

# The Wellbeing of Working-Age Adults with and without Disability in the UK: Associations with Age, Gender, Ethnicity, Partnership Status, Educational Attainment and Employment Status

Professor Eric Emerson, PhD (corresponding author: +44 (0)1297 680123; [eric.emerson@lancaster.ac.uk](mailto:eric.emerson@lancaster.ac.uk))<sup>1,2,3</sup>

Dr Nicola Fortune, PhD<sup>2</sup>

Dr Zoe Aitken, PhD<sup>4,5</sup>

Professor Chris Hatton, PhD<sup>2</sup>

Professor Roger Stancliffe, PhD<sup>1,2</sup>

Professor Gwynnyth Llewellyn, PhD<sup>1,2</sup>

1 Centre for Disability Research and Policy, Faculty of Health Sciences, University of Sydney, Sydney, NSW 2141, Australia

2 Centre of Research Excellence in Disability and Health, University of Sydney, Sydney, NSW 2141, Australia

3 Centre for Disability Research, Faculty of Health & Medicine, Lancaster University, Lancaster, LA1 4YW, UK

4 Melbourne School Population and Global Health, The University of Melbourne, Victoria 3010 Australia

5 Centre of Research Excellence in Disability and Health, University of Melbourne, Victoria 3010 Australia

## Abstract

### Background

Few population-based studies have examined the association between disability and personal wellbeing (PWB) among working-age adults.

### Objective/Hypothesis

To determine: (1) the magnitude of differences in wellbeing between working-age adults with and without disability in contemporary samples representative of the UK population; and (2) whether the size of any observed differences between people with and without disability is moderated by age, gender, ethnicity, partnership status, educational attainment or employment status.

### Methods

Secondary analysis of data from three national cross-sectional surveys.

### Results

In each survey, people with disability scored lower than people without disability on all four indicators of PWB. Adjusting for the main effects of potentially moderating variables reduced the effect size of disability on PWB by an average of 24%. Subsequently adjusting for the two-way interaction terms between disability and potentially moderating variables reduced the effect size of disability (main effect) on PWB by an additional average of 73%. PWB among people with disability was significantly lower for: (1) men; (2) younger people; (3) those who belong to the majority ethnic group (white British); (4) those without a partner; and (5) people with lower socio-economic position.

### Conclusions

Our findings indicate that demographic characteristics and exposure to specific social determinants of poor health play a major role in the negative association between disability and personal wellbeing. A more sophisticated understanding of how social determinants interact to produce inequities associated with identities such as disability, gender, race, sexuality, and class (intersectionality) can inform effective policy interventions.

## Introduction

In recent years, national governments and international organisations have made increasing use of measures of personal wellbeing (PWB) in monitoring social progress.<sup>1-3</sup> For example, the UK has recently developed a national strategy for measuring wellbeing<sup>4</sup> and introduced four indicators of PWB into major UK surveys as the standard against which PWB is to be monitored.<sup>5, 6</sup>

PWB (also called 'subjective wellbeing') 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'.<sup>7</sup> 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).<sup>8</sup>

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', and UN Sustainable Development Goal number 3 to 'ensure healthy lives and promote well-being for all at all ages' (<https://www.un.org/sustainabledevelopment/>). As such, PWB has potential relevance to public health research, which continues to focus predominantly on measures of 'disease or infirmity'. Research not only shows positive associations between PWB and health,<sup>9-12</sup> 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.<sup>8,</sup>

13-15

Well-established social determinants of health (e.g., higher educational status, employment, and home ownership) have been found to also explain variation in PWB.<sup>16</sup> Other factors associated with variation in PWB include demographic factors such as age, sex, and ethnicity<sup>9, 14, 16</sup> and personal factors (e.g., temperament) and circumstances (e.g., marital status).<sup>8, 9, 16, 17</sup>

There is growing evidence for, and concern about, inequities in wellbeing within societies, linked to disadvantage and differential access to resources such as education and social capital.<sup>1, 18</sup> Analysis of population survey data from the UK has identified particular groups that are over-represented among those who report the lowest levels of wellbeing, with self-reported health problems or disability a common characteristic of these groups.<sup>19</sup>

Research findings have demonstrated that people with disability can and do experience high levels of wellbeing.<sup>20</sup> In early studies this was termed the 'disability paradox', reflecting the assumption that living with disability must inevitably reduce wellbeing.<sup>21, 22</sup> In population studies, people with

disability typically do report, on average, lower levels of PWB than people without disability. However, evidence has been steadily accumulating to suggest that the extent of disability-related decrements in wellbeing varies significantly between population subgroups. For example, research focused on adolescents and young adults suggests that differential access to material and social resources, social support, and social exclusion explains, at least in part, observed negative associations between disability and wellbeing.<sup>23, 24</sup> There is also evidence to suggest moderation of disability-related differences in PWB by gender,<sup>25</sup> self-rated health status,<sup>12</sup> and partnership status.<sup>26</sup> This evolving body of knowledge suggests that disability-related inequalities in wellbeing should not be interpreted as evidence for a direct negative impact of an individual's impairment on their level of wellbeing. It also highlights the importance of identifying particular subgroups of people with disabilities who may be at particular risk of having low PWB.

Longitudinal studies investigating the impact of disability onset on PWB have reported conflicting results. Although some have concluded that disability acquisition is typically associated with long-lasting declines in PWB,<sup>27, 28</sup> others have suggested that this is not the case for some groups of people. For instance, one study found that the most common 'trajectory class' associated with disability onset among younger Australian adults involved no longer-term decline in PWB.<sup>29</sup> The covariates that predicted membership of classes that experienced deteriorating PWB after disability onset included younger age, not living with both parents at age 14, lower self-reported importance of religion, low English language proficiency, and lower parental education. In contrast, analysis of Swiss panel data found that neither income nor wealth buffered the effects of disability acquisition, however 'internal' resources (personal spirituality and personality attributes) did show buffering effects.<sup>30</sup>

Although there is substantial evidence concerning associations between disability and increased risk of exposure to well-established social determinants of poor health,<sup>31</sup> relatively few studies have investigated the effects of such exposure on the PWB of people with disability. Further, many of the studies that explore factors that mediate the relationship between disability and PWB focus on younger or older age groups.<sup>23, 24, 32</sup> There is a paucity of population-based studies focusing on working-age people. Given the indications that lower PWB associated with disability may be 'socially patterned, preventable and therefore inequitable',<sup>23</sup> there is clearly a need for further research to gain a more sophisticated and complete understanding of the factors and relationships at play.

Against this backdrop, the current study addresses the following research questions:

1. What is the magnitude of differences in wellbeing between working-age adults with and without disability in contemporary samples representative of the UK population?

2. Is the size of any observed difference between people with and without disability moderated by age, gender, ethnicity, partnership status, educational attainment or employment status?

## Method

Secondary analysis of PWB data collected in three national surveys: (1) the UK's *Annual Population Survey* (APS) 2017-18; (2) the *British Life Opportunities Survey* (LOS); and (3) the *English Community Life Survey* (CLS) 2016-17. Methodological details of the surveys are available in published reports,<sup>33-37</sup> key aspects of which are described below and in Supplementary File 1. Unweighted sample sizes of working age respondents were 108,655 in the APS, 5,530 in the LOS and 5,818 in the CLS.

## Measures

### Personal Wellbeing

Each survey included four indicators of PWB developed by the UK's Office for National Statistics.<sup>5</sup>

*'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: 4.0%-4.2% of respondents in the APS; 0.3%-0.4% of respondents in the LOS; and 0.1%-0.3% of respondents in the CLS.

### Disability

We extracted indicators of disability status from each survey that were aligned with the description of disability included in Article 1 of the UN Convention on the Rights of Persons with Disability; *'Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others'.*

APS contains a derived variable of current disability that meets the UK's 2010 Equality Act definition of disability; a person with a physical or mental impairment which has a substantial and long-term

adverse effect on his or her ability to carry out normal day-to-day activities.<sup>38</sup> Disability data were missing for 0.6% of working-age respondents. This approach gave an overall prevalence of disability in the working-age population (age 18-64) of 22.3% (95% CI 22.0%-22.5%).

LOS collected information on the presence/absence of 13 groups of impairments or health conditions. We defined disability as the self-reported presence of at least one impairment/health condition that presents the person with at least 'mild' difficulty and 'often' or 'always' limits activities. Disability data were missing for 0.1% of working age respondents. This approach gave an overall prevalence of disability in the working-age population (age 18-64) of 18.0% (95% CI 17.2%-18.8%).

Disability was determined in the CLS by 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?'*

Disability data were missing for 0.6% of working-age respondents. This approach gave an overall prevalence of disability in the working-age population (age 16-64) of 18.0% (95% CI 16.8%-19.3%).

#### Potential Moderating Variables

Potential moderating variables were selected based on: (1) their availability in all three surveys; and (2) prior evidence that they are related to variations on PWB.

Gender was based on a self-report binary question (male/female) in all three surveys. Ethnicity and partnership status were based on different classifications in each survey. These were re-coded to simple binary variables (white British vs. British minority ethnic community; partnered vs. living without a partner). Age and gender were available for all respondents in each survey. Ethnicity was available for 99.9% of respondents in the APS and LOS and 99.2% of respondents in the CLS. Partnership status was available for all respondents in the APS and LOS and 99.4% of respondents in the CLS.

Employment status was recorded in terms of three International Labour Organisation categories (employed, unemployed, economically inactive) and respondent socio-economic classification based on six categories.<sup>39</sup> We combined these two variables into a single five category variable: (1) employed in higher managerial, administrative and professional occupations; (2) employed in intermediate occupations, small employers and own account workers, lower supervisory and

technical occupations; (3) employed in semi-routine and routine occupations; (4) unemployed; (5) economically inactive. These data were available for all respondents in each survey.

A five-category measure of highest level of educational attainment commonly used in UK research was derived in each survey: (1) higher educational qualification (e.g., university-awarded degrees and diplomas); (2) A-Levels or equivalent (examinations undertaken at the end of high or secondary schooling); (3) O-Level or GCSE grade A-C or equivalent (examinations typically undertaken at age 16 prior to studying for A-Levels); (4) other qualifications (including foreign qualifications); (5) no formal qualifications. These data were available for 99.6% of respondents in the APS, 99.5% of respondents in the LOS and 98.3% of respondents in the CLS.

### Approach to Analysis

First, we derived descriptive statistics of the association between disability and the potentially moderating variables. Second, we compared the PWB of respondents with and without disability for each indicator of wellbeing in each survey using univariate general linear models and reporting partial Eta squared as a measure of effect size (the extent to which disability status accounts for variation in PWB within the population).<sup>40</sup> For each indicator in each sample we report: (model 1) unadjusted estimates; (model 2) estimates adjusted for the main effects associated with the potentially moderating variables; (model 3) estimates adjusted for both the main effects associated with potential moderators and all two-way interaction terms between disability and these variables. If the disability interaction term was statistically significant, we examined estimated marginal means to determine the nature of the interaction. 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 reflect differences in exposure rates to the potentially moderating variables. The results of model 3 provide evidence on specific disability-related moderating relationships, and changes in the effect size of disability (main effect) between models 2 and 3 indicate the extent to which differences in PWB between respondents with and without disability may reflect the operation of disability-related moderating variables.

Given that in each set of analyses in model 3 we examined the statistical significance of seven relationships (main effect of disability plus interaction terms between disability and six potential moderators), we applied a Bonferroni correction to the alpha level ( $p < 0.0071$ ). All analyses were undertaken in IBM SPSS v24 using sampling weights deposited with the released data to take account of sampling strategies and known biases in response rates. Given the relatively small amount of missing data, complete case analyses were undertaken.

## Results

Descriptive statistics on the association between disability and the six potentially moderating variables are presented in Supplementary Table 1. In all three samples, people with disability were more likely than other respondents to be older, female, of majority ethnic status, living alone, and to have lower employment status and educational qualifications. Descriptive statistics on the distribution of PWB indicators across the three surveys are presented in Supplementary Figure 1. While PWB scores in APS and LOS showed very similar distributions, PWB was consistently lower in CLS, especially for life satisfaction, worth and anxiety.

On all four indicators of PWB in all three samples, respondents with disability reported significantly lower wellbeing in all unadjusted (Model 1) and adjusted comparisons (Table 1, Figure 1). Across all four indicators and all three samples, adjusting for the main effects associated with the potentially moderating variables (Model 2) reduced the effect size of disability on PWB by an average of 24%. 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 reflect differences in exposure rates to the potentially moderating variables. The reductions in effect sizes were similar for the three positively worded indicators (satisfaction 32%, worth 27%, happiness 27%) and notably lower for anxiety (9%). Across all four indicators and all three samples, adjusting for the two-way interaction terms between disability and the potentially moderating variables (Model 3) reduced the effect size of disability (main effect) on PWB by an average of 73% between Models 2 and 3. The reductions in effect sizes were similar for all four indicators (satisfaction 78%, worth 70%, happiness 71%, anxiety 75%). Changes in the effect size of disability (main effect) between models 2 and 3 indicate the extent to which differences in PWB between respondents with and without disability may reflect the operation of disability-related moderating variables, rather than disability per se.

The data presented in Table 1 indicate that employment status had a significant moderating effect on the association between disability and PWB for 11 of the 12 analyses, and that in each of these 11 analyses the effect size associated with employment status was greater than for all other moderating effects. Inspection of estimated marginal means indicated that the direction of the moderating effects was consistent across PWB indicators and samples (Supplementary Figure 6). For example, Figure 2 shows estimated marginal means for life satisfaction by disability and employment status in the APS. In all employment status categories people with disabilities had significantly lower PWB than people without disabilities. However, the magnitude of the difference in PWB between respondents with and without disability was markedly greater for respondents who were either unemployed or economically inactive.



Gender, age and ethnicity showed statistically significant interactions with PWB in at least 50% of the analyses. Inspection of estimated marginal means (Supplementary Figure 2) indicates that the magnitude of the difference between respondents with and without disability in relation to PWB indicators of life satisfaction, worth and happiness was markedly greater for men. However, for the PWB indicator of anxiety gender effects were inconsistent; in the APS, the magnitude of between-group differences was markedly greater for women, while in the CLS the magnitude of between-group differences was markedly greater for men. There were also inconsistencies in the direction of moderation effects associated with age (Supplementary Figure 3) and ethnicity (Supplementary Figure 4). In the APS, the magnitude of between-group differences in satisfaction, worth and happiness were markedly greater for respondents in the 30-49 age group and the magnitude of between-group differences in anxiety were markedly greater for respondents in the under 30 age group. However, in the CLS, while the magnitude of between-group differences in anxiety were also markedly greater for respondents in the under 30 age group, so were the magnitude of between-group differences in worth. Regarding ethnicity, the magnitude of all significant between-group differences in PWB were markedly greater among the majority ethnic group (white British) with one exception; the magnitude of between-group differences in worth were markedly greater among minority ethnic groups in LOS.

Partnership status (Supplementary Figure 5) and educational attainment (Supplementary Figure 7) showed statistically significant interactions with all four indicators of PWB in the APS and with happiness in the CLS. The direction of these effects was consistent across indicators and samples, with the magnitude of between-group differences in PWB being markedly greater for non-partnered respondents and respondents with lower educational qualifications.

## Discussion

### Main finding of this study

Across three nationally representative surveys, people with disability reported lower PWB on all four indicators. Adjusting for the main effects of the potentially moderating variables reduced the effect size of disability on PWB by an average of 24%. Subsequently adjusting for the two-way interaction terms between disability and the potentially moderating variables reduced the effect size of disability (main effect) on PWB by an additional average of 73%. Employment status had the most consistent and strongest moderating effect on the association between disability and PWB, with differences in PWB between survey respondents with and without disability being markedly greater for those who were either unemployed or economically inactive. PWB among people with disability was also significantly lower in at least one survey for: (1) men (on indicators of life satisfaction,

worth and happiness); (2) younger respondents (on anxiety); and (3) on all four indicators for those who belong to the majority ethnic group (white British), non-partnered respondents and respondents with lower educational qualifications.

### What is already known on this topic

Few population-based studies have examined the association between disability and personal wellbeing among working-age adults. Although associations between disability and increased risk of exposure to social determinants of poor health are well established,<sup>31</sup> few population-based studies have investigated the effects of such exposures on the PWB of working-age adults with disability.

### What this study adds

Our study adds to the existing literature in four important ways. First, our findings highlight the importance of intersectionality in public health research; the notion that power structures based on identities such as disability, gender, race, sexuality, functioning and class may interact with each other in various ways in creating inequities.<sup>41, 42</sup> Specifically, we demonstrate that, after adjusting for the main effects of potential moderators, the effect size of disability was reduced by an average of 73% by the inclusion of interaction terms associated with the intersectionality of disability with age, gender, ethnicity, socio-economic position and partnership status. The analysis also identifies specific subgroups of people with disability whose PWB is particularly low: men, younger respondents, those who belong to the majority ethnic group, non-partnered respondents and respondents with lower socio-economic position. As such, the results suggest potential pathways for intervention (e.g., to increase employment rates among people with disability and/or opportunities for social participation to increase the chances of meeting a partner). They also highlight possible dimensions of differential resilience or vulnerability for people with disabilities (e.g., male gender) that warrant further investigation.<sup>43</sup>

Second, our results suggest that different aspects of intersectionality may be important for different PWB outcomes. For example, while gender and age showed significant moderating effects for life satisfaction and worth in the majority of instances (9 of 12 comparisons), they were only associated with variation in happiness in one comparison. In contrast, educational attainment showed significant moderating effects for happiness in the majority of instances (2 of 3 comparisons) but was only related to variation in life satisfaction or worth in one comparison. Third, our study adds substantially to the evidence base suggesting that it is not inevitable that people with disability will have lower PWB because of their disability, but that modifiable social determinants are also responsible for much of the observed difference. Finally, by analysing data from three separate

nationally-representative surveys (each using slightly different definitions of disability), our study adds methodological rigour to the existing evidence base.

### Limitations of this study

The study has four main limitations. First, it was not possible across the three surveys to disaggregate data by the nature or severity of the health condition/impairment associated with disability (e.g., cognitive vs. mobility impairments) or disability severity. This is problematic given the evidence that some aspects of PWB may vary considerably by such factors.<sup>44</sup> Second, general household surveys exclude people living in institutional settings and people who do not have the cognitive or communicative capacity to participate in survey interviews. Third, the surveys varied regarding a number of factors including: defining and measuring disability; mode of data collection (e.g., personal interview vs. online completion); and the population surveyed (the UK, Great Britain, England). As such, it is not possible to identify with any confidence specific issues that may underlie the observed variation in relationships between disability and PWB between surveys (e.g., the variation for both gender and ethnicity noted above). Further research is needed to address these issues. Finally, while the analysis identifies groups of people with disability who have particularly low PWB, it is not possible to identify the processes that produce these differences. While it may be plausible to speculate that the lower PWB of men with disability might be associated with the challenge of disability to prevailing conceptions of masculinity, further research is required to elucidate causal pathways.

### References

1. OECD. *How's Life 2017: Measuring Well-being*. Paris: OECD Publishing; 2017.
2. Exton C, Shinwell M. *Policy use of well-being metrics: Describing countries' experiences*. *OECD Statistics Working Papers, 2018/07*. Paris: OECD Publishing; 2018.
3. Diener E, Oishi S, Lucas RE. National Accounts of Subjective Well-Being. *American Psychologist*. 2015;70:234-242.
4. Allin P, Hand DJ. New statistics for old?—measuring the wellbeing of the UK. *Journal of the Royal Statistical Society: Series A - Statistics in Society*. 2017;180:3-43.
5. Office for National Statistics. *Methodology: Personal well-being user guidance*. Vol 20192018.
6. Office for National Statistics. *Personal and economic well-being in the UK: February 2019*. Newport: Office for National Statistics; 2019.
7. OECD. *Health at a Glance 2013: OECD Indicators*: OECD Publishing; 2013.
8. Diener E, Heintzelman SJ, Kushlev K, et al. Findings all psychologists should know from the new science on subjective well-being. *Canadian Psychology*. 2017;58:87.
9. Office for National Statistics. *Personal and economic well-being: what matters most to our life satisfaction?*2019.
10. Graham C, Pinto S. Unequal hopes and lives in the USA: optimism, race, place, and premature mortality. *Journal of Population Economics*. 2019;32:665-733.

11. Sun S, Chen J, Johannesson M, Kind P, Burstrom K. Subjective Well-Being and Its Association with Subjective Health Status, Age, Sex, Region, and Socio-economic Characteristics in a Chinese Population Study. *J Happiness Stud.* 2016;17:833–873.
12. Oguz S, Merad S, Snape D. Measuring National Well-being - What matters most to Personal Well-being? Newport: Office for National Statistics; 2013.
13. Diener E, Chan MY. Happy People Live Longer: Subjective Well-Being Contributes to Health and Longevity. *Applied Psychology-Health and Well Being.* 2011;3:1-43.
14. Steptoe A, Deaton A, Stone AA. Subjective wellbeing, health, and ageing. *Lancet.* 2015;385:640-648.
15. Lawrence EM, Rogers RG, Wadsworth T. Happiness and longevity in the United States. *Social Science & Medicine.* 2015;145:115-119.
16. Dolan P, Peasgood T, White M. Do we really know what makes us happy? A review of the economic literature on the factors associated with subjective well-being. *Journal of Economic Psychology.* 2008;29:94-122.
17. Wadsworth T. Marriage and Subjective Well-Being: How and Why Context Matters. *Social Indicators Research.* 2016;126:1025-1048.
18. World Health Organization. *Closing the gap in a generation: Health equity through action on the social determinants of health. Final report of the Commission on the Social Determinants of Health.* Geneva: World Health Organization; 2008.
19. Office for National Statistics. Understanding well-being inequalities: Who has the poorest personal well-being? Newport: Office for National Statistics; 2018.
20. Jiang B, Walstab J, Reid SM, Davis E, Reddihough D. Quality of life in young adults with cerebral palsy. *Disability & Health Journal.* 2016;9:673-681.
21. Brickman P, Coates D, Janoff-Bulman R. Lottery winners and accident victims: Is happiness relative? *Journal of Personality & Social Psychology.* 1978;36:917-927.
22. Albrecht GL, Devlieger PJ. The disability paradox: high quality of life against all odds. *Social Science & Medicine.* 1999;48:977-988.
23. Savage A, McConnell D, Emerson E, Llewellyn G. Disability-based inequity in youth subjective well-being: current findings and future directions. *Disability & Society.* 2014;29:877-892.
24. Emerson E, Llewellyn G, Honey A, Kariuki M. Lower well-being of young Australian adults with self-reported disability reflects their poorer living conditions rather than health issues. *Australian and New Zealand Journal of Public Health.* 2012;36:176-182.
25. Arciuli J, Emerson E, Llewellyn G. Self-report of school satisfaction: The interaction between disability and gender. *School Psychology Quarterly.* 2019;34:148-158.
26. Bierman A. Is Marital Status a Critical Contingency in the Relationship Between Physical Limitations and Subjective Well-Being Among Japanese Adults? *Journal of Family Issues.* 2014;35:1876-1897.
27. Anusic I, Yap SCY, Lucas RE. Testing Set-Point Theory in a Swiss National Sample: Reaction and Adaptation to Major Life Events. *Social Indicators Research.* 2014;119:1265-1288.
28. Lucas RE. Long-Term Disability Is Associated With Lasting Changes in Subjective Well-Being: Evidence From Two Nationally Representative Longitudinal Studies. *Journal of Personality and Social Psychology.* 2007;92:717–730.
29. Emerson E, Kariuki M, Honey A, Llewellyn G. Becoming disabled: The association between disability onset in younger adults and subsequent changes in productive engagement, social support, financial hardship and subjective wellbeing. *Disability and Health Journal.* 2014;7:448-456.
30. Kuhn U, Brule G. Buffering effects for negative life events: the role of material, social, religious and personal resources. *Journal of Happiness Studies.* 2019;20:1397–1417.
31. World Health Organization, World Bank. World report on disability. Geneva: WHO; 2011.
32. Freedman VA, Carr D, Cornman JC, Lucas RE. Aging, mobility impairments and subjective wellbeing. *Disability and Health Journal.* 2017;10:525-531.

33. Office for National Statistics. *Annual population survey (APS) QMI*. London: Office for National Statistics; 2012.
34. Office for National Statistics. *Labour Force Survey User Guide: Vol 6: Annual Population Survey/Local Area Database*. Newport: Office for Disability National Statistics; 2017.
35. Office for National Statistics. *Life Opportunities Survey*. Newport: Office for National Statistics; 2011.
36. Office for National Statistics. *Life Opportunities Survey: Wave Three, Final Report, October 2012 to September 2014*. Newport: Office for National Statistics; 2015.
37. Department for Digital Culture Media and Sport. *Community Life Online and Paper Survey Technical Report 2016-17*. London: Department for Digital, Culture Media and Sport; undated.
38. Office for Disability Issues. *Equality Act 2010: Guidance on matters to be taken into account in determining questions relating to the definition of disability*. London: Office for Disability Issues  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/570382/Equality\\_Act\\_2010-disability\\_definition.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/570382/Equality_Act_2010-disability_definition.pdf); 2011.
39. Office for National Statistics. *SOC 2010: The current standard occupational classification for the UK. Vol 2019*.
40. Richardson JTE. Eta squared and partial eta squared as measures of effect size in educational research. *Educational Research Review*. 2011;6:135-147.
41. Scheim AI, Bauer GR. The Intersectional Discrimination Index: Development and validation of measures of self-reported enacted and anticipated discrimination for intercategory analysis. *Social Science & Medicine*. 2019;226:225-235.
42. Evans CR, Williams DR, Onnela J-P, Subramanian SV. A multilevel approach to modeling health inequalities at the intersection of multiple social identities. *Social Science & Medicine*. 2018;203:64–73.
43. Diderichsen F, Hallqvist J, Whitehead M. Differential vulnerability and susceptibility: how to make use of recent development in our understanding of mediation and interaction to tackle health inequalities. *International Journal of Epidemiology*. 2019;48:268–274.
44. Emerson E, King T, Llewellyn G, et al. Emotional difficulties and self-harm among British adolescents with and without disabilities. *Disability & Health Journal*. 2019 online;  
<https://doi.org/10.1016/j.dhjo.2019.04.007>

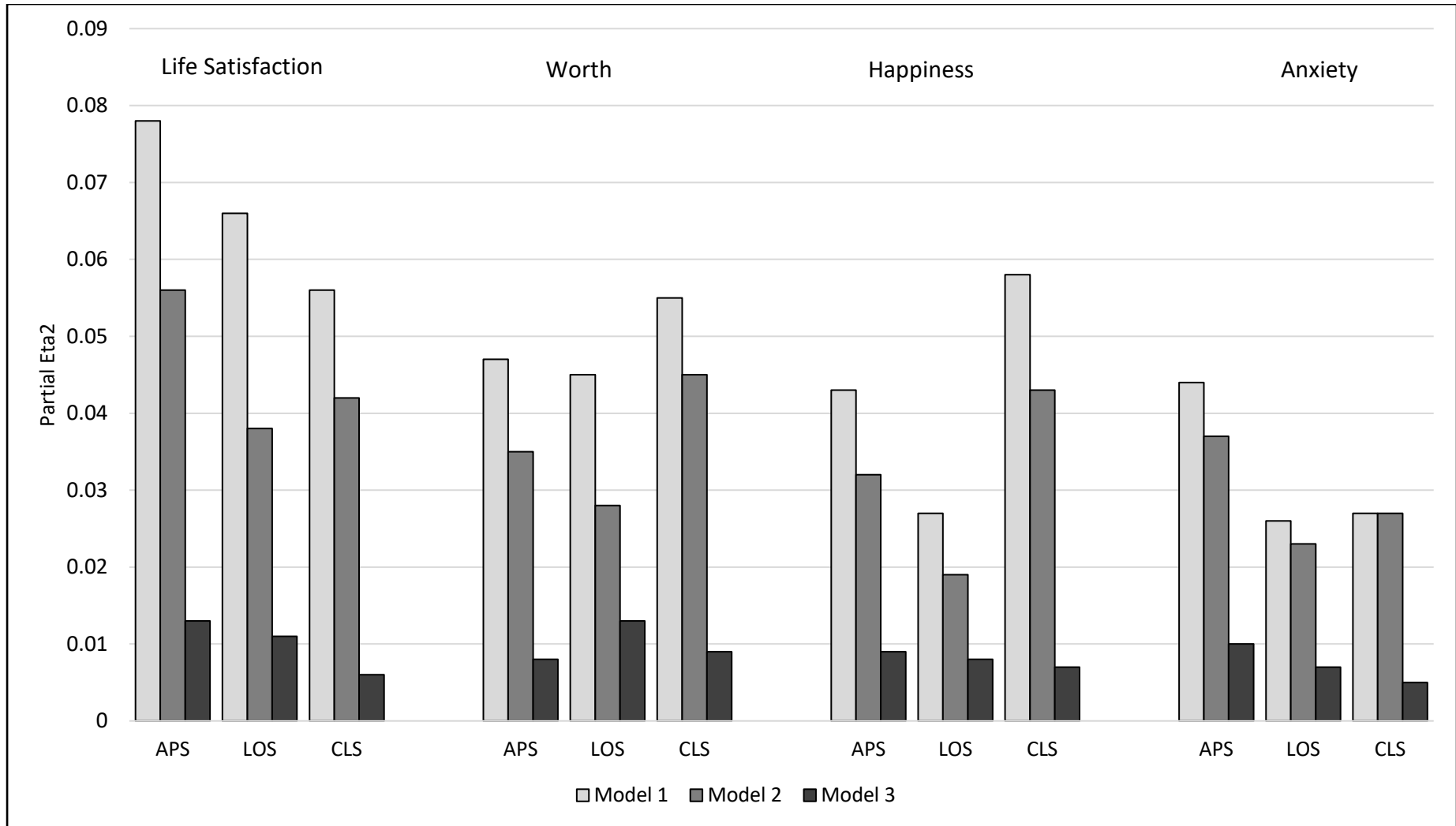
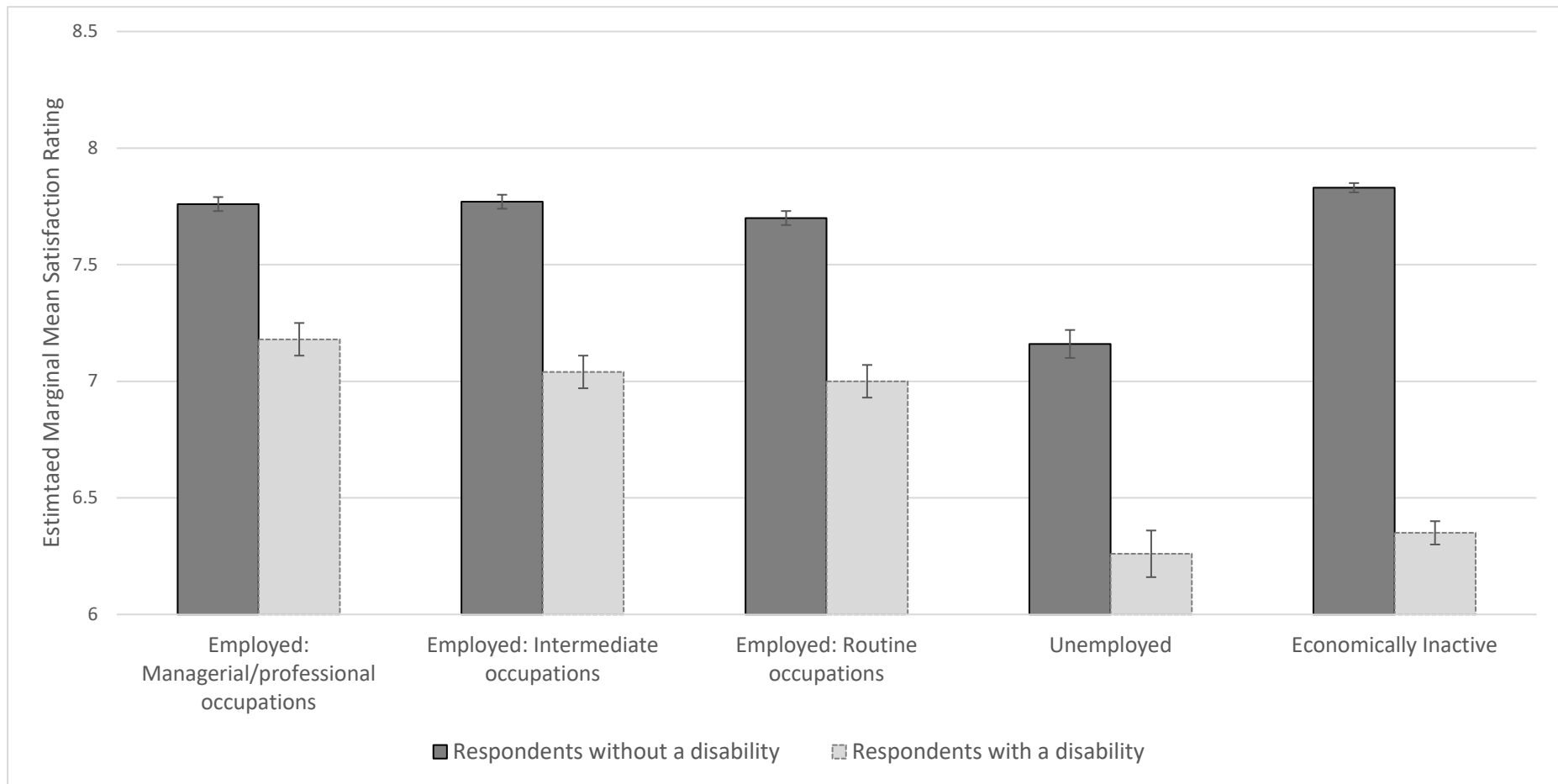


Figure 1: Effect size of disability (main effect) by indicators of PWB, survey and analytic model

Figure 2: Estimated marginal means (with 95% confidence intervals) for life satisfaction by disability and employment status (APS)



| <b>Table 1: Association between disability status and personal wellbeing in the APS, LOS and CLS</b> |    |             |        |        |                     |             |       |        |                     |             |       |        |                     |
|--|----|-------------|--------|--------|---------------------|-------------|-------|--------|---------------------|-------------|-------|--------|---------------------|
|  |    | APS         |        |        |                     | LOS         |       |        |                     | CLS         |       |        |                     |
|  | df | Mean square | F      | p      | Partial Eta Squared | Mean square | F     | p      | Partial Eta Squared | Mean square | F     | p      | Partial Eta Squared |
| <b>Satisfaction</b>  |    |             |        |        |                     |             |       |        |                     |             |       |        |                     |
| Disability main effect   |    |             |        |        |                     |             |       |        |                     |             |       |        |                     |
| Model 1  | 1  | 23051.0     | 8593.0 | <0.001 | 0.078               | 1518.2      | 535.8 | <0.001 | 0.066               | 1254.5      | 322.9 | <0.001 | 0.056               |
| Model 2  | 1  | 15246.7     | 6000.7 | <0.001 | 0.056               | 790.4       | 299.2 | <0.001 | 0.038               | 909.4       | 240.8 | <0.001 | 0.042               |
| Model 3  | 1  | 3490.4      | 1392.9 | <0.001 | 0.013               | 212.1       | 81.5  | <0.001 | 0.011               | 117.2       | 31.2  | <0.001 | 0.006               |
| Statistically significant disability interactions  |    |             |        |        |                     |             |       |        |                     |             |       |        |                     |
| Disability*employment  | 4  | 499.9       | 199.5  | <0.001 | 0.008               | 45.6        | 17.5  | <0.001 | 0.009               | 20.9        | 5.6   | <0.001 | 0.004               |
| Disability*education   | 4  | 19.0        | 7.6    | <0.001 | <0.001              |             |       |        |                     |             |       |        |                     |
| Disability* partnership status   | 1  | 516.4       | 206.1  | <0.001 | 0.002               |             |       |        |                     |             |       |        |                     |
| Disability*gender  | 1  | 136.9       | 54.6   | <0.001 | 0.001               | 110.1       | 42.3  | <0.001 | 0.006               |             |       |        |                     |
| Disability*age   | 2  | 67.2        | 26.8   | <0.001 | 0.001               | 18.4        | 7.1   | 0.001  | 0.002               |             |       |        |                     |
| Disability*ethnicity   | 1  | 122.4       | 48.8   | <0.001 | <0.001              |             |       |        |                     | 41.3        | 11.0  | 0.001  | 0.002               |
| <b>Worth</b>   |    |             |        |        |                     |             |       |        |                     |             |       |        |                     |
| Disability main effect   |    |             |        |        |                     |             |       |        |                     |             |       |        |                     |
| Model 1  | 1  | 13128.6     | 4988.7 | <0.001 | 0.047               | 961.9       | 354.3 | <0.001 | 0.045               | 1426.7      | 317.3 | <0.001 | 0.055               |
| Model 2  | 1  | 9273.0      | 3671.0 | <0.001 | 0.035               | 578.3       | 222.2 | <0.001 | 0.028               | 1114.7      | 258.3 | <0.001 | 0.045               |
| Model 3  | 1  | 2172.6      | 871.4  | <0.001 | 0.008               | 258.2       | 101.4 | <0.001 | 0.013               | 207.3       | 48.4  | <0.001 | 0.009               |
| Statistically significant disability interactions  |    |             |        |        |                     |             |       |        |                     |             |       |        |                     |
| Disability*employment  | 4  | 437.0       | 175.3  | <0.001 | 0.007               | 68.2        | 26.8  | <0.001 | 0.014               | 19.8        | 4.6   | 0.001  | 0.003               |
| Disability*education   | 4  | 40.4        | 16.2   | <0.001 | 0.001               |             |       |        |                     |             |       |        |                     |
| Disability* partnership status   | 1  | 511.2       | 205.0  | <0.001 | 0.002               |             |       |        |                     |             |       |        |                     |
| Disability*gender  |    | 90.5        | 36.3   | <0.001 | <0.001              | 64.9        | 25.5  | <0.001 | 0.003               |             |       |        |                     |
| Disability*age   | 2  | 71.8        | 28.8   | <0.001 | 0.001               | 36.4        | 14.3  | <0.001 | 0.004               | 24.9        | 5.8   | 0.003  | 0.002               |
| Disability*ethnicity   | 1  | 76.7        | 30.8   | <0.001 | <0.001              | 19.8        | 7.8   | 0.005  | 0.001               | 49.8        | 11.6  | 0.001  | 0.002               |



|   |   |         |        |        |        |        |       |        |       |        |       |        |       |  |
|---|---|---------|--------|--------|--------|--------|-------|--------|-------|--------|-------|--------|-------|--|
|   |   |         |        |        |        |        |       |        |       |        |       |        |       |  |
| <b>Happiness</b>                                  |   |         |        |        |        |        |       |        |       |        |       |        |       |  |
| Disability main effect                            |   |         |        |        |        |        |       |        |       |        |       |        |       |  |
| Model 1   | 1 | 18858.5 | 4589.2 | <0.001 | 0.043  | 892.2  | 208.6 | <0.001 | 0.027 | 1578.7 | 335.5 | <0.001 | 0.058 |  |
| Model 2   | 1 | 13515.5 | 3351.9 | <0.001 | 0.032  | 612.2  | 144.9 | <0.001 | 0.019 | 1126.7 | 245.5 | <0.001 | 0.043 |  |
| Model 3   | 1 | 3663.3  | 914.9  | <0.001 | 0.009  | 270.8  | 64.5  | <0.001 | 0.008 | 174.9  | 38.4  | <0.001 | 0.007 |  |
| Statistically significant disability interactions |   |         |        |        |        |        |       |        |       |        |       |        |       |  |
| Disability*employment                             | 4 | 339.7   | 84.8   | <0.001 | 0.003  | 29.0   | 6.9   | <0.001 | 0.004 | 27.6   | 6.1   | <0.001 | 0.004 |  |
| Disability*education                              | 4 | 57.9    | 14.5   | <0.001 | 0.001  |        |       |        |       | 16.2   | 3.6   | 0.007  | 0.003 |  |
| Disability* partnership status                    | 1 | 608.5   | 152.0  | <0.001 | 0.001  |        |       |        |       |        |       |        |       |  |
| Disability*gender                                 | 1 |         |        |        |        |        |       |        |       |        |       |        |       |  |
| Disability*age                                    | 2 | 38.0    | 9.5    | <0.001 | <0.001 |        |       |        |       |        |       |        |       |  |
| Disability*ethnicity                              | 1 | 59.1    | 14.8   | <0.001 | <0.001 |        |       |        |       | 65.3   | 14.4  | <0.001 | 0.003 |  |
| <b>Anxiety</b>                                    |   |         |        |        |        |        |       |        |       |        |       |        |       |  |
| Disability main effect                            |   |         |        |        |        |        |       |        |       |        |       |        |       |  |
| Model 1   | 1 | 35587.1 | 4720.4 | <0.001 | 0.044  | 1586.8 | 205.9 | <0.001 | 0.026 | 1141.2 | 151.3 | <0.001 | 0.027 |  |
| Model 2   | 1 | 29032.1 | 3883.0 | <0.001 | 0.037  | 1335.9 | 176.0 | <0.001 | 0.023 | 1115.7 | 149.8 | <0.001 | 0.027 |  |
| Model 3   | 1 | 7583.0  | 1019.8 | <0.001 | 0.010  | 399.3  | 52.9  | <0.001 | 0.007 | 202.9  | 27.3  | <0.001 | 0.005 |  |
| Statistically significant disability interactions |   |         |        |        |        |        |       |        |       |        |       |        |       |  |
| Disability*employment                             | 4 | 330.1   | 44.4   | <0.001 | 0.002  | 34.1   | 4.5   | 0.001  | 0.002 |        |       |        |       |  |
| Disability*education                              | 4 | 99.0    | 13.3   | <0.001 | 0.001  |        |       |        |       |        |       |        |       |  |
| Disability* partnership status                    | 1 | 411.9   | 55.4   | <0.001 | 0.001  |        |       |        |       |        |       |        |       |  |
| Disability*gender                                 | 1 | 100.1   | 13.5   | <0.001 | <0.001 |        |       |        |       | 55.0   | 7.4   | 0.007  | 0.001 |  |
| Disability*age                                    | 2 | 383.6   | 51.6   | <0.001 | 0.001  |        |       |        |       |        |       |        |       |  |
| Disability*ethnicity                              | 1 | 461.4   | 62.1   | <0.001 | 0.001  |        |       |        |       | 53.4   | 7.2   | 0.007  | 0.001 |  |

## Supplementary File 1: Sampling and Procedures

### *Annual Population Survey 2017-18*

The APS combines data from four successive quarters of the Labour Force Survey. The sample frame for the survey in Great Britain is the Royal Mail Postcode Address File and the National Health Service communal accommodation list. Due to the low population density in the far north of Scotland, telephone directories are used as sampling frames. In Northern Ireland, the Rating and Valuation Lists are used. Interviews are carried out either Computer Assisted Personal Interviews (CAPI) or Computer Assisted Telephone Interviews (CATI). All data used in the present study were collected using CAPI or CATI directly with the respondent (i.e., information obtained by proxy interview was not used in our analyses), giving a potentially usable unweighted sample size of 108,655 working age adults (age 18-64). The household response rate was estimated at 42.2% for all eligible households and 47.9% for households where some degree of contact was made.

### *Life Opportunities Survey*

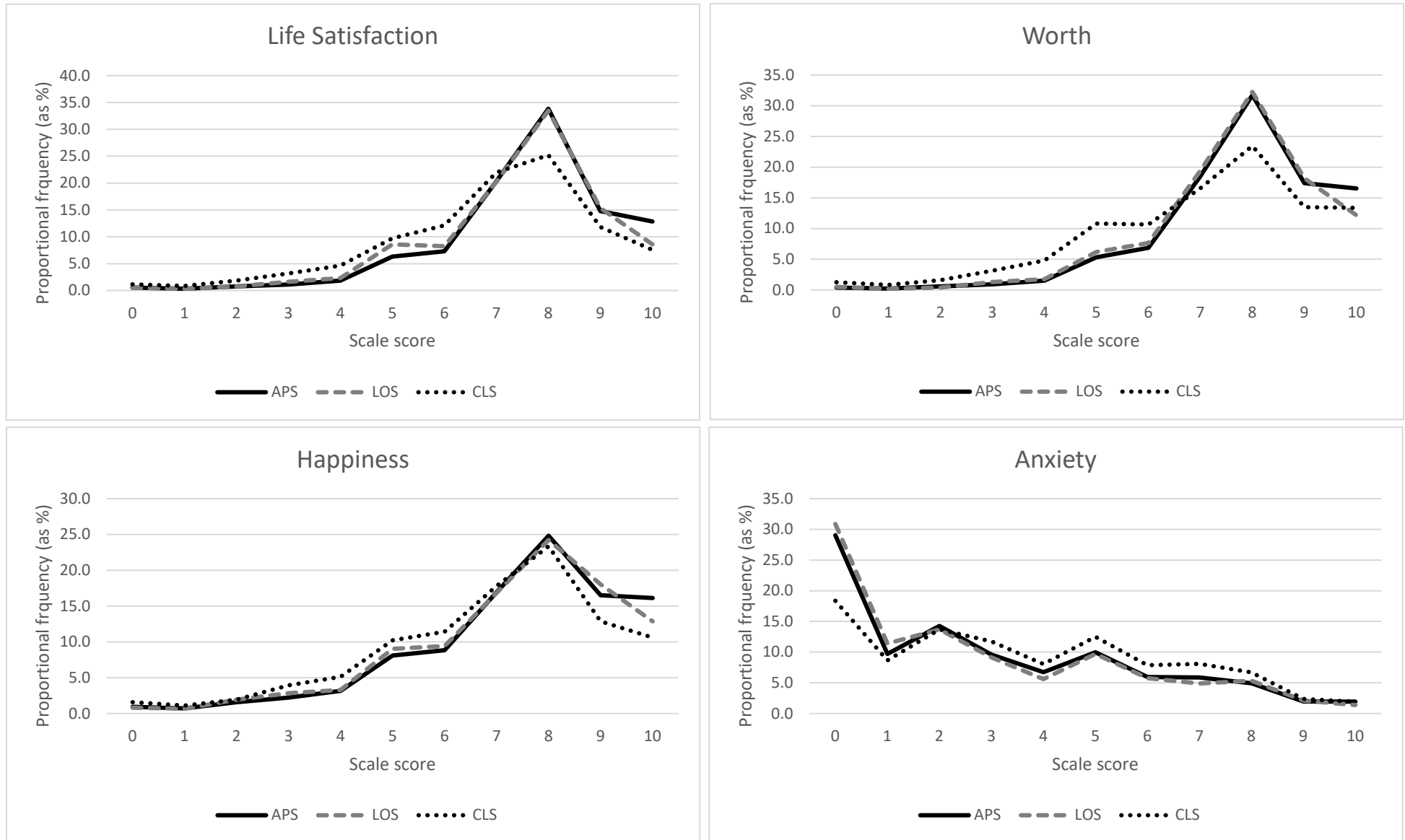
In the first wave of data collection (June 2009 to March 2011), random unclustered sampling from the small users Postcode Address File identified 34,004 eligible households. Interviews were completed with 37,513 individuals from 19,951 households (household response rate = 59%). Respondents were followed up after approximately 1 year (Wave 2) and approximately 2.5 years after the Wave 2 interview (Wave 3). Wave 3 (the only wave at which wellbeing measures were collected) achieved a household level response rate of 66% and an individual response rate of 64% with 7,687 interviews undertaken with working age adults (age 18-64). All data used in the present study were collected using CAPI directly with the respondent, giving a potentially usable unweighted sample size of 5,530.

### *Community Life Survey 2016-17*

CLS is an online survey. Invitations for the 2016-17 survey were sent out to 28,170 addresses, resulting in the completion of 7,365 online questionnaires. Random postal address sampling was used to select potential respondents with oversampling in areas with high proportions of minority ethnic communities. At each address, all permanently resident adults aged 16+ were invited to take part in the survey. The online household response rate was estimated at 18.9%, and the person level response rate was estimated at 15.0%. Responses were obtained from 5,818 working age respondents (age 16-64).

| Supplementary Table 1: Association between disability status and six potentially moderating variables |                   |                      |                             |                  |                     |                                  |                  |                     |                                   |
|---|-------------------|----------------------|-----------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|-----------------------------------|
|   | APS               |                      |                             | LOS              |                     |                                  | CLS              |                     |                                   |
|   | PWD<br>(n=21,275) | Others<br>(n=86,799) | X <sup>2</sup> & p<br>value | PWD<br>(n=1,439) | Others<br>(n=5,926) | X <sup>2</sup> & p<br>value      | PWD<br>(n=1,023) | Others<br>(n=4,669) | X <sup>2</sup> & p<br>value       |
| <i>Age</i>  |                   |                      | X <sup>2</sup> =            |                  |                     | X <sup>2</sup> =                 |                  |                     | X <sup>2</sup> =                  |
| <30   | 18.1%             | 27.5%                | 2255.8,<br>p<0.001          | 8.0%             | 18.3%               | 183.8,<br>p<0.001                | 23.7%            | 29.6%               | 120.3,<br>p<0.001                 |
| 30-49   | 38.1%             | 45.5%                |                             | 42.4%            | 49.3%               |                                  | 33.5%            | 44.7%               |                                   |
| 50-64   | 43.9%             | 27.5%                |                             | 49.6%            | 32.4%               |                                  | 42.8%            | 25.7%               |                                   |
| <i>Gender</i>   |                   |                      | X <sup>2</sup> =            |                  |                     | X <sup>2</sup> = 1.0,<br>p=0.317 |                  |                     | X <sup>2</sup> = 4.5,<br>p=0.035  |
| Men   | 43.4%             | 51.2%                | 416.0,<br>p<0.001           | 45.4%            | 46.9%               |                                  | 46.9%            | 50.5%               |                                   |
| Women   | 56.6%             | 48.8%                |                             | 54.5%            | 53.1%               |                                  | 53.1%            | 49.5%               |                                   |
| <i>Ethnicity</i>  |                   |                      | X <sup>2</sup> =            |                  |                     | X <sup>2</sup> = 2.1,<br>p=0.154 |                  |                     | X <sup>2</sup> = 20.4,<br>p<0.001 |
| BME   | 10.5%             | 14.0%                | 180.3,<br>p<0.001           | 8.9%             | 10.2%               |                                  | 11.0%            | 16.7%               |                                   |
| Non-BME   | 89.5%             | 86.0%                |                             | 91.1%            | 89.8%               |                                  | 89.0%            | 83.3%               |                                   |
| <i>Partnership Status</i>   |                   |                      | X <sup>2</sup> =            |                  |                     | X <sup>2</sup> =                 |                  |                     | X <sup>2</sup> = 37.8,<br>p<0.001 |
| Living as a couple  | 50.7%             | 62.8%                | 1046.5,<br>p<0.001          | 59.2%            | 68.3%               | 43.0,<br>p<0.001                 | 58.3%            | 68.3%               |                                   |
| Not   | 49.3%             | 37.2%                |                             | 40.8%            | 31.7%               |                                  | 41.7%            | 31.7%               |                                   |
| <i>Employment Status</i>  |                   |                      | X <sup>2</sup> =            |                  |                     | X <sup>2</sup> =                 |                  |                     | X <sup>2</sup> =                  |
| Employed (higher managerial/professional)   | 19.6%             | 37.9%                | 7754.8,<br>p<0.001          | 18.3%            | 35.6%               | 615.8,<br>p<0.001                | 29.4%            | 42.6%               | 273.4,<br>p<0.001                 |
| Employed (intermediate)   | 16.7%             | 24.7%                |                             | 17.2%            | 25.8%               |                                  | 15.2%            | 21.9%               |                                   |
| Employed (semi-routine/routine occupations)   | 13.2%             | 15.9%                |                             | 14.7%            | 18.6%               |                                  | 11.2%            | 15.5%               |                                   |
| Unemployed  | 5.3%              | 3.3%                 |                             | 11.7%            | 5.7%                |                                  | 4.6%             | 3.1%                |                                   |
| Economically inactive   | 45.3%             | 18.2%                |                             | 38.1%            | 13.2%               |                                  | 39.5%            | 16.9%               |                                   |
| <i>Educational Attainment</i>   |                   |                      | X <sup>2</sup> =            |                  |                     | X <sup>2</sup> =                 |                  |                     | X <sup>2</sup> = 69.8,<br>p<0.001 |
| Higher educational qualification  | 30.6%             | 45.1%                | 3347.3,<br>p<0.001          | 27.4%            | 40.8%               | 271.3,<br>p<0.001                | 34.0%            | 44.9%               |                                   |
| A-Levels or equivalent  | 22.7%             | 25.4%                |                             | 14.3%            | 20.6%               |                                  | 15.8%            | 17.2%               |                                   |
| O Level or GCSE grade A-C or equivalent   | 23.2%             | 17.9%                |                             | 27.1%            | 22.7%               |                                  | 23.9%            | 21.0%               |                                   |
| Other qualifications (including overseas)   | 10.1%             | 6.9%                 |                             | 14.8%            | 10.0%               |                                  | 12.8%            | 9.2%                |                                   |
| No formal qualifications  | 13.4%             | 4.7%                 |                             | 16.4%            | 5.9%                |                                  | 13.6%            | 7.7%                |                                   |

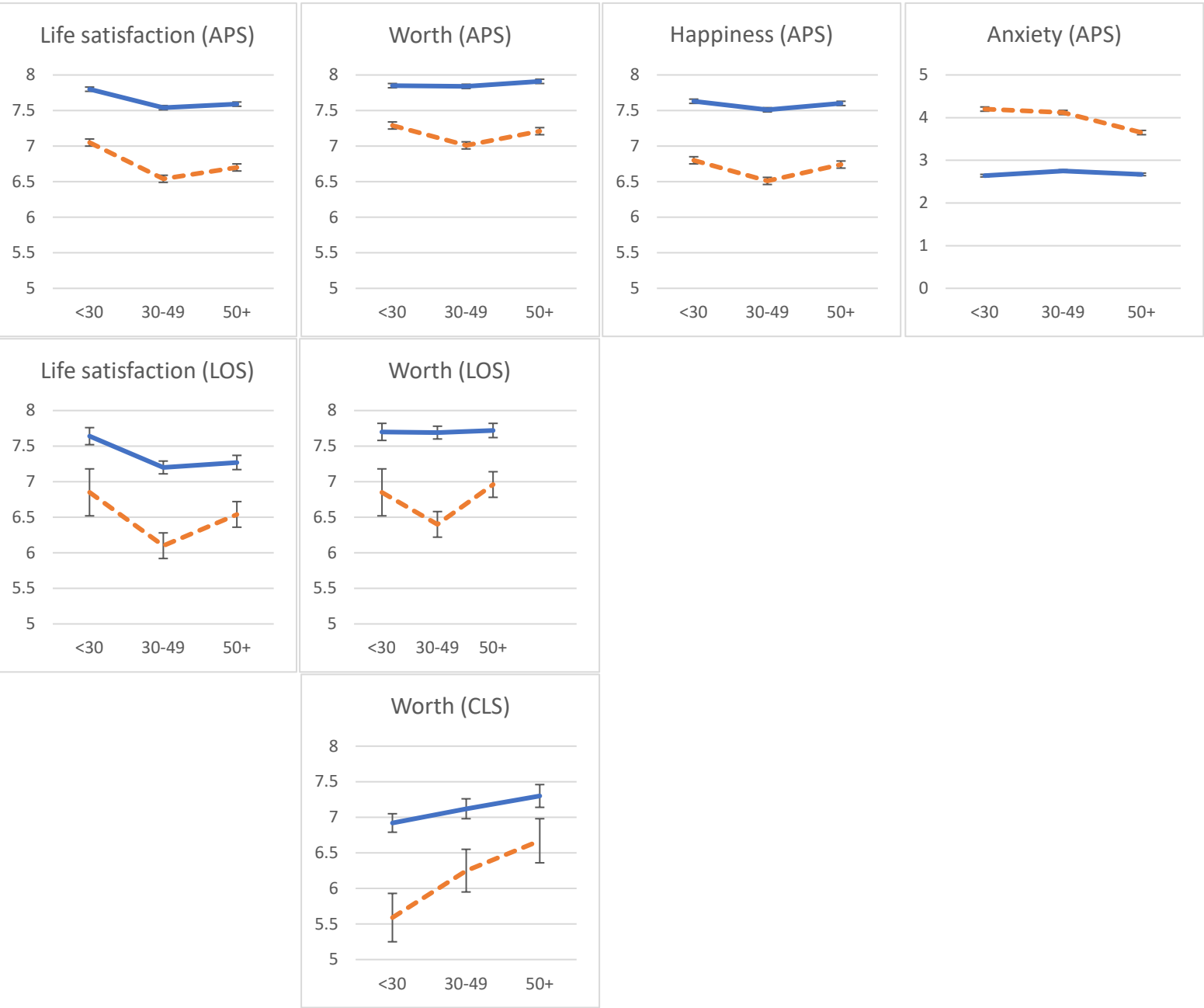
Supplementary Figure 1: Distribution of PWB scores across surveys



Supplementary Figure 2: Estimated Marginal Means for Significant Interactions between Disability and Gender



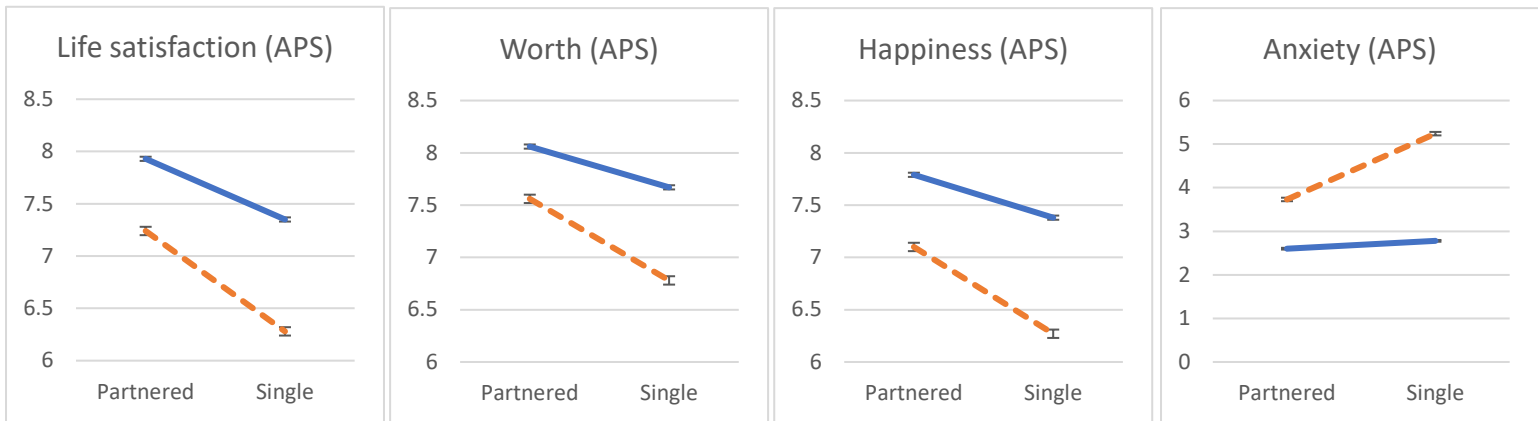
Supplementary Figure 3: Estimated Marginal Means for Significant Interactions between Disability and Age



Supplementary Figure 4: Estimated Marginal Means for Significant Interactions between Disability and Ethnicity

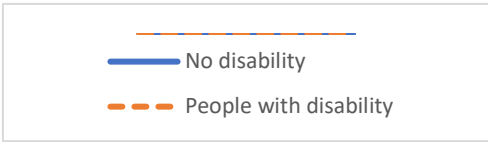
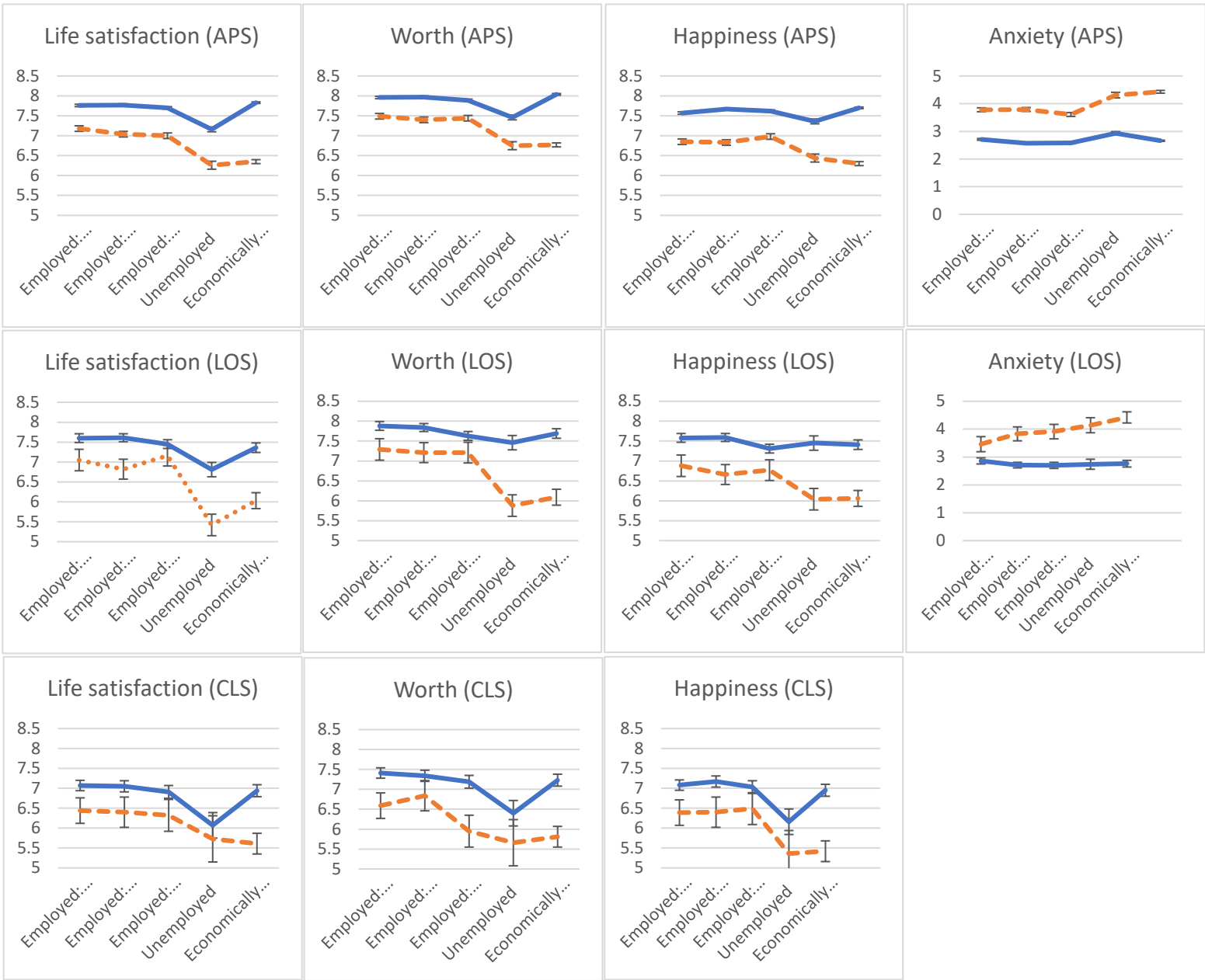


Supplementary Figure 5: Estimated Marginal Means for Significant Interactions between Disability and Partnership Status





Supplementary Figure 6: Estimated Marginal Means for Significant Interactions between Disability and Employment Status



Supplementary Figure 7: Estimated Marginal Means for Significant Interactions between Disability and Highest Educational Attainment

