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Does how you
measure income
make a difference to
measuring poverty?

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a difference to measuring poverty?**

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Abstract

Income is regarded as one of the clearest indicators of socioeconomic status and wellbeing in the developed world and is highly correlated with a wide range of outcomes. Despite its importance, there remains an issue as to the best way to collect income as part of surveys. This paper examines differences in how income is collected in a nationally representative birth cohort, the Millennium Cohort Study, looking at variations by questions asked and by respondent characteristics before then examining the implications different methods of collecting and reporting income may have for measuring poverty. Results show that less than a third of respondents give consistent information on income between measurement tools. Using multiple questions is associated with a substantially lower response rate but this method generally results in a higher estimate of family income than using a single question. This is particularly true for certain groups of the population - those on means tested benefits, in self-employment and in part-time. Not surprisingly then, in our analysis of poverty using a single question produces an inflated proportion of families who could be classified as living in poverty and is less associated with other measures of financial deprivation than the more conservative poverty measure based on multiple questions.

Keywords

Income, survey data collection, poverty.

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Introduction

Income is regarded as one of the clearest indicators of socioeconomic status and wellbeing in the developed¹ world and is highly correlated with outcomes across most lifecourse domains including longevity, education, health, crime, family life, and happiness (for example Easterlin, 2001; Hansen and Machin, 2002; Lynch et al. 2000; Mayer, 1997; Wilkinson, 1992). Despite its importance, there remain issues as to the accuracy of income collected as part of surveys. These include the sensitivity of asking about income; whether weekly, monthly or annual income is reported; respondent knowledge of different definitions of income (gross compared to net for instance); and the more fundamental issue of whether respondents actually know their income. In addition, there is no consensus as to the best way to minimise these problems and therefore no agreement as to be best way to collect income data in surveys. Some surveys ask a single question others use a number of more detailed questions, some ask for exact amounts, others for a banded range. These differences all lead to potential bias in the data (Micklewright and Schnepf, 2010; Moore et al., 2000).

This paper makes a unique contribution to the debate by examining whether different methods of collecting income within a single survey produce consistent estimates of income. This is possible within the MCS due to the different ways in which income is collected from the same respondents. We compare differences in how the same individual reports income in the most recent sweep of data collection (at age 7) when it is asked as a single question alongside to multiple questions. We then look at whether the pattern varies across different sub-groups of the population or by the period over which incomes are reported, for example weekly, monthly etc? The paper finally examines the implications any differences may have on the subsequent analysis of that data – on particular in an area of key substantive interest – the measurement of child poverty.

Respondent issues

The fact that people are said to be more reluctant to discuss their income than they are their sexual behaviour (Gordon, 1998) is testament to the sensitivity of the subject matter, although acceptability is just one aspect of respondent issues. In piloting questions on income for the 2001 UK census, Collins and White (1996) encountered respondents who were unsure as to the definition of household or family income (whether it represented earnings alone or total income); unsure of the meaning of net income (whether it referred to earnings after taxes or earnings after taxes and regular bills (disposable income)); and could not in several cases report on the partner's income and thereby the family or household income (see also Atkinson and Micklewright, 1983; Gordon, 1998; Micklewright and Schnepf, 2010).

¹ In the developing world, expenditure is regarded as a clearer indicator of socioeconomic status (for example Van de Poel et al., 2008).

Recall and reconciliation are other areas in which the respondent may introduce bias into the data (Atkinson and Micklewright, 1983). The importance of recall in surveys is affected by the relevant measurement unit (Clarke, Fiebig, and Gerdtham, 2008); in the case of income it is usually annual income that is taken as a gold-standard (Becker et al., 2003)². This is generally not problematic for many salaried employees. However, for a large section of the population whose incomes come from a range of sources, recalling each source may be difficult. For those who are in short-term or seasonal employment, those reliant on several sources of income, or who otherwise have inconsistent forms of income, reporting an annual total figure can be very difficult (Schrapler, 2006). Even for salaried employees, providing both net and gross income estimates may be challenging. This moves from an issue of recall to an issue of reconciliation in reporting income. In the case of respondents who recently changed employment and income, providing one sum to reflect income during the period of change further compounds any possible existing difficulties in providing information on income. For all respondents, regardless of earnings instability, providing a figure for annual income is a complex process involving issues of interpretation, understanding, retrieval, judgement, calculation, conversion and finally, communication (Collins and White, 1996).

Measurement issues: to ask a single question?

There is no consensus as to the best way to collect income data in surveys. Large scale surveys in the UK collect information on income in a variety of ways - the majority either by single questions or by a set of detailed questions. Table 1 shows the different ways income is collected in a number of key UK studies³. Some of this lack of consensus in measurement between surveys is likely due to the fact that surveys collect income data for different purposes (Davern et al., 2005; Micklewright and Schnepf, 2010). Although even in multipurpose and multidisciplinary studies, such as the MCS, where income is not collected for a specific purpose there is no agreement as to the best method.

² Although Britain varies somewhat in the high prevalence of 'current' measures of income as opposed to annual (Boheim and Jenkins, 2006).

³ But this is not the only distinction; differences also occur in terms of household versus individual income etc.

Table 1: Collection of income data in major UK studies

Study	Study Sample Size (at last wave of data collection)	Respondent and Definition of Income	Measurement Tool (Single or Multiple)	Notes
Millennium Cohort Study*	13,857 households with children (2008)	Family and Individual Income – Main respondent and Partner	Single question and multiple questions available for main, multiple questions only for partner	*described in depth in next sections Units vary Exclude housing and council tax benefit
National Child Development Study	9,790 cohort members aged 50	Family and Individual Income – Main respondent and Partner (Main respondent reports of partner's income)	Multiple questions only available for both main and partner respondents	Partner income excluded some sources i.e. irregular income Units vary Exclude housing and council tax benefit
British Cohort Study	9,665 cohort members aged 34	Family and Individual Income – Main respondent and Partner (Main respondent reports of partner's income)	Multiple questions only available for both main and partner respondents	Partner income excluded some sources i.e. irregular income Units vary Exclude housing and council tax benefit
British Household Panel Survey	21,133 possible respondents – adult household members in 2008 income dataset	All adult members of household eligible: Individual and Household Income	Multiple questions only available asked in same format to all adult household members	Weekly income made available
Family Resources Survey	23,163 cooperating households in 2008/9	All adult members of household eligible: Individual and Household Income	Multiple questions only available asked in same format to all adult household members	
Living Costs and Food Survey (previously Food and Expenditure Survey)	5,655 households in UK (2008)	All adult members of household eligible: Individual and Household Income	Multiple questions only available asked in same format to all adult household members	
Labour Force Survey	114,493 individuals from approximately 60,000 households	All adult members of household eligible: Individual and Household Earnings	Multiple questions only available asked in same format to all adult household members	Earnings not income calculated. Benefit receipt is recorded and could be imputed. Income from odd jobs and other sources not recorded
British Social Attitudes Survey	Approximately 3,000 people each year	All adult members of household eligible: Individual and Household Earnings	Single questions on own earnings and household income available for main, single questions on own earnings only for partner	
National Statistics Opinion Survey (previously Omnibus Survey)	1,071 individuals	All adult members of household eligible: Individual and Household Earnings	Single question on individual gross income, although household income is possible as all members of household eligible	

In reality single question and multiple question strategies both have their merits and shortcomings. Limiting a respondent to answering a single question on income can introduce difficulties in recall and reconciliation as discussed above. These difficulties are likely to be encountered differentially amongst different groups in the population resulting in differential item non-response across sub-populations. When coupled with more basic problems of study coverage and representativeness (Becker et al., 2003; Francesconi, 2008) this may lead to serious flaws in estimates.

In asking a single question, there are also considerations to be made as to whether this is asked for a total figure or whether respondents should select a band. Banded data may improve response but may limit detail, although the loss of detail may not be so severe as to affect the data quality for the majority of the population (Micklewright and Schnepf, 2010). But banded data can also introduce respondent bias. In pilot studies, reported in Collins and White, (1996) respondents were found to select the band below which their actual income lay because they were concerned that selecting the correct band would imply that they had an income close to the top limit of the band.

There are also issues related to the loss of detail encountered when using a single question even if not collected in bands, particularly if researchers are interested in the contribution different components of income make to the overall total. However, while providing additional detail, asking multiple questions on income can introduce new problems of unmanageable questionnaire length and heavy respondent burden (Micklewright and Schnepf, 2010) in addition to vastly increased survey costs. In large scale, longitudinal surveys, the implications of heavy respondent burdens can have a two-fold effect through unit missingness as well as attrition in subsequent sweeps (Burchell and Marsh, 1992). Moreover, many sections of detailed questions on income may be irrelevant for some respondents; questions on state benefits are likely to be irrelevant for the most advantaged while questions on dividend from stocks, shares and investments are likely to be irrelevant for the least advantaged respondents for example. However, restricting these questions to certain respondents only could introduce further inaccuracies.

In addition, detailed questions on income may compound issues of acceptability in responding to income questions; while some respondents may be comfortable in providing a total figure for income, they may not be as comfortable providing details of the origin of each component of income. Not all researchers agree, some unequivocally state that asking a number of detailed income questions provides a more accurate response than a single income question. Of this persuasion (Davern et al., 2005) argue the individual components allow policy makers to better understand the dynamics of poverty and income in determining eligibility for intervention programmes. Yet this debate remains unresolved in the literature at present.

Other Measurement issues: what to count as household income and when to count it?

The Canberra Group, an international expert group concerned by inconsistencies in the measurement of income, defined the essential elements of household income as: (i) income from employment, (ii) income from self-employment, (iii) property income (including from stocks and shares), (iv) income from social insurance benefits, (v) deductions from income (social insurance), and (vi) social transfers in kind (for example government provided education and healthcare services) (The Canberra Group, 2001)⁴.

While suitable as a conceptual definition for international comparison, in reality, such a definition is difficult to implement in the UK setting for a nationally representative population survey. Even if we limit the focus to the first four components alone, difficulties arise. Firstly, in the UK context, measuring income from state benefits (which would include means tested benefits) directly from respondents is difficult as respondents may be unaware of the total benefits they receive. For example, housing benefit and council tax benefits, means-tested benefits which cover housing rents for those on no/low incomes, may constitute a large proportion of household income unknown to the respondent as they may be paid directly to landlords.

Seasonality in employment or in income (for example through performance related bonuses) can mean that results are dependent on when questions are asked. In analyses comparing results from questions on annual income and current income in the British Household Panel Survey, Boheim and Jenkins (2006) found small differences in the distributions, which did not alter the relative position of groups. However, within some groups, the differences were more pronounced with annual income reports producing lower values when harmonised with current values, notably in cases where the head of household was unemployed (Boheim and Jenkins, 2006). Furthermore, it is easy to speculate that those in seasonal or unstable employment may also be those who have most difficulty in providing a single figure for annual income (as discussed earlier), and known correlates of irregular earnings include having low qualifications and being self-employed (Drewinka, 2010).

The period of payment used to collect the information on income also has the potential to cause problems for a wide range of respondents⁵ who may prefer to report income in the period in which they receive payment, as opposed to the period dictated by the researcher. This will then vary by sub-population as those paid weekly will answer in weekly amounts, those monthly in monthly amounts. As the low paid are more likely to be paid weekly we will see systematic differences across different groups of the population. Moreover, it is common for respondents to report the figures they are most familiar with; often this means reporting gross annual income as an annual total but their net income on a monthly basis.

⁴ Elements excluded from the definition were irregular payments such as lottery winnings, inheritance or retirement and redundancy pay outs.

⁵ Although according to Hurd et al., (2003) there is very little literature on these effects.

Each component of income will have substantial variation in terms of the response rate and the reliability, Hawkes and Plewis (2008) found that questions on income from self-employment had particularly low response rates in the MCS⁶, while Moore et al. (2000) found that estimates of survey-collected self-employment income were substantially lower than independently verified self-employment income. Wages and salaries data collected in surveys generally have the highest levels of consistency with externally verified sources (Biancotti et al., 2008; Moore et al., 2000), while income from dividends and interest from investments have the lowest, with estimates being approximately half of the actual total (Moore et al., 2000). Income from pensions is found to have high levels of reliability in some studies (Biancotti et al., 2008), but others argue that in a number of cases income from pensions tends to be overstated (Moore et al., 2000).

This paper builds upon the literature and offers a unique contribution to the income debate by comparing differences in how the same MCS respondent reports income in the most recent sweep of data collection (at age 7) when it is asked as a single question as opposed to multiple questions. We then examine the implications that different methods of collecting and reporting income have for data collected from different groups within the population.

More specifically, based on the evidence presented above, we ask:

- What differences can be observed from using single question banded income data versus multiple questions for measuring income?
 - Does the pattern change across different sub-groups of the population?
 - How does the pattern change by unit of measurement, for example weekly, monthly etc?
- What effect does using a banded single question versus detailed questions have on the analysis of a key area of substantive interest - the estimation of child poverty in the survey?

Data

The data used in this paper are from the most recent sweep of the Millennium Cohort Study (MCS), collected from families when children were aged 7⁷. This study recruited families of children born between 2000/1 in randomly selected electoral wards, disproportionally stratified to ensure adequate representation of children from disadvantaged and ethnic minority families. Information has been collected at 9 months, 3, 5 and 7 years, with the next sweep of data collection due when the

⁶ This only included sweeps 1 and 2 which did not include questions on the amount of state benefits received.

⁷ Although the focus of this paper is on data collected at age 7, Hansen and Kneale (2011) examine trends between the third sweep in 2006 (MCS3) collected at age 5 and the age 7 sweep collected in 2008 (MCS4). They show consistency in the reporting of income over the different sweeps. The majority of respondents who reported higher incomes using the multiple questions at MCS4 also did so at MCS3.

children are aged 11 years. Initially, over 19,000 households were recruited into the study; by age 7 the number of participating families had dropped to 13,800. In the most recent sweeps, information on family income was collected through both a battery of detailed questions as well as a single question⁸⁹.

Detailed income questions

At the age 7 survey detailed income questions collect information on earnings and income from benefits as well as other sources. They generally allow respondents to report each component of their income in units of their choice (weekly, monthly etc), although this may not cover all arrangements. In an effort to improve the response rate for individual components of income, respondents who didn't give an initial answer were given a number of follow-up options known as 'unfolding brackets'. Respondents who are unable, or refuse, to give an exact answer are asked a series of follow up questions designed to elicit a minimum and maximum number defining a range within which the value lies (Centre for Longitudinal Studies, 2009).

While income from earnings and benefits was collected in detail, income from other sources was collected less comprehensively, and is reported as monthly payments to the main respondent only. These include income from investments, studentships and cash from parents¹⁰.

Single question

In addition to the detailed questions at age 7 each main respondent (who is usually the mother) was asked to choose which bracket of family income their income equated to. The question was not asked of partner respondents (usually fathers) and therefore assumes that a mother is aware of both her own and, where applicable, her partner's income. The question asks about income after deductions, and while respondents were given a choice to report a total income in weekly, monthly or annual amounts, they were nevertheless expected to know and report different components of their income in the same periods of receipt¹¹. At the age 7 sweep in 2008, the single question achieved a response rate of 89 per cent, which was

⁸ Although this varies from sweep to sweep (for more detailed information see Hansen and Kneale, 2011).

⁹ Our measure is family rather than household income as it refers only to the parental unit of the child and any dependent children in the household who are siblings of the cohort member (biological, adopted, step or foster), excluding other adults. MCS does collect employment information for all household members over the age of 15. As such, it may be questionable to classify 16-18 year olds as dependent if they are employed. However, as the employment status theoretically treats any paid employment, from a paper round upwards, as being 'in employment', then we treat any 16-18 year old who is a sibling of the cohort member as dependent member of the household.

¹⁰ Although in the case of investments, dividends and studentships, these may not necessarily be paid on a monthly basis to respondents.

¹¹ A different set of income bands was given to main respondents in couples and those who were lone parents (Centre for Longitudinal Studies, 2009).

substantially higher than the 58 per cent achieved for income from the multiple questions¹².

The single question followed the detailed questions on income. It can therefore be expected that the multiple questions served as a prompt for what should go into the report of net family income. However, this is not made explicit. For example receipt of housing benefit is included in the detailed questions but not the amount. It is expected that housing benefits will also be excluded from the answers to the single question, although respondents are not explicitly reminded to exclude housing benefits from their total calculation in responding to the single question. Showcards were shown to respondents with the intervals displayed in weekly, monthly or annual amounts, although no record exists of which unit respondents chose.

Results

What is the impact of using single question banded income data versus multiple questions for measuring income?

To examine our first research question, we compare the descriptive statistics from five different definitions of income (detailed below) using information from both the detailed set of questions and the single income question.

1. Income as collected with the single question in banded groups (Definition 1)
2. Income as collected with the single question in banded groups continuously using the mid-point of the interval as the value (Definition 2)¹³
3. Income collected from multiple questions, and including the income of any respondent with a valid answer to any of the component questions as having a valid income response (Definition 3)
4. Income collected from multiple questions, excluding incomes from respondents with any missing component parts and logical inconsistencies in benefits and other information (Definition 4)
5. Income collected from multiple questions, excluding incomes from respondents with any missing component parts and logical inconsistencies in benefits and other information, but including information from brackets data (Definition 5)

In definitions 4 and 5 we impose restrictions to filter out inconsistencies in the data. This includes filtering out those whose gross income is less than their net income;

¹² Once logical inconsistencies and missing data were excluded from the data.

¹³ For the top brackets (which are not closed, accounting for 0.4% of lone parents and 2.0% of couples), we selected the mean value from the continuous income for those who selected the top bracket and whose income also fell into the top bracket. For the lowest bracket (0.8% lone parents and 0.4% of couples), we selected the mid-point.

couples with a valid main but no valid partner report; those who claims certain benefits but give no amount; and those who give inflated estimates of benefits. The effect of filters in depleting sample size of income derived from using multiple questions poses one of the main disadvantages of collecting income information in this way.

Reassuringly, examining Table 2 shows that the different definitions of income produce similar results in terms of the mean value of income. They vary from the lowest, £29,660 (using definition 3) to the highest, £32,898 (using definition 5). However, the sample sizes do vary across definition. There are also considerable differences in the level of the bottom quartile of income between definition 3 (which includes virtually no validity criteria) and definitions 4 and 5 (both using more robust criteria for validity). The median level of income is also considerably higher using definitions 4 and 5 (using more robust criteria for validity) compared to definition 3 (limited criteria for validity), bringing the median and mean values much closer together. The 90:10 index of inequality is also substantially lower using definitions 4 and 5, while the inter-quartile range is similar across all definitions. Using definition 5 based on the information from the multiple questions, produces a higher mean value of income and higher percentile estimates than the definitions of income based on a single question. The correlation coefficient of 0.63 between the income derived from multiple questions and from the single question indicates a strong, but imperfect, correlation between measurement tools.

Table 2: Descriptive information for differing definitions of income

	Definition 2	Definition 3	Definition 4	Definition 5
N	12278	13527	6753	6903
Mean	£32001	£29328	£32614	£32898
Median	£23400	£23221	£28458	£28560
Lower Quartile	£14300	£12080	£18244	£18360
Upper Quartile	£39000	£36180	£39845	£40176
Inequality Measure (90:10 ratio)	7.25	8.14	5.20	5.19

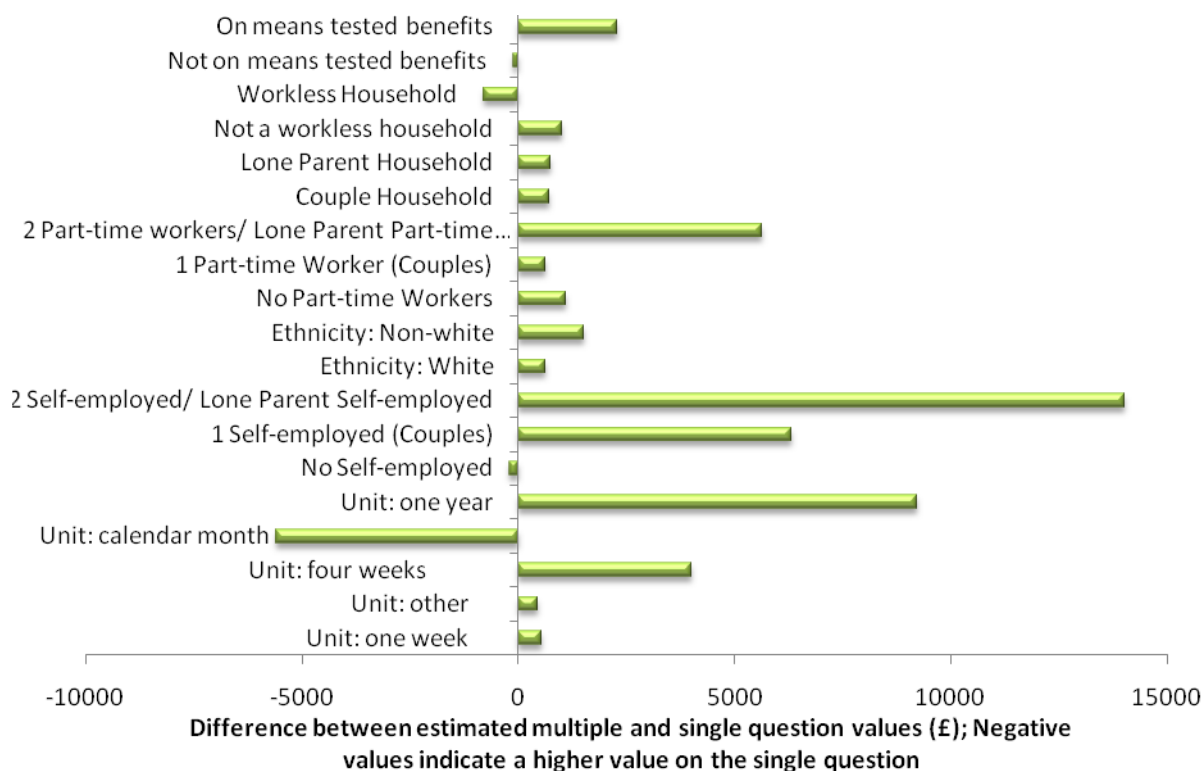
Notes: data weighted by dowwt2.

Does the difference between using single question banded income data and multiple questions for measuring income vary by sub-group or period of measurement?

Having charted the differences seen in the income data by using the different definitions of income we now want to examine variations in this pattern. We are particularly interested in whether income, measured in these different ways varies across sub-groups of the population. For this reason we compare the descriptive statistics using definitions 2 (the preferred definition taking the single question using the mid-point of the intervals) and 5 (the preferred measure of income using multiple questions with restrictions to filter out inconsistencies but including information from brackets). We examine these definitions for different populations groups including single parents versus those in couples; workless families compared to families where

at least 1 person works; those reliant on state benefits versus households who do not claim any means tested benefits; those self-employed and those not self-employed; part-time workers (defined as those working less than 30 hours per week) compared to full-time workers; and variations across different ethnic groups¹⁴¹⁵. We also compare the similarity in estimates by unit of pay and period of pay. All these variations are shown in Figure 1.)

Figure 1: Difference between single income question* and multiple income question average estimates**



Notes: * using the estimated interval mid-point (definition 2)
 ** Components question with imputed information from brackets (definition 5)

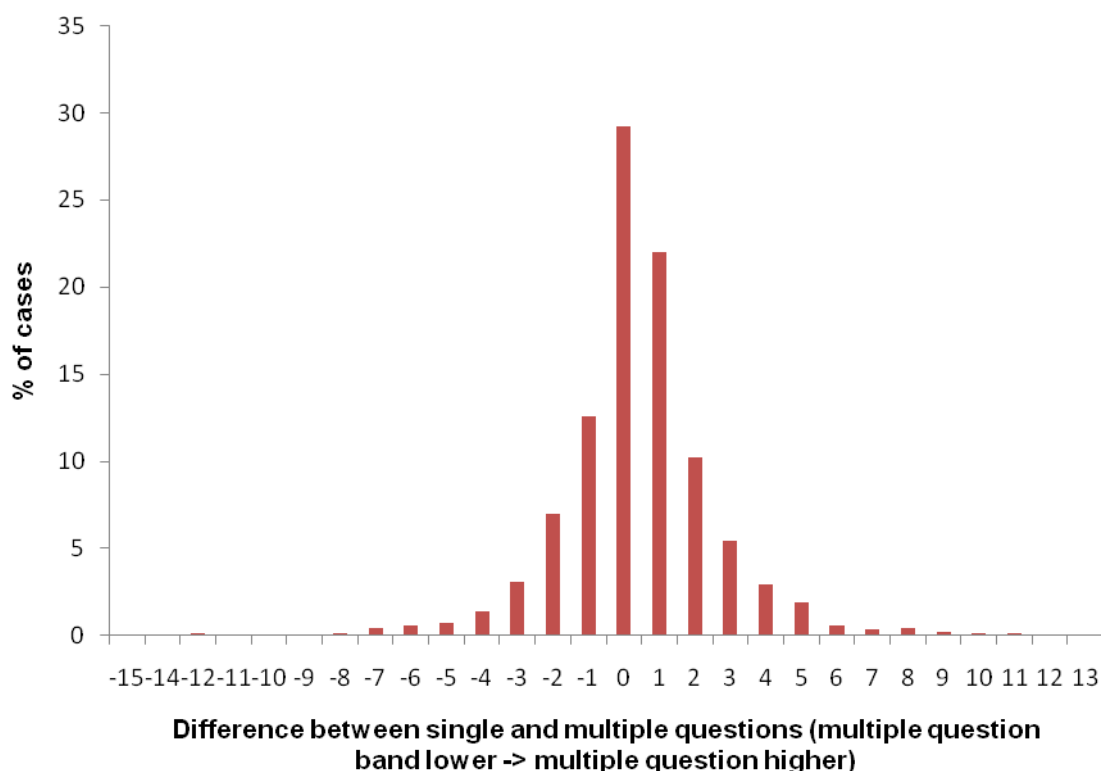
We can see the sub-groups of the population that might be considered more vulnerable such as those on means tested benefits, part-time workers, non-whites and the self-employed are more likely to record higher incomes through the multiple questions than the single question measurement. The difference is largest for those in self-employment where the multiple questions appear to capture a substantially higher mean level of income £46,069 than data from the single banded question £32,822, producing a discrepancy of around £13,000. When the period of reporting (defined as one week, 4 weeks, calendar month or annual) is examined the results show that higher values of income are recorded through the multiple questions than the single question when respondents report their income annually or in a 4 week period. But respondents who report their income by calendar month report higher incomes using the single question.

¹⁴ Based on the ethnic group of the child.

¹⁵ For parsimony, we insert a variable reflecting white versus non-white in Figure 1 although we use an expanded variable in subsequent models.

So far we have examined differences in income recorded by respondents using a range of definitions based either on the single banded income question or the multiple questions by comparing the income at various points of the distribution. An alternate way to illuminate differences between income measurements is to impose the bands of the single question on to the continuous data from the multiple questions and examine the differences. Figure 2 shows the difference between the income distributions from the single question (using definition 2) and multiple questions (definition 5). A negative value indicates that the income bracket derived from the multiple questions is lower than that derived from the single questions. In total 29 per cent of the cohort fell into the same bracket using a single question, 26 per cent had a lower income bracket using the multiple questions and 44 per cent had a higher income bracket using the multiple questions. In a substantial number of cases (19%), the difference was greater than two brackets.

Figure 2: Difference between single income question and multiple income question bands



Notes: same as Figure 1.

We have examined descriptively differences in income recorded by respondents using a range of definitions based either on the single banded income question or the multiple questions. Results have shown that there are non-negligible variations between the income measures for certain sub-groups of the population and by the unit of time respondents record their income over. However, as many of the factors that are examined descriptively may overlap, we explore these relationships more

robustly using a multinomial probit regression model (presented in Table 3)¹⁶. Our model examines the relative probability of reporting a higher income band or lower income band using the multiple questions compared to reporting the same band using both the multiple and single questions (the latter being the baseline category). The process is similar to constructing a (binary) probit regression model, although as we have a nominal, as opposed to a binary, variable the models for predicting the probability of 'higher band versus the same' and 'lower band versus the same' are run simultaneously with the added constraint that resulting predicted probabilities sum to one across all categories. In our model, we enter all of the factors contained in Table 2 as predictors and present in Table 3 the relative magnitude of our predictors in determining the probability of achieving, for example, a higher income band with the multiple questions than a single question, compared to the probability of achieving the same or lower band respectively.

Table 3: Multinomial probit regression showing estimation of income using single versus multiple questions

	Lower	Higher
Part-time working (Base full-time only)		
One working part-time#	0.071 (0.072)	0.055 (0.065)
Only part-time working in family	0.092 (0.155)	0.476** (0.161)
Self-employment (Base: no self-employment in family)		
One in self-employment #	-0.160 (0.119)	0.002 (0.104)
Only self-employment in family	0.511 (0.279)	0.694** (0.255)
Unit of Payment (Base weekly)		
4 weeks	-0.119 (0.132)	-0.102 (0.135)
Calendar month	-0.149 (0.084)	-0.294** (0.086)
Annually	0.057 (0.150)	0.399** (0.152)
Ethnicity (Base white)		
Indian	0.197 (0.228)	0.370 (0.198)
Pakistani/Bangladeshi	-0.369* (0.149)	-0.149 (0.131)
Black	-0.290 (0.160)	0.100 (0.127)
Chinese/Other	-0.353 (0.371)	0.404 (0.400)
Household Structure (Base: couples)		

¹⁶ We initially tested a multinomial regression model but were unable to satisfy the Independence of Irrelevant Alternatives test using the Hausman test.

	Lower	Higher
Lone Parent Household	0.488** (0.106)	0.301** (0.094)
Worklessness (Base: Non workless HH)		
Workless family	-0.338** (0.117)	-0.688** (0.125)
Mean tested benefit status (Base: Not claimin)		
Family claiming means tested benefit (not CTC)	0.157+ (0.087)	0.691** (0.079)
Observations	6,388	6,388

Notes: Constant term included by not shown.

Couples only

Lower = Lower band with multiple questions compared to single question.

Higher = Higher band with multiple questions compared to single question.

P = ***<1%; **<5%; *<10%.

The results confirm earlier descriptive analyses that those with more diverse sources of income are more likely to report higher incomes using the multiple income questions. Those in self-employment, part-time employment and those in receipt of means tested benefits are significantly more likely to report higher incomes using the multiple questions. Net of other factors, lone parents are less likely to report the same income using either measurement instrument. Ethnicity is not statistically significantly predictive of response patterns¹⁷.

What implications do using a banded single question versus detailed questions have for measuring child poverty?

Looking at the differences in reported income according to measurement method allows us to gain insight in to which groups are most likely to give inconsistent income estimates. However, we remain unable to comment on which of these methods is likely to provide the most accurate estimate¹⁸. However due to the

¹⁷ The negative coefficient on the workless family variable in the opposite direction to the coefficient on families claiming means-tested benefits is an unexpected result. For this reason we also ran the same regression as Model A but this time included an interaction term in an attempt to illuminate this issue but the interaction term was not significant in predicting the relative risk. This was further explored by examining the predicted probabilities for each variation of worklessness and means tested benefits was explored. The results (not shown here) indicate that those families in receipt of means tested benefits, but where at least one partner worked, are particularly likely to record a higher income using the multiple questions (52%), but those who were workless and did not claim means tested benefit are among the least likely to do so (27%) and to report a lower band using the multiple questions (56%). Although this analysis compares the cleaned (banded) family income variable from the multiple questions with the single question variable, the latter result for workless families not claiming means tested benefits could suggest a residual effect of underreporting of benefits income. Nevertheless, clearly these results demonstrate that the consistency between measurement instruments is very much dependent on socioeconomic characteristics.

¹⁸ This will be possible if MCS data are matched to administrative records on income but this has not been done to date. We did carry out analysis which compare MCS income data to income data recorded in the FRS. We also considered the validity of our income estimates using other sources. We identified a number of possible comparisons (Table 1) although were unable to find a suitable match. We identified the closest match as the Family Resources Survey (FRS) collected by the Department of

extensive range of information collected in the MCS we are able to look at how the different measures of income are associated with different financial wellbeing measures. In the first instance we examine how the classification of families in poverty in the MCS varies according to measurement instrument. Furthermore, we speculate on the accuracy of those classified and living in poverty (or not) by comparing our results with other, more subjective measures of financial wellbeing collected in the MCS.

We classify households as living in poverty based on a similar definition as OECD, a relative classification of poverty in which equivalised household incomes that fall below 60 per cent of median income are classified as being in poverty. Our definition approximates the DWP practice of comparing net income to the median using a modified version of the OECD equivalised scales and focusing on families rather than the household. This resembles the procedure adopted by Ketende and Joshi (2008) but here we use a separate median threshold for households who are in receipt of housing benefits for whom housing costs are not included in our family income estimates (£206pw), compared to those who are not in receipt of housing benefit (£244pw) (Adams et al., 2010)¹⁹.

The analysis continues to compare banded data and continuous data, although if we were to use the banded data as the basis for our poverty cut-off point, we risk significantly underestimating or overestimating the proportion in poverty by ignoring the within band distribution (for example up to 10 per cent of the cohort fall within the same income band). In order to obtain a more accurate point at which to impose a cut-off point for poverty, we use interval regression to obtain predicted values. Interval regression is used to model banded data, and holds an advantage over OLS when estimating the distributions at the bottom and top of the interval (Ketende and Joshi, 2008; Micklewright and Schnepf, 2010). Interval regression also has advantages where the bottom or top thresholds of the interval are unknown (or censored), as in the case of our single income variable.

We construct an interval regression model using a number of predictors (region and sample stratum, worklessness, self-employment, part-time working, educational level (of main respondent), age (of main respondent), family structure, ethnicity (of child), unit of payment of main component of income, housing tenure and receipt of means tested benefits) to obtain predicted values of income. As the predicted values are highly dependent on the choice of predictors used, to facilitate comparison, we compare the predicted results from the interval regression with the predicted results from an OLS model that uses the continuous income from the battery of questions

Work and Pensions, and selected only those families with a child aged 6-8 years. However, even after weighting, the FRS average household income estimate was much higher at £40,863 than any estimate for the MCS (there were similar discrepancies for the median and quartile values). Likely reasons for this discrepancy include the estimation of housing benefit in FRS incomes and the more detailed collection of incomes from other sources. However, this does not necessarily affect the generalisability of our results to other surveys, as our focus is on within survey differences in income by measurement instruments.

¹⁹ This innovation allows for income from housing benefits not being included in our family income measure.

with brackets (definition 5 earlier)²⁰. In addition, we also compare the impact of using the observed continuous income (definition 5 earlier), and for reference the banded single question data using mid-points (definition 2 earlier), on estimates of poverty. We equalise our four income values using OECD scales (Adams et al., 2010) and present the results in Table 4.

Table 4: Percent in poverty by different measurement tools and derivations of income

		Based on Income from Single Question		Based on Income from Multiple Questions with Brackets	
		Predictions from interval regression	Estimates of mid-point from single question	Predictions from OLS regression	Based on observed data using multiple questions
Poverty Threshold	Above 60% median	77.0	71.7	83.0	78.5
	Below 60% median	23.0	28.3	17.0	21.5

Notes: Sample includes only those with valid definitions across all income measures (N=6,377)

By comparing the predicted values from the two different data sources in the models constructed, we see that a greater number of families would be classed as being in poverty using the data from the single question compared to the multiple questions (looking at either predicted or observed values). Essentially, the higher level of income estimated using data from the multiple questions leads to a more conservative estimate of poverty²¹.

Due to the range of alternative measures of financial wellbeing available in the MCS we can additionally compare how well our measures of poverty (using the different definitions of income) correspond to measures of poverty defined in more subjective ways. We do this in Table 5 which shows the positive predictive power of our poverty definitions in detecting other indicators of financial deprivation: free school meal eligibility and uptake (FSM), reports of financial wellbeing (financially 'just about getting by' or 'finding it difficult'), receipt of housing benefit and FSM combined (termed indicator of deprivation). This is a simple measure which identifies the percentage of people who are identified as being in poverty using our income measures who are predicted to be in poverty using the alternative measures of financial wellbeing.

²⁰ As we are only interested in the predicted values and not in the effect of the covariates, we do not present the full output.

²¹ All our estimates of poverty are also lower compared to other estimates in the literature because of our treatment of those in receipt of housing benefits, our calculation of the OECD equivalisation factor, and our choice of income predictors (Ketende and Joshi 2008). In addition, we make no correction for non-response here, which may bias the sample composition.

Table 5: The positive predictive values of poverty defined using the different income measures against poverty defined using other measures of financial wellbeing.

	Based on Income from Single Question		Based on Income from Multiple Questions with Brackets	
	Predictions from interval regression	Estimates of mid-point from single question	Predictions from OLS regression	Based on observed data using multiple questions
Receipt of housing benefit	55.7	43.4	66.8	50.2
Receipt of FSM	59.1	46.5	74.6	56.8
Reports of financial difficulties	65.2	65.1	68.7	66.6
Indicator of deprivation	45.2	34.0	59.1	42.8

Notes: Percentages reported. Sample includes only those with valid definitions across all income measures (N=6,377)

The results show the definitions of poverty derived from multiple questions have higher positive predictive values across the other measures of financial wellbeing. In other words, those we define as being in the poverty category from the multiple questions have a higher likelihood of being in a deprived category on another indicator of financial wellbeing, than poverty definitions derived from the single income question.

While our analysis is highly dependent on our choice of indicators of financial wellbeing, the evidence suggests that income measured through a single question may be overestimated, and as such, the higher levels of poverty estimated through a single question may not necessarily be corroborated by other measures of financial wellbeing. However, we do exercise caution in drawing our conclusions as the definition of poverty does not correlate perfectly with other indicators of financial wellbeing – for example in the latest official records, 50 per cent of households with children defined as being ‘in poverty’ (before housing costs) were not in receipt of housing benefit and 13 per cent were not in receipt of any means tested benefits (Adams et al., 2010).

Summary

Family income is measured in a variety of different ways across national surveys impeding comparability between sources. However, given that income represents a key variable of interest in many studies, obtaining accurate measurements is of great importance. Here, we have examined differences between two of the main distinctions in measurement methods – whether to use a single variable with a choice of intervals or multiple questions examining each portion of income in detail. Each has its own merits. Researchers wishing to examine certain portions of income will need to use information from multiple questions. However, for many studies, researchers may not need the additional detail, and respondent time may be better spent addressing other questions.

Our results show that using multiple questions is associated with a substantially lower response rate especially when safeguards to ensure logical consistency are imposed. However, this method generally results in a higher estimate of family income than using a single question. This is particularly true for certain groups of the population - those on means tested benefits, those in self-employment and those in part-time work and on low incomes. All of these groups report higher incomes using the multiple questions than a single question.

As the battery of income questions result in higher income estimates, particularly for those in self-employment and on low incomes, it could be assumed that the results from the battery of questions provide the most accurate answer. While it is only through external verification that such an assumption could be qualified, we do explore this further looking at the definition of poverty. The results show that using a single question generally produces a higher proportion of families who could be classified as living in poverty. These results concur with a number of other studies, where the use of a single question was found to overestimate the rate of poverty (Davern et al., 2005). In the MCS when examining other measures of financial deprivation, the more conservative estimate of poverty when using the multiple questions shows more concurrence with the other measures of financial wellbeing as indicated by higher positive predictive power.

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