented as means (SD) and n (%)

Table 2: Cross-sectional & prospective associations between perceived sex discrimination and emotional wellbeing outcomes (imputed)

		Wave 1				Wave 5	
		n	**No perceived discrimination**	**n**	**Perceived discrimination**	**No perceived discrimination**	**Perceived discrimination**
Depression							
	% (SE)	2377	2.7 (0.00)	576	8.3 (0.01)	-	-
	OR [95%CI]		Ref		3.16 [2.10; 4.79]***	-	-
Psychological distress							
	Mean score (SE)	1585	1.65 (0.07)	452	2.91 (0.14)	2.79 (0.81)	3.45 (0.87)
	Coeff. [95%CI]		Ref		1.26 [0.95; 1.56]***	Ref	0.66 [0.07; 1.24]*
Mental functioning							
	Mean score (SE)	2360	50.49 (0.21)	574	45.09 (0.43)	48.08 (0.29)	46.71 (0.60)
	Coeff. [95%CI]		Ref		-5.39 [-6.33; -4.46]***	Ref	-1.37 [-2.71;-0.03]*
Life satisfaction							
	Mean score (SE)	1595	5.19 (0.04)	454	4.67 (0.07)	4.95 (0.06)	4.63 (0.13)
	Coeff. [95%CI]		Ref		-0.52 [-0.69; -0.36]***	Ref	-0.32 [-0.58; -0.05]*
Fair/poor self-rated health							
	% (SE)	2379	20.1 (0.01)	576	27.9 (0.02)	22.4 (0.01)	25.2 (0.02)
	OR [95%CI]		1.00 (Ref)		1.89 [1.47; 2.41]***	1.00 (Ref)	1.39 [0.94; 2.05]

All analyses are adjusted for age, household income, education and ethnicity. Prospective analyses are additionally adjusted for baseline wellbeing scores/status.

Coeff = unstandardized B coefficient (white rows), CI = confidence interval, OR = odds ratio (grey rows), SE = standard error.

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

Possible scores on the psychological distress scale range from 0-12, SF-12 mental functioning component scale range from 0-100 and the life satisfaction scale range from 0-7.

Table 3: Sensitivity analysis: Cross-sectional & prospective associations between perceived sex discrimination and emotional wellbeing outcomes (complete case analysis)

		Wave 1				Wave 5			
		n	**No perceived discrimination**	**n**	**Perceived discrimination**	**n**	**No perceived discrimination**	**n**	**Perceived discrimination**
Depression									
	% (SE)	2377	2.7 (0.00)	576	8.3 (0.01)	-	-	-	-
	OR [95%CI]		Ref		3.16 [2.10; 4.79]***		-		-
Psychological distress									
	Mean score (SE)	1585	1.65 (0.07)	452	2.91 (0.14)	672	1.86 (0.12)	217	2.57 (0.21)
	Coeff. [95%CI]		Ref		1.26 [0.95; 1.56]***		Ref		0.71 [0.24; 1.9]**
Mental functioning									
	Mean score (SE)	2360	50.49 (0.21)	574	45.09 (0.43)	880	48.37 (0.33)	253	47.07 (0.63)
	Coeff. [95%CI]		Ref		-5.39 [-6.33; -4.46]***		Ref		-1.31 [-2.71; 0.97]
Life satisfaction									
	Mean score (SE)	1595	5.19 (0.04)	454	4.67 (0.07)	680	4.99 (0.06)	218	4.65 (0.11)
	Coeff. [95%CI]		Ref		-0.52 [-0.69; -0.36]***		Ref		-0.34 [-0.58; -0.10]*
Fair/poor self-rated health									
	% (SE)	2379	20.1 (0.01)	576	27.9 (0.02)	1191	23.5 (0.01)	298	25.7 (0.02)
	OR [95%CI]		1.00 (Ref)		1.89 [1.47; 2.41]***		1.00 (Ref)		1.32 [0.92; 1.89]

All analyses are adjusted for age, household income, education and ethnicity. Prospective analyses are additionally adjusted for baseline wellbeing scores/status.
Coeff = unstandardized B coefficient (white rows), CI = confidence interval, OR = odds ratio (grey rows), SE = standard error.
*p<0.05, **p<0.01, ***p<0.001
Possible scores on the psychological distress scale range from 0-12, SF-12 mental functioning component scale range from 0-100 and the life satisfaction scale range from 0-7.

Table 4: Sensitivity analysis: Perceived sex discrimination measure excluding each discriminatory behaviour in turn

Cross-sectional analyses (wave 1)		**Model 1**	**Model 2**	**Model 3**	**Model 4**
Depression	OR [95%CI]	3.17 [2.09; 4.79]***	2.79 [1.86; 4.22]***	2.97 [1.95; 4.52]***	3.17 [1.97; 5.09]***
Psychological distress	Coeff. [95%CI]	1.26 [0.96; 1.57]***	1.21 [0.89; 1.51]***	1.30 [0.99; 1.62]***	1.59 [1.20; 1.99]***
Mental functioning	Coeff. [95%CI]	-5.38 [-6.31; -4.44]***	-5.27 [-6.21; -4.32]***	-5.43 [-6.39; -4.46]***	-5.76 [-7.04; -4.48]***
Life satisfaction	Coeff. [95%CI]	-0.52 [-0.69; -0.36]***	-0.53 [-0.69; -0.37]***	-0.56 [-0.72; -0.39]***	-0.67 [-0.88; -0.45]***
Fair/poor self-rated health	OR [95%CI]	1.89 [1.47; 2.42]***	1.93 [1.51; 2.47]***	1.99 [1.55; 2.56]***	1.82 [1.31; 2.51]***
Prospective analyses (wave 5)		**Model 1**	**Model 2**	**Model 3**	**Model 4**
Psychological distress	Coeff. [95%CI]	0.66 [0.07; 1.25]*	0.59 [-0.00; 1.20]	0.68 [0.11; 1.25]*	0.85 [0.15; 1.56]*
Mental functioning	Coeff. [95%CI]	-1.35 [-2.69; -0.01]*	-1.36 [-2.73; 0.01]	-1.40 [-2.79; -0.00]*	-1.86 [-3.67; -0.06]*
Life satisfaction	Coeff. [95%CI]	-0.32 [-0.58; -0.05]*	-0.31 [-0.58; -0.04]*	-0.32 [-0.59; -0.04]*	-0.28 [-0.60; 0.05]
Fair/poor self-rated health	OR [95%CI]	1.39 [0.94; 2.06]	1.42 [0.95; 2.10]	1.31 [0.87; 1.98]	1.65 [1.03; 2.62]*

All analyses are adjusted for age, household income, education and ethnicity. Prospective analyses are additionally adjusted for baseline wellbeing status/score.
Model 1 excludes "*was attacked at some place*" from the measure of perceived sex discrimination; Model 2 excludes ""*was insulted at some place* "; Model 3 excludes "*avoided some place* "; and Model 4 excludes "*felt unsafe at some place*".
Coeff = unstandardized B coefficient (white rows), CI = confidence interval, OR = odds ratio (grey rows), SE = standard error.
*p<0.05, **p<0.01, ***p<0.001
Possible scores on the psychological distress scale range from 0-12, SF-12 mental functioning component scale range from 0-100 and the life satisfaction scale range from 0-7.

Table 5: Sensitivity analysis: Associations between perceived sex discrimination and emotional wellbeing outcomes with depression (imputed)

		Wave 1				Wave 5	
		n	**No perceived discrimination**	**n**	**Perceived discrimination**	**No perceived discrimination**	**Perceived discrimination**
Psychological distress							
	Mean score (SE)	1585	1.69 (0.07)	452	2.77 (0.13)	2.79 (0.80)	3.45 (0.87)
	Coeff. [95%CI]		Ref		1.08 [0.78; 1.38]***	Ref	0.65 [0.05; 1.25]*
Mental functioning							
	Mean score (SE)	2360	50.34 (0.20)	574	45.68 (0.41)	48.08 (0.29)	46.71 (0.59)
	Coeff. [95%CI]		Ref		-4.66 [-5.57; -3.75]***	Ref	-1.37 [-2.71;-0.03]*
Life satisfaction							
	Mean score (SE)	1595	5.17 (0.04)	454	4.73 (0.07)	4.95 (0.06)	4.63 (0.13)
	Coeff. [95%CI]		Ref		-0.45 [-0.61; -0.29]***	Ref	-0.31 [-0.58; -0.04]*
Fair/poor self-rated health							
	% (SE)	2379	20.4 (0.01)	576	26.5 (0.02)	22.4 (0.01)	25.0 (0.02)
	OR [95%CI]		1.00 (Ref)		1.70 [1.32; 2.19]***	1.00 (Ref)	1.35 [0.91; 2.01]

All analyses are adjusted for age, household income, education and ethnicity and clinical depression. Prospective analyses are additionally adjusted for baseline wellbeing scores/status.

Coeff = unstandardized B coefficient (white rows), CI = confidence interval, OR = odds ratio (grey rows), SE = standard error.

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

Possible scores on the psychological distress scale range from 0-12, SF-12 mental functioning component scale range from 0-100 and the life satisfaction scale range from 0-7.