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**The Health of Parents with and without Intellectual
Impairment in the UK**

Abstract

Background: Little is known about the health and wellbeing of the 'hidden majority' of parents with mild intellectual disability, who are less likely to be in contact with disability services.

Method: We sought to add to knowledge in this area by examining the health and living conditions of parents with and without intellectual impairment in a large contemporary nationally representative sample of UK parents aged between 16 and 49 years old (n=14,371).

Results: Our results indicated that, as expected, parents with intellectual impairment were at significantly greater risk than other parents of having poorer self-reported general, mental and physical health. They were also at significantly greater risk of experiencing higher rates of household socio-economic disadvantage and environmental adversities and lower rates of neighborhood social capital and intergenerational support. Adjusting risk estimates to take account of between group differences in household socio-economic disadvantage eliminated statistically significant differences in health status between parents with and without intellectual impairment on all but one indicator (obesity). Further adjusting risk estimates to take account of between group differences in neighborhood adversity, neighborhood social capital and intergenerational support had minimal impact on the results.

Conclusions: That controlling for between-group differences in exposure to socio-economic disadvantage largely eliminated evidence of poorer health among parents with intellectual impairment is consistent with the view that a significant proportion of the poorer health of people with intellectual disabilities may be attributable to their poorer living conditions rather than biological factors associated with intellectual disability per se.

Keywords: intellectual disability, intellectual impairment, parents, parenting, health, poverty, socio-economic disadvantage

Introduction

While the scientific literature on parenting by people with intellectual disability has entered its seventh decade, it continues to face some significant methodological challenges (IASSID Special Interest Research Group on Parents and Parenting with Intellectual Disabilities 2008, Llewellyn 2012, Llewellyn and Hindmarsh 2015, online early, Llewellyn *et al.* 2010, Wilson *et al.* 2013). These include: the almost exclusive focus on mothers with intellectual disability (Mayes and Sigurjonsdottir 2010); the lack of robust data about parents with intellectual disability and their parenting compared to the non-disabled parent population (Llewellyn and Hindmarsh 2015, online early); the lack of knowledge about the influence of various individual adult, child, family and environmental variables on parents with intellectual disability and their parenting (Feldman 2002, Wade *et al.* 2011); and concerns about bias resulting from the field's reliance on the use of samples drawn from administrative databases of people with intellectual disability who are in contact with disability or other welfare services (IASSID Special Interest Research Group on Parents and Parenting with Intellectual Disabilities 2008, Llewellyn 2012, Llewellyn and Hindmarsh 2015, online early, Llewellyn *et al.* 2010).

The latter is of particular concern as: (1) most parents with intellectual disability have mild or borderline cognitive limitations; and (2) most people with mild or borderline cognitive limitations do not use and are not known to disability services (Emerson 2011, Emerson and Glover 2012, Tymchuk *et al.* 2001). As such, reliance on convenience samples drawn from administrative records is likely to focus attention on a particular subsample of parents with intellectual disability (e.g., those with more severe disabilities, those who also have mental health problems, those who have difficulty parenting). This potential bias could lead to an overestimation of the impact of parenting with an intellectual disability on parental health and on child health and development.

One approach to addressing these issues is to extract information from national population surveys (Llewellyn and Hindmarsh 2015, online early). The advantage of this approach is that a large number of respondents are recruited using sampling strategies that ensure representativeness

within a defined sampling frame at the population level. This allows for analysis of between group differences on survey items and also for testing hypotheses of relationships between variables of theoretical interest. The standout findings from the small number of studies that have used data extracted from national population surveys are that: (1) at the birth of a child, mothers with intellectual disability are more likely to experience several risk factors of pregnancy including younger maternal age, single parenthood, low birth weight newborns, poorer mental health, and lower socio-economic position (Goldacre *et al.* 2014 online early, Hindmarsh *et al.* 2014); (2) that in the early years, parents with intellectual disability also experience poorer mental health, socio-economic circumstances and environmental adversities (Emerson and Brigham 2013); and (3) while many children of parents with intellectual disability do not appear to experience poor developmental outcomes, they do as a group show significantly higher rates of poorer outcomes when compared to their peers, although the risk of poorer outcomes appears to be related to increased risk of exposure to low socio-economic position and other environmental adversities rather than parental intellectual disability per se (Emerson and Brigham 2013, Emerson and Brigham 2015, Feldman *et al.* 2012).

The aims of the present paper are to add to this growing literature by: (1) examining the health of parents with and without intellectual impairment in a contemporary population-based survey of adults in the UK; and (2) to estimate the extent to which any between-group differences in health status could be potentially attributable to between-group differences in rates of exposure to some common social determinants of poor health.

Methods

We undertook secondary analysis of data collected in the first four waves of *Understanding Society*, a new annual household panel survey focusing on the social and economic circumstances, attitudes, behaviours and health of UK citizens (<https://www.understandingsociety.ac.uk/>). Data were downloaded from the UK Data Archive (<http://www.data-archive.ac.uk/>). Full details of the surveys' development and methodology are available in a series of reports (Boreham *et al.* 2012,

Buck and McFall 2012, Knies 2014, McFall 2012, McFall and Garrington 2011, Saggar 2014), key aspects of which are summarized below.

Samples

Understanding Society incorporates a complex sample design with four components: a new general population sample; a new ethnic minority boost sample; a new Innovation Panel; and the existing British Household Panel Survey (Buck and McFall 2012). In the first wave of data collection (undertaken between January 2009 and March 2011), random sampling from the Postcode Address File in Great Britain and the Land and Property Services Agency list of domestic properties in Northern Ireland were used to identify a sample of 55,684 households. Interviews were completed with 50,994 individuals aged 16 or older from 30,169 households, giving a household response rate of 54% and an individual response rate within co-operating households of 86% (Buck and McFall 2012, Knies 2014). Sample sizes for subsequent Waves are: Wave 2 (January 2010 and March 2012) 54,584 individuals from 30,428 households; Wave 3 (January 2011 and July 2013) 49,708 individuals from 27,715 households; and Wave 4 (January 2012 and June 2014) 47,132 individuals from 25,814 households (Knies 2014). Longitudinal individual re-interview rates have risen consistently from 75% (between Waves 1 and 2) to 85% (between Waves 3 and 4) (Knies 2014).

Procedures

Data collection for variables used in the present paper was undertaken using Computer Assisted Personal Interviewing or by self-report completed during the interview visit (see below).

Measures

Intellectual Impairment

Understanding Society does not include information on the formal diagnosis of intellectual disability. As a result, we identified adults with intellectual impairment (as a proxy for intellectual disability) on the basis of the results of cognitive testing undertaken at Wave 3 and self-reported educational attainment. The vast majority of children with intellectual disability have very low educational attainment (Department for Education 2013). As a result, low self-reported educational

attainment (no educational qualifications) was used as a selection criterion as evidence that low cognitive ability may have originated in childhood (one of the defining characteristics of intellectual disability). Due to historical changes in educational qualifications and attainment in the UK, we restricted our analysis to the age range 16-49 years.

In Wave 3 a battery of five cognitive tests was used to assess memory (two tests) and cognitive functioning (three tests; Number Series, Verbal Fluency, Numerical Ability) (McFall 2013). The Number Series test was developed for use in the US Health and Retirement Study (HRS) (Fisher *et al.* 2013). The Verbal Fluency test has been used in the English Longitudinal Study of Ageing (ELSA) (Llewellyn and Matthew 2009), the German Socio-economic Panel Study (Lang *et al.* 2007) and the National Survey of Health and Development (Richards *et al.* 2004). The Numerical Ability test was taken from ELSA and some portions of it have been used in the HRS and Survey of Health, Ageing and Retirement in Europe (Banks *et al.* 2006).

First, we standardized test scores on the latter three tests to have a mean of zero and standard deviation of one. Second, we used linear regression to impute missing standardized test scores from obtained scores on completed tests. No other variables were used in the imputation process. This led to the imputation of Numeric Ability scores for 153 participants (0.6% of the used sample), Verbal Fluency scores for 141 participants (0.6%) and Number Series scores for 1,214 participants (4.9%). Third, we used principal components analysis to extract the first component (which accounted for 63% of the variance) from the three scales as an estimate of general intelligence (Emerson *et al.* 2014a, Jones and Schoon 2008). Fourth, we identified participants as having intellectual impairment if they scored lower than two standard deviations below the mean on the extracted component (the conventional cut-off point for defining intellectual disability used in ICD-10, World Health Organization 1996) and had no educational qualifications. This identified 294 participants (1.2% of the unweighted age-restricted sample) as having intellectual impairment. An additional 532 participants scored lower than two standard deviations below the mean on the extracted component but did have educational qualifications. Of these, 20% had a graduate level

qualification, 20% A-Level qualifications, 38% General Certificate of Secondary Education (GCSE) qualifications and 22% 'other' qualifications. Given the low educational attainment of children with intellectual disabilities (Department for Education 2013) and lack of information on the nature of 'other' qualifications and grades attained at GCSE level, we allocated these participants to the non-intellectual impairment group.

Fifth, we included in the intellectual impairment group five participants who gave consent for testing but for whom all three tests were terminated due to their inability to understand the test instructions (as deemed by the interviewer), and also had no educational qualifications. The complete procedure identified 299 participants (1.2% of the unweighted age-restricted sample) as having intellectual impairment.

Parenting

Participants were identified as parents if in Waves 1-4 they reported that a biological child of theirs was living in the household, that a biological child of theirs who was under 16 years of age was living elsewhere or they had ever given birth to/fathered a child. This procedure identified 197 parents with intellectual impairment (66% of participants with intellectual impairment) and 14,174 parents without intellectual impairment (57% of participants without intellectual impairment).

Health

Information on health was collected by a combination of computer assisted personal interviewing (CAPI) and computer assisted self-completion. CAPI variables included a measure of self-rated health incorporating five possible response options: *'In general, would you say your health is ... (1) excellent, (2) very good, (3) good, (4) fair, (5) poor'* (Bowling 2005, DeSalvo *et al.* 2006). We converted these data into a binary measure of 'poor' vs. better than 'poor' health.

In Waves 1-4 participants were asked *'Has a doctor or other health professional ever told you that you have any of the conditions listed on this card?'* Response options included: asthma, arthritis, congestive heart failure, coronary heart disease, angina, heart attack or myocardial infarction, stroke, emphysema, hyperthyroidism or an over-active thyroid, hypothyroidism or an under-active

thyroid, chronic bronchitis, any kind of liver condition, cancer or malignancy, diabetes, epilepsy, high blood pressure. No information is available on the psychometric properties of this item. We combined data across Waves 1-4 to derive lifetime prevalence rates of each health condition. Due to very low prevalence rates of specific conditions we derived a measure of respiratory disorder (one or more of emphysema or chronic bronchitis), other cardio-vascular disease (one or more of congestive heart failure, coronary heart disease, angina, heart attack or myocardial infarction, stroke) and thyroid condition (one or more of hyperthyroidism or an over-active thyroid, hypothyroidism or an under-active thyroid). In Wave 1 self-reported weight and height was collected and from these data BMI was calculated and obesity determined as $BMI \geq 30$ (National Obesity Observatory 1999).

Participants were also asked if since the previous Wave they had had a hospital admission for any newly diagnosed health conditions (using the list of conditions presented above). We combined data across Waves 2 to 4 to derive a variable of hospitalization for a newly diagnosed condition.

Two scales were administered by computer assisted self-completion, the 12-item version of the General Health Questionnaire (GHQ-12) (Goldberg and Williams 1988) and the 12-item version of (SF-12) (Jenkinson and Layte 1997). The self-completion procedure contained an option for either the interviewer or another person to help with the self-completion if required. The GHQ-12 is a widely used and well-validated screening measure of risk of potential mental health problems, containing 12 items concerning self-rated symptoms over the past four weeks (six worded positively, six worded negatively) using four-point scales relating to the frequency or severity of the symptom in comparison to what is usual for the respondent (e.g. better than usual; same as usual; less than usual; much less than usual). For this study the standard GHQ-12 scoring method (0,0,1,1) was used with a relatively conservative threshold of 4+ being indicative of probable caseness (Goldberg *et al.* 1997, Goldberg and Williams 1988). The SF-12 contains six items concerning mental health problems and six items concerning physical health problems, self-assessed as present state or over a short time period, with different response options for different items and a standard norm-based

algorithm used for combining item scores into a total mental health score (Ware *et al.* 1996a, Ware *et al.* 1996b). We used a cut off of 45.6 to identify participants with potential mental health problems (Vilagut *et al.* 2013). We derived a binary measure of SF-12 Physical Health on the basis of Wave 3 responses to the SF-12 Physical Component scores falling within the bottom decile of the weighted Wave 3 sample. Self-completion response rates were 55% for parents with intellectual impairment and 91% for parents without intellectual impairment.

Socio-Economic Disadvantage

We used five indicators of socio-economic disadvantage. **Poverty** was defined as the equivalised household income falling below 40% of the sample median (Emerson *et al.* 2006). **Self-assessed financial status** was assessed at Wave 3 by a single item: *'How well would you say you yourself are managing financially these days? Would you say you are... 1 Living comfortably, 2 Doing alright, 3 Just about getting by, 4 Finding it quite difficult or 5 finding it very difficult?'* This was recoded into a binary variable (1-3 vs 4-5). **Low household assets** was defined as owning eight or fewer of a list of twelve household items; colour television, video recorder/dvd player, satellite dish/sky tv, cable tv, deep freeze or fridge freezer (exclude: fridge only), washing machine, tumble drier, dishwasher, microwave oven, home computer/pc (not games console), compact disc player (include if part of sound system), landline telephone, mobile telephone (anyone in household). **Not employed** was defined as not being employed on either a part or full-time basis. **Living in rented accommodation** was defined in contrast to all other forms of accommodation (primarily home ownership).

Neighborhood Adversities

Participants were asked about nine aspects of environmental adversity. *'Please tell me how common or uncommon each of the following things is in your area First, graffiti on walls or on buildings? Rubbish or litter lying around? Teenagers hanging around in streets? Drunks or tramps on the streets? Vandalism and deliberate damage to property? Insults or attacks to do with someone's race or colour? Homes broken into? Cars broken into or stolen? People attacked on the streets?'*

Response options were: 1 *Very common*; 2 *Fairly common*; 3 *Not very common*; 4 *Not at all common*.

Given the variables showed excellent internal consistency ($\alpha = 0.88$), scores were summed across items into a scale of 'neighborhood adversities' (range 9-36) that was then recoded into approximate sample terciles (low 33-36, medium 28-32, high 9-27).

Neighborhood Social Capital

A scale of neighborhood social capital was derived from 12 items relating to perceptions of neighborhood quality and civic and social participation (Emerson *et al.* 2014b). The items were: (1) *'Overall, do you like living in this neighborhood (Yes/No)?'* (2) *'Are you able to access all services such as healthcare, food shops or learning facilities when you need to (Yes/No)?'* (3) *'I am going to read out a set of statements that could be true about your neighborhood. Please tell me how much you agree or disagree that each statement describes your neighborhood (1 Strongly agree, 2 Agree, 3 Neither agree nor disagree, 4 Disagree, 5 Strongly disagree): (a) First, this is a close-knit neighborhood; (b) People around here are willing to help their neighbors; (c) People in this neighborhood can be trusted; (d) People in this neighborhood generally don't get along with each other.'* Data were recoded into binary variables; 1-2 vs 3-5 for positively worded questions (a-c), 1-3 vs 4-5 for question (d). (4) *'Now I have some questions about crime. Do you ever worry about the possibility that you, or anyone else who lives with you, might be the victim of crime? Is this a big worry, a bit of a worry, or an occasional doubt?'* Data were recoded into a binary variable; crime is a big worry vs not. (5) *'How safe do you feel walking alone in this area after dark? (1 Very safe, 2 Fairly safe, 3 A bit unsafe, 4 Very unsafe, 5 SPONTANEOUS: Never goes out after dark).'* Data were recoded into a binary variable fairly safe/very safe vs not. (6) *'How many close friends would you say you have?'* Data were recoded into a binary variable; two or more close friends vs not. (7) *'Do you go out socially or visit friends when you feel like it (Yes/No)?'* (8) *'Please tell me how easy or difficult you would find it to visit family or relatives when you need to (1 Very difficult, 2 Difficult, 3 Neither difficult nor easy, 4 Easy, 5 Very easy, 6 Has no family).'* Data were recoded into a binary variable; Easy/very easy vs not. (9) *'Are you currently a member of any of the kinds of organizations on this*

card (1 Political party, 2 Trade Unions, 3 Environmental group, 4 Parents'/School Association, 5 Tenants'/Residents' Group or Neighborhood Watch, 6 Religious group or church organization, 7 Voluntary services group, 8 Pensioners group/organization, 9 Scouts/Guides organization, 10 Professional organization, 11 Other community or civic group, 12 Social Club/Working men's club, 13 Sports Club, 14 Women's Institute/Townswomen's Guild, 15 Women's Group/Feminist Organization, 16 Other group or organization)'. Data were recoded into a binary variable; member of one or more organization vs. not. Given the recoded binary variables showed acceptable internal consistency ($\alpha = 0.62$), they were combined into a scale of 'neighborhood social capital' (range 0-12) that was then recoded into approximate sample terciles (low 0-8, medium 9-10, high 11-12).

Intergenerational Support

Participants were asked the frequency with which they (1) saw and (2) had other contact with (a) their mother and (b) their father. These were recoded as binary variables with frequency of contact of monthly or more frequently or not. Participants were also asked whether they regularly or frequently received eight forms of specific help from their parent(s). *'Do you regularly or frequently receive any of these things from your parent? 1 Getting a lift in their car (if they have one); 2 Shopping for you; 3 Providing or cooking meals; 4 Looking after your children; 5 Washing, ironing or cleaning; 6 Dealing with personal affairs e.g. paying bills, writing letters; 7 Decorating, gardening or house repairs; 8 Financial help'*. Given these twelve items demonstrated good internal consistency ($\alpha = 0.78$), they were combined into a scale of 'intergenerational support' (range 0-12) that was then recoded into approximate sample terciles (none 0, low 1-3, high 4-12).

Approach to Analysis

Our approach to analysis was undertaken in three stages. First, we made simple bivariate comparisons between parents with and without intellectual impairment with regard to available socio-demographic characteristics that may have a potential association with health (e.g., socio-economic disadvantage, social support). Second, we made unadjusted and adjusted bivariate comparisons (using multivariate binary logistic regression) between parents with and without

intellectual impairment with regard to health status. The adjusted comparisons took account of potential confounding variables in four stages. In Model 1 we controlled for between sample differences in age, gender and (for self-report measures collected over multiple waves) the number of waves in which the respondent participated. In Model 2 we also controlled for between sample differences in socio-economic disadvantage. In Model 3 we also controlled for between sample differences in neighborhood social capital and neighbourhood adversities. In Model 4 we also controlled for between sample differences in intergenerational support. We used the recommendations of Olivier and Bell (2013) to characterise odds ratios of ≤ 0.82 or ≥ 1.22 , ≤ 0.54 or ≥ 1.86 and ≤ 0.33 or ≥ 3.00 as corresponding to small, medium and large effect sizes. All analyses were undertaken using SPSS 20.

Ethical Approval

Understanding Society is designed and conducted in accordance with the ESRC Research Ethics Framework and the ISER Code of Ethics. The University of Essex Ethics Committee approved Waves 1-5 of *Understanding Society*. Approval from the National Research Ethics Service was obtained for the collection of biosocial data by trained nurses in Waves 2 and 3 of the main survey (Understanding Society – UK Household Longitudinal Study: A Biosocial Component, Oxfordshire A REC, Reference: 10/H0604/2).

Results

Age and Marital Status

Both mothers and fathers with intellectual impairment were less likely to report being married or cohabiting than their peers without intellectual impairment, though the result for mothers was not statistically significant (mothers 54% vs 60%, OR = 0.81 95%CI 0.60-1.08, n.s.; fathers 44% vs 60%, OR = 0.52 95%CI 0.36-0.76, $p < 0.001$). Mothers and fathers with intellectual impairment were marginally older than their peers without intellectual impairment (mothers mean 38.7 years vs 37.9 years, Mann Whitney $z = 1.32$, n.s.; fathers mean 40.9 years vs 39.1 years, Mann Whitney $z = 2.01$, $p < 0.05$).

Household Composition

Mothers with intellectual impairment were less likely than other mothers to be living with their parents, though the result was not statistically significant (1% vs 3%, OR = 0.27 95%CI 0.04-1.90, n.s.). Fathers with intellectual impairment were significantly more likely than other fathers to be living with their parents (10% vs 4%, OR = 2.66 95%CI 1.05-6.76, $p < 0.05$).

Socio-Economic Disadvantage, Neighborhood Adversities, Intergenerational Support and Neighborhood Social Capital

Prevalence of exposure to five indicators of socio-economic disadvantage and the scales of neighborhood adversities, intergenerational support and neighborhood social capital are presented in Table 1. On all measures parents with intellectual impairment were significantly more disadvantaged than other parents. For seven of the eight comparisons the differences were indicative of 'large' effect sizes (Olivier and Bell 2013).

Health

Information on the health status of parents with and without intellectual impairment is presented in Table 2. In the unadjusted comparisons, parents with intellectual impairment had significantly poorer health status on self-reported health, the physical and mental health components of the SF-12, the GHQ-12 and on five of the eleven specific health conditions (obesity, arthritis, cancer, diabetes and 'other' cardiovascular disease). They were also significantly more likely to have multiple health conditions. In all but one case, the differences were indicative of moderate or large effect sizes. Adjusting risk estimates for between group differences in age and gender had only a marginal impact. However, also adjusting risk estimates to take account of between group differences in socio-economic disadvantage eliminated statistically significant differences in health status between parents with and without intellectual impairment on all but one indicator (obesity) and reduced effect sizes from moderate to small or none for all but two indicators (obesity, cancer). Further adjusting risk estimates to take account of between group differences in

neighborhood adversity, neighborhood social capital and intergenerational support had minimal impact on the results.

Discussion

Our unadjusted results suggested that parents with intellectual impairment were at significantly greater risk than other parents of having poorer self-reported general, mental and physical health. They were also at significantly greater risk of experiencing higher rates of household socio-economic disadvantage and environmental adversities and lower rates of neighborhood social capital and intergenerational support. However, adjusting risk estimates to take account of between group differences in household socio-economic disadvantage eliminated statistically significant differences in health status between parents with and without intellectual impairment on all but one indicator (obesity). Further adjusting risk estimates to take account of between group differences in neighborhood adversity, neighborhood social capital and intergenerational support had minimal impact on the results.

Our results add to existing knowledge on the wellbeing of parents with intellectual disability in two important ways. First, the data were derived from a nationally representative sample of UK adults with and without intellectual impairment. As such, the study addresses two important limitations evident in current knowledge; the lack of robust data about parents with intellectual disability and their parenting compared to the non-disabled parent population and concerns about bias resulting from the field's reliance on the use of samples drawn from administrative databases of people with intellectual disability who are in contact with disability or other welfare services (Llewellyn and Hindmarsh 2015, online early). Second, this is the only study of which we are aware that has employed risk estimates for poorer health adjusted to take account of between-group differences in exposure to some common and important social determinants of health, socio-economic and neighbourhood disadvantage and social capital (Berkman *et al.* 2014). That controlling for between-group differences in exposure to socio-economic disadvantage largely eliminated evidence of poorer health among parents with intellectual impairment is consistent with the view

that a significant proportion of the poorer health of people with intellectual disabilities may be attributable to their poorer living conditions rather than biological factors associated with intellectual disability (Emerson and Hatton 2014, Emerson et al. 2014b). This effect was most notable for measures of general health, multiple morbidity and hospitalisation for new conditions and a small number of specific health conditions (arthritis, diabetes and 'other' CVD). However, controlling for between-group differences in exposure to socio-economic disadvantage had a minimal impact on the increased risk of parents with intellectual impairments for self-reported obesity and cancer, suggesting a much weaker relationship between socio-economic disadvantage and the prevalence of these particular conditions in this sample.

However, there are six limitations to the study that should be kept in mind when considering the salience and implications of these results. First, intellectual impairment was identified on the basis of abbreviated tests of cognitive ability. Second, we have only indirect evidence (reported lack of educational qualifications) that these cognitive limitations may have originated in childhood. These data need to be treated with caution as lack of educational qualifications may have been due to factors other than intellectual impairment and some levels of educational qualifications reported may have been attained by children with intellectual impairment. However, given the lack of information on the nature of 'other' qualifications and of grades attained at GCSE level, we adopted a conservative approach and allocated these participants to the non-intellectual impairment group. It is unclear what impact errors in the classification of intellectual impairment as a proxy for intellectual disability may have had on our results. Third, the use of a general household sampling frame excludes people with (primarily more severe) intellectual impairment living in institutional forms of residential care. Fourth, the consent and interview procedures used in *Understanding Society* are also likely to exclude people with more severe intellectual impairment from participating. Consequently, the results are likely to be particularly relevant to understanding the health of parents in the 'hidden majority' of those with less severe intellectual disability (Emerson 2011, Tymchuk et al. 2001). Fifth, no reasonable adjustments were made to the interview process to take account of

possible intellectual impairments among participants. As a result, some participants with intellectual impairment may have found some questions confusing, reducing the validity of their responses. Finally, while the cross-sectional analyses presented in this paper are consistent with the hypothesis that the poorer health of parents with intellectual impairment may be attributable to their poorer living conditions, the cross-sectional nature of the data do not allow us to rule out other explanations (e.g., parents with intellectual impairment may be more susceptible to social exclusion and downward social mobility if they have poor health than their non-disabled peers).

However, given the extensive body of knowledge that many of the differences in health status that occur between population subgroups are socially determined (Berkman et al. 2014, World Health Organization 2008, World Health Organization and Calouste Gulbenkian Foundation 2014, World Health Organization Regional Office for Europe 2013), consideration should be given to policy and practice initiatives that address the potential impact of well established social determinants (e.g., poverty, unemployment, discrimination) on the health of people with intellectual disabilities, including parents with intellectual disability. Specifically, consideration should be given to policy and practice initiatives that: (1) reduce the exposure of people with intellectual disabilities to low socio-economic position; (2) reduce the exposure of people with intellectual disabilities to specific material (e.g., damp housing, second hand tobacco smoke) and psychosocial hazards (e.g., victimisation) associated with poor health; and (3) increase the resilience of people with intellectual disabilities when exposed to well established social determinants of poor health (Public Health England 2015).

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Competing Interests

None of the authors have any financial or non-financial competing interests to declare.

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Table 1: Socio-Economic Disadvantage, Neighborhood Adversities , Neighborhood Social Capital, Intergenerational Support and Parents with and without Intellectual Impairment

		With Intellectual Impairment	No Intellectual Impairment	Odds Ratio and 95% Confidence Intervals
Socio-Economic Disadvantage				
	Poverty	54%	22%	4.42 (3.33-5.86)***
	Low Assets	33%	12%	3.72 (2.75-5.03)***
	Low Self-Assessed Financial Status	39%	17%	3.16 (2.36-4.22)***
	Not Employed	72%	25%	7.70 (5.64-10.52)***
	Living in Rented Accommodation	69%	34%	4.28 (3.16-5.80)***
Neighborhood social capital				
	High	8%	28%	0.18 (0.11-0.31)***
	Medium	37%	35%	0.26 (0.15-0.45)***
	Low	56%	37%	1 (reference)
Neighborhood adversities				
	High	48%	32%	2.12 (1.49-3.02)***
	Medium	28%	35%	1.82 (1.30-2.53)***
	Low	23%	33%	1 (reference)
Intergenerational Support				
	High	7%	29%	0.12 (0.07-0.21)***
	Medium	40%	45%	0.42 (0.31-0.57)***
	Low	53%	26%	1 (reference)

*** p<0.001

Table 2: The Health of Parents with and without Intellectual Impairment

	Prevalence (ID)	Prevalence (no ID)	Unadjusted risk	Model 1 ^a	Model 2 ^b	Model 3 ^c	Model 4 ^d
General Health (W3)							
'Poor' self-rated health	15%	4%	4.47*** (3.00-6.65)	4.09*** (2.72-6.14)	1.41 (0.91-2.18)	1.37 (0.88-2.13)	1.37 (0.88-2.14)
SF-12 Physical Health caseness	29%	12%	3.09*** (2.03-4.71)	2.96*** (1.94-4.51)	1.41 (0.90-2.20)	1.37 (0.87-2.13)	1.35 (0.87-2.12)
SF-12 Mental Health caseness	44%	32%	1.68** (1.15-2.46)	1.63* (1.11-2.39)	0.96 (0.64-1.43)	0.91 (0.61-1.36)	0.93 (0.62-1.39)
GHQ-12 caseness	33%	21%	1.94** (1.29-2.92)	1.86** (1.23-2.80)	1.03 (0.67-1.59)	0.99 (0.65-1.53)	1.02 (0.66-1.56)
Self-Reported Health Conditions (W1-4)							
Obesity (W1 only)	46%	26%	2.37*** (1.74-3.23)	2.34*** (1.71-3.20)	1.95*** (1.42-2.68)	1.95*** (1.42-2.68)	1.93*** (1.40-2.66)
Asthma	10%	11%	0.92 (0.58-1.46)	1.00 (0.62-1.62)	0.86 (0.53-1.40)	0.86 (0.53-1.40)	0.90 (0.55-1.47)
Arthritis	8%	4%	2.02** (1.19-3.45)	1.97* (1.12-3.45)	1.09 (0.61-1.94)	1.08 (0.60-1.92)	1.08 (0.61-1.94)
Cancer or malignancy	3%	1%	2.58* (1.05-6.38)	2.77* (1.11-6.89)	2.18 (0.85-5.59)	2.19 (0.85-5.63)	2.23 (0.87-5.75)
Diabetes	7%	2%	3.25*** (1.83-5.77)	3.36*** (1.88-6.01)	1.80 (0.99-3.29)	1.78 (0.98-3.26)	1.67 (0.92-3.06)
Epilepsy	1%	1%	1.02 (0.25-4.14)	1.18 (0.29-4.82)	0.59 (0.14-2.45)	0.59 (0.14-2.45)	0.63 (0.15-2.62)
Thyroid disorder	1%	2%	0.46 (0.11-1.86)	0.40 (0.10-1.60)	0.35 (0.09-1.42)	0.35 (0.09-1.43)	0.36 (0.09-1.46)
Respiratory disorder ^e	1%	1%	1.18 (0.29-4.80)	1.06 (0.26-4.34)	0.47 (0.11-1.95)	0.47 (0.11-1.95)	0.48 (0.12-2.00)

High blood pressure	6%	7%	0.83 (0.45-1.53)	0.87 (0.47-1.61)	0.61 (0.32-1.13)	0.60 (0.32-1.13)	0.58 (0.31-1.09)
Other CVD ^f	4%	1%	4.33*** (2.09-8.96)	4.18*** (2.01-8.69)	1.73 (0.81-3.69)	1.71 (0.80-3.65)	1.65 (0.77-3.54)
Clinical depression	9%	6%	1.62 (0.99-2.64)	1.74* (1.06-2.86)	0.80 (0.48-1.35)	0.79 (0.47-1.33)	0.81 (0.48-1.36)
Multiple morbidity							
2+	9%	5%	1.85* (1.13-3.02)	1.87* (1.12-3.11)	0.95 (0.56-1.62)	0.95 (0.56-1.61)	0.95 (0.56-1.61)
3+	3%	1%	2.44* (1.07-5.57)	2.50* (1.09-5.74)	1.06 (0.45-2.50)	1.05 (0.44-2.47)	1.02 (0.44-2.39)
Hospital admission for newly diagnosed condition (W2-4)	8%	3%	2.92*** (1.64-5.19)	2.50* (1.09-5.74)	1.84 (0.96-3.52)	1.82 (0.95-3.48)	1.09 (0.46-2.57)

Risk: Odds ratio with 95% confidence intervals. Odds ratios in **bold** equivalent to moderate or large effect size

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

^a Risk adjusted for age, gender and number of waves participated in

^b Risk adjusted for age, gender, number of waves participated in and socio-economic disadvantage

^c Risk adjusted for age, gender, number of waves participated in, socio-economic disadvantage, neighbourhood adversities and neighborhood social capital

^d Risk adjusted for age, gender, number of waves participated in, socio-economic disadvantage, neighbourhood adversities, neighborhood social capital and intergenerational support

^e One or more of emphysema or chronic bronchitis

^f One or more of congestive heart failure, coronary heart disease, angina, heart attack or myocardial infarction, stroke