Abstract

Background. Loneliness is significantly related to health and wellbeing. However, there is little information on the prevalence of loneliness among people with disability or the association between disability, loneliness and wellbeing.

Objective/Hypothesis. For a nationally representative sample of adults (age 16-64) with/without disability, to examine exposure to three indicators of low social connectedness (loneliness, low perceived social support, social isolation), and to evaluate the association between low social connectedness and wellbeing. To test whether disability status moderated the relationship between low social connectedness and wellbeing.

Methods. Secondary analysis of data from three annual rounds of the cross-sectional English Community Life Survey (CLS) 2016-19.

Results. People with disability experienced loneliness, low perceived social support and social isolation at significantly higher rates than people without disability. Effect sizes were significantly greater for loneliness. Disability was associated with lower wellbeing. With one exception, low social connectedness was associated with lower wellbeing. Again, effect sizes were significantly greater for loneliness. The prevalence of loneliness was highest among adults with disability who were younger, economically inactive, living in rented or other accommodation, living alone and with low levels of access to environmental assets. There was no evidence that disability status moderated the association between exposure to low social connectedness and low wellbeing.

Conclusions. Loneliness was a particularly significant driver of poor wellbeing among people with disability. The relative independence between different indicators of social connectedness suggests that interventions to reduce loneliness will need to do more than simply increase rates of social contact or social support.

Introduction

The degree to which individuals are interconnected and embedded in communities has a powerful impact on their health and wellbeing.[1] Knowledge in this area is based on a range of approaches for conceptualizing and measuring social connectedness including: social network analysis; level of social support; and level of social engagement/isolation.[1,2] One of the key challenges of this literature is disentangling the effects associated with different aspects of low social connectedness.[1,3]

Social isolation is typically defined by a low frequency of social contact.[4] Social support typically refers to either the perceived availability or actual level of receipt of social contacts to fulfil specific functions (e.g., to provide practical help or emotional support).[1,3] More recently, increasing attention has focused on loneliness as an indicator of low social connectedness.[4-8] Loneliness has been defined primarily as an emotional state; a '*distressing feeling that accompanies the perception that one's social needs are not being met by the quantity or especially the quality of one's social relationships*'.[5]

Loneliness is relatively common in the general population. For example, in England 5% of adults report feeling 'often' or 'always' lonely, with an additional 16% reporting feeling lonely 'some of the time'.[9] In Germany, 11% of adults (aged 35-74) report feeling lonely.[10] Increased levels of loneliness have been reported among: women; younger adults; those not living in a couple relationship, living alone, and without children; and people who are unemployed.[9,10]

Compared to the general population, people with disability have fewer friends, less social support and are more socially isolated.[11-15] However, few studies have addressed the relationship between disability and loneliness. Most have focused on disability related to either physical impairments[16-21] or intellectual impairment.[22-25] We are aware of only one study that has investigated loneliness among people with disability associated with a range of impairments. In a convenience sample of 680 adults in one city in England, higher rates of loneliness were reported among people with disability than among their non-disabled peers, with particularly high rates of loneliness being reported among participants with cognitive or intellectual impairments.[26]

Personal wellbeing (PWB) may be defined as 'good mental states, including all of the various evaluations, positive and negative, that people make of their lives and the affective reactions of people to their experiences'.[27] It is a multi-dimensional phenomenon, commonly recognised as involving four distinct facets: life satisfaction (alternatively called 'cognitive' or 'evaluative' wellbeing), positive affect (e.g., happiness), negative affect (e.g., anxiety), and eudemonic wellbeing (sense of worth, purpose and meaning in life).[28] In population studies, people with disability typically report, on average, lower levels of PWB than people without disability. However, there is an evolving body of knowledge suggesting that disability-related inequalities in wellbeing do not reflect a direct negative impact of impairment, but rather that demographic characteristics and exposure to social determinants of poor health play a major role in the negative association between disability and wellbeing.[29]

The concept of PWB resonates strongly with the World Health Organization's definition of health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. As such, PWB has potential relevance to public health research, which continues to conceptualise health outcomes predominantly in terms of 'disease or infirmity'. For example, of the 40 systematic reviews on the public health consequences of social isolation and loneliness identified by Leigh-Hunt and colleagues,[6] 19 focused on morbidity, 8 focused on morality, 7 focused on health behaviours associated with mortality or morbidity (e.g., smoking, excess alcohol use), while only 2 focused on positive aspects of health (one on wellbeing, one on self-efficacy). Research not only

shows positive associations between PWB and health,[30] but also suggests a causal relationship between higher PWB and more positive future health outcomes such as lower mortality and increased longevity, and a possible protective effect of PWB.[28,31-33]

Very few studies have examined the association between loneliness and wellbeing among people with disability. The few exceptions have suggested that, among people with intellectual disability, increased loneliness has been associated with increased rates of depression, mental health problems and poorer physical health in a small number of cross-sectional studies.[22]

Given this paucity of information on the association between disability, loneliness and wellbeing, our aims were:

1. Prevalence of low social connectedness:
    a. To estimate the prevalence of exposure to three indicators of low social connectedness (loneliness, low perceived social support, social isolation) among a nationally representative sample of 'working age' adults in England with and without disability (age range 16-64);
    b. To identify personal demographic characteristics and aspects of living circumstances that may be associated with variation in exposure rates.
2. Association between low social connectedness and wellbeing:
    a. To estimate the strength of the association between the three indicators of low social connectedness and four indicators of personal wellbeing (life satisfaction, worthwhileness of life activities, happiness, anxiety) among 'working age' adults with and without disability;
    b. To determine whether disability status moderated the relationship between the three indicators of low social connectedness and four indicators of personal wellbeing.

Method

Secondary analysis of data collected in three annual rounds of the cross-sectional English *Community Life Survey* (CLS) 2016/17 to 2018/19. The CLS is a key evidence source for the UK government for understanding more about issues relating to community engagement, volunteering and social cohesion. It involves annual cross-sectional samples of approximately 5,000 'working age' adults (aged 16-64) throughout England. The government Department for Digital, Culture, Media & Sport took on responsibility for publishing results from the CLS from 2016/17 onwards. Previously it had been commissioned by the Cabinet Office since 2012. Methodological details of the surveys are available in a series of reports (available at https://www.gov.uk/government/collections/community-life-survey--2),[34,35] key aspects of which are described below.

Sampling & Procedure

A stratified unequal probability sample of addresses was drawn from the Royal Mail Postcode Address File (which includes 99% of all residential addresses in England). The sample was designed to ensure: (1) a responding sample size of at least 10,500 adults per year in England aged 16 years or over; (2) a responding sample size of Black and Minority Ethnic (BAME) respondents of at least 2,000; and (3) 'usable' sample sizes for each of four major ethnic categories. At each selected address, all permanently resident adults aged 16 or over were invited to take part in the survey. Attained sample sizes in the 16-64 age range were 5,733 for 2016/17, 5,872 for 2017/18 and 6,118

for 2018/19, giving a total sample size of 17,723. Data collection was by online self-completion. Estimated response rates were 17.9% for households and 14.3% for individual adults.

Measures

All measures are based on online self-report.

Disability

The CLS contains a disability identifier based on positive answers to two questions: (1) *'Do you have any physical or mental health conditions or illnesses lasting or expected to last for 12 months or more*?'; (2) *'[Does your condition or illness/do any of your conditions or illnesses] reduce your ability to carry out day-to-day activities?'* The prevalence of disability among people aged 16-64 was 18.0% in 2016/17, 18.1% in 2017/18 and 20.7% in 2018/19. Disability data were missing for 0.7% of respondents.

Low Social Connectedness

Loneliness

A single question was used to measure the prevalence of loneliness: *How often do you feel lonely?* (Response options: *Often/always; Some of the time; Occasionally; Hardly ever; Never*). We recoded this ordinal scale into a simple binary indicator of *'often/always'* feeling lonely versus other valid response options (the headline measure of loneliness reported annually by the relevant English government ministry).[36] Loneliness data were missing for 0.1% of respondents. The weighted prevalence of *'often/always'* feeling lonely across the three surveys was 6.7%.

Perceived Social Support

Three items measured perceptions of social support: *'How much do you agree or disagree with the statements* (1) *if I needed help, there are people who would be there for me?* (2) *if I wanted company or to socialise, there are people I can call on'?* (3) *Is there anyone who you can really count on to listen to you when you need to talk?* Response options for the first two questions ranged from *'Definitely agree'* to *'Definitely disagree'* on a four-point scale. Response options for the third question was: (1) *Yes, one person*; (2) *Yes, more than person*; (3) *Nobody.* The three items were moderately inter-correlated (r range 0.419-0.646) and showed reasonable levels of internal consistency (Cronbach's alpha = 0.76). As a result, we summed scores on the three items to create a social support scale and converted this to a simple binary indicator of perceived social support that used a cut point producing an overall prevalence as close as possible to the prevalence of *'often/always'* feeling lonely. The main reason for this decision was to facilitate the ease of making comparisons between effect sizes of relative risk associated with different indicators of low social connectedness by ensuring that the denominators (prevalence among people with no disability) did not vary too widely. Social support data were missing for less than 0.1% of respondents. The weighted prevalence of low perceived social support across the three surveys was 8.4%.

Social Isolation

Four items measured frequency of contact with family and friends: (1) *How often do you meet up in person with family members or friends?* (2) *How often do you speak on the phone or video or audio call via the internet with family members or friends?* (3) *How often do you email or write to family members or friends?* (4) *How often do you exchange text messages or instant messages with family members or friends?* Response options ranged from *'More than once a day'* to *'Never'* on an eight-point scale. The four items were moderately inter-correlated (r range 0.186-0.462) and showed acceptable levels of internal consistency (Cronbach's alpha = 0.64). As a result, we summed scores on the four items to create a social isolation scale and converted this to a simple binary indicator of social isolation using a cut point that produced an overall prevalence as close as possible to the

prevalence of *'often/always'* feeling lonely. Social isolation data were missing for less than 0.1% of respondents. The weighted prevalence of social isolation across the three surveys was 5.0%.

Personal Wellbeing (PWB)

The CLS included four indicators of PWB developed by the UK's Office for National Statistics for inclusion in national surveys;[37] '*Next I would like to ask you four questions about your feelings on aspects of your life. There are no right or wrong answers. For each of these questions I'd like you to give an answer on a scale of nought to 10, where nought is 'not at all' and 10 is 'completely'*.

- Satisfaction: *Overall, how satisfied are you with your life nowadays?*
- Worth: *Overall, to what extent do you feel that the things you do in your life are worthwhile?*
- Happiness: *Overall, how happy did you feel yesterday?*
- Anxiety: *On a scale where nought is 'not at all anxious' and 10 is 'completely anxious', overall, how anxious did you feel yesterday?*

Data on PWB questions were missing for 0.1%-0.3% of respondents in the CLS.

Covariates

Round of Survey

Round of survey (coded 1-3) data were available for all respondents.

Demographics

Information was collected on age group (16-19, 20-24, 25-34, 35-49, and 50-64, which was the most detailed age classification released with the data), gender (male/female) and ethnicity (British minority ethnicity vs. not). Age data were available for all respondents. Gender and ethnicity data were missing for 0.1% and 0.8% of respondents, respectively.

Living Circumstances

Information was included in the analyses on seven aspects of current living circumstances: living arrangements; housing status; highest level of educational attainment; employment status; environmental assets (community amenities such as local grocery shops and parks); neighborhood deprivation; and urban/rural location. Full details of these are presented in Supplementary Table 1.

Approach to Analysis

First, prevalence rates were calculated for exposure to loneliness, low perceived social support and social isolation, disaggregated by disability status and gender. Crude and adjusted prevalence rate ratios (PRRs) for exposure were estimated using Poisson regression with robust standard errors.[38] Partially adjusted models took account of between-sample differences in round of survey and personal demographics. Fully adjusted models took account of between-sample differences in round of survey, personal demographics and current living circumstances. The difference between partially and fully adjusted PRRs provides an estimate of the extent to which differences in low social connectedness between respondents with and without disability may be accounted for by differential exposure to disadvantageous living circumstances.

Second, the fully adjusted models were also used to identify personal demographic and living circumstance variables that were independently related to rate of exposure to the three indicators of low social connectedness. For all variables significantly related to variation in exposure ($p<0.05$) we added into the model an interaction term to assess whether disability status moderated the observed association between the predictor variable and variation in exposure. We estimated marginal means (with 95% confidence intervals) for exposure for all significant associations.

Third, we compared the PWB of respondents with and without disability for each indicator of wellbeing using univariate general linear models, reporting partial Eta squared as a measure of effect size (the extent to which variation in a variable accounts for variation in PWB within the population).[39] For each indicator in each sample we report three adjusted models: (model 1) estimates adjusted for between-group differences in personal demographics and round of survey; (model 2) estimates adjusted for between-group differences in personal demographics, round of survey and living conditions; (model 3) estimates adjusted for between-group differences in personal demographics, round of survey, living conditions and exposure to low social connectedness. Changes in the effect size of disability between models 1 and 2 indicate the extent to which differences in PWB between respondents with and without disability may be accounted for by differences in living conditions. Changes in the effect size of disability between models 2 and 3 indicate the extent to which differences in PWB between respondents with and without disability may be accounted for by differences in exposure to low social connectedness. Finally, we included interaction terms into model 3 to determine whether disability status moderated the association between the three indicators of low social connectedness and PWB.

Data were combined across three annual rounds of CLS. There were no statistically significant changes over round of survey for social isolation or loneliness (Spearman's r = -0.003 and +0.009, respectively). There were, however, weak but significant increases over time for the prevalence of disability (r = +0.029, p<0.001) and low perceived social support (r = +0.019, p<0.05). As a result, year of data collection was entered as a covariate in all multivariate models. All analyses were undertaken using IBM SPSS 24 with sample weights released with the data to account for known recruitment biases. Given the small amounts of missing data, complete case analysis was undertaken on a subsample of 17,066 respondents (96% of the available sample of 17,723).

Results

Prevalence of Exposure to Low Social Connectedness

Overall, people with disability were significantly more likely than their non-disabled peers to report loneliness, low social support and social isolation and to report exposure to multiple forms of low social connectedness (Table 1).

[insert Table 1]

Effect sizes were significantly greater for loneliness (fully adjusted PRR = 3.14 (95% CI 2.79-3.54)) than low perceived social support (1.86 (1.66-2.08)), which were in turn significantly greater than for social isolation (1.20 (1.02-1.41)). Partially adjusting risk estimates to take account of between-group differences in round of data collection and personal demographics had only a marginal impact on effect sizes. Further adjusting risk estimates to take account of between-group differences in living circumstances significantly reduced effect sizes for loneliness by 28%, low perceived social support by 24% and social isolation by 21%.

Association between Indicators of Low Social Connectedness

The correlations (Kendall's Tau-b) between the three indicators were modest to weak in the full sample: loneliness/low perceived social support (r=0.249, p<0.001); loneliness/social isolation (r=0.068, p<0.001); low perceived social support/social isolation (r=0.205, p<0.001).

Factors Associated with Variation in Exposure

The associations between covariates and indicators of low social connectedness are summarized in Table 2. Estimated marginal means for all statistically significant associations, disaggregated by

disability status, are presented in Supplementary Tables 2-4. In the sections below, we report for all statistically significant associations the category with the lowest level of social connectedness.

[insert Table 2]

Loneliness

Inspection of estimated marginal means indicated that the prevalence of loneliness was highest among adults with disability who were younger, economically inactive, living in rented or 'other' accommodation, living alone and had low levels of access to environmental assets. The significant disability-by-predictor interactions indicated that the relative disadvantage in loneliness experienced by adults with disability was particularly pronounced for adults living as a couple, in 'other' housing arrangements, with low to medium levels of access to environmental assets and higher rates of neighborhood deprivation.

Low Perceived Social Support

Inspection of estimated marginal means indicated that the prevalence of low perceived social support was highest among adults with disability who were men, of minority ethnic status, living alone, full-time students or economically inactive, living in 'other' accommodation and with either higher educational or 'other' educational qualifications. The significant disability-by-predictor interactions indicated that the relative disadvantage in social support experienced by adults with disability was particularly pronounced for adults at younger ages, who were full-time students and with higher educational qualifications.

Social Isolation

Inspection of estimated marginal means indicated that the prevalence of social isolation was highest among adults with disability who were men, young, living alone or in other arrangements, economically inactive, had lower educational qualifications and living in 'other' housing arrangements. The significant disability-by-predictor interactions indicated that the relative disadvantage in social isolation experienced by adults with disability was particularly pronounced for adults at younger ages, who were living alone and had access to moderate levels of environmental assets.

Associations between Exposures and PWB

The association between disability, the three indicators of low social connectedness and the four indicators of PWB are presented in Table 3. Disability was associated with lower PWB in all analyses. With one exception (the association between social isolation and anxiety), low social connectedness was associated with lower PWB in all analyses.

Adjusting for personal demographics resulted in modest increases in the size of association between disability and PWB (Eta^2 range +4% to +16%). Additionally, adjusting for exposure to differences in living conditions (model 2) was associated with marked decreases in the size of association between disability and PWB (Eta^2 range -18% to -33%). Finally, additionally adjusting for between-group differences in exposure to low social connectedness resulted in further marked decreases in the size of association between disability and PWB (Eta^2 range -31% to -41%).

[insert Table 3]

For all four PWB indicators, loneliness had a significantly greater association with lower PWB than perceived low social support which, in turn, had a significantly greater association with PWB than social isolation. In the fully adjusted model (Model 3), the association between loneliness and PWB was equivalent to a large effect size for three of the four PWB variables.

In none of the analyses did interaction terms between disability and any of the indicators of low social connectedness reach statistical significance (p<0.05). That is, there was no evidence that disability status moderated the association between exposure to low social connectedness and low wellbeing.

Discussion

Main findings of this study

People with disability were significantly more likely than their non-disabled peers to report loneliness, low social support and social isolation and to report exposure to low social connectedness on more than one indicator. Effect sizes were significantly greater for loneliness than low perceived social support, which were in turn significantly greater than for social isolation. Adjusting risk estimates to take account of between-group differences in living circumstances significantly reduced effect sizes for all three indicators of low social connectedness. The prevalence of loneliness was highest among adults with disability who were younger, economically inactive, living in rented or other accommodation, living alone and had low levels of access to environmental assets. The relative disadvantage in loneliness experienced by adults with disability was particularly pronounced for adults living as a couple, in 'other' housing arrangements, with low to medium levels of access to environmental assets and higher rates of neighborhood deprivation. Disability and, with one exception, low social connectedness were associated with lower PWB in all analyses. There was no evidence that disability status moderated the association between exposure to low social connectedness and low wellbeing. For all four PWB outcomes, loneliness had a significantly greater association with PWB than low perceived social support which, in turn, had a significantly greater association with PWB than social isolation.

What is already known on this topic

We are aware of only one previous study that has investigated loneliness among people with disability associated with a range of impairments. This study, based on a convenience sample drawn from one city in England, reported that people with disability had higher rates of loneliness and social isolation than their peers, with particularly high rates of loneliness among people with cognitive or intellectual impairments.[26] We are not aware of any previous study that has investigated the association between loneliness and wellbeing among people with disability associated with a range of impairments.

What this study adds

This study adds to the existing literature by providing evidence from a nationally representative survey of 'working age' adults on four key issues: (1) the extent of disadvantage faced by people with disability with regard to low levels of social connectedness; (2) how this disadvantage varies by demographic characteristics and living conditions; (3) the relative independence of different aspects of social connectedness; and (4) marked differences in the strength of association between different types of exposure to low social connectedness and lower PWB.

In analyses adjusted for between-group differences in age, gender and ethnicity, adults with disability in England were 51% more likely to be socially isolated, 246% more likely to report low levels of perceived social support and 438% more likely to be lonely. For all four PWB outcomes, loneliness had a significantly greater association with lower PWB than low perceived social support which, in turn, had a significantly greater association with PWB than social isolation. Given that disability status does not appear to moderate the association between exposure to low social connectedness and low PWB, these data suggest that people with disability are not any more or less

vulnerable than non-disabled people to the effects of low social connectedness on wellbeing. Given the markedly higher risk of exposure to loneliness among people with disability (compared with other indicators of low social connectedness), reducing loneliness may have particularly significant benefits in improving the wellbeing of adults with disabilities. However, the weak to modest correlations between indicators of low social connectedness among adults with and without disability suggests that interventions to reduce loneliness will need to do much more than simply increase rates of social contact or social support.[40]

Loneliness (and other indicators of low social connectedness) was higher among people in more disadvantaged living circumstances (e.g., economically inactive, living in rented or other accommodation, living alone and with low levels of access to environmental assets). Indeed, adjusting risk estimates to take account of between-group differences in living circumstances significantly reduced effect sizes for all three outcomes, especially loneliness (risk reduced by 28%). These observations are consistent with the notion that effectively addressing social and economic disadvantage for people with disability may reduce loneliness and improve wellbeing. In addition, our results identify specific sub-groups of people with disability that interventions that are targeted toward 'at risk' groups or based on the notion of 'proportionate universalism' will need to take into account.[41] The evidence we provide that disability status moderates the risk of loneliness (e.g., among adults living in areas with low to medium levels of access to environmental assets and higher rates of neighborhood deprivation) points to some specific contexts in which intervention may be particularly beneficial for adults with disability.

Limitations of this study

The four main limitations of the study were: (1) the use of a cross-sectional design that precludes the identification of causal associations between the main variables; (2) the low response rate; (3) our inability within the CLS data to disaggregate results by impairment type; and (4) the unavailability of data in the survey on some key aspects of socio-economic position, especially income. With regard to response rate, it is notable that household response rate to the CLS declined from 61% in 2015/16 (the last year the survey was undertaken by face-to-face interviews) to 18% in 2016/17 (online self-completion version). It should be noted that the data are weighted to ensure that the weighted sample matches population totals for: gender by age group, degree level education by age group, housing tenure, region, household size, ethnic group and internet usage by age group.[34] – However, it is not possible to know whether there is non-response bias specifically associated with the variables we focus on in this analysis (disability, social connectedness, wellbeing). The benefits of online administration include increased sustainability (primarily through reduced cost), avoidance of geographical clustering in the survey design and opportunity to include respondents in more remote areas. In the UK in 2017 it has been estimated that: (1) 98% of adults aged 18-54 had recently used the internet; (2) 90% among adults aged 55-64 had recently used the internet; and (3) there were no gender differences in internet use among working age adults.[42] Further research is needed to determine the extent to which our results generalize across people with disability associated with different types of impairments, especially since existing evidence suggests that risk of exposure of people with disability to socially determined adversities can vary significantly across different types of impairments.[43-45] Nevertheless, our results suggest that people with disability as a whole should be considered to be at increased risk of exposure to loneliness and that this exposure may be an important mediator for their lower wellbeing; an issue of particular importance given the substantial impacts on social interactions associated with the outbreak of the 2020 COVID-19 pandemic.

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Table 1: Prevalence of Exposure to Low Social Connectedness					
	Crude Prevalence (%)		Risk (prevalence rate ratios with 95% CI)		
	With disability	Without disability	Unadjusted	Partially Adjusted[a]	Fully Adjusted[b]
Loneliness	17.2%	4.2%	4.04*** (3.62-4.50)	4.38*** (3.92-4.90)	3.14*** (2.79-3.54)
Low perceived social support	15.5%	6.5%	2.41*** (2.18-2.67)	2.46*** (2.21-2.73)	1.86*** (1.66-2.08)
Social isolation	7.1%	4.5%	1.57*** (1.35-1.81)	1.51*** (1.30-1.75)	1.20* (1.02-1.41)
Low social connectedness					
All three	1.6%	0.2%	9.61*** (6.17-19.46)	10.96*** (6.91-17.39)	6.70*** (4.06-11.08)
Two	7.3%	2.2%	3.84*** (3.26-4.52)	3.99*** (3.35-4.74)	2.68*** (2.22-3.24)
One	20.3%	10.2%	2.12*** (1.95-2.30)	2.18*** (2.00-2.37)	1.78*** (1.63-1.95)
None	70.8%	87.4%	1.0 (ref)	1.0 (ref)	1.0 (ref)
Notes: [a] adjusted for age category, gender, ethnicity and round of survey [b] adjusted for above plus living arrangements, housing status, educational attainment, employment status, environmental assets, neighborhood deprivation and urban/rural location * p<0.05, ** p<0.01, *** p<0.001					

Table 2: Summary of Associations between Covariates and Indicators of Low Social Connectedness			
Covariates	Loneliness	Low Social Support	Social Isolation
Age	Main	Int	Main + Int
Gender	--	Main	Main
Ethnicity	--	Main	--
Living arrangements	Main + Int	Main	Main + Int
Housing status	Main + Int	Main	Main
Educational attainment	--	Main + Int	Main
Employment status	Main	Main + Int	Main
Environmental assets	Main + Int	--	Int
Neighborhood deprivation	Int	--	--
Urban/rural status	--	--	--
Round of survey	--	--	--
Notes: -- No significant relationship between covariate and outcome Main = significant main effect between covariate and outcome Int = significant interaction effect between disability and covariate on outcome Adjusted prevalence rate ratios (PRRs) for exposure were estimated using Poisson regression with robust standard errors			

Table 3: Association between Disability, Low Social Connectedness and Personal Wellbeing						
	Model 1 (adjusted for personal demographics and round of survey)		Model 2 (adjusted for personal demographics, round of survey and living conditions)		Model 3 (adjusted for personal demographics, round of survey, living conditions and low social connectedness)	
	Partial Eta^2	Estimated normalized marginal mean difference[a] (with 95% CI)	Partial Eta^2	Estimated normalized marginal mean difference[a] (with 95% CI)	Partial Eta^2	Estimated normalized marginal mean difference[a] (with 95% CI)
Outcome: Life Satisfaction						
Disability	0.077***	0.72 (0.68-0.75)	0.052***	0.59 (0.54-0.63)	0.031***	0.43 (0.38-0.48)
Loneliness	n/a	n/a	n/a	n/a	0.074***	1.05 (0.98-1.11)
Low social support	n/a	n/a	n/a	n/a	0.028***	0.57 (0.51-0.63)
Social isolation	n/a	n/a	n/a	n/a	0.002***	0.19 (0.12-0.26)
Outcome: Worthiness of activities						
Disability	0.066***	0.66 (0.63-0.70)	0.044***	0.55 (0.50-0.60)	0.026***	0.39 (0.34-0.44)
Loneliness	n/a	n/a	n/a	n/a	0.072***	1.05 (0.99-1.11)
Low social support	n/a	n/a	n/a	n/a	0.024***	0.54 (0.48-0.60)
Social isolation	n/a	n/a	n/a	n/a	0.003***	0.23 (0.16-0.30)
Outcome: Happiness						
Disability	0.073***	0.70 (0.66-0.74)	0.052***	0.60 (0.55-0.65)	0.032***	0.44 (0.39-0.49)
Loneliness	n/a	n/a	n/a	n/a	0.073***	1.07 (1.01-1.13)
Low social support	n/a	n/a	n/a	n/a	0.022***	0.52 (0.46-0.58)
Social isolation	n/a	n/a	n/a	n/a	0.001***	0.14 (0.07-0.21)
Outcome: Anxiety						
Disability	0.044***	0.54 (0.50-0.58)	0.036***	0.51 (0.46-0.56)	0.025***	0.42 (0.37-0.47)
Loneliness	n/a	n/a	n/a	n/a	0.025***	0.66 (0.60-0.72)
Low social support	n/a	n/a	n/a	n/a	0.004***	0.23 (0.17-0.29)
Social isolation	n/a	n/a	n/a	n/a	0.000	0.01 (-0.06-0.08)
Notes: * p<0.05, ** p<0.01, *** p<0.001						
[a] Difference in estimated marginal mean of outcome between presence and absence of variable presented using normalized SWB scores (mean = 0, SD = 1)						
n/a Not applicable as the variable was not entered into this analysis						