



Department
for Communities
& Local Government



English Housing Survey

Technical Advice Note

**Household Derived Indicators:
2011-12 Update**

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Introduction

1. This is one of a series of Technical Advice Notes to give users of the English Housing Survey (EHS) further information about how EHS data are collected and quality assured and how some of the key derived measures are created.
2. This note focuses on the more complex derived household variables created using EHS interview survey data where the home is occupied and covers the following variables:
 - income
 - equivalised income
 - rents and housing benefit
 - Modelling of mortgage repayments
 - equity
3. These complex derived household variables, along with more straight forward household variables e.g. household composition, age of the household reference person (HRP) etc, are used throughout the EHS Households Reports which present results on household circumstances and attitudes to housing, the EHS Homes Reports which present results on the condition, amenities and services, and energy efficiency of the housing stock, and in any associated tables.
4. Checks are made on the derived variables to ensure as far as possible that the data values are reasonable and that missing data have been assigned correctly. Implausible values are investigated and only when it is as certain as possible that the data are incorrect is a change made. To assist in analysis, changes made to the data are flagged in the derived EHS interview variable dataset indicating the nature and extent of any imputation.
5. All interview based variables are derived from the full annual EHS sample. The EHS Households Reports are based mainly on one full annual EHS sample, whereas the EHS Homes Reports are mainly based on two years of data using the paired household sub-sample (i.e. where an EHS household interview survey and a physical inspection of the property are secured).
6. The EHS datasets containing these household variables are available to users via the UK Data Archive www.data-archive.ac.uk/

Income

7. Both the EHS Households Report and EHS Homes Report present household/housing related characteristics in relation to various income indicators.
8. The income indicators used within the EHS reports are based on the annual income of the HRP and their partner from wages, pensions, savings, and state benefits. The interview survey collects information on the main components of income for the HRP and their partner. These include:
 - earnings from regular employment (including government training scheme income) or as self-employed
 - Government Training Scheme income
 - income from occupational and private pensions
 - income from other private sources such as rent from lodgers, student loans, maintenance payments etc
 - state benefits including state pensions
 - income from savings and investments
9. The income data are thoroughly checked for inconsistencies and errors to make sure as far as possible that the data are reasonable and that missing data has been imputed correctly. Implausible values are interrogated and only changed when it is almost certain that the data are incorrect. Any changes made are flagged indicating the nature and extent of any imputation (variable hhincflg).
10. Where respondents report receipt of private income sources, e.g. employment, self-employment income, but are unable/refuse to specify an amount, then an estimated amount is assigned according to the methods outlined in Table 1.

Table 1: Imputation procedure for private sources

	Type of missing data	Method of imputation
Self-employed	Amount missing	Uses data from the Annual Survey of Hours and Earnings (ASHE) based on age, sex, part-time/full-time , social economic group and geographical location
Regular employment	Amount missing	
Occupational pension	Amount missing	Sample median based on sex and social economic group
Private pension	Amount missing	
Other private sources	Amount missing	Sample median based on working status

11. Average values are based on the sample median rather than the sample mean as use of median values better reflects the characteristics of skewed distributions such as are common with income data.
12. Where respondents state receipt of particular types of benefits but are unable/refuse to specify an amount, an estimate is inserted based on their theoretical entitlement to the particular benefit. The EHS interview survey incorporates checks on the missing benefit amounts to ascertain whether this were due to the inclusion of the missing amounts with other specified benefits. Use of this data is incorporated into the assessment of missing benefit incomes to avoid double counting of benefit income where this looks probable. Only households that state they are in receipt of benefits are allocated income from benefits. If they are entitled to other benefits but are not claiming them, then estimates for these are not included. However, see paragraph 15, below, on imputation of low incomes.
13. Information is also collected on savings of the HRP and partner. Where the amount of savings/investment has not been provided, a method based on CHAID analysis is used to estimate the combined savings/investment of the HRP and any partner using predictor variables such as tenure, age/sex of HRP, number of jobs (HRP plus any partner) etc.
14. When the annual net income measure needs to be derived, Income Tax and National Insurance payable for the HRP and their partner are calculated where applicable according to Income Tax and National Insurance rates and allowances and deducted to give the total net annual income of the HRP and partner.
15. Low incomes in the dataset are uplifted, the justification being that it is likely the respondent under reported their income; either deliberately or by mistake. Where the calculated income of the HRP and any partner is lower than the household's calculated basic theoretical income support entitlement, the income amount is changed as follows. Households in receipt of one or more of the main benefits (excluding

child benefit) and with an income below their theoretical income support entitlement are allocated their basic income support level plus any disability premiums that they might qualify for. Households that are not in receipt of any of the main benefits and with an income below their theoretical income support entitlement have their income initially set to missing as it was assumed key components of income had been missed or seriously under-reported. An imputed value is then derived – see below.

16. Households where the total HRP and partner income is missing have this estimated using the median income for households as defined by working status, social economic group and whether a partner of the HRP is present in the household.
17. There are two versions of the variable for the annual income of the HRP and any partner. One variable is in terms of gross income i.e. income before tax and National Insurance deductions (labelled JOINTINCx) and the other in terms of net income i.e. with the deduction of Tax and National Insurance where applicable (labelled hhincx). It should be noted that these two income variables do not include any housing related benefits/allowances.
18. In addition, a variable giving the gross income of the HRP and partner has been created that includes housing benefit/Local Housing Allowance as income (labelled 'ALLincx'). This variable is derived by simply adding together the annual gross income of the HRP and partner (JOINTINCx) and an annualised housing benefit/LHA amount ($\text{amthbenx} * 52$). See the section on 'Rents and housing benefit' for the calculation of housing benefit/LHA using EHS data.
19. There is also a further gross income variable available, labelled HYEARGRx which is an extension of the gross income of the HRP and any partner. This variable represents the household gross income of the HRP and any partner but also includes the gross income of other adults living within the household that are not part of the primary benefit unit¹ e.g. a grown-up child living with their parents or two or more unrelated individuals sharing a house. Note that this income variable does not include any housing related benefits/allowances.
20. The EHS Households Reports tend to refer to income in terms of the gross income of the HRP and partner. This is used throughout the Households Report (and associated tables) to relate household income to factors such as tenure and housing benefit receipt. The income measure used within the EHS Homes Reports is that of 'equivalised' income. This is an extension of the net income measure outlined in this section and is discussed in detail below.

¹ Additional adult household members reported during the EHS interview survey to be living in halls of residence are excluded from the analysis and their income is not considered to be part of the household.

Equivalised income

21. A measure known as 'in poverty' is reported on throughout the EHS Homes Report. This is based upon an income measure that is 'equivalised' before housing costs are taken into account. All analysis makes clear the precise measures being used.
22. The purpose of income equivalisation is based on the concept that the cost of living varies according to size and type of household. It recognises that, for example, a household of three people requires a higher income than a one person household to achieve the same standard of living. Accordingly an equivalence scale (the modified OECD² scale) is employed, taking each household's size and composition into account, to make sensible comparisons.
23. Equivalised income measures have been constructed for the EHS in order to assess the relationship between relative poverty and housing conditions and amenities, not to provide estimates of poverty as such. Across Government, poverty is assessed principally through the Households Below Average Income (HBAI)³ series. The EHS income variables have been constructed to reproduce similar definitions to those laid out in the HBAI report. For details on the similarities and differences between the HBAI and EHS equivalised income variables see Tables 1, 2 and 3 in Appendix A.
24. The HBAI report uses two different equivalised income measures: Before Housing Costs (BHC) and After Housing Costs (AHC). The income components that make up the EHS equivalised BHC income variable include; net income of the HRP and any partner, net income from additional adults in the household, winter fuel payment, with the addition of council tax benefit and housing benefit/Local Housing Allowance. For each household the BHC income measure adds up the income from these specified sources and then deducts the amount of council tax payable. These income sources are outlined in Table 2 below together with the method of calculating each income component. The AHC is derived by deducting rent and mortgage payments from the BHC measure, as outlined in Table 3.

² Organisation for Economic Co-operation and Development

³ <http://statistics.dwp.gov.uk/asd/index.php?page=hbai>

Table 2: Income components of the BHC equivalised income

Components of the BHC income measure	Method of calculating the income component
Net income of the HRP and any partner	The income variable hhincx is used. See the section above on 'Income'.
Net income from additional adults in the household	The EHS interview survey collects income data at a basic level for all household members that are 16 or over which is converted to a net amount by deducting the applicable Income Tax and National Insurance
Winter Fuel Payment	The applicable amount of WFP for the household is modelled based on the number of household members that have reached the qualifying age for WFP
Council tax benefit	The BHC income measure includes income from council tax benefit. The EHS interview survey collects information on council tax benefit receipt of the HRP and any partner. Council tax benefit is assigned based on this information combined with knowledge of theoretical eligibility and the amount of council tax due.
Housing benefit/Local Housing Allowance (LHA)	The BHC income measure includes income from Housing benefit/LHA. See the section on 'Rents and housing benefit' for the calculation of housing benefit/LHA using EHS data. The derived variable amthbenx is used.
Deduction of council tax payable	<p>The BHC income measure deducts council tax paid by the household. The amount of council tax paid by the household is modelled using the council tax band of the dwelling and information about charges in the relevant local authority area.</p> <p>The council tax band for each dwelling is collected via a data matching exercise undertaken by the Valuation Office Agency. The council tax band information is only for use in the production of statistics.</p>

Table 3: Income components of the AHC equivalised income

Components of the AHC income measure	Method of calculating the income component
Deduction of rent	The AHC income measure deducts the amount of rent paid by the household (if applicable). See the section on 'Rents and housing benefit' for the calculation of rent using EHS data. The derived variable RentExS is used.
Deduction of mortgage payment	The AHC income measure deducts the mortgage payments paid by the household (if applicable). See the section on 'Mortgage Payment' for the calculation of mortgage payments using EHS data. The derived variable mortwkx is used.

25. The HBAI series and poverty estimates are based on a modified OECD scale (modified so that a couple with no children is considered the reference point and has an equivalence factor equal to unity). The EHS follows this approach and determines the number of 'first' adults (i.e. HRP), other adults, children aged 14 years and over and children under 14 for each sample case in the dataset. This provides the necessary information to be able to apply the OECD equivalisation factors (presented in Table 4) in order to produce an equivalised income.

Table 4: OECD equivalisation factors

Equivalence scales	Modified OECD scaled to couple without children = 1	
	BHC	AHC
First adult	0.67	0.58
Spouse	0.33	0.42
Subsequent adults	0.33	0.42
Children aged under 14 years	0.20	0.20
Children aged over 14 years	0.33	0.42

Note: additional adult household members reported during the EHS interview survey to be living in Halls of Residence are excluded from the analysis.

26. The measured household income is divided by this equivalisation factor so that any household with a factor of less than one (e.g. a single person household) will have their income inflated, reflecting the fact that they are relatively better off than a larger household with the same income. Households with a factor greater than one have their incomes reduced, reflecting the fact that they are relatively worse off than a

smaller household. The incomes of households containing two adults without children will not change.

27. The EHS Homes Report tends to use the BHC equivalised weekly income measure ranked and grouped into five equal sized categories. Thus the first quintile relates to the households with the lowest 20% of BHC equivalised weekly incomes and the fifth quintile relates to the households with the highest 20% of BHC equivalised weekly incomes. As previously mentioned, a term referred to as 'in poverty' is also used in the EHS Homes Reports. Households are defined to be 'in poverty' if their equivalised income is below 60% of the median household income before housing costs (BHC) are taken into account.

Rents and housing benefit

28. Information on rents and housing benefit are presented in detail in the EHS Households Report in analysis of social and private renters. The amount of rent and housing benefit also feeds into the calculation of Equivalised income (see above) as used in the EHS Homes Report.
29. Household rents and housing benefit receipts are collected in the EHS interview survey and apply only to households that rent their own home or households in a shared ownership scheme. Renting households that live rent-free are not asked the series of rent and housing benefit questions in the interview survey. For rent-free cases the rent and housing benefit amounts are set to zero.
30. The total weekly rent payable for the property (variables *rentwqx*) includes the rent paid by the householder plus any housing benefit/Local Housing Allowance (LHA) received (variable *amthbenx*). These variables are calculated based on the householder's response to the set of detailed rent and housing benefit questions asked in the EHS interview. For households with a rent holiday, an adjustment is made so that the actual total amount of rent/housing benefit paid over the course of the year (over *n* weeks) is averaged out over the full year (as if paid over 52 weeks).
31. Households that pay rent but do not provide an amount for their rent/housing benefit, because the amount was either unknown or refused, are assigned an estimated total weekly guide rent amount. This is based on tenure, number of bedrooms and area where they live, (and for private renters also the type of landlord and level of furnishing), using the sources of rent data outlined in Table 5. For these cases, the estimated total weekly rent payable (*rentwqx*) is calculated by adding the total weekly guide rent to the estimated modelled amount for services e.g. heating and regular meals etc. that are included in the rent (where applicable as specified by the householder). See paragraphs 33 to 35 for more information on services.

Table 5: Data sources used for missing rent amounts

Tenure of the renting household	Type of missing data	Rent data source for missing values
Local authority	Rent amount missing	Housing Revenue Accounts (HRA) Second Subsidy Claims form for the financial year. [2011/12 is the last year for which rental estimates were collected in the HRA Subsidy Claim form]
Housing association and shared owners	Rent amount missing	Two successive years of data is drawn from the Statistical Data Return submitted by Private Registered Providers (to reflect a mid-year rent value)
Private renters	Rent amount missing	EHS data using the year in question and modelled accordingly

32. Households that receive housing benefit/LHA but do not provide an amount or households that do not know if they receive housing benefit/LHA are assigned an estimated housing benefit/LHA amount as follows:

- If the household states that they are in receipt of full housing benefit/LHA then the weekly housing benefit is set to their theoretical guide rent amount (as opposed to the total weekly rent payable, since housing benefit does not cover the cost of services such as heating and regular meals)
- If the household states that they are in receipt of partial housing benefit/LHA or if they do not know if their housing benefit/LHA covers all or some of their rent then an amount of housing benefit/LHA is imputed based on their total rent amount payable and their theoretical entitlement to housing benefit

33. An extension of the derived variable for total weekly rent payable for the property (labelled rentw_{kx}) is the total weekly rent payable for the property excluding the cost of services e.g. heating, council tax etc (labelled rentEx_S). The EHS interview survey asks the householder if the rent amount that they provided included any of the following services:

- Council tax
- heating
- water and sewerage
- lighting
- hot water
- fuel for cooking

- regular meals
 - TV licence
34. If the amount of rent the householder provided does not include any of these services, then the total weekly rent payable for the property is the same as the total weekly rent payable for the property excluding the cost of services i.e. $rent_{wkx} = rent_{ExS}$.
35. If the rent amount provided by the householder does include one or more of the services stated above then the householder is asked to provide a rent value excluding the selected services. Based on this rent information, an amount is calculated for total weekly rent payable for the property, excluding the cost of services. If a rent amount excluding services is not provided by the householder then an estimated amount for the selected services is modelled according to the methods shown in Table 6 in order to derive a rent amount excluding the cost of services.

Table 6: Imputation procedure for service amounts

Service	Method of imputation
Council tax	The amount is derived using the council tax band information for the property and the council tax rate from the local authority. For any cases where the respondent selects that council tax is included in their rent but also selected full housing benefit then the amount is set to 0.
Water and sewerage	This is calculated using the mean average water and sewerage rate for a household in England for the given year multiplied by a dwelling factor (that reflects the size/type of property) multiplied by a factor for that geographical area
Heating	Amounts are calculated based on DWP deductions from rent (as used in the assessment of housing benefit)
Lighting	
Hot-water	
Fuel for cooking	
Regular meals	
TV license	Based on the cost of a colour TV license

36. The EHS Households Report mainly focuses on the weekly rent amount payable for the property, excluding the cost of services, e.g. heating, council tax etc. Between the 2007-08 and 2008-9 data there were some methodological changes to the way in which rent data were processed in the EHS compared to the previous Survey of English Housing (SEH). These changes are detailed in the EHS Households Report 2008-09 where an assessment of the impact of the

methodological changes between 2007-08 and 2008-09 on the private rent estimates and further details of the changes to the calculation of social rents are provided.

37. The rent and housing benefit amounts are thoroughly checked for inconsistencies and errors to make sure as far as possible that the data is reasonable and that missing data has been imputed correctly. Implausible values are interrogated and only changed when almost certain that the data is incorrect. Any changes made are flagged indicating the nature and extent of any imputation (variables rentflg and rentExSflg).

Modelling of mortgage repayments

38. Mortgage repayments are calculated from raw data collected from respondents on payments for all mortgages/loans secured on the dwelling, deducting any notional amounts for building and contents insurance, mortgage protection, and other insurance payments where they have been accidentally included. Endowment policy premiums are included in repayments. Information collected is converted to weekly amounts (variable mortwkx).

39. Where repayment amounts are unknown or missing, data is imputed. Where alternative data is available, using the formula below:

Monthly mortgage repayment=

$$\frac{(\text{value of current main mortgage} \times \text{annual interest rate}/12)}{(1-1/((1+\text{annual interest rate}/12)^{\text{length of main mortgage in months}}))}$$

40. The 'current main mortgage' refers to the highest value mortgage if there is more than one loan secured on the property. Where the value of the current main mortgage is not provided, it is derived from original purchase price minus deposit paid, if these data are available. The purchase price is imputed if unknown, based on current market value, year dwelling bought (if available) and DCLG annual house price inflation indices for each area. From 2010, the EHS ceased collecting current market valuations from the Valuation Office Agency (VOA) for all households participating in the interview survey who had a physical inspection of their dwelling. In the interview survey, households are now asked to provide a recent (in last 12 months) valuation of their dwelling, and, if not available, their own estimate of the market value. This valuation/estimate is now used as a proxy for current market value. Any missing values are imputed using data from the Regulated Mortgage Survey based on dwelling type and geographical area. Valuations are checked for outliers and corrected if possible to determine. Payments for other loans secured on the property are not included in this imputation process.
41. If the length of the main mortgage is unknown, it is modelled where data are available, based on the age of HRP and when the main mortgage was taken out (or if missing, when the dwelling was bought),

assuming a maximum mortgage length of 25 years and that it will be paid off when the HRP is 60 years old.

42. The annual interest rate is taken from monthly data provided by the council of mortgage lenders (CML). An average is calculated for the period covered by the EHS survey.
43. Monthly mortgage payments are set to not applicable (-9) for tenancies. If the owner owns the dwelling outright, payments are zero. Shared owners are treated as owners and mortgage payments are derived as above. Flexible/all in one/offset mortgages are also derived as above. Payments for equity release mortgages are modelled as above.
44. Monthly repayment amounts are then converted to weekly payments. The data are thoroughly checked for inconsistencies, outliers and errors although data are only corrected where totally implausible and it is possible to determine an alternative more reliable imputed value.

Equity

45. The value of a household's equity in their property is calculated for all owner occupied (including shared owner) households who participate in the interview survey. It is based on the current market value of the property minus the amount of mortgage outstanding.
 - ie. $\text{Equity} = \text{current market value} - \text{amount of mortgage outstanding including other loans on the property}$
46. All owner occupiers are asked in the interview for an estimated current valuation of their property. This is used to derive an approximate equity value as detailed above (variables 'equityr' and 'equityr5').
47. Research has demonstrated that owner occupiers are more likely to overestimate the value of their homes than underestimate it, and only 40% of household estimates are within 10% of the VOA valuation. Those who moved in just over a year ago, are on the highest incomes or in the highest value properties are most likely to overestimate value. Those homes most likely to be underestimated contain singletons and couples aged over 60 and those resident for at least 20 years. As a result of respondents tending to overestimate property value, equity based on this source of market value ('equityr' and 'equityr5') is likely to be an overestimate.
48. Missing equity valuations are imputed using data from the regulated mortgage survey based on dwelling type and area. Valuations are checked for outliers and corrected if it is possible to determine a more reliable imputed value.
49. Where data used in the above formula is not available, equity is set to unknown (-88888888) or not applicable (-99999999) for tenancies.

Appendix A: Equivalised income

Information on household incomes is not collected in as much detail by the EHS as it is by the Family Resources Survey (the data source for the HBAI series). Therefore there are some limitations to which components can be included in the income measures produced for the EHS. Tables 1, 2 and 3 list the HBAI components of the BHC and AHC measures and describe how the information is addressed through the EHS.

Appendix Table 1: BHC Income components

HBAI Income component	Treatment in the EHS
Income from all household members	The EHS collects income data for the Primary Benefit Unit from the respondent (HRP or any partner). Income data for any additional adult household members is also collected.
Net earnings from employment	Collected
Profit or loss from self-employment	Self-employment income is collected in the EHS and it is included as an income component. The EHS does not collect information on negative self-employment income amounts (i.e. if the respondent experienced a self-employment loss) and thus income losses are not included.
Social security benefits and Tax Credits	Collected for the HRP and any partner
Income from occupational and private pensions	Asked about explicitly in EHS interview
Investment income	Collected
Maintenance payments	Would only be picked up as an 'other' source of income
Income from educational grants and scholarships	Would only be picked up as an 'other' source of income
Cash value of certain forms of income in kind	Not collected

Appendix Table 2: BHC deductions

HBAI BHC Income deduction	Treatment in the EHS
Income tax payments	Deducted using standard rules
National Insurance contributions	Deducted using standard rules
Council tax	Deducted based on information from the council tax band for the property and the council tax rate from the local authority
Contributions to occupational pension	Not collected
Insurance premium payments made in case of sudden loss of earnings	Not collected
Maintenance and child support payments	Not included
Parental contributions to students living away from home	Not collected
Student loan repayments	Not collected

Appendix Table 3: AHC deductions

HBAI AHC Income deduction	Treatment in the EHS
Rent	Collected
Water rates, community or council water charges	Not collected
Mortgage interest payments	Some mortgage data collected but not in sufficient detail to be able to derive a mortgage interest variable. Total mortgage repayments used as a proxy.
Structural insurance premiums	Not collected
Ground rent and service charges	Not included