Housing Executive

CLIENT

Estimates of fuel poverty in Northern Ireland in 2020+2021

Modelled using data from the Northern Ireland House Condition Survey 2016

Published 19 October 2023
Ad-hoc official statistics

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1. Introduction

In Northern Ireland, fuel poverty is defined under the 10% fuel poverty methodology, where a household is considered to be in fuel poverty if, in order to maintain a satisfactory level of heating (21°C in the main living room and 18°C in other occupied rooms), it is required to spend more than 10% of its household income on all fuel use.

In 2016, the Northern Ireland House Condition Survey (NIHCS) estimated that there were 160,000 households in fuel poverty, representing 22% of all households in Northern Ireland[1]. This showed a significant improvement since the 2011 survey, when 294,000 households were estimated to be in fuel poverty (42% of all households in Northern Ireland).

In February 2022, in response to the needs of data users, the Housing Executive published modelled estimates of fuel poverty in Northern Ireland for 2019[2]. This followed a previous publication in May 2019 which modelled estimates of fuel poverty for 2017 and 2018[3]. The estimates of fuel poverty were modelled by BRE using data from the 2016 NIHCS as a base and adjusting the three main components of fuel poverty (fuel prices, household incomes and energy efficiency) to each year of interest. The results for the previous estimates of fuel poverty are shown in Table 1, showing an increase in the modelled estimates of fuel poverty between 2017 (17% of households estimated to be in fuel poverty) and 2019 (24%).

Table 1. Estimates of fuel poverty in Northern Ireland, 2017, 2018 and 2019

Fuel poor households (full income definition)	2016 (Base position from NIHCS)	2017 (modelled estimates)	2018 (modelled estimates)	2019 (modelled estimates)
Number of households	160,000	128,000	131,000	179,000
% of households	22	17	18	24

Base: all households, Northern Ireland 2016

The Housing Executive commissioned BRE to model further estimates of fuel poverty to 2020 and 2021, following a comprehensive review of the data sources and methodology used to provide these estimates. Inflation figures have been applied to fuel prices and household incomes, and the installation of energy efficiency measures have been simulated, based on external data. Due to the uncertainty regarding the reliability of external data used in this exercise, in particular for income data, additional adjustments have been made to account for the probable impact of COVID-19 within the household income estimates, by replicating the effect of furlough. The validity of the final estimates has been compared against external data sources, with further details provided in Appendix B, alongside the assumptions and limitations of the methodology.

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[1] For more information see https://www.nihe.gov.uk/Documents/Research/HCS-2016-Main-Reports/HCS-Main-Report-2016.aspx
[2] https://www.nihe.gov.uk/getattachment/8d9c18cd-14f1-4105-b93a-be017a062dfa/Estimates-of-fuel-poverty-in-Northern-Ireland-in-2019.pdf
[3] https://www.nihe.gov.uk/getattachment/a6f47a43-e547-470f-9955-714998eabb40/fuel-poverty-estimates-2017-2018-NI.pdf

2. Executive summary

Fuel poverty under the 10% methodology is determined by three components: fuel prices, energy consumption (which combined with fuel prices, forms the household costs) and household income. When examined individually, these components influence fuel poverty to varying degrees, however, it is the combination of all three components that determines the fuel poverty estimate.

Table 2 shows the fuel poverty estimates for 2020 and 2021, following the adjustment of fuel prices, household incomes, and simulating the installation of energy efficiency measures within the Northern Ireland housing stock. Fuel poverty was estimated to increase since 2016 from 160,000 fuel poor households to 180,000 fuel poor households (24%) in 2020, and this number decreased slightly in 2021 to 179,000 households (24%).

Table 2. Estimates of fuel poverty in Northern Ireland, 2020 and 2021

Fuel poor households (full income definition)	2016 (Base position from NIHCS)	2020 (modelled estimates)	2021 (modelled estimates)
Number of households	160,000	180,000	179,000
% of households	22	24	24

Base: all households, Northern Ireland 2016

A more detailed indication of the impact of each component on fuel poverty is provided in Table 3, which shows the results when changes since 2016 to fuel prices, incomes, and energy efficiency measures were applied cumulatively. When fuel prices and incomes were adjusted without energy efficiency improvements, the proportion of fuel poor households was estimated to increase to around 26 and 27 per cent, in 2020 and 2021 respectively. If only fuel prices were considered, without any adjustments for income or energy efficiency measures, then fuel poverty was estimated to increase to 28 per cent in 2020 and 30 per cent in 2021.

Table 3. Fuel poverty components, 2020 and 2021

	2020		2021	
	Number of households	% of households	Number of households	% of households
Fuel prices only	206,000	28	219,000	30
Fuel prices and income only	196,000	26	199,000	27
Fuel prices, income and improvement measures	**180,000**	**24**	**179,000**	**24**

Base: all households, Northern Ireland 2016

3. Methodology and modelling outcomes

In February 2022, estimates of fuel poverty in Northern Ireland in 2019 were published, as modelled using data from the 2016 NIHCS, and using external data to project changes to the three components that determine fuel poverty levels (fuel prices, household incomes and energy efficiency). A similar methodology has been used to estimate the number of fuel poor households in 2020 and 2021, with the following deviations from the 2019 methodology:

- Firstly, the external data used to calculate inflation factors has been reviewed, due to the impact of the COVID-19 pandemic on the reliability of survey estimates. In addition, additional modelling to simulate the impact of the COVID-19 pandemic on individual household incomes has been included.
- Secondly, the methodology used to model the number of energy efficiency improvements in the Northern Ireland housing stock has been improved, using additional external data sources, and analysing trends in the English Housing Survey (EHS) data.

Fuel poverty has been calculated using the full income[4] 10% definition, in line with the reporting of fuel poverty in the 2016 NIHCS report. Further details on the methodology used, and the modelling outcomes, are outlined below.

3.1 Northern Ireland House Condition Survey

The 2016 Northern Ireland House Condition Survey (NIHCS) report is a national statistics report that was published in May 2018[5]. It details the status of Northern Ireland's dwelling stock and household occupants, with information provided on many key topics relating to housing, including the energy efficiency of homes, and fuel poverty. The dwelling and household data collected in the 2016 NIHCS has been used as a base for calculating fuel poverty projections in Northern Ireland in 2020 and 2021.

3.2 Fuel prices

Metered fuels in Northern Ireland

Gas and electricity are metered fuels in Northern Ireland, and the fuel prices are based upon data obtained from the Quarterly Energy Price tables (2.2.4) for electricity[6], and the Sutherland Tables for gas[7]. Fuel prices for 2020 and 2021 were updated using average annual prices for standard electricity and off-peak electricity (Economy 7), by the three types of payment (direct debit, standard credit, and pre-payment). Gas prices were also updated for each method of payment from the Sutherland tables and using Consumer Council data for validation.

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[4] Gross household income is collected for the Household Reference Person and partner. This excludes housing related benefits but includes other benefits and other sources of income. Rates, the winter fuel payment, income tax, National Insurance and additional adults are factored in to create a 'basic' income variable. Housing Benefit and rates rebate are added to the basic income, and then the net rates payable are deducted to create a 'full' income variable. For further information please see the Northern Ireland income calculation on page 137 Appendix E of the main 2016 NIHCS report.
[5] https://www.nihe.gov.uk/Documents/Research/HCS-2016-Main-Reports/HCS-Main-Report-2016.aspx
[6] QEP tables 2.2.4 contain average fuel prices for Northern Ireland, based on the calendar year
[7] Sutherland tables

Non-metered fuels in Northern Ireland

The majority of households in Northern Ireland use heating oil to heat their homes[8], which is a non-metered fuel in Northern Ireland. The fuel prices for heating oil, as well as house coal and smokeless fuel, was obtained from the Northern Ireland specific data collected by the UK Government as a component of the Consumer Price Index (CPI). Where data was missing, data for Northern Ireland was extrapolated based on the UK trend. Prices of other non-metered fuels (anthracite, bulk LPG and bottled fuel) come from the Sutherland tables. These are all based upon a retrospective three-year average ending in April of the 2020 and 2021 years[9]. Finally, fuel prices for coal and communal heating were updated to 2020 and 2021 using October CPI data from QEP table 2.1.3.

Modelling outcomes

The percentage change in fuel prices between 2016 and the modelled years are shown for all fuels in Table 4. Heating oil and electricity are most important for fuel poverty, due to high levels of energy consumption from these fuels for households in Northern Ireland[10]. The largest change in fuel prices was seen for electricity, with standard electricity prices increasing by 20% between 2016 and 2020, and by 29% between 2016 and 2021. Heating oil prices increased by 3% between 2016 and 2020, but then dropped by 6% when focussing on the five-year trend between 2016 and 2021. In addition, gas prices also showed a notable increase between 2016 and 2021, increasing by 23%.

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[8] Approximately 68% of dwellings in Northern Ireland used oil central heating in 2016, see Section 7.4 of the NIHCS main report

[9] A three-year average is used to make the data more representative and reduce the variability or fluctuations of very high and very low oil prices.

[10] See the energy consumption in Northern Ireland report: https://www.nihe.gov.uk/getattachment/ae90cd71-618d-4d1c-898c-38a6b4c2dabe/Energy-consumption-NI-housing-stock-2016-(PDF-525kb).pdf

Table 4. Change in the Northern Ireland fuel prices used in modelling, 2016 to 2020 and 2021

Fuel	% change between 2016 and 2020	% change between 2016 and 2021
Bulk LPG	+14	+11
Bottled gas	+3	+5
Oil[11]	+3	-6
Coal	+4	+7
Smokeless fuel	-3	-1
Anthracite	-1	+3
Wood	+13	+16
Communal heat	-17	+6
Gas[12]	+5	+23
Electricity (standard)[5]	+20	+29
Electricity (economy 7 - day)[5]	+17	+25
Electricity (economy 7 - night)[5]	+33	+46

Applying the updated fuel prices to the 2016 data resulted in different rates of changes in fuel costs, dependent on the fuel type used. The changes to fuel prices led to the following changes in the average annual household fuel expenditure in Northern Ireland:

- Between 2016 and 2020, the mean household fuel costs increased by 10%, from £1,530 in 2016 to £1,680 in 2020;
- Between 2016 and 2021, the mean household fuel costs were increased further to £1,700 in 2021, equivalent to an 11% increase.

3.3 Household income and COVID-19

Household income

To project incomes to 2020 and 2021 the NIHCS 2016 derived income variables were used as a base, and uplift values were applied to the components that make up household income as summarised in Table 5: employment income, benefit income, winter fuel payment, rates and rates rebate, and additional adult incomes. The 'basic' and 'full' household income values[13] were then recalculated.

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[11] See footnote nine
[12] The price changes shown are for standard credit payment method. Equivalent changes were applied for direct debit and pre-payment methods within the analysis.
[13] The full income definition is the method used to calculate the published 2016 Northern Ireland fuel poverty figures in the Northern Ireland House Condition Survey (NIHCS) 2016 Main Report. See https://www.nihe.gov.uk/Documents/Research/HCS-2016-Main-Reports/HCS-Main-Report-2016.aspx

Table 5. Adjustments made to the components of income to model 2020 and 2021 incomes

Income component	2020 and 2021 projections
Employment income for the HRP and partner (based on working status/benefit receipt)	Using data from the Northern Ireland Annual Survey of Hours and Earnings (ASHE)[14], inflation factors were applied to the 2016 data based on the age, working status and benefit receipt of the HRP and partner.
Benefit income	From 2016 to 2019 the majority of means tested benefits were frozen and as a result, no changes to the amounts of benefits received were made. In 2020, the benefits freeze ended, and income from means tested benefits in the UK were increased by 1.7% in 2020, and by 0.5% in 2021[15].
Winter Fuel Payment (WFP)	No change occurred in the WFP rates between 2016 and the two modelled years, therefore no adjustment was made to this amount.
Rates (deduction from household income)	The 2020 and 2021 Northern Ireland domestic poundage values were used to calculate 2020 and 2021 annual domestic rate bill.
Rates rebate	The 2020 and 2021 rate rebate amounts were applied at the same ratio of rates as used in Northern Ireland in 2016.
Additional adult income	Inflated in line with the change in the net income of the HRP and partner of the household in Northern Ireland.

COVID-19 adjustment

The coronavirus disease (COVID-19) pandemic was first reported in Northern Ireland on the 27th February 2020, with a nationwide lockdown a month later, on the 23rd March 2020. Various government support schemes were set up for businesses and the self-employed as a result. These included the Coronavirus Job Retention Scheme (CJRS) and Self Employment Income Support Scheme (SEISS) that commenced in April and May, respectively[16]. In addition, extra financial support for households claiming benefits was made available[17].

Data from the Annual Survey of Hours and Earnings (ASHE) data was used to uplift incomes to 2020, as noted in Table 5 above[18]. The gross annual incomes used in the projections were unaffected by furlough, as the reference date was the 5th April 2020, before the CJRS scheme was introduced on the 20th April 2020. Therefore, the impact of the CJRS (otherwise referred to as furlough) on the projected household incomes in 2020 has been modelled[19], using the following method.

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[14] ASHE data for Northern Ireland is published by the Northern Ireland Statistics and Research Agency: https://www.nisra.gov.uk/statistics/labour-market-and-social-welfare/annual-survey-hours-and-earnings
[15] For more information on benefit uprating see here: https://commonslibrary.parliament.uk/research-briefings/cbp-8806/
[16] https://www.gov.uk/government/collections/financial-support-for-businesses-during-coronavirus-COVID-19
[17] https://www.nidirect.gov.uk/articles/coronavirus-COVID-19-and-benefits
[18] https://www.nisra.gov.uk/publications/ni-ashe-2020-publication
[19] Due to the nature of the modelling exercise, it was not possible to model the impact of the following: redundancies; the SEISS; discretionary grants; or changes to households in receipt of universal credit.

Firstly, the number of employments on furlough in Northern Ireland, as a percentage of eligible employments, was calculated from the external data which showed that between April 2020 and March 2021, around 16% of employments in Northern Ireland were on furlough[20].

Assuming that all regions had a similar rate of furlough, that this rate was constant for the whole year and that each furlough resulted in a reduction in income[21], the net income of adults in employment (HRP or partner) were reduced to 80% of the 2020 income values. The final household income was then simulated using a similar approach to the energy efficiency projections (see Section 3.4):

1. A household where the HRP had a reduced income from furlough was selected at random in the dataset. Further households were randomly selected until 16% of households where the HRP is in employment were assigned the income reduction.
2. Independent of the HRP income, this process was repeated for the partner until 16% of households where the partner is in employment was assigned the income reduction.
3. Once all cases had been assigned the income reduction, the total household income of the household and fuel poverty status for each case was re-calculated, for the 2020 projections.

Because the methodological approach used a random selection process, the procedure above was repeated 100 times alongside the energy efficiency improvements, and a final run was selected (see Section 3.4). Further information on the quality of the external data, and other data sources used for validation, is covered in Appendix B.

In 2021, the impact of furlough was accounted for within the Northern Ireland ASHE statistics, and therefore no additional adjustment was required to calculate the change in household income between 2016 and 2021.

Modelling outcomes

Using the full income definition, applying the income changes from 2016 to the modelled years increased the average net household income in Northern Ireland. The median income increased by 3% between 2016 and 2020 (from £20,100 to £20,600), including the adjustment of employment income to account for furlough.

In 2021, the impact of furlough is accounted for within the 2021 ASHE statistics, and therefore the inflators were applied to the non-adjusted 2020 income values so that the effect of furlough was not double counted. This led to an increase in the median full household income of 4% between 2016 and 2021 (from £20,100 to £20,900).

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[20] https://www.gov.uk/government/collections/hmrc-coronavirus-COVID-19-statistics
[21] As reported in the 2020 ASHE bulletin (footnote 9), in April 2020, approximately 25% of employments were identified as furloughed, while 15% were identified as furloughed with reduced pay (no top-up from employer). From the 1st July 2020, on average 74% of households were on the full furlough scheme.

3.4 Energy

Incorporating the estimated effect of energy efficiency improvements installed in the Northern Ireland housing stock between 2016 and the modelled years, involved a two-stage process:

- Stage 1: selection of energy efficiency improvement measures to be installed in the 2020 and 2021 years, and an estimation of the number of installations in this period based on external data

- Stage 2: identification of suitable homes for the energy efficiency upgrades and random allocation of the improvements to eligible cases, and re-calculation of energy consumption

In line with the method used to calculate fuel poverty estimates in 2017, 2018 and 2019, three mainstream energy efficiency measures were used in the 2020 and 2021 fuel poverty estimates: loft insulation, cavity wall insulation (CWI) and heating system improvements. To estimate the number of improvements between 2016 and each modelled year, the trends in the installation of improvements between the 2011 and 2016 NIHCS data was determined.

To further improve the estimated number of energy efficiency improvements between 2016 and each target year, adjustments were made as follows:

- Northern Ireland external data was used to estimate rates for CWI, using data from the Department for Communities (DfC) affordable warmth scheme, and the Northern Ireland Sustainable Energy Programme (NISEP).
- Trends in the English Housing Survey (EHS) data were used to adjust the Northern Ireland trends to 2019 levels for loft insulation and heating system improvements[22].
- Adjustments were made for new builds added into the housing stock.

This provided an updated baseline for the number of energy efficiency measures assumed to be installed each year in Northern Ireland, before the COVID-19 pandemic. The impact of COVID-19 was then accounted for by using the external data from multiple schemes in Northern Ireland to re-adjust the figures for 2020 and 2021, assuming the drop in the background rate of installations was the same as the drop in the rate of installations through the specific schemes. The schemes included: Northern Ireland Housing Executive (NIHE) planned maintenance schemes for heating and boiler replacements; the Department for Communities (DfC) affordable warmth and boiler replacement schemes; Northern Ireland Sustainable Energy Programme (NISEP), and housing association boiler upgrades.

The estimated number of installations for each type of measure is shown in Table 6 below.

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[22] This approach was considered suitable as the trend in energy efficiency of dwellings over time from the NIHCS mirrors the trend in the English Housing Survey.

Table 6. Estimated improvement measures in Northern Ireland households, 2016 to 2020 and 2021

Improvement measure[23]	Number of installations modelled - 2016 to 2020	Number of installations modelled - 2016 to 2021
Cavity Wall Insulation (CWI) – added to homes with unfilled cavity walls	11,000	13,000
Loft insulation – added to homes with a suitable loft space and where there is less than or equal to 150mm of insulation present	49,000	59,000
Gas/oil condensing boiler – added to homes that require a heating system upgrade	112,000	142,000

Reduced household energy consumption was simulated by incorporating the energy efficiency improvements identified in Table 6 into the 2016 base data using the following method:

1. A case requiring CWI was selected at random in the dataset for improvement. Further cases were randomly selected until 11,000 in 2020 or 13,000 homes in 2021 were assigned the CWI improvement measure in the dataset.
2. Homes selected for CWI were also assigned the loft insulation upgrade if applicable.
3. The remaining loft insulation improvements were randomly assigned to homes requiring the upgrade until 49,000 in 2020 and 59,000 in 2021 homes were assigned the loft insulation improvement measure.
4. Heating system upgrades were treated independently of the CWI and loft insulation improvement measures. A case requiring the heating system upgrade was selected at random in the dataset for improvement. Further cases were randomly selected until 112,000 homes in 2020 and 142,000 homes in 2021 were assigned the heating system improvement measure.
5. Once all the identified improvement measures had been assigned, the energy consumption of the household was re-calculated where applicable to account for the energy improvement upgrades.
6. The fuel poverty status for each case was re-calculated based upon the projected incomes, fuel prices and energy consumption, and an overall level of fuel poverty was determined.

The methodological approach used a random selection process, and the process was repeated 100 times alongside the furlough simulation. The run that was closest to the average fuel poverty status, for all households and when split into the private and social tenures, was then selected (using a least-squares approach) based on the income reduction due to furlough and selected energy efficiency improvements.

Modelling outcomes

Overall, combining the increase in fuel prices with the application of energy efficiency measures, led to an increase in the average annual household fuel expenditure in Northern Ireland by 7%, from £1,530 in 2016 to £1,630 in 2020. Between 2016 and 2021, the average annual household fuel costs increased by 8%, to £1,640 in 2021.

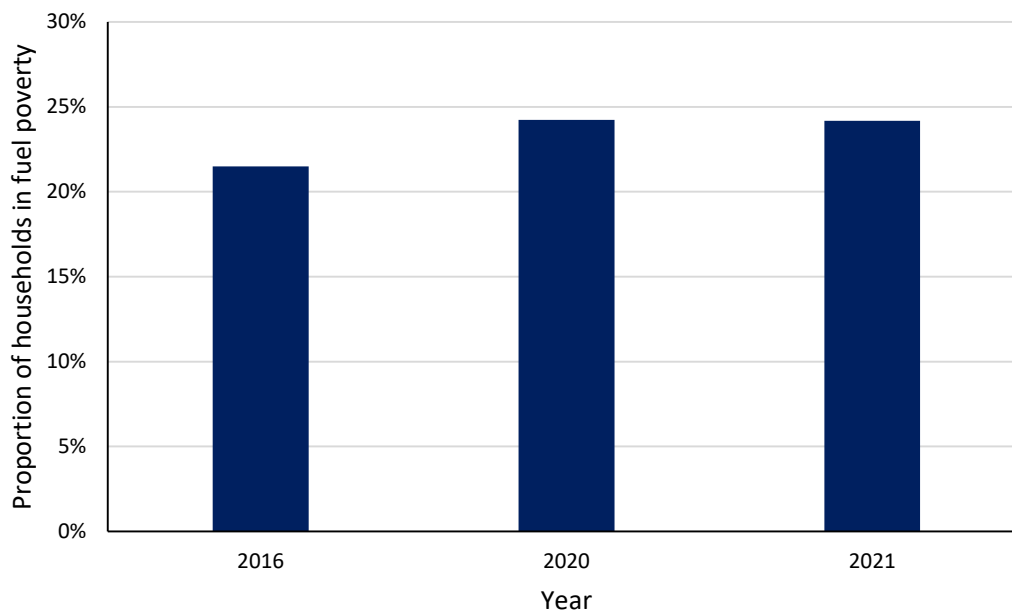[23] To update installation estimates based on survey data, the following Northern Ireland scheme data was used: Northern Ireland Housing Executive (NIHE) planned maintenance schemes for heating and boiler replacements; the Department for Communities (DfC) affordable warmth and boiler replacement schemes; Northern Ireland Sustainable Energy Programme (NISEP), and housing association boiler upgrades.

4. Results

4.1 Headline statistics

The 2020 and 2021 Northern Ireland fuel poverty indicators have been estimated by modelling the changes to fuel prices, household incomes and energy efficiency, since 2016. The estimated proportion of households in fuel poverty for 2020 and 2021 are shown in Figure 1, showing the increase in the rate of fuel poverty since 2016, from 22% households in 2016 to around 24% households in both 2020 and 2021. This equates to an increase in the number of households in fuel poverty from 160,000 households in 2016, to 180,000 in 2020, with a slight decrease to 179,000 in 2021. The drivers for the increase in fuel poverty are discussed in Section 4.2 and further details on the sample and confidence intervals for these estimates are provided in Appendix A.

Figure 1. Proportion of households estimated to be in fuel poverty, 2020 and 2021

Base: all households, Northern Ireland 2016

4.2 Components of fuel poverty

As mentioned in Section 4.1, fuel poverty estimates have been calculated by applying changes to fuel prices, incomes, and energy efficiency measures since 2016. In this section, the changes have been applied cumulatively and the results presented at each stage, to provide an indication of the impact of each component on fuel poverty. The following combinations were analysed: fuel prices only; fuel prices and income only; fuel prices, income, and energy efficiency improvements (the final fuel poverty estimate). The number and percentage of households in fuel poverty for each of these scenarios is shown in Table 7.

Table 7. Fuel poverty components, 2020 and 2021

	2020		2021	
	Number of households	% of households	Number of households	% of households
Fuel prices only	206,000	28	219,000	30
Fuel prices and income only	196,000	26	199,000	27
Fuel prices, income and improvement measures	180,000	24	179,000	24

Base: all households, Northern Ireland 2016

The impact following the application of changes to fuel prices, incomes and energy efficiency measures on fuel poverty were as follows:

Fuel prices only

Fuel prices increased between 2016 and 2020, and between 2016 and 2021, although this differed by fuel type and the year of interest. Between 2016 and 2020, the most notable increase was for electricity, where prices increased by 20% over the four-year period. Heating oil prices and gas prices also increased over the period (3% and 5% respectively). However, between 2016 and 2021 there was a dip in heating oil prices (decreasing by 6%), while increases were seen for electricity (29%) and gas (23%) over the five-year period.

In total, the impact of fuel prices alone led to an increase in mean fuel costs (10% between 2016 and 2020, 11% between 2016 and 2021), and subsequently resulted in an increase in fuel poverty by six percentage points between 2016 and 2020, and eight percentage points between 2016 and 2021.

Fuel prices and income only

Median incomes increased by 3% between 2016 and 2020, following an adjustment for furlough within the 2020 figures. This was not enough to compensate for the increase in fuel prices between 2016 and 2020. The 2020 fuel poverty estimates, with adjusted fuel prices and incomes, decreased by two percentage points compared with the fuel poverty with adjusted fuel prices only. A similar picture was seen for 2021, with median incomes increasing by 4% between 2016 and 2021, leading to a decrease in the fuel poverty estimates (with adjusted fuel prices and incomes) by three percentage points.

Fuel prices, income, and improvement measures

In total, following the allocation of energy efficiency improvements (cavity wall insulation, loft insulation and heating system upgrades), the mean household fuel costs for households in Northern Ireland decreased by 3% in both 2020 and 2021. Overall, the combined effect of fuel price increases and energy efficiency improvements was for an increase in the mean household fuel costs by 7% between 2016 and 2020, and 8% between 2016 and 2021 (from £1,530 in 2016 to £1,630 in 2020, and £1,640 in 2021).

Nevertheless, similarly to incomes, the number of measures applied was not enough to compensate for the increase in fuel prices between 2016 and 2020, and between 2016 and 2021. Overall, the impact of

energy efficiency improvements was to reduce the number of households in fuel poverty by two percentage points in 2020, and by three percentage points in 2021, when compared with fuel poverty with adjusted fuel prices and incomes only.

For further information on the assumptions used, and the adjustments made to the methodology to account for the impact of COVID-19 on the fuel poverty estimates, please see Appendix B.

Appendix A - Confidence intervals

Standard errors measure the uncertainty around the survey estimates. Confidence intervals are calculated from standard errors and provide a method of assessing the magnitude of sampling errors by indicating the range of random variation in survey estimates. Note: The confidence intervals do not account for all potential sources of error e.g., the NIHCS 2016 survey design, measurement error and surveyor variability.

The fuel poverty projections should be interpreted as indicative estimates based on the assumptions and modelling techniques used.

Table A1: Proportion of fuel poor households, 2020 and 2021 projections

	Unweighted base	In fuel poverty (%)	95% confidence interval	
			lower	upper
2020 projections: fuel prices only	1,917	27.8	25.5	30.2
2020 projections: fuel prices and income only	1,917	26.4	24.1	28.7
2020 projections: fuel prices, income and improvement measures	1,917	24.2	22.0	26.5
2021 projections: fuel prices only	1,917	29.5	27.2	31.9
2021 projections: fuel prices and income only	1,917	26.8	24.5	29.1
2021 projections: fuel prices, income and improvement measures	1,917	24.2	22.0	26.5

Base: all households, Northern Ireland 2016

Appendix B - User guide

a. Method

The BRE 'Estimates of fuel poverty in Northern Ireland in 2020 and 2021 methodology' comprises data modelling of the 2016 NIHCS to simulate a 2020 and 2021 position.

The 2016 NIHCS data was adjusted to account for:

– Changes in fuel prices between 2016 and both 2020 and 2021
– Changes in income between 2016 and both 2020 and 2021
– Improvements in energy efficiency between 2016 and both 2020 and 2021

Following these adjustments, the number of households in fuel poverty was calculated for 2020 and 2021.

To aid understanding, further information about the methodology along with the various outputs is contained in the body of the report. For more information on fuel poverty and how it is measured see Appendix E page 136 of the main 2016 NIHCS report[24].

b. Quality information

The quality assurance of the modelling work used to produce this report focused on ensuring that the data translation and modelling processes were performed correctly, to provide accurate and reliable results. The process of development and the creation of results followed an internal procedure so the work undertaken could be reviewed and assessed by project managers.

Examples of the quality assurance undertaken to validate the model and results included:

– Updating and revising the methodology using the latest assumptions for this area of work
– Checking of transformations undertaken and mathematical formulae
– Internal checks of data inputs to assure translation was completed correctly
– Checks of correct units for calculations
– Check correct and latest external data sources were used
– Sense check of results
– Internal review of results and reporting.

Surveyors working on the 2016 NIHCS received training and support to help ensure their collection of energy related data were consistent and robust. A re-fresher training session in 2016 explained the principles, how the form should be completed as well as conducting practical exercises with feedback sessions. While these measures ensure a good level of consistency in judgements, some surveyor variability is to be expected.

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[24] https://www.nihe.gov.uk/Documents/Research/HCS-2016-Main-Reports/HCS-Main-Report-2016.aspx

c. Impact of COVID-19

Methodology changes

In February 2022, estimates of fuel poverty in Northern Ireland in 2019 were published[25]. Due to concerns with the availability and quality of external data for the 2020 year, the publication of the 2020 estimates were delayed pending further investigation of the data used to calculate the estimates of fuel poverty. Further investigation of the data included a review of the external data used in the income calculation; validation of the final household incomes using additional external data; and revision to the methodology used to estimate the number of energy efficiency measures applied within the stock. The results of each of these are summarised below:

1. **Review of the external data used in the income calculation**

The Annual Survey of Hours and Earnings (ASHE) data was used to inflate employment incomes, from the base 2016 data to each year of interest. The quality of the 2020 and 2021 ASHE data was analysed, and the estimates used in the model were considered acceptable, with the majority retaining a reasonably robust coefficient of variation of <10%. In addition, the trends in the Northern Ireland data were found to track the UK trends, with UK average income figures typically 10% higher than the Northern Ireland average incomes.

2. **Validation of the final household incomes using additional external data**

Since the latest publication of the Northern Ireland fuel poverty estimates for 2019, two leading income surveys published their 2020-21 income data, both in March 2022. The first was the Family Resources Survey (FRS) and Households Below Average Income (HBAI) data, and the second was the ONS Household Finances Survey (a combination of the Living Costs and Food Survey, LCFS, and the Survey on Living Conditions, SLC). Large cautionary notes were provided with the publication of the HBAI time series data, with confidence intervals provided and no statistically significant differences noted between 2019-20 and 2020-21. In addition, no regional breakdowns were provided by the ONS due to concerns with the reliability of the estimates. Due to these reasons, it was not proposed to use the HBAI or ONS data in place of the current methodology, allowing for consistency in the approach used with previous years. Instead, the data has been used to validate the 2020 modelled household incomes in the absence of other Northern Ireland specific data.

The 2019, 2020 and 2021 modelled estimates for household income in Northern Ireland were equivalised to compare with the data from the HBAI and the ONS. The HBAI data reported a decrease in the median BHC income by 1.3% between 2019-20 and 2020-21, in cash prices. This was in contrast with the ONS where the UK equivalised disposable income was found to increase by 2.8% between 2019-20 and 2020-21, in cash prices. Therefore, the modelled 2020 estimates (when accounting for furlough) were found to be broadly in line with the findings from the two main income sources, showing a 1.2% increase in the median BHC equivalised income between 2019 and 2020.

Due to the reliability of the estimates from the ASHE data, used to inflate the employment incomes, and the broad alignment of the final modelled household incomes with other external data sources, this provided increased confidence in the calculation of fuel poverty estimates for 2020 and 2021.

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[25] https://www.nihe.gov.uk/getattachment/8d9c18cd-14f1-4105-b93a-be017a062dfa/Estimates-of-fuel-poverty-in-Northern-Ireland-in-2019.pdf

Finally, additional gross household income data for Northern Ireland, was provided by the FRS for the following years: 2016, 2019, 2020 and 2021. This data was used to quality assure the 2020 and 2021 modelled estimates for net household income in Northern Ireland, by comparing the change in the distributions over time, with the findings providing greater confidence in the derived estimates.[26]

3. Revision to the methodology used to estimate the number of energy efficiency measures applied within the stock

The timeframe used for the estimation of energy efficiency improvements between 2016 and 2019 was flagged as a weakness of the methodology, as this was based on the trend in improvement measures applied between the 2011 and 2016 Northern Ireland house condition surveys.

Alternative external data was sourced to update the current estimates, including data from the English Housing Survey (EHS) and data from the Home Energy Conservation Authority (HECA) on the number of energy efficiency improvements provided by schemes in Northern Ireland.[27] This data was used to update the baseline (pre-covid) numbers, and also to adjust the number of measures applied in 2020 and 2021 accordingly with the external data.

In addition, the methodology for estimating the number of energy efficiency improvements installed in the stock has been strengthened.

Further Assumptions

The following lists some further assumptions used in the calculation of fuel poverty estimates in 2020 when accounting for the impact of COVID-19:

– The number of households in employment and on benefits remained constant. Universal credit claimants increased by almost double between March 2020 and the end of May 2020, however, these were assumed to be constant for the purposes of re-calculating household income in 2020. Data from the FRS showed stable trends in employment status between 2016 and 2019, however there were uncertainties with the FRS 2020 data, due to the smaller sample and change in survey mode. In addition, changes to demographics are complex to model (see the limitations section).
– The income of households in self-employment was not affected by COVID-19. The Self-Employment Income Support Scheme (SEISS) statistics showed that average uptake across the three grants was 73% of the self-employed. It was reported by the IFS that on average the first payment fully replaced lost household income (with some households under compensated, and others over compensated)[28]. Due to the impact of the payments, the small proportion of households affected, and the uncertainty around the application of the support, no further adjustments were made to the household incomes
– The income of households from benefits was not affected by COVID-19. The rate of benefit uplift was considered to be constant for all households in receipt of means-tested benefits.
– The number of households on furlough was constant throughout the 2020 year, and only the HRP and partner were eligible for furlough payments.

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[26] Over the five-year period, the FRS gross income distribution did not show any large changes, in line with the observations from the NIHCS net income distributions.

[27] The following Northern Ireland scheme data was used: Northern Ireland Housing Executive (NIHE) planned maintenance schemes for heating and boiler replacements; the Department for Communities (DfC) affordable warmth and boiler replacement schemes; Northern Ireland Sustainable Energy Programme (NISEP), and housing association boiler upgrades. In addition, EHS data from headline report stock annex tables, and NIHCS 2011 and 2016 data were used.

[28] https://ifs.org.uk/publications/15157

– The reduction in income from furlough was 80% of net 2020 income, and this was constant throughout the 2020 year. In addition, all regions in Northern Ireland had the same rates of furlough, and all household composition groups, and age bands observed the same furlough rates.

d. Strengths and limitations

Strengths

The basis of this report is the 2016 NIHCS dataset. All results should be taken in the context of this background, and the survey and modelling assumptions which occur within these. Consistency with this approach is a strength of the modelling undertaken.

The bases of most assumptions are large scale and high quality national statistics; e.g. the Annual Survey of Hours and Earnings (ASHE) or Quarterly Energy Prices (QEP). The impact of the COVID-19 pandemic on the quality of external data has also been reviewed.

The size of the sample for the NI House Condition Survey 2016 was 3,000 addresses. A weighting and grossing process translated the information gathered into figures that reflected the real world. This provided robust data at Northern Ireland level. Further information on the sampling, and weighting and grossing processes for the Northern Ireland House Condition Survey 2016 is available in the report[29]. See Appendix A page 88 of the main 2016 House Condition Survey report for more information on for the survey's user guide.

Limitations

The fuel poverty estimates for 2020 and 2021 are based on the most recent NIHCS data, collected in 2016. For any modelling, the more time that passes from the data collection time, the more uncertainty there will be with the estimates.

In the calculation of the 2020 and 2021 fuel poverty estimates, it was assumed that household composition remained stable since 2016. This includes: the number of households in Northern Ireland, the composition of individual households, and the employment status of individuals in households. Further modelling and adjustments would be required using external data on demographic changes, to account for any compositional changes over time, and are subject to the quality of the base data and external data. Due to concerns with the complexity of undertaking such an adjustment process and assessing the robustness of the remodelled estimates, no adjustments have been made to 2020 and 2021.

Energy efficiency improvements have been modelled based on available external data. Improvements have been made to more accurately estimate the number of energy efficiency improvements applied in the housing stock in 2020 and 2021. In addition, the impact of energy efficiency improvements over this period is small, and it is unlikely that the assumptions used will have a large effect on the final fuel poverty estimates.

The 2020 fuel poverty estimates were calculated using the best available information, and the methodology was broadly the same as for previous estimates. However, it is important to note that

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[29] https://www.nihe.gov.uk/Documents/Research/HCS-Main-Reports-2016/HCS-Main-Report-2016.aspx

additional modelling was carried out to account for the impact of COVID-19, leading to a higher level of uncertainty in the 2020 fuel poverty estimates, due to the following reasons:

- The method used to model the impact of furlough on household income was based on a random selection of adults in employment (HRP or partner), and as such could not account for any differences in the rate of furlough based on job type, nor differences in furlough by region, age of employee, or other additional factors.
- External data sources were used to model changes to fuel prices, household income and energy efficiency measures. As a result of the pandemic, there was a reduction in the availability of income data that would usually be used as a consistency check.

A note of caution

Please use caution when quoting the 2020 fuel poverty estimates, and when comparing them with other years, because the level of uncertainty is higher than would be usual for our estimates.

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