A multivariate cross-sectional analysis of Child disability, parental self-rated health and food security

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[**Note**: this article provides a summary of the analysis previously published in full in the International Journal of Disability & Human Development - please see: Shahtahmasebi, S. Emerson, E. Berridge, D. and Lancaster, G. (2008) Child disability, parental self-rated health and food security: a multivariate cross-sectional analysis. Int J Disabil Hum Dev 2009;8(4): 417-438.]

Abstract
The literature on child disability reports differentials in health and socio-economic outcomes between families with child disability and families without child disability. Three models are fitted to a large secondary data set for three outcomes: health, poverty, and child disability. The results suggest after controlling for multicollinearity far fewer variables appear to be associated with health, child disability and food security outcomes; child disability appears to be related to health or food security but health or food security does not appear to be related to child disability i.e. none of the child disability variables appeared significant in models of health or poverty. Furthermore, the analysis highlights complex inter-relationships in data due to the dynamic nature of these processes, and, the definition and measurement of these outcomes.

INTRODUCTION
A trawl of the literature suggests that disability has received attention from a variety of view points e.g. the relationship between disability and a range of outcome variables such as health, socio-economic, and health and social policy (1-12). Specifically, the literature suggests an association between child disability, parental health and poverty. For example, child disability is associated with poorer parental health including mental health (6,25); child disability is associated with lower socio-economic position (SEP) and poverty (6,25,26); and lower SEP and lower poverty is associated with poorer health (including mental health) among adults (27-29). The literature appears to infer a number of causal assumptions such as child disability leads to poorer parental health (27); poorer parental health increases the risk of child disability (27); child disability leads to poverty (15, 30); poverty leads to child disability (1,31,32), and so on.

There is ample evidence to suggest that the effects from family poverty and hardship are, at least in part, through other social, economic and lifestyle factors such as income, nutrition, education and access to information (33-39). Taken at face value, the relationship between health outcomes and family poverty is therefore subject to many other variables which themselves may be interrelated. Therefore, when investigating the relationship between a health outcome and an explanatory variable we must take into account the effects

from other variables e.g. in assessing the net effect of age on health status we must separate out the joint effect of age with sex, income, housing, and education level. In other words we must control for other variables included in the analysis.

This paper examines the relationship between parental health and child disability with food insecurity within a statistical modelling framework to distinguish systematic from random patterns due to other variables. For full results and discussion please see Shahtahmasebi, et al. 2009.

METHODS

Wave 3 (2001) of FACS (Families & Children Study: http://statistics.dwp.gov.uk/asd/asd5/facs/) was used for the analysis reported in this paper. Relevant data files and supporting documentation were obtained from the UK Data Archive (www.data-archive.ac.uk). Full details of the FACS study are available in a series of technical and annual reports (http://www.dwp.gov.uk/asd/asd5/facs/). Briefly, Wave 3 involved face to face interviews with a nationally representative sample of 8,063 British families.

Variables

The variables used in an earlier paper (7) were extracted from the 2001 wave 3 of FACS. The survey included measures of health (e.g. state of health, longstanding illness, type of illness), and a sereis of variables measuring unmet needs which were used to construct family hardship and food insecurity.

Variables such as worrying about finances and debt repayments are used as proxies for emotional hardship. The construction of child disability variables was based on those reported by Emerson (7), which are counts of affirmative responses by the respondents to series of questions about the children's health and behavioural problems.

Response variables

Response variables were defined as: poverty [1] vs. no poverty [0], good health [1] vs. poor health [0], hardship [1] vs. no hardship [0], presence of a child with ill-health or disability [1] against no disability or ill-health [0], and, "food insecurity" [1] against 'food security' [0].

Statistical modelling

The common approach to modelling this type of response is to fit a logistic regression to data (48,58,62). The software package Sabre (63) was used to fit a logistic regression to data (48,58,62).

Social circumstances will have an impact on health, in part, by affecting lifestyle and possibly financial dependency (e.g. educational qualification and income). Controlling for these variables may therefore result in an over-conservative, attenuated estimate of the effects of social circumstances. Reverse causality is also possible, with education and income influencing social circumstances. Excluding these variables may therefore exaggerate the effects of social circumstances. A pragmatic approach to this problem was adopt by testing the variables 'income', 'employment status' and 'qualification' separately tested in the final model.

Model selection proceeded with a bivariate analysis where each explanatory variable was tested in the model on its own and without control and their significance ws noted. Due to the large number of explanatory variables backward elimination method was adopted where variables which were statistically significant in the binary analysis were entered in the model. Subsequently, explanatory variables were dropped from the model one at a time and those variables which were not significant at 5% level were excluded from the final model.

Table 1 - *Model fitting results for child disability outcome*

Explanatory Variables	Parameter estimates	Standard Error	Significance level
Type of longstanding illness			
none	0.00		<<0.005
physical external (arms etc)	0.72	0.095	
physical internal (respiratory, etc)	0.75	0.1	
Mental issues	0.57	0.155	
Other	0.34	0.163	
Child's state of health			
Good	0.00		<<0.0005
fairly good	1.46	0.071	
Not good	2.51	0.156	
Missing	-13.9	88.2	
Behind with bills			
Not behind	0.00		<0.05
Electric bill	0.02	0.177	
Gas bill	-0.27	0.193	
Water bill	0.47	0.170	
Phone bill	0.31	0.158	
Council tax	0.04	0.122	
Other	0.27	0.230	
Respondent's employment status			
Working 16 or more hours	0.00		<0.005
Working fewer than 16 hours	0.28	0.093	
Unemployed and seeking work	-0.07	0.196	
On a training scheme	-0.24	0.635	
Full time education	0.21	0.253	
Sick/disabled(up to 6 months)	-1.02	0.537	
Sick/disabled (6 months or longer)	-0.01	0.176	
Looking after the homeor family	0.23	0.707	
Caring for a sick, elderly or disabled person	1.37	0.300	
Retired	-0.10	0.544	
Other	0.25	0.428	
What do you really need			
none	0.00		<0.05
Clothes	-0.007	0.113	
Footwear	0.83	0.258	
Car	-0.14	0.16	
Bed/bedding	0.31	0.277	
Furniture	0.11	0.222	
Carpet/curtains	-0.26	0.266	
Holiday	0.19	0.189	
Electric equipment/repair	0.12	0.166	
Home improvement	0.25	0.156	
Other	-0.11	0.189	
Home tenure			
outright ownership	0.00		<0.025
Mortgaged/bank loan	0.12	0.110	
Council housing	0.34	0.126	
Private rent	0.2	0.134	
Rent free	0.34	0.35	

Other	-0.03	0.253

As expected, a high correlation can be observed for the child disability outcome when child disability explanatory variables are tested on their own and without any control. Furthermore, when adding child disability explanatory variables to the model the likelihood function failed to converge. Out of the remaining variables four child disability explanatory variables were tested in the base model. The inclusion of these four child disability explanatory variables appear to have a modest effect on the non-disability explanatory variables but this model does not converge. The final model is therefore without the child disability explanatory variables. The base model was further used to explore the effects of the variables 'income', 'qualifications' and 'employment status'. Only the variable 'employment status' is statistically significant and the inclusion of this variable appear to inflate the effects of the explanatory variables except the variables 'behind with payments' and 'hardship (personal)'. The latter is no longer significant and has dropped out of the model. The final model fitting results are shown in Table 1.

RESULTS

The first point to notice is the reduced number of explanatory variables that are now associated with health. Out of a list of 42 explanatory variables which were all highly significant on their own, only 10 remain significant. The model fitting results are shown in table 1. Note that negative parameter estimates indicate poor health, e.g. increasing age on average increases the likelihood of poor health.

The second interesting and counterintuitive result is that the child disability explanatory variables were highly significant on their own, yet none remained in the final model.

The effects from the health explanatory variables (not shown) are predictable and unsurprising: non-smokers are more likely to describe their health as 'good' and those with a longstanding illness are more likely to claim 'not good' health. Perhaps the main feature is the relationship with (first) child's health status: those who reported the health of their first child as 'fairly good' or 'not good' appear to have a higher probability of reporting their own health status as 'fairly good' or 'not good'.

The model fitting results for child disability are shown in table 1. As we were modelling the probability of child disability, positive parameter estimates indicate the likelihood of child disability. The results suggest that the respondents with a longstanding illness have a higher probability of child disability than those who claimed no longstanding illness. Within a cross-sectional analysis we are unable to address causality, i.e whether longstanding illness is the result of looking after a child with disability or longstanding illness may lead to presence of child disability?

The interpretation of results for hardship variables 'being behind with bills', 'what do you really need' is not straightforward. For example, being behind with the gas bill appears to be inversely related to child disability while being behind with water and phone bills appear to significantly increase the likelihood of presence of child disability compared with those who are not behind with their bill repayments. It is plausible that phone and water bills are indicative of household needs with a child disability whilst, gas bill may simply be indicative of presence of younger children or elderly or both in the household where there is a greater requirement for heating, hot water and cooking. Similarly, those who said they needed footwear, bed/bedding, furniture, holidays, electrical equipment, and home improvements appear more likely to be households with a child disability than those who did not need

anything. The category needing 'footwear' appears to have the largest effect. The result for 'home tenure' suggests that those who do not own their home appear more likely to have a child disability in the family, and it appears that this variable owes its significance to the category 'council housing'.

The variable 'employment status' is statistically significant. Intuitively, those working fewer than 16 hours are more likely to be household with a chid disability than those working more than 16 hours. Furthermore, those who classed themselves as sick/disabled appear less likely to be households with a child disability, and those in full time education appear more likely to be households with a child disability.

The results for food insecurity (not shown) appear more straightforward and less counterintuitive than those from previous models. As expected, the socio-economic explanatory variables as measured by 'hardship', 'home tenure', 'being behind with bill/debt repayments' are strongly correlated with the 'food insecurity' variable: those who are more likely to do better are respondents who reported no hardship (personal or household); own their own home; are not behind with repayments.

Discussion

Child's state of health could simply be a statement of the respondent's perception of the child's health in the presence of a disability. In other words, the perception of the responding mother of the child's state of health may well be influenced by the knowledge of the child's disability and/or the respondent's own state of health. Without longitudinal data we are unable to disentangle temporal dependencies and causal pathways as whether poorer state of health is indicative of child disability.

Similarly, the question must be asked of the home tenure effect. The variable home tenure is a proxy for social class and income. The results suggest that the prevelence of having a child with a disability appears similar in all the categories of this variable. Wealth may not be a factor in identifying a disability in the family but it may be a major factor in how disability is managed. In other words, wealth will positively interact with other variables to aleviate negative impacts of some of the social and health pressure, e.g. easy access to private support services. The reverse causality may also be true that the transition from affluence to less affluence may be due to the prevalence (and incidence) of child disability.

The child disability explanatory variables are not overly having an impact on the outcomes explored in this paper. However, the interesting aspect of these analyses is that we can get some idea of the dynamics of health and poverty from the cross-sectional analysis.

Cross-sectionally it appears that ill health and lower levels of family economy are correlated with child disability. Without knowing the prior levels and duration of child disability and health status we cannot conclude that changes in the levels of health or hardship will lead to commensurate changes in child disability. It may be visualised that both poor health and food insecurity were affected by levels of worrying about repayments/debts. The results suggest that those who worry most of the time are more likely to do worse than those who classed their health as 'good' and were food secured. But food insecurity and worrying appear to predict health status. These results provide some support for the presence of a feedback effect: regardless of the direction of causality poor health could lead to food insecurity. We need to investigate temporal dependencies in this relationship e.g. previous spells and duration of poor health, spells and duration of 'food insecurity', and whether changes in health will lead to commensurate changes in levels of food insecurity, vice versa.

Similarly, we could ask the questions: does child disability lead to food insecurity and lower psychological performance such as low self-esteem or confidence? Or, are families with a child disability able to turn their experience into a rewarding, meaningful and fulfilling challenge? The cross-sectional evidence from this analysis indicated no child disability

variables affecting food insecurity or health status. Although, the health and poverty explanatory variables may exacerbate living with a child disability. Variables such as 'reward', 'frailty', and the 'feel good' factor are difficult to measure and often left unobserved. Longitudinal studies are recommended to deal with this complexity.

CONCLUSIONS

Cross-sectionally it is easy to conclude a relationship between various explanatory variables and child disability, health or food insecurity outcomes. For example, as discussed earlier a cross-sectional analysis of health outcome would suggest a strong poverty effect on state of health. This result does not provide insight into whether poor health was present before the incidence of food insecurity. We are, therefore, unable to account for changes in the explanatory variables to assess how these changes may be related to changes in the outcomes of interest. Furthermore, in a cross-sectional analysis of survey data that contain subjective as well as objective variables we cannot account for the fact that some individuals may have been prone to depression, low self-esteem or low confidence before the incidence of disability. Subjective variables together with temporal dependencies in the data lead to model mis-specification and erroneous results (80-82).

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