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Disability discrimination and mental health: A prospective analysis

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1 **Disability discrimination and mental health: A prospective analysis**

2

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26 **Abstract**

27 **Objectives:** Disability discrimination is linked with poorer mental health cross-sectionally.

28 The aim of this study was to explore prospective associations between disability discrimination

29 and mental wellbeing.

30 **Design:** Prospective cohort study

31 **Setting:** The United Kingdom Household Longitudinal Study

32 **Participants:** Data were from 871 individuals with a self-reported physical, cognitive or

33 sensory disability.

34 **Primary outcome measures:** Depression was assessed in 2009/10. Psychological distress,

35 mental functioning, life satisfaction and self-rated health were assessed in 2009/10 and

36 2013/14.

37 **Results:** Data were analysed using linear and logistic regression with adjustment for age, sex,

38 household income, education, ethnicity and impairment category. Perceived disability

39 discrimination was reported by 117 (13.4%) participants. Cross-sectionally, discrimination was

40 associated with depression (Odds ratio (OR) = 5.40, 95% Confidence Interval (CI) 3.25; 8.97)

41 fair/poor self-rated health (OR=2.05; 95% CI 1.19; 3.51), greater psychological distress (B =

42 3.28, 95% CI 2.41; 4.14), poorer mental functioning (B = -7.35; 95% CI -9.70; -5.02) and life

43 satisfaction (B = -1.27, 95% CI -1.66; -0.87). Prospectively, discrimination was associated with

44 increased psychological distress (B = 2.88, 95% CI 1.39; 4.36) and poorer mental functioning

45 (B = -5.12; 95% CI -8.91; -1.34), adjusting for baseline scores.

46 **Conclusions:** Perceived disability-related discrimination is linked with poorer mental

47 wellbeing. These findings underscore the need for interventions to combat disability

48 discrimination.

49

50 **Key words:** disability, discrimination; prejudice; stigma; mental health; wellbeing

2

51 **Article Summary**

52 • The use of the prospective United Kingdom Household Longitudinal Study allowed

53   use to examine changes in mental wellbeing over a 4 year period.

54 • The disability discrimination measure took into account several kinds of

55   discriminatory behaviour and included multiple settings where perceived disability

56   discrimination could be encountered.

57 • Our findings are based on perceptions of disability discrimination rather than

58   objective encounters with disability discrimination.

59 • Disability discrimination was only assessed at one point in time, meaning our measure

60   does not necessarily reflect pervasive discrimination.

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68 **Competing interests:** The authors declare that they have no conflict of interest.

69 **Data sharing:** The UKHLS datasets analysed during the current study are freely available in

70 the UK Data Service repository https://ukdataservice.ac.uk/

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Introduction

76

77 "Disability" is an umbrella term for long-term impairments, activity limitations and

78 participation restrictions, experienced by an individual with a health condition in interaction

79 with their environment[1–3]. In the UK, the prevalence of disability is rising, with 21% of the

80 population reporting a disability in 2017-2018, an increase from 18% in 2007-2008[4]. The

81 majority of disabled people report experiencing difficulties in everyday life. For example,

82 disabled people in Britain have lower educational attainment, are less likely to be employed

83 and are more likely to live in poverty than non-disabled adults[5], with knock on effects

84 regarding access to health and other services[6].

85 These practical difficulties may be aggravated by discrimination. Disability

86 discrimination has been defined as unwanted, exploitative or abusive conduct against disabled

87 people which violates their dignity and security or creates an intimidating or offensive

88 environment[7]. Although disability is a protected characteristic under equality legislation[1],

89 disability discrimination is perceived to be common. In a 2015 population survey of 27,718

90 adults from 26 European countries, 50% of participants reported disability discrimination to be

91 widespread, a 4% increase from 2012 data[8]**.**

92 Disability discrimination can happen in a variety of settings including on the street, in

93 the workplace and in public venues such as shops or pubs[9]. Recent British data suggests that

94 disabled people are more likely than non-disabled people to report feeling unsafe when walking

95 alone and to worry about physical attack and theft [10,11]. Disability is the second most

96 common motivator for hate crime incidents, after race in England and Wales[12]. In the

97 workplace, several studies suggest that a greater proportion of disabled than non-disabled

98 individuals report experiences of discrimination [7,13].

99 A growing body of research has investigated discrimination as a determinant of mental

100 wellbeing[14–16]. Meta-analyses have linked perceived discrimination with depression and

4

101 psychological distress and with poorer life satisfaction and self-rated health[14–16]. However,

102 disability discrimination was not assessed in two of these meta-analyses and the majority of

103 previous working has focused on racism [14,15]. In the most recent pooled analysis of

104 328 studies, physical illness discrimination and disability discrimination were assessed as a

105 combined category[16], with associations between discrimination and greater psychological

106 distress and lower self-esteem detected.

107 Several cross-sectional studies have assessed perceived disability discrimination alone

108 in relation to mental wellbeing outcomes. One study of 229 individuals with an intellectual

109 disability in England found that self-reported stigma was associated with a greater number of

110 depression and anxiety symptoms[17]. Two analyses of the Australian Survey of Disability,

111 Ageing and Carers (n=9655 and n=6183, respectively) linked disability discrimination with

112 greater psychological distress[18,19]. This association was similarly observed in a Swedish

113 general population survey[20]. Research has also linked perceived disability discrimination

114 with lower life satisfaction in Canadian adolescents[21], Korean women with severe

115 disabilities[22] and Israeli nationals with physical disabilities[23]. Perceived disability

116 discrimination has been associated with poorer self-rated health cross-sectionally in three

117 studies[19,24,25] including a general population analysis of 52,458 individuals, from the

118 European Social Survey[25].

119 Cross-sectional correlations are difficult to interpret: perception of discrimination may

120 result in emotional distress, but it is also possible that emotional distress leads to alterations in

121 how people interpret social interactions with others. To date, only one study has assessed

122 prospective associations between perceived disability discrimination and mental health and

123 wellbeing outcomes[26]. In an analysis of older adults (≥50 years) participating in the US-

124 based Health and Retirement Study (HRS), perceived disability discrimination was associated

125 with poorer life satisfaction, self-rated health, and greater loneliness over four-year follow-up.

5

126   Overall, previous research has been dominated by cross-sectional studies, precluding

127   the assessment of the temporal relationship between perceived disability discrimination and

128   mental wellbeing outcomes. No longitudinal studies have compared people with a disability

129   who do or do not report discrimination and wellbeing outcomes. To address these limitations,

130   this study aimed to investigate cross-sectional and prospective associations between perceived

131   disability discrimination and mental wellbeing in a UK population cohort.

132

133   **Methods**

134   **Study population**

135   This study uses data from Understanding Society: The UK Household Longitudinal Study

136   (UKHLS)[27]. Data collection began in 2009/10 (wave 1) with follow-ups annually. This study

137   uses data from waves 1 (2009/10) and 5 (2013/14). The UKHLS comprises of a representative

138   sample of the UK population, in addition to an ethnic minority boost sample[28,29]. Our data

139   come from the 'extra 5 minutes sample' of over 8,000 participants who had an additional 5

140   minutes of questions on issues pertinent to ethnicity research including discrimination. This

141   sample comprises of mostly ethnic minorities ($n = 6722$) along with a comparison group of

142   white participants ($n = 1428$)[28]. We restricted our sample to those who responded to the

143   disability discrimination questions ($n = 4788$) with a self-reported disability ($n = 871$). At wave

144   5 there was loss to follow-up (n=431), leaving a follow-up sample size of 440 participants. Our

145   definition of disability did not include mental health-related impairments. Ethical approval for

146   UKHLS was obtained from the University of Essex Ethics Committee. All participants

147   provided fully informed consent.

148

149   **Perceived disability discrimination**

6

150   To assess discrimination, participants were asked whether in the past 12 months they (a) felt

151   unsafe, (b) avoided going to or being in, (c) had been insulted, called names, threatened or

152   shouted at, or (d) had been physically attacked, in seven different settings: 1) At

153   school/college/work, 2) On public transport, 3) At or around bus or train stations, 4) In a taxi,

154   5) Public buildings such as shopping centres or pubs, 6) Outside on the street, in parks or other

155   public places, or 7) At home. If they answered yes, a follow-up question asked them to choose

156   a reason from a list of categories including disability, sex and ethnicity among others. It was

157   possible to choose multiple settings and attributions for the perceived discrimination. Those

158   who attributed any experience of discrimination to disability are treated as cases of perceived

159   disability discrimination.

160

161   **Outcome variables**

162   Self-reported doctor-diagnosed clinical depression was measured at wave 1 (2009/10) with

163   responses coded as yes/no. Depression was not analysed longitudinally due to a lack of incident

164   cases. All other outcomes were assessed at waves 1 (2009/10) and 5 (2013/14). Psychological

165   distress was measured using the General Health Questionnaire (GHQ)-12[30], which involved

166   ratings of 12 statements including whether the individual had "*Been able to enjoy your normal*

167   *day to day activities*" or whether they "*Felt constantly under strain*" with response options of

168   0="no" and 1="yes". Total scores range from 0 (least distressed) to 12 (most distressed). The

169   12-item short-form health survey (SF-12) mental component summary score was used to

170   measure limitations caused by emotional, mental health and social functioning issues[31].

171   Items included ratings of feelings experienced over the past 4 weeks such as "*Have you felt*

172   *downhearted or blue*?" or *"Accomplished less than you would like"*. Overall scores were

173   derived using standard methods ranging from 0 (low functioning) to 100 (high functioning)

174   [32]. Life satisfaction was assessed using one item asking participants how satisfied they were

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175   with their "life overall", with scores ranging from 1 (completely dissatisfied) to 7 (completely

176   satisfied). Self-rated health was assessed using a single item: "*Would you say your health*

177   *is...poor/fair/good/very good/excellent?*" In keeping with previous investigations [33,34] self-

178   rated health was dichotomised with 0 being "good/very good/excellent" and 1 meaning

179   "poor/fair".

180

181   **Covariates**

182   A number of covariates (assessed at wave 1) that are likely relevant to perceived disability

183   discrimination and mental health were included in our analyses. Age in years was entered as a

184   continuous variable. Sex was included as a binary variable (male/female). Equivalised monthly

185   household income was calculated by dividing total household net income by the modified

186   Organization for Economic Cooperation and Development (OECD) equivalence scale to adjust

187   for the effects of household size and composition[35]. Education was included as a 3-level

188   variable: 1 "university degree", 2 "high school qualification" and 3 "no qualification". As our

189   sample was ethnically diverse, we included ethnicity as a 4-level variable with 1 being "white"

190   including those of white British, white Irish and any other white background, 2 being "south

191   Asian" including Indian, Pakistani and Bangladeshi individuals, 3 being "black" including

192   black African and black Caribbean participants and 4 being "other" including individuals from

193   Chinese and mixed backgrounds. There were 4 categories of impairment measured in the study:

194   "physical" disability which included difficulties with manual dexterity and mobility;

195   "cognitive" disability including problems with memory or the ability to concentrate, learn and

196   understand; "sensory" disability including hearing (apart from using a standard hearing aid)

197   and sight impairments (apart from wearing standard glasses) and "other" which encompassed

198   reports of unspecified disability not captured in the other categories.

199

8

Statistical analyses

200

201   We compared the characteristics of those who did and those who did not report disability

202   discrimination at wave 1 using Chi-squared tests for categorical variables and independent

203   samples t-tests for continuous variables. Associations between perceived disability

204   discrimination and the various wellbeing measures were assessed using linear regression for

205   continuous outcomes and logistic regression for categorical outcomes. For cross-sectional

206   analyses, depression, psychological distress (GHQ-12), SF-12 mental component score, life

207   satisfaction and self-rated health at wave 1 (2009/10) were the outcome variables. For

208   prospective analyses, psychological distress (GHQ-12), SF-12 mental component score, life

209   satisfaction and self-rated health at wave 5 (2013/14) were the outcomes. Age, sex, household

210   income, education, ethnicity and disability type at wave 1 were controlled for in all analyses.

211   Baseline (wave 1) scores/status on the relevant wellbeing variable was included as an additional

212   covariate in prospective analyses. We tested for interactions between perceived disability

213   discrimination and age, sex, income, education, ethnicity or impairment type on wellbeing at

214   wave 5. No significant effects were detected. Thus, interaction terms were not included in our

215   models. Results from linear regression analyses are presented as unstandardized B and 95%

216   confidence intervals (95% CI). Results from logistic regression analyses are presented as odds

217   ratios (ORs) and 95% CI. All analyses were conducted using SPSS v.24.

218

Sensitivity analyses

219

220   We carried out two sensitivity analyses. In our first, we assessed whether those who were lost

221   to follow-up ($n = 431$) differed from those who provided data at both waves ($n = 440$). We

222   tested whether this impacted the results by conducting the cross-sectional analyses (wave 1)

223   including only those who provided follow-up data at wave 5. In our second sensitivity analysis,

224   we assessed whether a certain type of discriminatory behaviour contributing to the measure of

9

225   perceived disability discrimination was driving the results. We tested this cross-sectionally and

226   prospectively removing each type of discriminatory behaviour in turn.

227

228   **Results**

229   A total of 871 participants were included in the study and of these 117 (13.4%) reported

230   perceived disability discrimination. Of the categories of discrimination assessed, the most

231   commonly reported was feeing unsafe (86.1%; 95% CI 79.48-92.74), followed by avoiding

232   somewhere (72.8%; 95% CI 64.08-81.55), being insulted (23.5%; 95% CI 14.33-32.73) and

233   being physically attacked (2.8%; 95% CI 0.04-5.98). The most common settings in which

234   disability discrimination was reported were on the street (77.8%; 95% CI 70.13-85.42), in

235   public buildings such as shops or pubs (59.8%; 95% CI 50.81-68.84), on public transport

236   (51.3%; 95% CI 42.09-60.47) and at or around bus or train stations (40.2%; 95% CI 31.16-

237   49.19). A quarter of participants reported experiencing disability discrimination at home (25%;

238   95% CI 17.61-33.67). Perceived disability discrimination was less frequently reported in

239   school or workplace settings (12.8%; 95% CI 6.67-18.97) or in taxis (12%; 95% CI 6-17.93).

240   The prevalence of the various types of perceived disability discrimination and the settings in

241   which the discrimination occurred for different types of disability can be found in

242   Supplementary Table 1. There were no statistically significant differences between people with

243   different types of disability in discrimination type or discrimination setting.

244   The baseline characteristics of the sample are displayed in Table 1. The group who

245   reported disability discrimination were younger on average (48.29 ± 14.89 years) than those

246   who did not report discrimination (53.42 ± 16.56 years). They were more likely to be white

247   (27.4% vs. 20.3%) and to be better educated than those who did not report discrimination, with

248   a greater proportion holding university degrees (28.2% vs 22.7%). Physical disability was most

249 common in those who did not perceive discrimination (46.6%), whereas other unspecified

250 disabilities (65%) were most frequently reported by those who perceived discrimination.

251

252 **Cross-sectional associations between perceived disability discrimination and wellbeing**

253 Our findings suggest that individuals who perceived disability discrimination were

254 significantly more likely to report a diagnosis of clinical depression (OR=5.40; 95% CI 3.25;

255 8.97, p <0.001) and were more likely to rate their health as fair/poor (OR=2.05; 95% CI 1.19;

256 3.51, p =0.009) than those who did not perceive disability discrimination, independent of

257 covariates (first panel Table 2). Those who reported discrimination also had significantly

258 higher levels of psychological distress (B = 3.28, 95% CI 2.41; 4.14, p <0.001), poorer mental

259 functioning on the SF-12 (B = -7.35; 95% CI -9.70; -5.02, p <0.001) and lower life satisfaction

260 (B = -1.27, 95% CI -1.66; -0.87, p <0.001), than those who did not report discrimination

261

262 **Prospective associations between perceived disability discrimination and wellbeing**

263 In prospective analyses (second panel Table 2), those who reported perceived disability

264 discrimination had higher levels of psychological distress 4 years later than those who did not

265 report discrimination, independent of covariates and baseline psychological distress (B = 2.88,

266 95% CI 1.39; 4.36, p <0.001). We detected a prospective association between perceived

267 disability discrimination and poorer SF-12 mental functioning (B = -5.12; 95% CI -8.91; -1.34,

268 p =0.008). Those who reported disability discrimination had slightly lower life satisfaction

269 (means= 4.14 vs 4.67) and a greater proportion rated their health as fair/poor (67.3% vs 62.1%)

270 than those who did not report discrimination at follow-up. However, these differences did not

271 reach statistical significance.

272

273 **Sensitivity analyses**

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274   In the first sensitivity analysis (Table 3), cross-sectional findings for those who provided

275   complete data at wave 5 were similar to the full-sample at wave 1. The demographic

276   characteristics of those lost to follow-up were similar to those of complete cases (Table 4).

277   Only education differed significantly between the groups, with those who provided complete

278   data at wave 5 more likely to hold a degree (27.0%) than those lost to follow-up (19.7%).

279   In the second sensitivity analysis, removing each of the discriminatory behaviours from

280   the measure of discrimination in turn did not alter the cross-sectional results (Table 5).

281   Prospectively, the association between perceived disability discrimination and increased

282   psychological distress remained the same regardless of the type of discriminatory behaviour

283   removed from the measure. For SF-12 mental functioning, the association was fairly robust to

284   the type of discriminatory behaviour, but was slightly attenuated when "feeling unsafe" was

285   removed from the discrimination variable ($p = 0.058$). Again, no significant prospective

286   associations were detected for life satisfaction and self-rated health.

287

Discussion

289   In a sample of UK-based participants with self-reported disability, perceived discrimination

290   was associated with higher prevalence of depression, greater psychological distress, and poorer

291   mental functioning, life satisfaction and self-rated health. Prospectively, disability

292   discrimination was associated with increased psychological distress and worse mental

293   functioning four-years later. Our results were robust to adjustment for a range of covariates and

294   were not driven by any specific kind of discriminatory behaviour. No significant prospective

295   relationships with life satisfaction and self-rated health were observed.

296   Previous literature has been dominated by cross-sectional studies. To our knowledge,

297   only one previous study has investigated the prospective association between disability

298   discrimination and wellbeing outcomes. In this analysis of US adults from the HRS cohort,

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299 perceived disability discrimination was associated with poorer life satisfaction and self-rated

300 health over four year follow-up [26]. In the current study we observed poorer mental

301 functioning and greater psychological distress four years later in those who reported disability

302 discrimination, taking into account baseline scores on these variables. We failed to detect a

303 significant association between perceived discrimination and life satisfaction or self-rated

304 health at follow-up. Although on average, those who perceived disability discrimination in our

305 sample had poorer life satisfaction and were more likely to rate their health as fair/poor at

306 follow-up than those who did not perceive discrimination, these differences did not reach

307 statistical significance. One reason for the divergence in findings between our study and the

308 HRS analysis [26] may be study design. We limited our analyses to those with a confirmed

309 disability, whereas in the HRS study associations between wellbeing and disability

310 discrimination were assessed across the entire sample. Our analysis offers more precision in

311 the assessment of the relationship between disability discrimination and wellbeing outcomes,

312 by directly comparing people with disability who did and did not perceive discrimination.

313 Another possibility for these null findings may be that significant associations between

314 discrimination and life satisfaction and self-rated health do not become apparent until older

315 adulthood, perhaps allowing for repeated exposures to disability discrimination. However, this

316 assertion remains to be tested. Another potential explanation is that the impact of ongoing

317 disability discrimination on life satisfaction and self-rated health in our sample had already

318 become apparent at the time of the baseline survey, limiting the scope for further decline.

319   Our study adds to the cross-sectional literature linking perceived disability

320 discrimination and poorer mental health and wellbeing outcomes by demonstrating

321 associations in a community sample of disabled people living in the UK. Our results extend the

322 findings of an earlier study linking stigma and depression in those with intellectual

323 disability[17], by establishing this relationship in a sample with a broader range of disability.

13

324   In keeping with previous studies, we observed greater psychological distress[18–20] and

325   poorer life satisfaction[21–23,26] in those who reported disability discrimination. Our study

326   adds to this existing evidence by demonstrating this link in a UK-based sample for the first

327   time. Similar to earlier work from Australian, European and North American

328   samples[19,24,26,36], we observed a relationship between perceived disability discrimination

329   and poorer self-rated health. Cross-sectional studies cannot determine whether perceived

330   disability discrimination predicts poor mental wellbeing, or whether perceptions of

331   discrimination are an indicator of psychological distress. Our prospective findings therefore

332   add to the field in establishing that perceived disability discrimination predicts psychological

333   distress and poorer mental functioning, net of baseline associations, so has negative

334   implications for future mental health.

335   This is an observational study and longitudinal analyses do not necessarily imply

336   causality. There could be unmeasured factors responsible for the associations that emerged.

337   Nevertheless, with regard to the pathways linking perceived disability discrimination and

338   mental health and wellbeing, there are several possibilities that could explain our results. One

339   mechanism could be that perceptions of disability discrimination in healthcare settings serve

340   to impede access to health services. An analysis of HRS found that reports of frequent

341   discrimination in healthcare settings were predictive of new or worsened disability over four

342   year follow-up[37]. Quantitative[38,39] and qualitative[40] evidence suggests that those who

343   perceive disability discrimination are less likely to seek healthcare. However, there may be sex

344   differences in this association, with a Swedish study only detecting a relationship between

345   disability discrimination and healthcare avoidance in women[39].However, no interaction

346   between sex and perceived discrimination was detected in the current study (data not shown).

347   Poor health behaviours are another potential mechanism linking disability

348   discrimination and poorer mental wellbeing. For example, perceived disability discrimination

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349 has been linked with worse sleep quality in the HRS, with psychological distress acting as a

350 full mediator of this association[41]. It is possible that disabled people could engage in negative

351 health behaviours as a means of coping with the psychological impact of discrimination. In a

352 study of 304 individuals with disability, perceived disability discrimination was positively

353 associated with illicit drug use[42]. Eating may offer a source of comfort in the face of

354 discrimination[43]. A US study of over 5000 individuals, observed a link between physical

355 disability discrimination and overeating[44].

356 Another possibility is that perceived disability discrimination and mental wellbeing are

357 linked through disturbed stress-related biological processes. In line with the theory of allostatic

358 load, perceived chronic discrimination causing frequent activation of the stress response

359 system, could over time result in disturbances across multiple biological systems[45].

360 Systematic reviews and meta-analyses, which have predominately focused on racism, suggest

361 that discrimination is linked with heightened cardiovascular stress reactivity[14,46], while

362 race[46–48] and weight discrimination[49] have been linked with alterations in cortisol. To our

363 knowledge, no study has investigated associations between perceived disability discrimination

364 and changes in cardiovascular or neuroendocrine activity. In the HRS cohort, perceived

365 disability discrimination was linked with raised c-reactive protein levels cross-sectionally[50].

366 Heightened inflammation is thought to be predictive of poorer mental wellbeing[51], offering

367 a plausible pathway between perceived disability discrimination and later psychological

368 distress and poorer mental functioning seen in the present study. Further work is required to

369 confirm this assertion, particularly as the HRS analysis was not limited to those with a

370 confirmed disability.

371 Our study had several strengths. The use of the UKHLS cohort allowed us to examine

372 changes in mental wellbeing over a 4-year period across a wide age range (17 – 96 years),

373 while adjusting statistically for factors that could confound associations. The discrimination

15

374 measure took into account several kinds of discriminatory behaviour and included multiple

375 settings where perceived disability discrimination could be encountered.

376 However, the study was not without limitations. Our findings are based on perceptions

377 of disability discrimination rather than objective encounters with disability discrimination. It

378 is possible that perceiving oneself as a target for discrimination and objective encounters with

379 discrimination could have differing consequences for mental wellbeing. Indeed, earlier work

380 in a sample with significant health limitations, indicates that individuals with poorer mental

381 wellbeing may be more likely to perceive stigma[52]. Future studies assessing reciprocal

382 prospective associations between perceived disability discrimination and health could help to

383 clarify this issue. Our discrimination measure was based on self-reports of experiences during

384 the past 12 months and was therefore subject to recall bias. Further, this measure was not

385 specific to disability discrimination. The fact that participants were able to attribute multiple

386 reasons for their experience of discrimination, could have helped avoid priming or bias. Other

387 tools specifically designed to assess disability discrimination could have garnered different

388 results. Further work is required to understand how disability discrimination interacts with

389 other types of discrimination to influence wellbeing. Disability discrimination was only

390 assessed at one point in time, meaning our measure does not necessarily reflect pervasive

391 discrimination. Future research is required to determine whether perceptions of disability

392 discrimination are persistent or alter over time. Our study included participants with physical,

393 cognitive and sensory disabilities. However, for a large proportion (37%) their disability type

394 was unknown and classified as "other", limiting our understanding.

395 Overall, our study adds to the literature by demonstrating prospective associations

396 between perceived disability discrimination and mental wellbeing outcomes. These findings

397 emphasise the need to reduce the prevalence of disability discrimination, with the benefit of

398 promoting equality as well as possible advantages for mental wellbeing too. Though complete

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399 elimination of disability discrimination is likely to be difficult, recognition of disability

400 discrimination as an issue is the first step in preventing its occurrence. Addressing this could

401 involve raising awareness through the use of campaigns. The Public Sector Equality Duty in

402 the UK requires public bodies to have due regard to the need to eliminate discrimination and

403 this awareness raising should begin early in life[7]. However, it is estimated that less than 40%

404 of English primary schools have a disability equality scheme in place, with race and gender

405 equality more often prioritised over disability equality[53]. Therefore, further effort on this

406 issue is required[7], particularly as disability discrimination is perceived to be more widespread

407 than gender discrimination in Europe[8].

408 As well as macro-level awareness raising, on an individual basis the negative impact of

409 perceived disability discrimination on mental health may be buffered through the use of social

410 support. In two cross-sectional studies of US adults with varied disability diagnoses, those with

411 more friends reported greater life satisfaction and these friendships attenuated the link between

412 functional impairment and poorer quality of life[54]. In an Israeli study, perceived disability

413 discrimination and poorer life satisfaction were only linked in those with low and moderate

414 levels of social support, with no association in those with greater levels of support[55]. Further

415 research into the mechanisms underlying disability discrimination is necessary to develop

416 awareness campaigns and to appropriately target individual-level interventions.

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422   **Author contributions:** RAH conducted the statistical analysis and wrote the manuscript. AS

423   edited and reviewed the manuscript. RPL edited and reviewed the manuscript. SJ provided

424   scientific overview, edited and reviewed the manuscript.

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426   **Patient and Public Involvement**

427   No patients or members of the public were involved in study design or conduct.

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

	No perceived discrimination (*n* = 754)	Perceived discrimination (*n* = 117)	*p*
Age (years)	53.42 (16.56)	48.29 (14.89)	0.001
17-34	100 (13.3%)	20 (17.1%)	
35-44	149 (19.8%)	23 (19.7%)	
45-54	150 (19.9%)	34 (29.1%)	
55-64	134 (17.8%)	23 (19.7%)	
65+	221 (29.3%)	17 (14.5%)	
Sex (% men)	334 (44.3%)	54 (46.2%)	0.707
Household income (£)	1123.28 (930.47)	1087.07 (698.65)	0.687
£0-499	105 (13.9%)	12 (10.3%)	
£500-999	314 (41.6%)	55 (47.0%)	
£1000-1499	189 (25.1%)	27 (23.1%)	
£1500-1999	77 (10.2%)	13 (11.1%)	
£2000+	69 (9.2%)	10 (8.5%)	
Education (% yes)			0.003
University Degree	171 (22.7%)	33 (28.2%)	-
School qualification	285 (37.8%)	57 (48.7%)	-
No qualification	298 (39.5%)	27 (23.1%)	-
Ethnicity			0.002
White	153 (20.3%)	32 (27.4%)	-
South Asian	333 (44.2%)	36 (30.8%)	-
Black	168 (22.3%)	21 (17.9%)	-

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Other	100 (13.3%)	28 (23.9%)	-
Disability type			< 0.001
Physical	351 (46.6%)	16 (13.7%)	
Sensory	84 (11.1%)	11 (9.4%)	
Cognitive	73 (9.7%)	14 (12.0%)	
Other	246 (32.6%)	76 (65.0%)	

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

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Table 2: Cross-sectional and prospective associations between perceived disability discrimination and emotional wellbeing outcomes

		n	No perceived discrimination	n	Perceived discrimination	n	No perceived discrimination	n	Perceived discrimination
			Cross-sectional				**Prospective**		
Depression									
	% (SE)	751	9.3 (0.11)	117	38.4 (0.03)	-	-	-	-
	OR [95%CI]		Ref		5.40 [3.25; 8.97]***		-	-	-
Psychological distress									
	Mean score (SE)	454	2.93 (0.17)	82	6.21 (0.40)	177	2.53 (0.26)	31	5.40 (0.68)
	Coeff. [95%CI]		Ref		3.28 [2.41; 4.14]***		Ref		2.88 [1.39; 4.36]***
SF-12 mental									
	Mean score (SE)	742	44.87 (0.42)	117	37.57 (1.10)	239	45.24 (0.69)	43	40.12 (1.74)
	Coeff. [95%CI]		Ref		-7.35 [-9.70; -5.02]***		Ref		-5.12 [-8.91; -1.34]**
Life satisfaction									
	Mean score (SE)	454	4.69 (0.08)	84	3.42 (0.18)	171	4.67 (0.12)	34	4.14 (0.29)
	Coeff. [95%CI]		Ref		-1.27 [-1.66; -0.87]***		Ref		-0.53 [-1.18; 0.11]
Fair/poor self-rated health									
	% (SE)	754	69.7 (0.01)	117	80.7 (0.04)	385	62.1 (0.02)	55	67.3 (0.06)
	OR [95%CI]		1.00 (Ref)		2.05 [1.19; 3.51]**		1.00 (Ref)		1.29 [0.59; 2.83]

All analyses are adjusted for age, sex, household income, education, ethnicity and disability type. Prospective analyses are additionally adjusted for baseline wellbeing status/score.

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 component scale range from 0-100 and the life satisfaction scale scores range from 0-7.

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Table 3: Cross-sectional and prospective associations between perceived disability discrimination and emotional wellbeing outcomes (complete cases at wave 5)

		Cross-sectional				Prospective			
		n	No perceived discrimination	n	Perceived discrimination	n	No perceived discrimination	n	Perceived discrimination
Psychological distress									
	Mean score (SE)	177	2.81 (0.26)	31	5.46 (0.66)	177	2.53 (0.26)	31	5.40 (0.68)
	Coeff. [95%CI]		Ref		2.65 [1.21; 4.08]***		Ref		2.88 [1.39; 4.36]***
SF-12 mental									
	Mean score (SE)	239	45.89 (0.71)	43	38.69 (1.76)	239	45.24 (0.69)	43	40.12 (1.74)
	Coeff. [95%CI]		Ref		-7.20 [-11.01; -3.39]***		Ref		-5.12 [-8.91; -1.34]**
Life satisfaction									
	Mean score (SE)	171	4.78 (0.12)	34	3.50 (0.29)	171	4.67 (0.12)	34	4.14 (0.29)
	Coeff. [95%CI]		Ref		-1.27 [-1.91; -0.63]***		Ref		-0.53 [-1.18; 0.11]
Fair/poor self-rated health									
	% (SE)	385	66.5 (0.02)	55	81.6 (0.06)	385	62.1 (0.02)	55	67.3 (0.06)
	OR [95%CI]		1.00 (Ref)		2.66 [1.16; 6.08]*		1.00 (Ref)		1.29 [0.59; 2.83]

All analyses are adjusted for age, sex, household income, education, ethnicity and disability type. Prospective analyses are additionally adjusted for baseline wellbeing status/score.

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 component scale range from 0-100 and the life satisfaction scale scores range from 0-7.

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Table 4 Participant characteristics at wave 1 (2009/10) of complete cases and those lost to follow-up

	Lost to follow-up (n=431)	Complete cases (n=440)	*p*
Age (years)	52.26 (17.08)	53.19 (15.76)	0.407
17-34	25 (5.8%)	12 (2.7%)	
35-44	46 (10.7%)	37 (8.4%)	
45-54	79 (18.4%)	93 (21.1%)	
55-64	91 (21.2%)	93 (21.1%)	
65+	189 (44.0%)	205 (46.6%)	
Sex (% men)	200 (46.4%)	188 (42.7%)	0.275
Household income (£)	1101.26 (1037.11)	1135.22 (748.46)	0.579
£0-499	69 (16.0%)	48 (10.9%)	
£500-999	175 (40.6%)	194 (44.1%)	
£1000-1499	113 (26.2%)	103 (23.4%)	
£1500-1999	42 (9.7%)	48 (10.9%)	
£2000+	32 (7.4%)	47 (10.7%)	
Education (% yes)			0.024
University Degree	85 (19.7%)	119 (27.0%)	-
School qualification	171 (39.7%)	171 (38.9%)	-
No qualification	175 (40.6%)	150 (34.1%)	-
Ethnicity			0.213
White	88 (20.4%)	97 (22.0%)	-
South Asian	172 (39.9%)	197 (44.8%)	-

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Black	105 (24.4%)	84 (19.1%)	-
Other	66 (15.3%)	62 (14.1%)	-
Disability type			0.189
Physical	166 (38.5%)	201 (45.7%)	
Sensory	51 (11.8%)	44 (10.0%)	
Cognitive	47 (10.9%)	40 (9.1%)	
Other	167 (38.7%)	155 (35.2%)	
Mental health/wellbeing			
Psychological distress	3.46 (3.85)	3.41 (3.86)	0.874
SF-12	43.72 (12.93)	44.01 (12.30)	0.741
Life satisfaction	4.40 (1.75)	4.56 (1.69)	0.306
Self-rated health (% fair/poor)	319 (74.0%)	301 (68.4%)	0.068

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

*Complete cases are defined as those who were present at wave 1 and provided data on at least one wellbeing measure at wave 5.

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Table 5: Sensitivity analysis: Perceived disability 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]	4.41 (2.55;7.60)***	5.24 (3.06;8.98)***	4.80 (2.92;7.88)***	5.41 (3.26;8.98)***
Psychological distress	Coeff. [95%CI]	3.64 (2.68;4.60)***	3.28 (2.33;4.23)***	3.13 (2.26;4.01)***	3.27 (2.41;4.14)***
SF-12 mental	Coeff. [95%CI]	-6.63 (-9.29;-3.97)***	-7.61 (-10.15;-5.08)***	-7.53 (-9.89;-5.18)***	-7.35 (-9.68;-5.02)***
Life satisfaction	Coeff. [95%CI]	-1.23 (-1.69;-0.76)***	-1.45 (-1.88;-1.02)***	-1.24 (-1.64;-0.85)***	-1.27 (-1.66;-0.87)***
Fair/poor self-rated health	OR [95%CI]	1.92 (1.04;3.53)*	2.39 (1.32;4.33)**	2.21 (1.28;3.81)**	2.04 (1.19;3.50)**
Prospective analyses (wave 5)		Model 1	Model 2	Model 3	Model 4
Psychological distress	Coeff. [95%CI]	2.78 (1.14;4.41)***	2.69 (1.15;4.24)***	2.89 (1.45;4.33)***	2.88 (1.39;4.36)***
SF-12 mental	Coeff. [95%CI]	-4.33 (-8.81;0.14)	-4.90 (-8.86;-0.94)**	-5.94 (-9.59;-2.28)**	-5.13 (-8.91;-1.34)**
Life satisfaction	Coeff. [95%CI]	-0.39 (-1.14;0.36)	-0.37 (-1.06;0.32)	-0.39 (-1.02;0.25)	-0.53 (-1.18;0.11)
Fair/poor self-rated health	OR [95%CI]	1.23 (0.50;3.03)	1.30 (0.57;2.95)	1.31 (0.61;2.83)	1.29 (0.59;2.83)

All analyses are adjusted for age, sex, household income, education, ethnicity and disability type. Prospective analyses are additionally adjusted for baseline wellbeing status/score.

Model 1 excludes "*felt unsafe at some place*" from the measure of perceived gender discrimination; Model 2 excludes "*avoided some place* "; Model 3 excludes ""*was insulted at some place* "; and Model 4 excludes "*was attacked 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 component scale range from 0-100 and the life satisfaction scale scores range from 0-7.

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Supplementary table 1: Perceived disability discrimination types and settings by type of disability

Types of discrimination	Physical	Sensory	Cognitive	Other	p value
Felt unsafe at someplace	12 (85.7%)	9 (90%)	12 (92.3%)	60 (84.5%)	0.874
Avoided at someplace	8 (53.3%)	6 (75%)	9 (75%)	52 (69.3%)	0.336
Felt insulted at someplace	3 (25%)	1 (12.5%)	1 (10%)	15 (27.3%)	0.572
Attacked at someplace	0 (0%)	0 (0%)	0(0%)	3(4.4%)	0.621
Settings					
School/work	2 (12.5%)	1 (9.1%)	0 (0%)	12 (15.8%)	0.424
Public transport	10 (62.5%)	3 (27.3%)	6 (42.9%)	41 (53.9%)	0.266
Bus or train stations	5 (31.3%)	2 (18.2%)	6 (42.9%)	34 (44.7%)	0.328
Taxis	4 (25%)	0 (0%)	1 (7.1%)	9 (11.8%)	0.223
Public buildings	8 (50%)	7 (63.6%)	7 (50%)	48 (63.2%)	0.654
On the street	12 (75%)	8 (72.7%)	9 (64.3%)	62 (81.6%)	0.504
At home	3 (18.8%)	3 (27.3%)	4 (28.6%)	20 (26.3%)	0.920

Data are presented as numbers (% yes)

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		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary	2

of what was done and what was found

Introduction

Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	#3	State specific objectives, including any prespecified hypotheses	6

Methods

Study design	#4	Present key elements of study design early in the paper	6
6Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up.	6
Eligibility criteria	#6b	For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	7-8

Bias	#9	Describe any efforts to address potential sources of bias	8
Study size	#10	Explain how the study size was arrived at	6
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	9
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	9
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	9
Statistical methods	#12c	Explain how missing data were addressed	6
Statistical methods	#12d	If applicable, explain how loss to follow-up was addressed	6
Statistical methods	#12e	Describe any sensitivity analyses	9-10

Results

| Participants | #13a | Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable. | 6 |
| Participants | #13b | Give reasons for non-participation at each stage | N/A |

Participants	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	6
Descriptive data	#14c	Summarise follow-up time (eg, average and total amount)	6
Outcome data	#15	Report numbers of outcome events or summary measures over time. Give information separately for exposed and unexposed groups if applicable.	N/A
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11
Main results	#16b	Report category boundaries when continuous variables were categorized	9
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	12

Discussion

Key results	#18	Summarise key results with reference to study objectives	12
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	16
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-14
Generalisability	#21	Discuss the generalisability (external validity) of the study results	16-17

Other Information

| Funding | #22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 1 |

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Disability discrimination and wellbeing: A prospective analysis

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1 **Disability discrimination and wellbeing: A prospective analysis**

2

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4

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3   26   **Abstract**
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6   27   **Objectives:** Disability discrimination is linked with poorer wellbeing cross-sectionally. The
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8   28   aim of this study was to explore prospective associations between disability discrimination and
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10   29   wellbeing.
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13   30   **Design:** Prospective cohort study
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15   31   **Setting:** The United Kingdom Household Longitudinal Study
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17   32   **Participants:** Data were from 871 individuals with a self-reported physical, cognitive or
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20   33   sensory disability.
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22   34   **Primary outcome measures:** Depression was assessed in 2009/10. Psychological distress,
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24   35   mental functioning, life satisfaction and self-rated health were assessed in 2009/10 and
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26   36   2013/14.
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29   37   **Results:** Data were analysed using linear and logistic regression with adjustment for age, sex,
30
31   38   household income, education, ethnicity and impairment category. Perceived disability
32
33   39   discrimination was reported by 117 (13.4%) participants. Cross-sectionally, discrimination was
34
35   40   associated with depression (Odds ratio (OR) = 5.40, 95% Confidence Interval (CI) 3.25; 8.97)
36
37   41   fair/poor self-rated health (OR=2.05; 95% CI 1.19; 3.51), greater psychological distress (B =
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39   42   3.28, 95% CI 2.41; 4.14), poorer mental functioning (B = -7.35; 95% CI -9.70; -5.02) and life
40
41   43   satisfaction (B = -1.27, 95% CI -1.66; -0.87). Prospectively, discrimination was associated with
42
43   44   increased psychological distress (B = 2.88, 95% CI 1.39; 4.36) and poorer mental functioning
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45   45   (B = -5.12; 95% CI -8.91; -1.34), adjusting for baseline scores.
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48   46   **Conclusions:** Perceived disability-related discrimination is linked with poorer wellbeing.
49
50   47   These findings underscore the need for interventions to combat disability discrimination.
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52   48
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55   49   **Key words:** disability, discrimination; prejudice; stigma; mental health; wellbeing
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51 **Article Summary**

52 • The use of the prospective United Kingdom Household Longitudinal Study allowed

53 use to examine wellbeing over a 4 year period.

54 • The disability discrimination measure took into account several kinds of

55 discriminatory behaviour and included multiple settings where perceived disability

56 discrimination could be encountered.

57 • Our findings are based on perceptions of disability discrimination rather than

58 objective encounters with disability discrimination.

59 • Disability discrimination was only assessed at one point in time, meaning our measure

60 does not necessarily reflect pervasive discrimination.

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76 **Introduction**

77 "Disability" is an umbrella term for long-term impairments, activity limitations and

78 participation restrictions, experienced by an individual with a health condition in interaction

79 with their environment[1–3]. In the UK, the prevalence of self-reported disability is rising, with

80 21% of the population reporting a disability in 2017-2018, an increase from 18% in 2007-

81 2008[4]. This increase is likely driven by population ageing. The majority of disabled people

82 report experiencing difficulties in everyday life. For example, disabled people in Britain have

83 lower educational attainment, are less likely to be employed and are more likely to live in

84 poverty than non-disabled adults[5], with knock on effects regarding access to health and other

85 services[6].

86 These practical difficulties experienced by a person with a long-term impairment may

87 be aggravated by and interact with discrimination in the person's environment. Disability

88 discrimination has been defined as unwanted, exploitative or abusive conduct against disabled

89 people which violates their dignity and security or creates an intimidating or offensive

90 environment[7]. Although disability is a protected characteristic under equality legislation[1],

91 disability discrimination is perceived to be common. In a 2015 population survey of 27,718

92 adults from 26 European countries, 50% of participants reported disability discrimination to be

93 widespread, a 4% increase from 2012 data. However, the reasons behind this increase are

94 unclear due to the cross-sectional nature of the Eurobarometer data[8].

95 Disability discrimination can happen in a variety of settings including on the street, in

96 the workplace and in public venues such as shops or pubs[9]. Recent British data suggests that

97 disabled people are more likely than non-disabled people to report feeling unsafe when walking

98 alone and to worry about physical attack and theft [10,11]. Disability is the second most

99 common motivator for hate crime incidents, after race in England and Wales[12]. In the

4

100   workplace, several studies suggest that a greater proportion of disabled than non-disabled

101   individuals report experiences of discrimination [7,13].

102   A growing body of research has investigated discrimination as a determinant of

103   wellbeing[14–16]. Meta-analyses have linked perceived discrimination with depression and

104   psychological distress and with poorer life satisfaction and self-rated health[14–16]. However,

105   disability discrimination was not assessed in two of these meta-analyses and the majority of

106   previous working has focused on racism [14,15]. In the most recent pooled analysis of

107   328 studies, of which only 8 studies concerned physical illness discrimination and disability

108   discrimination[16], the combined category of physical illness/disability discrimination was

109   associated with greater psychological distress and lower self-esteem.

110   Several cross-sectional studies have assessed perceived disability discrimination alone

111   in relation to wellbeing outcomes. One study of 229 individuals with an intellectual disability

112   in England found that self-reported stigma was associated with a greater number of depression

113   and anxiety symptoms[17]. Two analyses of the Australian Survey of Disability, Ageing and

114   Carers (n=9655 and n=6183, respectively) linked disability discrimination with greater

115   psychological distress[18,19]. This association was similarly observed in a Swedish general

116   population survey[20]. Research has also linked perceived disability discrimination with lower

117   life satisfaction in Canadian adolescents[21], Korean women with severe disabilities[22] and

118   Israeli nationals with physical disabilities[23]. Perceived disability discrimination has been

119   associated with poorer self-rated health cross-sectionally in four studies[19,24–26] including a

120   general population analysis of 52,458 individuals, from the European Social Survey[25].

121   Cross-sectional correlations are difficult to interpret: perception of discrimination may

122   result in emotional distress, but it is also possible that emotional distress leads to alterations in

123   how people interpret social interactions with others. To date, only one study has assessed

124   prospective associations between perceived disability discrimination and wellbeing [27]. In an

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125   analysis of older adults (≥50 years) participating in the US-based Health and Retirement Study

126   (HRS), perceived disability discrimination was associated with poorer life satisfaction, self-

127   rated health, and greater loneliness over four-year follow-up.

128   Overall, previous research has been dominated by cross-sectional studies, precluding

129   the assessment of the temporal relationship between perceived disability discrimination and

130   wellbeing outcomes. No longitudinal studies have compared people with a disability who do

131   or do not report discrimination and wellbeing outcomes. To address these limitations, this study

132   aimed to investigate cross-sectional and prospective associations between perceived disability

133   discrimination and wellbeing in a UK population cohort.

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Methods

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Study population

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137   This study uses data from Understanding Society: The UK Household Longitudinal Study

138   (UKHLS)[28]. The overarching purpose of UKHLS is to provide high quality longitudinal

139   data about the health, work, education, income, family, and social life of the UK population

140   [29]. Data collection began in 2009/10 (wave 1) with follow-ups annually. The current study

141   uses data from waves 1 (2009/10) and 5 (2013/14). These data were collected through face-to-

142   face interview via computer aided personal interview and self-completion paper questionnaires

143   and from wave 3 via computer administered self-interview. The UKHLS comprises of a

144   representative general population probability sample of UK households, in addition to an ethnic

145   minority boost sample[29,30]. The general population sample is based on proportionality

146   stratified clustered samples of residential addresses in England, Scotland and Wales. In

147   Northern Ireland, an unclustered systematic random sample of domestic addresses was

148   selected. The ethnic minority boost was selected from high concentration ethnic minority areas,

149   where 80% of the United Kingdom's five major ethnic minorities live [29].

6

150   Our data come from the 'extra 5 minutes sample' of over 8,000 participants who had

151   an additional 5 minutes of questions on issues pertinent to ethnicity research including

152   discrimination. This sample comprises of mostly ethnic minorities ($n = 6722$) who were drawn

153   from the ethnic minority boost along with a comparison group of white participants ($n =$

154   1428)[30]. We restricted our sample to those who responded to the disability discrimination

155   questions ($n = 4788$) with a self-reported disability ($n = 871$). Self-reported disability was based

156   on a positive response the question *"Do you have any health problems or disabilities which*

157   *mean you have substantial difficulties with any of the following areas of your life"* across any

158   of the 12 types of difficulty assessed. These included issues with manual dexterity and mobility,

159   problems with memory or the ability to concentrate, difficulties with learning and

160   understanding, as well as hearing and sight impairments. The response rates for the UKHLS

161   general population sample and the ethnic minority boost at Wave 1 were 81.8% and72.4%,

162   respectively [30]. The response rate for the "extra 5-min sample" was 42.5%. At wave 5 there

163   was loss to follow-up (n=431), leaving a follow-up sample size of 440 participants. Our

164   definition of disability did not include mental health-related impairments. Ethical approval for

165   UKHLS was obtained from the University of Essex Ethics Committee. All participants

166   provided fully informed consent.

167

Perceived disability discrimination

169   To assess discrimination, participants were asked whether in the past 12 months they (a) felt

170   unsafe, (b) avoided going to or being in, (c) had been insulted, called names, threatened or

171   shouted at, or (d) had been physically attacked, in seven different settings: 1) At

172   school/college/work, 2) On public transport, 3) At or around bus or train stations, 4) In a taxi,

173   5) Public buildings such as shopping centres or pubs, 6) Outside on the street, in parks or other

174   public places, or 7) At home. If they answered yes to any one of these questions, a follow-up

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175   question asked them to choose a reason from a list of categories including disability, sex and

176   ethnicity among others. It was possible to choose multiple settings and attributions for the

177   perceived discrimination. Those who attributed any experience of discrimination to disability

178   are treated as cases of perceived disability discrimination.

179

180   **Outcome variables**

181   Self-reported doctor-diagnosed clinical depression was measured at wave 1 (2009/10) with

182   responses coded as yes/no. Depression was not analysed longitudinally due to a lack of incident

183   cases. All other outcomes were assessed at waves 1 (2009/10) and 5 (2013/14). Psychological

184   distress was measured using the General Health Questionnaire (GHQ)-12[31], which involved

185   ratings of 12 statements including whether the individual had "*Been able to enjoy your normal*

186   *day to day activities*" or whether they "*Felt constantly under strain*" with response options of

187   0="no" and 1="yes". Total scores range from 0 (least distressed) to 12 (most distressed). The

188   12-item short-form health survey (SF-12) mental component summary score was used to

189   measure limitations caused by emotional, mental health and social functioning issues[32].

190   Items included ratings of feelings experienced over the past 4 weeks such as "*Have you felt*

191   *downhearted or blue*?" or "*Accomplished less than you would like*". Overall scores were

192   derived using standard methods ranging from 0 (low functioning) to 100 (high functioning)

193   [33]. Life satisfaction was assessed using one item asking participants how satisfied they were

194   with their "life overall", with scores ranging from 1 (completely dissatisfied) to 7 (completely

195   satisfied). Self-rated health was assessed using a single item: "*Would you say your health*

196   *is…poor/fair/good/very good/excellent?*" In keeping with previous investigations [34,35] self-

197   rated health was dichotomised with 0 being "good/very good/excellent" and 1 meaning

198   "poor/fair".

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8

Covariates

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201 A number of covariates (assessed at wave 1) that are likely relevant to perceived disability

202 discrimination and wellbeing were selected a priori for inclusion in our analyses. Age in years

203 was entered as a continuous variable, as there may be age differences in reports of

204 discrimination [36] and in wellbeing outcomes [37]. Sex was included as a binary variable

205 (male/female) based on previous literature demonstrating sex differences in the impact of

206 discrimination on health [38]. Income and education were included as covariates as there may

207 be socio-economic differences in the perception of discrimination and in wellbeing outcomes

208 [36,39]. Equivalised monthly household income was calculated by dividing total household net

209 income by the modified Organization for Economic Cooperation and Development (OECD)

210 equivalence scale to adjust for the effects of household size and composition[40]. Income was

211 entered as a continuous variable in our models. Education was included as a 3-level categorical

212 variable: 1 "university degree", 2 "high school qualification" and 3 "no qualification". As our

213 sample was ethnically diverse, we included ethnicity as a 4-level variable with 1 being "white"

214 including those of white British, white Irish and any other white background, 2 being "south

215 Asian" including Indian, Pakistani and Bangladeshi individuals, 3 being "black" including

216 black African and black Caribbean participants and 4 being "other" including individuals from

217 Chinese and mixed backgrounds. There were 4 categories of impairment measured in the study:

218 "physical" disability which included difficulties with manual dexterity and mobility;

219 "cognitive" disability including problems with memory or the ability to concentrate, learn and

220 understand; "sensory" disability including hearing (apart from using a standard hearing aid)

221 and sight impairments (apart from wearing standard glasses) and "other" which encompassed

222 reports of unspecified disability not captured in the other categories.

223

224 **Statistical analyses**

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225 We compared the characteristics of those who did and those who did not report disability

226 discrimination at wave 1 using Chi-squared tests for categorical variables and independent

227 samples t-tests for continuous variables. Associations between perceived disability

228 discrimination and the various wellbeing measures were assessed using linear regression for

229 continuous outcomes and logistic regression for categorical outcomes. For cross-sectional

230 analyses, depression, psychological distress (GHQ-12), SF-12 mental component score, life

231 satisfaction and self-rated health at wave 1 (2009/10) were the outcome variables. For

232 prospective analyses, psychological distress (GHQ-12), SF-12 mental component score, life

233 satisfaction and self-rated health at wave 5 (2013/14) were the outcomes. Age, sex, household

234 income, education, ethnicity and disability type at wave 1 were controlled for in all analyses.

235 Baseline (wave 1) scores/status on the relevant wellbeing variable was included as an additional

236 covariate in prospective analyses. Only those with complete case information at wave 1

237 (n=871) and wave 5 (n=440) were included in the analyses. Results from linear regression

238 analyses are presented as unstandardized B and 95% confidence intervals (95% CI). Results

239 from logistic regression analyses are presented as odds ratios (ORs) and 95% CI. All analyses

240 were unweighted and conducted using SPSS v.24.

241

Sensitivity analyses

243 We carried out three sensitivity analyses. In our first, we assessed whether those who were lost

244 to follow-up (n = 431) differed from those who provided data at both waves (n = 440). We

245 tested whether this impacted the results by conducting the cross-sectional analyses (wave 1)

246 including only those who provided follow-up data at wave 5. We carried out our second

247 sensitivity analysis to test the possibility that one of the four types discriminatory behaviour

248 contributing to the measure of perceived disability discrimination (i.e. feeling unsafe, avoiding

249 somewhere, being insulted or being physically attacked) was driving the results. We tested this

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250 cross-sectionally and prospectively by repeating our analyses removing each type of

251 discriminatory behaviour in turn. In our third sensitivity analysis, we tested whether the

252 prospective results from our complete cases analysis at wave 5 (n=440) were similar when

253 missing outcome information was imputed for those participants lost to follow-up (n=431).

254

255

256 **Results**

257 A total of 871 participants were included in the study and of these 117 (13.4%) reported

258 perceived disability discrimination. Disability discrimination was the mostly commonly

259 reported form of discrimination in the sample, followed by age discrimination (4.3%), sex

260 discrimination (3.9%), ethnicity discrimination (3.8%), religious discrimination (2.2%) and

261 discrimination on the basis of sexual orientation (0.5%). Of the categories of disability

262 discrimination assessed, the most commonly reported was feeing unsafe (86.1%; 95% CI

263 79.48-92.74), followed by avoiding somewhere (72.8%; 95% CI 64.08-81.55), being insulted

264 (23.5%; 95% CI 14.33-32.73) and being physically attacked (2.8%; 95% CI 0.04-5.98). The

265 most common settings in which disability discrimination was reported were on the street

266 (77.8%; 95% CI 70.13-85.42), in public buildings such as shops or pubs (59.8%; 95% CI 50.81-

267 68.84), on public transport (51.3%; 95% CI 42.09-60.47) and at or around bus or train stations

268 (40.2%; 95% CI 31.16-49.19). A quarter of participants reported experiencing disability

269 discrimination at home (25%; 95% CI 17.61-33.67). Perceived disability discrimination was

270 less frequently reported in school or workplace settings (12.8%; 95% CI 6.67-18.97) or in taxis

271 (12%; 95% CI 6-17.93). The prevalence of the various types of perceived disability

272 discrimination and the settings in which the discrimination occurred for different types of

273 disability can be found in Supplementary Table 1. There were no statistically significant

11

274 differences between people with different types of disability in discrimination type or

275 discrimination setting.

276   The baseline characteristics of the sample are displayed in Table 1. The group who

277 reported disability discrimination were younger on average (48.29 ± 14.89 years) than those

278 who did not report discrimination (53.42 ± 16.56 years). They were more likely to be white

279 (27.4% vs. 20.3%) and to be better educated than those who did not report discrimination, with

280 a greater proportion holding university degrees (28.2% vs 22.7%). Physical disability was most

281 common in those who did not perceive discrimination (46.6%), whereas other unspecified

282 disabilities (65%) were most frequently reported by those who perceived discrimination.

283

284 Cross-sectional associations between perceived disability discrimination and wellbeing

285 Our findings suggest that individuals who perceived disability discrimination were

286 significantly more likely to report a diagnosis of clinical depression (OR=5.40; 95% CI 3.25;

287 8.97, p <0.001) and were more likely to rate their health as fair/poor (OR=2.05; 95% CI 1.19;

288 3.51, p =0.009) than those who did not perceive disability discrimination, independent of

289 covariates (first panel Table 2). Those who reported discrimination also had significantly

290 higher levels of psychological distress (B = 3.28, 95% CI 2.41; 4.14, p <0.001), poorer mental

291 functioning on the SF-12 (B = -7.35; 95% CI -9.70; -5.02, p <0.001) and lower life satisfaction

292 (B = -1.27, 95% CI -1.66; -0.87, p <0.001), than those who did not report discrimination

293

294 Prospective associations between perceived disability discrimination and wellbeing

295 In prospective analyses (second panel Table 2), those who reported perceived disability

296 discrimination at wave 1 had higher levels of psychological distress 4 years later at wave 5 than

297 those who did not report discrimination, independent of covariates and baseline psychological

298 distress (B = 2.88, 95% CI 1.39; 4.36, p <0.001). We detected a prospective association

12

between perceived disability discrimination at wave 1 and poorer SF-12 mental functioning at wave 5 (B = -5.12; 95% CI -8.91; -1.34, p =0.008). Those who reported disability discrimination at wave 1 had slightly lower life satisfaction (means= 4.14 vs 4.67) and a greater proportion rated their health as fair/poor (67.3% vs 62.1%) than those who did not report discrimination at follow-up (wave 5). However, these differences did not reach statistical significance.

Sensitivity analyses

In the first sensitivity analysis (Table 3), cross-sectional findings for those who provided complete data at wave 5 were similar to the full-sample at wave 1. The demographic characteristics of those lost to follow-up were similar to those of complete cases (Table 4). Only education differed significantly between the groups, with those who provided complete data at wave 5 more likely to hold a degree (27.0%) than those lost to follow-up (19.7%).

In the second sensitivity analysis, removing each of the discriminatory behaviours from the measure of discrimination in turn did not alter the cross-sectional results (Table 5). Prospectively, the association between perceived disability discrimination and increased psychological distress remained the same regardless of the type of discriminatory behaviour removed from the measure. For SF-12 mental functioning, the association was fairly robust to the type of discriminatory behaviour, but was slightly attenuated when "feeling unsafe" was removed from the discrimination variable (p = 0.058). Again, no significant prospective associations were detected for life satisfaction and self-rated health.

In our final sensitivity analysis (Supplementary Table 2), we repeated the prospective analyses with imputation for missing outcome information of participants lost to follow-up (n=431). The prospective relationship between perceived disability discrimination and poor SF-12 mental functioning remained (p = 0.034). However, there was no longer a statistically

13

324   significant prospective association between reported discrimination and psychological distress

325   ($p = 0.128$).

326

Discussion

328   In a sample of UK-based participants with self-reported disability, perceived discrimination

329   was associated with higher prevalence of depression, greater psychological distress, and poorer

330   mental functioning, life satisfaction and self-rated health. Prospectively, disability

331   discrimination was associated with increased psychological distress and worse mental

332   functioning four-years later. Our results were robust to adjustment for a range of covariates and

333   were not driven by any specific kind of discriminatory behaviour. No significant prospective

334   relationships with life satisfaction and self-rated health were observed.

335   Previous literature has been dominated by cross-sectional studies. To our knowledge,

336   only one previous study has investigated the prospective association between disability

337   discrimination and wellbeing outcomes. In this analysis of US adults from the HRS cohort,

338   perceived disability discrimination was associated with poorer life satisfaction and self-rated

339   health over four year follow-up [27]. In the current study we observed poorer mental

340   functioning and greater psychological distress four years later in those who reported disability

341   discrimination, taking into account baseline scores on these variables. We failed to detect a

342   significant association between perceived discrimination and life satisfaction or self-rated

343   health at follow-up. Although on average, those who perceived disability discrimination in our

344   sample had poorer life satisfaction and were more likely to rate their health as fair/poor at

345   follow-up than those who did not perceive discrimination, these differences did not reach

346   statistical significance. One reason for the divergence in findings between our study and the

347   HRS analysis [27] may be study design. We limited our analyses to those with self-reported

348   disability, whereas in the HRS study associations between wellbeing and disability

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349 discrimination were assessed across the entire sample. Our analysis offers more precision in

350 the assessment of the relationship between disability discrimination and wellbeing outcomes,

351 by directly comparing people with disability who did and did not perceive discrimination.

352 Another possibility for these null findings may be that significant associations between

353 discrimination and life satisfaction and self-rated health do not become apparent until older

354 adulthood, perhaps allowing for repeated exposures to disability discrimination. However, this

355 assertion remains to be tested. Another potential explanation is that the impact of ongoing

356 disability discrimination on life satisfaction and self-rated health in our sample had already

357 become apparent at the time of the baseline survey, limiting the scope for further decline.

358   Our study adds to the cross-sectional literature linking perceived disability

359 discrimination and poorer wellbeing outcomes by demonstrating associations in a community

360 sample of disabled people living in the UK. Our results extend the findings of an earlier study

361 linking stigma and depression in those with intellectual disability[17], by establishing this

362 relationship in a sample with a broader range of disability. In keeping with previous studies,

363 we observed greater psychological distress[18–20] and poorer life satisfaction[21–23,27] in

364 those who reported disability discrimination. Our study adds to this existing evidence by

365 demonstrating this link in a UK-based sample for the first time. Similar to earlier work from

366 Australian, European and North American samples[19,24,27,41], we observed a relationship

367 between perceived disability discrimination and poorer self-rated health. Cross-sectional

368 studies cannot determine whether perceived disability discrimination predicts poor mental

369 wellbeing, or whether perceptions of discrimination are an indicator of psychological distress.

370 Our prospective findings therefore add to the field in establishing that perceived disability

371 discrimination predicts psychological distress and poorer mental functioning, net of baseline

372 associations, so has negative implications for future wellbeing.

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373   This is an observational study and longitudinal analyses do not necessarily imply

374   causality. There could be unmeasured factors responsible for the associations that emerged.

375   Nevertheless, with regard to the pathways linking perceived disability discrimination and

376   wellbeing, there are several possibilities that could explain our results. One mechanism could

377   be that perceptions of disability discrimination in healthcare settings serve to impede access to

378   health services. An analysis of HRS found that reports of frequent discrimination in healthcare

379   settings were predictive of new or worsened disability over four year follow-up[42].

380   Quantitative[38,43] and qualitative[44] evidence suggests that those who perceive disability

381   discrimination are less likely to seek healthcare. However, there may be sex differences in this

382   association, with a Swedish study only detecting a relationship between disability

383   discrimination and healthcare avoidance in women[38].However, no interaction between sex

384   and perceived discrimination was detected in the current study (data not shown).

385   Poor health behaviours are another potential mechanism linking disability

386   discrimination and poorer wellbeing. For example, perceived disability discrimination has been

387   linked with worse sleep quality in the HRS, with psychological distress acting as a full mediator

388   of this association[45]. It is possible that disabled people could engage in negative health

389   behaviours as a means of coping with the psychological impact of discrimination. In a study of

390   304 individuals with disability, perceived disability discrimination was positively associated

391   with illicit drug use[46]. Eating may offer a source of comfort in the face of discrimination[47].

392   A US study of over 5000 individuals, observed a link between physical disability

393   discrimination and overeating[48].

394   Another possibility is that perceived disability discrimination and wellbeing are linked

395   through disturbed stress-related biological processes. In line with the theory of allostatic load,

396   perceived chronic discrimination causing frequent activation of the stress response system,

397   could over time result in disturbances across multiple biological systems[49]. Systematic

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398 reviews and meta-analyses, which have predominately focused on racism, suggest that

399 discrimination is linked with heightened cardiovascular stress reactivity[14,50], while race[50–

400 52] and weight discrimination[53] have been linked with alterations in cortisol. To our

401 knowledge, no study has investigated associations between perceived disability discrimination

402 and changes in cardiovascular or neuroendocrine activity. In the HRS cohort, perceived

403 disability discrimination was linked with raised c-reactive protein levels cross-sectionally[54].

404 Heightened inflammation is thought to be predictive of poorer mental wellbeing[55], offering

405 a plausible pathway between perceived disability discrimination and later psychological

406 distress and poorer mental functioning seen in the present study. Further work is required to

407 confirm this assertion, particularly as the HRS analysis was not limited to those with a

408 confirmed disability.

409 Our study had several strengths. The use of the UKHLS cohort allowed us to examine

410 wellbeing over a 4-year period across a wide age range (17 – 96 years), while adjusting

411 statistically for factors that could confound associations. The discrimination measure took into

412 account several kinds of discriminatory behaviour and included multiple settings where

413 perceived disability discrimination could be encountered.

414 However, the study was not without limitations. We lost a considerable number of

415 participants at follow-up, and although the cross-sectional findings did not differ between those

416 who provided data at both waves and those lost to follow-up (sensitivity analysis 1), we cannot

417 be sure that selection bias due to low retention did not impact our findings longitudinally due

418 to the extent of missing data. Indeed, in imputed analyses (sensitivity analysis 3) the association

419 between disability discrimination and wellbeing held for SF-12 mental functioning but not for

420 psychological distress. Our findings are based on perceptions of disability discrimination rather

421 than objective encounters with disability discrimination. It is possible that perceiving oneself

422 as a target for discrimination and objective encounters with discrimination could have differing

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423   consequences for wellbeing. Indeed, earlier work in a sample with significant health

424   limitations, indicates that individuals with poorer mental wellbeing may be more likely to

425   perceive stigma[56]. Future studies assessing reciprocal prospective associations between

426   perceived disability discrimination and wellbeing could help to clarify this issue. Our

427   discrimination measure was based on self-reports of experiences during the past 12 months and

428   was therefore subject to recall bias. Further, this measure was not specific to disability

429   discrimination. The fact that participants were able to attribute multiple reasons for their

430   experience of discrimination, could have helped avoid priming or bias. Other tools specifically

431   designed to assess disability discrimination could have garnered different results. Our sample

432   was ethnically diverse, and we took ethnicity into account in our models. Although disability

433   discrimination was the most commonly reported form of discrimination in this sample,

434   perceived discrimination on the basis of ethnicity may also have been relevant for this sample.

435   Further work is required to understand how disability discrimination interacts with ethnicity

436   discrimination, as well as other types of discrimination to influence wellbeing. Disability

437   discrimination was only assessed at one point in time, meaning our measure does not

438   necessarily reflect pervasive discrimination. However, other work in UKHLS suggests that

439   perceived disability discrimination is still frequently reported at later stages of data collection

440   [57]. Future research is required to determine whether perceptions of disability discrimination

441   are persistent or alter over time. We operationalised perceived discrimination as a simple binary

442   variable and had no information on the frequency of encounters with discrimination over time.

443   Therefore, the potential dose response relationship between the frequency of discrimination

444   and wellbeing remains to be elucidated. Our study included participants with physical,

445   cognitive and sensory disabilities. However, our sample is unlikely to have captured those with

446   severe cognitive impairments due to the demands of survey participation.   For a large

447   proportion (37%) their disability type was unknown and classified as "other", limiting our

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understanding. While, no one with a mental health-related disability was included in the physical, cognitive and sensory disabilities categories, we cannot be certain that the "other" category did not include participants with mental health-related impairments.

Overall, our study adds to the literature by demonstrating prospective associations between perceived disability discrimination and wellbeing outcomes. These findings emphasise the need to reduce the prevalence of disability discrimination, with the benefit of promoting equality as well as possible advantages for wellbeing too. Though complete elimination of disability discrimination is likely to be difficult, recognition of disability discrimination as an issue is the first step in preventing its occurrence. Addressing this could involve raising awareness through the use of campaigns. The Public Sector Equality Duty in the UK requires public bodies to have due regard to the need to eliminate discrimination and this awareness raising should begin early in life[7]. However, it is estimated that less than 40% of English primary schools have a disability equality scheme in place, with race and gender equality more often prioritised over disability equality[58]. Therefore, further effort on this issue is required[7], particularly as disability discrimination is perceived to be more widespread than gender discrimination in Europe[8].

As well as macro-level awareness raising, on an individual basis the negative impact of perceived disability discrimination on wellbeing may be buffered through the use of social support. In two cross-sectional studies of US adults with varied disability diagnoses, those with more friends reported greater life satisfaction and these friendships attenuated the link between functional impairment and poorer quality of life[59]. In an Israeli study, perceived disability discrimination and poorer life satisfaction were only linked in those with low and moderate levels of social support, with no association in those with greater levels of support[60]. Further research disability discrimination is necessary to develop awareness campaigns and to appropriately target individual-level interventions.

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473 **Author contributions:** RAH conducted the statistical analysis and wrote the manuscript. AS

474 edited and reviewed the manuscript. RPL edited and reviewed the manuscript. SJ provided

475 scientific overview, edited and reviewed the manuscript.

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477 **Patient and Public Involvement**

478 No patients or members of the public were involved in study design or conduct.

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Table 1 Associations between perceived disability discrimination and sociodemographic factors (wave 1) and wellbeing measures (waves 1 and 5)

	Overall sample (*n*= 871)	No perceived discrimination (*n* = 754)	Perceived discrimination (*n* = 117)	*p*
Age (years)	52.73 (16.43)	53.42 (16.56)	48.29 (14.89)	0.001
17-34	120 (13.7%)	100 (13.3%)	20 (17.1%)	
35-44	172 (19.7%)	149 (19.8%)	23 (19.7%)	
45-54	184 (21.1%)	150 (19.9%)	34 (29.1%)	
55-64	157 (18.0%)	134 (17.8%)	23 (19.7%)	
65+	238 (27.3%)	221 (29.3%)	17 (14.5%)	
Sex (% men)	388 (44.5%)	334 (44.3%)	54 (46.2%)	0.707
Household income (£)	1118.42 (902.54)	1123.28 (930.47)	1087.07 (698.65)	0.687
£0-499	117 (13.4%)	105 (13.9%)	12 (10.3%)	
£500-999	369 (42.4%)	314 (41.6%)	55 (47.0%)	
£1000-1499	216 (24.8%)	189 (25.1%)	27 (23.1%)	
£1500-1999	90 (10.3%)	77 (10.2%)	13 (11.1%)	
£2000+	79 (9.1%)	69 (9.2%)	10 (8.5%)	
Education (% yes)				0.003
University Degree	204 (23.4%)	171 (22.7%)	33 (28.2%)	-
School qualification	342 (39.3%)	285 (37.8%)	57 (48.7%)	-
No qualification	325 (37.3%)	298 (39.5%)	27 (23.1%)	-
Ethnicity				0.002
White	185 (21.2%)	153 (20.3%)	32 (27.4%)	-
South Asian	369 (42.4%)	333 (44.2%)	36 (30.8%)	-
Black	189 (21.7%)	168 (22.3%)	21 (17.9%)	-
Other	128 (14.7%)	100 (13.3%)	28 (23.9%)	-
Disability type				< 0.001
Physical	367 (42.1%)	351 (46.6%)	16 (13.7%)	
Sensory	95 (10.9%)	84 (11.1%)	11 (9.4%)	
Cognitive	87 (10.0%)	73 (9.7%)	14 (12.0%)	
Other	322 (37.0%)	246 (32.6%)	76 (65.0%)	
Wellbeing measures (wave 1)				
Depression	115 (13.2%)	65 (8.7%)	50 (42.7%)	< 0.001
Psychological distress	3.43 (3.85)	2.85 (3.49)	6.65 (4.18)	< 0.001
SF-12 mental	43.87 (12.61)	45.16 (12.22)	35.72 (12.02)	< 0.001
Life satisfaction	4.49 (1.71)	4.71 (1.63)	3.29 (1.67)	< 0.001
Fair/poor self-rated health	620 (71.2%)	525 (69.6%)	95 (81.2%)	0.010
Wellbeing measures (wave 5)				
Psychological distress	3.33 (3.99)	2.86 (3.82)	5.98 (3.91)	< 0.001
SF-12 mental	44.38 (12.20)	45.79 (11.62)	36.47 (12.51)	< 0.001
Life satisfaction	4.48 (1.61)	4.62 (1.57)	3.67 (1.64)	< 0.001
Fair/poor self-rated health	276 (62.7%)	235 (61.0%)	41 (74.5%)	0.053

Data are presented as means (SD) and n (%). Percentages are valid percent.

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Table 2: Cross-sectional and prospective associations between perceived disability discrimination and wellbeing outcomes

	Depression OR (95% CI)	Psychological distress *B* (95% CI)	SF-12 mental *B* (95% CI)	Life satisfaction *B* (95% CI)	Fair/poor self-rated health *B* (95% CI)
Wave 1					
No perceived discrimination	1 (Reference)[a]	Reference[b]	Reference[c]	Reference[d]	1 (Reference)[e]
Perceived discrimination	5.40 [3.25; 8.97]***	3.28 [2.41; 4.14]***	-7.35 [-9.70; -5.02]***	-1.27 [-1.66; -0.87]***	2.05 [1.19; 3.51]**
Wave 5					
No perceived discrimination	-	Reference[f]	Reference[g]	Reference[h]	1 (Reference)[i]
Perceived discrimination	-	2.88 [1.39; 4.36]***	-5.12 [-8.91; -1.34]**	-0.53 [-1.18; 0.11]	1.29 [0.59; 2.83]

All analyses are adjusted for age, sex, household income, education, ethnicity and disability type. Prospective analyses are additionally adjusted for baseline wellbeing status/score.

[a]= *n*= 751 for the no perceived discrimination group; *n*= 117 for the perceived discrimination group; [b]= *n*= 454 for the no perceived discrimination group; *n*= 82 for the perceived discrimination group; [c]= *n*= 742 for the no perceived discrimination group; *n*= 117 for the perceived discrimination group; [d]= *n*= 454 for the no perceived discrimination group; *n*= 84 for the perceived discrimination group; [e]= *n*= 754 for the no perceived discrimination group; *n*= 117 for the perceived discrimination group; [f]= *n*= 177 for the no perceived discrimination group; *n*= 31 for the perceived discrimination group; [g]= *n*= 239 for the no perceived discrimination group; *n*= 43 for the perceived discrimination group; [h]= *n*= 171 for the no perceived discrimination group; *n*= 34 for the perceived discrimination group; [i]= *n*= 385 for the no perceived discrimination group; *n*= 55 for the perceived discrimination group.

CI = confidence interval, OR = odds ratio

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

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

Table 3: Cross-sectional and prospective associations between perceived disability discrimination and wellbeing outcomes (complete cases at wave 5)

	Psychological distress[a]	SF-12 mental[b]	Life satisfaction[c]	Fair/poor self-rated health[d]
	B (95% CI)	*B* (95% CI)	*B* (95% CI)	*B* (95% CI)
Wave 1				
No perceived discrimination	Reference	Reference	Reference	1 (Reference)
Perceived discrimination	2.65 [1.21; 4.08]***	-7.20 [-11.01; -3.39]***	-1.27 [-1.91; -0.63]***	2.66 [1.16; 6.08]*
Wave 5				
No perceived discrimination	Reference	Reference	Reference	1 (Reference)
Perceived discrimination	2.88 [1.39; 4.36]***	-5.12 [-8.91; -1.34]**	-0.53 [-1.18; 0.11]	1.29 [0.59; 2.83]

All analyses are adjusted for age, sex, household income, education, ethnicity and disability type. Prospective analyses are additionally adjusted for baseline wellbeing status/score.

[a]= *n*= 177 for the no perceived discrimination group; *n*= 31 for the perceived discrimination group; [b]= *n*= 239 for the no perceived discrimination group; *n*= 43 for the perceived discrimination group; [c]= *n*= 171 for the no perceived discrimination group; *n*= 34 for the perceived discrimination group; [d]= *n*= 385 for the no perceived discrimination group; *n*= 55 for the perceived discrimination group.

CI = confidence interval, OR = odds ratio

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

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

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Table 4 Participant characteristics at wave 1 (2009/10) of complete cases and those lost to follow-up

	Lost to follow-up (n=431)	Complete cases (n=440)	*p*
Age (years)	52.26 (17.08)	53.19 (15.76)	0.407
17-34	25 (5.8%)	12 (2.7%)	
35-44	46 (10.7%)	37 (8.4%)	
45-54	79 (18.4%)	93 (21.1%)	
55-64	91 (21.2%)	93 (21.1%)	
65+	189 (44.0%)	205 (46.6%)	
Sex (% men)	200 (46.4%)	188 (42.7%)	0.275
Household income (£)	1101.26 (1037.11)	1135.22 (748.46)	0.579
£0-499	69 (16.0%)	48 (10.9%)	
£500-999	175 (40.6%)	194 (44.1%)	
£1000-1499	113 (26.2%)	103 (23.4%)	
£1500-1999	42 (9.7%)	48 (10.9%)	
£2000+	32 (7.4%)	47 (10.7%)	
Education (% yes)			0.024
University Degree	85 (19.7%)	119 (27.0%)	-
School qualification	171 (39.7%)	171 (38.9%)	-
No qualification	175 (40.6%)	150 (34.1%)	-
Ethnicity			0.213
White	88 (20.4%)	97 (22.0%)	-
South Asian	172 (39.9%)	197 (44.8%)	-
Black	105 (24.4%)	84 (19.1%)	-
Other	66 (15.3%)	62 (14.1%)	-
Disability type			0.189
Physical	166 (38.5%)	201 (45.7%)	
Sensory	51 (11.8%)	44 (10.0%)	
Cognitive	47 (10.9%)	40 (9.1%)	
Other	167 (38.7%)	155 (35.2%)	
Mental wellbeing			
Psychological distress	3.46 (3.85)	3.41 (3.86)	0.874
SF-12	43.72 (12.93)	44.01 (12.30)	0.741
Life satisfaction	4.40 (1.75)	4.56 (1.69)	0.306
Self-rated health (% fair/poor)	319 (74.0%)	301 (68.4%)	0.068

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Data are presented as means (SD) and n (%)
*Complete cases are defined as those who were present at wave 1 and provided data on at least one wellbeing measure at wave 5.

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Table 5: Sensitivity analysis: Perceived disability 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]	4.41 (2.55;7.60)***	5.24 (3.06;8.98)***	4.80 (2.92;7.88)***	5.41 (3.26;8.98)***
Psychological distress	Coeff. [95%CI]	3.64 (2.68;4.60)***	3.28 (2.33;4.23)***	3.13 (2.26;4.01)***	3.27 (2.41;4.14)***
SF-12 mental	Coeff. [95%CI]	-6.63 (-9.29;-3.97)***	-7.61 (-10.15;-5.08)***	-7.53 (-9.89;-5.18)***	-7.35 (-9.68;-5.02)***
Life satisfaction	Coeff. [95%CI]	-1.23 (-1.69;-0.76)***	-1.45 (-1.88;-1.02)***	-1.24 (-1.64;-0.85)***	-1.27 (-1.66;-0.87)***
Fair/poor self-rated health	OR [95%CI]	1.92 (1.04;3.53)*	2.39 (1.32;4.33)**	2.21 (1.28;3.81)**	2.04 (1.19;3.50)**
Prospective analyses (wave 5)		Model 1	Model 2	Model 3	Model 4
Psychological distress	Coeff. [95%CI]	2.78 (1.14;4.41)***	2.69 (1.15;4.24)***	2.89 (1.45;4.33)***	2.88 (1.39;4.36)***
SF-12 mental	Coeff. [95%CI]	-4.33 (-8.81;0.14)	-4.90 (-8.86;-0.94)**	-5.94 (-9.59;-2.28)**	-5.13 (-8.91;-1.34)**
Life satisfaction	Coeff. [95%CI]	-0.39 (-1.14;0.36)	-0.37 (-1.06;0.32)	-0.39 (-1.02;0.25)	-0.53 (-1.18;0.11)
Fair/poor self-rated health	OR [95%CI]	1.23 (0.50;3.03)	1.30 (0.57;2.95)	1.31 (0.61;2.83)	1.29 (0.59;2.83)

All analyses are adjusted for age, sex, household income, education, ethnicity and disability type.

Prospective analyses are additionally adjusted for baseline wellbeing status/score.

Model 1 excludes "*felt unsafe at some place*" from the measure of perceived gender discrimination; Model 2 excludes "*avoided some place*"; Model 3 excludes ""*was insulted at some place*"; and Model 4 excludes "*was attacked 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 component scale range from 0-100 and the life satisfaction scale scores range from 0-7.

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Supplementary table 1: Perceived disability discrimination types and settings by type of disability

Types of discrimination	Physical	Sensory	Cognitive	Other	*p* value
Felt unsafe at someplace	12 (85.7%)	9 (90%)	12 (92.3%)	60 (84.5%)	0.874
Avoided at someplace	8 (53.3%)	6 (75%)	9 (75%)	52 (69.3%)	0.336
Felt insulted at someplace	3 (25%)	1 (12.5%)	1 (10%)	15 (27.3%)	0.572
Attacked at someplace	0 (0%)	0 (0%)	0(0%)	3(4.4%)	0.621
Settings					
School/work	2 (12.5%)	1 (9.1%)	0 (0%)	12 (15.8%)	0.424
Public transport	10 (62.5%)	3 (27.3%)	6 (42.9%)	41 (53.9%)	0.266
Bus or train stations	5 (31.3%)	2 (18.2%)	6 (42.9%)	34 (44.7%)	0.328
Taxis	4 (25%)	0 (0%)	1 (7.1%)	9 (11.8%)	0.223
Public buildings	8 (50%)	7 (63.6%)	7 (50%)	48 (63.2%)	0.654
On the street	12 (75%)	8 (72.7%)	9 (64.3%)	62 (81.6%)	0.504
At home	3 (18.8%)	3 (27.3%)	4 (28.6%)	20 (26.3%)	0.920

Data are presented as numbers (% yes)

Supplementary table 2: Prospective associations between perceived disability discrimination and wellbeing outcomes (imputed analysis)

	Psychological distress[a]	SF-12 mental[b]	Life satisfaction[c]	Fair/poor self-rated health[d]
	B (95% CI)	B (95% CI)	B (95% CI)	B (95% CI)
Wave 5				
No perceived discrimination	Reference	Reference	Reference	1 (Reference)
	0.22 [-3.21; 3.64]			1.38 [0.65; 2.93]
Perceived discrimination		-4.55 [-8.75; -0.34]*	-0.49 [-1.10; 0.12]	

All analyses are adjusted for age, sex, household income, education, ethnicity and disability type. Prospective analyses are additionally adjusted for baseline wellbeing status/score.

[a]= n= 454 for the no perceived discrimination group; n= 82 for the perceived discrimination group; [b]= n= 742 for the no perceived discrimination group; n= 117 for the perceived discrimination group; [c]= n= 454 for the no perceived discrimination group; n= 84 for the perceived discrimination group; [d]= n= 754 for the no perceived discrimination group; n= 117 for the perceived discrimination group

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

CI = confidence interval, OR = odds ratio

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

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Reporting checklist for cohort study.

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Instructions to authors

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	Reporting Item		Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary	2

of what was done and what was found

Introduction

| Background / rationale | #2 | Explain the scientific background and rationale for the investigation being reported | 4 |
| Objectives | #3 | State specific objectives, including any prespecified hypotheses | 6 |

Methods

Study design	#4	Present key elements of study design early in the paper	6
6Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up.	6
Eligibility criteria	#6b	For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	7-8

Bias	#9	Describe any efforts to address potential sources of bias		8
Study size	#10	Explain how the study size was arrived at		6
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why		9
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding		9
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions		9
Statistical methods	#12c	Explain how missing data were addressed		6
Statistical methods	#12d	If applicable, explain how loss to follow-up was addressed		6
Statistical methods	#12e	Describe any sensitivity analyses		9-10

Results

Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.		6
Participants	#13b	Give reasons for non-participation at each stage		N/A

Participants	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	6
Descriptive data	#14c	Summarise follow-up time (eg, average and total amount)	6
Outcome data	#15	Report numbers of outcome events or summary measures over time. Give information separately for exposed and unexposed groups if applicable.	N/A
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11
Main results	#16b	Report category boundaries when continuous variables were categorized	9
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	12

Discussion

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Key results	#18	Summarise key results with reference to study objectives	12
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	16
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-14
Generalisability	#21	Discuss the generalisability (external validity) of the study results	16-17

Other Information

| Funding | #22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 1 |

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