

# Annex D: Modelling Public Services

## 1. Purpose of the Paper

This paper is concerned with the approaches that have been taken in modelling the public services components of the model. The paper gives an overview of our approach and underlying principles and then goes through the different public services included in turn.

### 1.1 Issues in modelling Public Services

Whilst the methodology to undertake distributional analysis of tax and cash benefits is well established and has been used for some time – there is no standard methodology for carrying out a distributional analysis of public service provision. Distributional analysis is produced by both HM Treasury and Office for National Statistics to show the impacts of the UK budgets in terms of tax, social security payments (benefits) and public expenditure. Their analysis focuses on impacts by equivalised net household incomes rather than protected characteristics.

The key questions we have had to consider and address are:

- which services to include
- which people to allocate the services to
- how to allocate the spend on included services to those individuals.

### 1.2 Our approach

We decided that an overarching principle would be helpful in deciding which expenditure on public services to include. For the purposes of this work, **we've decided to include expenditure only on frontline public services which is spent within a given year and where the benefit is realised in the same year**

The decisions about who to allocate spending to and how the spending is allocated is made on a service by service basis – and details for each service is given in the tables in this document.

### 1.3 Services included in model

One way of thinking about which spending meets our principle is to consider the four categories of public expenditure:

- **Fiscal Resource** makes up over two-thirds of the Scottish budget (67%). It includes staff costs, benefit payments, grants to NHS boards and local governments, and other spending on day-to-day management and administration.
- **Annually Managed Expenditure (AME)** (19% of the Scottish Budget) includes funding which is ring-fenced for less predictable expenses, such as pensions in the health and education sectors (c £4.4bn for 2019/20), non-domestic rates (£2.6bn) and student loans (c £400m). This funding is provided by the UK Government even though the policy areas are devolved.
- **Capital** expenditure (12% of the Scottish Budget) is investment in infrastructure and other long-term assets. In the 2019/20 budget, the largest items of capital expenditure are house construction (£775m), planning support (£704m), rail services (£836m), and motorways/trunk roads (£409m).
- **Non-cash** expenditure (2% of the Scottish Budget) is predominantly the depreciation of public-sector assets.

The majority of expenditure which falls within our principle is likely to come under Fiscal Resource. In many cases this will include administration costs, and we will highlight where these costs have been included.

In addition to the Scottish Government Budget, Local Government contributes an additional £5.4 billion to public service expenditure from funds raised from Council Tax, Non-Domestic Rates, fees and charges and money from their reserves. For consistency with HMT Treasury, funding from reserves should also be excluded.

Whilst this is only a partial picture of all public sector expenditure on services, these services have a relatively clear basis for allocation – which is necessary for the modelling.

The model includes expenditure on the following services: health; schools; social work; higher education & student support; concessionary fares, bus and rail support; child care; and apprenticeships.

<b>Public Service</b>	<b>2019/20 Expenditure (£m)</b>	<b>Proportion</b>
Health	13,522.10	55%
Education	4,712.78	19%
Social Work	3,244.26	13%
Higher and Further Education	1,756.97	7%
Childcare	712.2	3%
Transport	477.7	3%
Apprenticeships	88.0	<1%
<b>Total expenditure on Public Services in model for 2019/20</b>	<b>£24,514.0</b>	<b>100%</b>

A more detailed breakdown for each public service can be found in Annex A – Budget Lines and Sources.

## 1.4 Estimate of Coverage

The services included in the model cover an estimated 73% of all expenditure on public services. The table below shows how this is calculated. We have deducted Social Security and Older People resource funding as this is included within the benefits section. Communities and Local Government funding is excluded to avoid double counting of local authority expenditure. We have added in Local Government expenditure through the Provisional Outturn and Budget Estimates (POBE)<sup>1</sup> budget estimates for 2019/20.

	<b>£ million</b>
SG Resource Funding	28,714.6
Less Social Security and Older People	(7,102.5)
Less Communities and Local Government	(574.9)
Plus POBE for 2019/20	12,635.0
<b>Total Resource Expenditure on Public Services</b>	<b>33,672.2</b>
Value of Public Services in this work.	24,514.0
Coverage	73%

## 1.5 Methodology

The remainder of this paper details how we have modelled each public service in turn.

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<sup>1</sup> <https://www.gov.scot/publications/local-government-revenue-expenditure-financing-2018-19-provisional-outturn-2019-20-budget-estimates/>

HEALTH			
	Expenditure in 2019/20	Caseload Target	Caseload Modelled
<b>Health</b>	<b>£13,522.1m</b>  (This is £13,592.1m less £70m transferred to Higher Education budget for nursing and midwifery training).	2019 Scottish Population	5,452,444  Used Mid-Year 2019 Scottish Population
<u>Methodology</u>	<p>Health expenditure in Scotland is allocated using the NHSScotland Resource Allocation Committee (NRAC) formula,<sup>2</sup> which takes account of the age and sex profile of the population, relative need due to morbidity and life circumstances, and the cost of providing health services in different geographical areas. This includes the additional spend targeted to deprived areas to address health inequalities.</p> <p>Initially we focused on using age and sex only to allocate the health spend as these variables account for most of the health allocation. For example, comparing two allocations, one which uses age-sex only and the other which is the NRAC final allocation, only shifts approximately 6% of the total health budget.<sup>3</sup> However, following discussions with health colleagues, there was a clear need to go further than this. We decided to include a measure of deprivation within the allocation (the Scottish Index of Multiple Deprivation –SIMD) to reflect the other parts of the NRAC formula.</p> <p>Two challenges needed to be overcome.</p> <ul style="list-style-type: none"> <li>• The Family Resources survey (FRS) does not contain SIMD quintiles and so these would need to be modelled.</li> <li>• We do not have cost by age, sex and SIMD quintiles for Scotland, only national costs for Scotland broken down by age and sex.</li> </ul>		

<sup>2</sup> <https://www.isdscotland.org/Health-Topics/Finance/Resource-Allocation-Formula/information.asp>

<sup>3</sup> <https://www.isdscotland.org/Health-Topics/Finance/Publications/2016-12-13/2019-20-Resource-Allocations-Datazone-data.xlsm?12:47:42>

## HEALTH

### Challenge One: Modelling SIMD Quintiles onto the Family Resources Survey

Analysis of the NRAC data<sup>4</sup> indicates that moving from an age-sex only allocation to the full NRAC allocation moved resources from the top three quintiles (SIMD quintiles 3,4 and 5) to the bottom two quintiles (SIMD quintiles 1 and 2). We therefore decided to use this as the binary split in our logistic regression modelling.

We've used the Scottish Household Survey (SHS) as the training dataset and then applied this to the FRS. The key predictors used were:

- the proportion of the population in each local authority in the lowest SIMD quintile;
- the Socio-economic classification of the person;
- the tenure of the household, and;
- the highest level of qualification that an individual holds.

Using the SHS, we estimate that our model is correct 73% of the time (by chance we would expect to be right 60% of the time). Including other predictors such as income makes negligible improvements to the logistic model.

Applying the model to the FRS using the same predictors, we developed a further stage to ensure that any household in the bottom 15% of SIMD areas (which is recorded in the FRS) is in our predicted lower two SIMD quintiles. In addition, we ensure that the predicted SIMD result is consistent across all individuals within the household.

### Challenge Two: Identify Health Costs by Age-Sex and Deprivation

Whilst we have age-sex health care costs for Scotland, age-sex-deprivation costs for Scotland are not readily available. However, similar data for England, using the English Index of Multiple Deprivation (IMD) has been published by the University of York.<sup>5</sup> The healthcare costs in the York data include inpatient and outpatient hospital costs, GPs, prescriptions, dental and ophthalmic costs.

<sup>4</sup> <https://www.isdscotland.org/Health-Topics/Finance/Publications/2016-12-13/2019-20-Resource-Allocations-Datazone-data.xlsm?12:47:42>

<sup>5</sup> <https://www.york.ac.uk/che/news/2017/che-research-paper-147/>

## HEALTH

The age – sex costs for England and Scotland are similar (Chart 1), although there are some differences for the very young (0 to 1 years) and older people aged over 75 years. These differences may be driven by variations in life expectancy across the UK, and differences in the levels of staffing. For example, in a 2012 report,<sup>6</sup> the National Audit Office stated that:

- Life expectancy is lower in Scotland than in England, which would suggest that older people may need acute services sooner in Scotland than in England
- In 2009, Scotland had the most GPs per 100,000 people compared to England, Wales and Northern Ireland. Scotland also has the most medical hospital staff and nursing, midwifery and health visiting staff per person.

In the absence of other information, we make the assumption that age– sex-deprivation costs follow a similar pattern in both countries. Further investigation shows that the modelling is not sensitive to these cost differences.

Therefore we use this University of York data for the breakdowns of age-sex-IMD deprivation. These costs are shown in Chart 2. We assume that the shape of these profiles holds for people in Scotland in the SIMD 1 & 2 and SIMD 3, 4 and 5, although we apply a small boost (a multiple of 1.115) to the SIMD 1&2 profile to ensure that 45.3% of health spending is allocated to the four most deprived deciles – the same as in the NRAC formula allocation. We use these shares to allocate the health budget.

### Allocating the Health Budget

The health budget of £13,592.1 million is split into three parts:

- Money for the fourteen NHS Territorial Boards (£9,811.4m), and;
- Fixed costs which cover the remaining £3,710.7m. (This includes £1,225.6 m for NHS National Boards).<sup>7</sup>
- Money to support the training of nurses and midwives (£70m) as part of the Nursing and Midwifery Student Bursary (NMSB). (This money is removed from the health budget and transferred to Higher Education student support).

<sup>6</sup> <https://www.nao.org.uk/report/healthcare-across-the-uk-a-comparison-of-the-nhs-in-england-scotland-wales-and-northern-ireland/>

<sup>7</sup> NHS National Boards covers: National Waiting Times Centre, Scottish Ambulance Service, The State Hospital, NHS 24, NHS Education for Scotland, NHS Health Scotland, NHS National Services Scotland and Healthcare Improvement Scotland.

## HEALTH

	<p>Our approach is to first give each person a healthcare cost which depends on their age, sex and their SIMD quintile,<sup>8</sup> as detailed above.</p> <p>For fixed costs, the healthcare costs of each person are summed. This total is then scaled so that it equals the fixed cost total of £3,780.7m. This same scaling factor is then applied to each individual, to give the fixed cost allocation per person.</p> <p>From the Family Resource Survey (FRS), we know the local authority in which each household resides. As local authorities and health boards share the same boundaries, each household is then assigned a health board. The healthcare costs for each individual in each health board are then summed. This total is then scaled so that this equals the allocation for each health board. This scaling factor is then applied to each individual, to give the health board allocation for each person.</p> <p>Fixed costs and health board allocations are added together to give the value of healthcare for each person.</p>
<p><u>Quality Assurance</u></p>	<p>We can look at the results of the NRAC Allocation, using age and sex only, or by looking at the final allocation. The final allocation takes into account the relative additional needs due to morbidity and life circumstances (MLC) and the relative unavoidable excess costs of providing services in remote places.</p> <p>Comparing age-sex only with the final allocation, the National Allocation formula is estimated to move around £780m of expenditure from the top three SIMD quintiles to the bottom two SIMD quintiles.<sup>9</sup> This shift represents about 6% of the total health budget.</p> <p>Checking our method, using SIMD as an additional allocation factor (compared to age-sex only) moves £660m of expenditure from the top three SIMD quintiles to the bottom two.</p>

<sup>8</sup> <https://www.york.ac.uk/che/news/2017/che-research-paper-147/>

<sup>9</sup> <https://www.isdscotland.org/Health-Topics/Finance/Publications/2016-12-13/2019-20-Resource-Allocations-Datazone-data.xlsm?12:47:42>

## HEALTH

<u>Data sources used</u>	<ol style="list-style-type: none"> <li>1. NRS Population Projections – 21 October 2019 (2018-based).<sup>10</sup></li> <li>2. NRAC Cost Index Summary - supplied by ISD 02 May 2019.<sup>11</sup></li> <li>3. Health care costs in the English NHS: reference tables for average annual NHS spend by age, sex and deprivation group.<sup>12</sup> See Charts 1 and 2.</li> </ol>
<u>Comments</u>	<p>Our approach is different to HM Treasury. We have spread the cost of the health service across the entire Scottish population, whilst HM Treasury have allocated expenditure to users of the health service – a smaller group of people. They have modelled users of the health service using a number of variables as predictors. We've attempted to replicate Treasury's approach and can't produce robust results, possibly due to the small numbers of people interacting with different parts of the health service.</p>
<u>Exceptions</u>	<p>No adjustment has been made for private healthcare.</p>

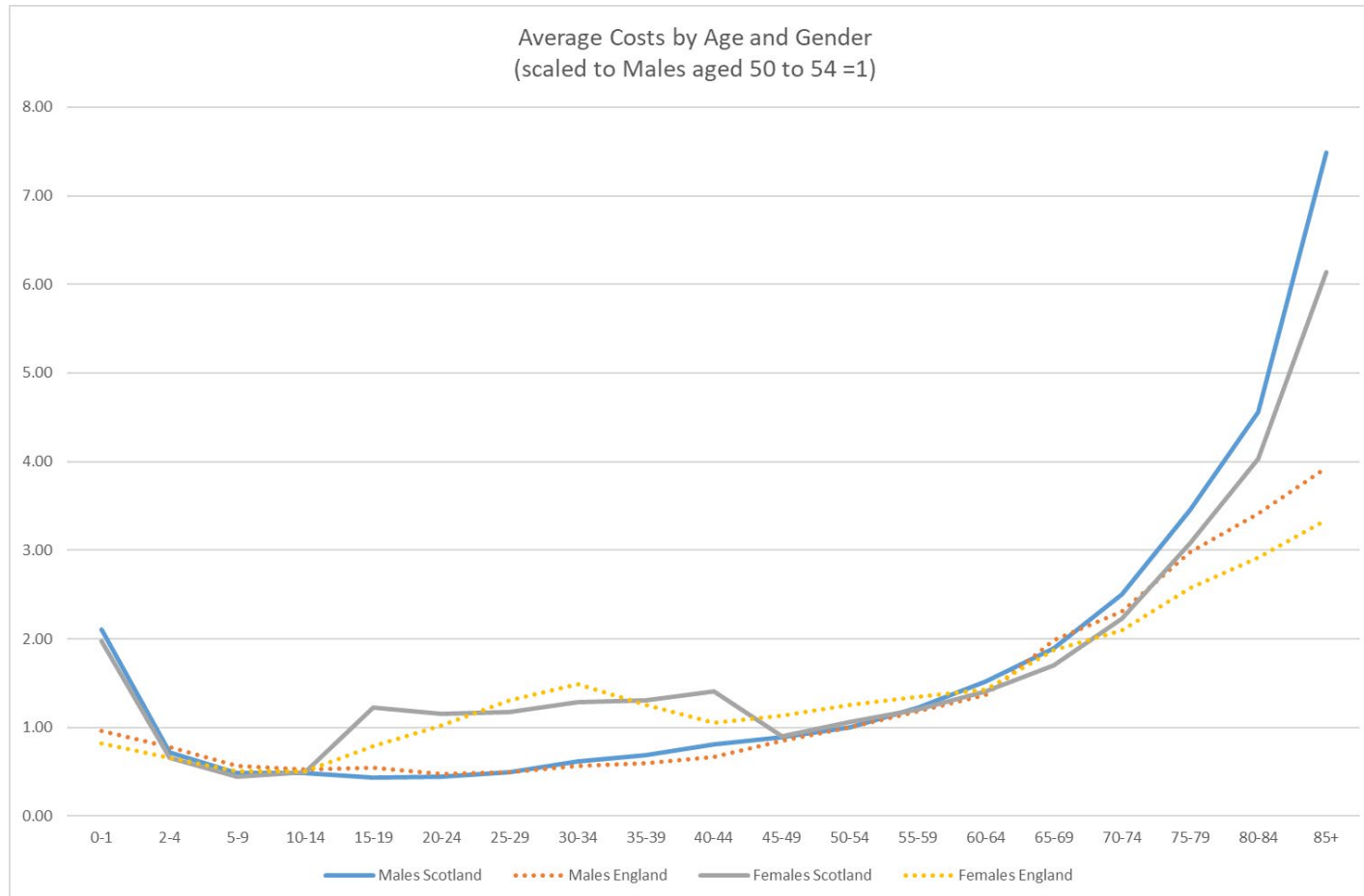
<sup>10</sup> <https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-projections/population-projections-scotland/2018-based>

<sup>11</sup> [file:///s0177a/datashare/Strategy Unit/Social%20Contract%20Project/Data/Health%20Costs/ISD%20Health%20costs%20per%20person%20by%20age%20-%2002%20May%202019.xlsx](file:///s0177a/datashare/Strategy%20Unit/Social%20Contract%20Project/Data/Health%20Costs/ISD%20Health%20costs%20per%20person%20by%20age%20-%2002%20May%202019.xlsx)

<sup>12</sup> <https://www.york.ac.uk/che/news/2017/che-research-paper-147/>

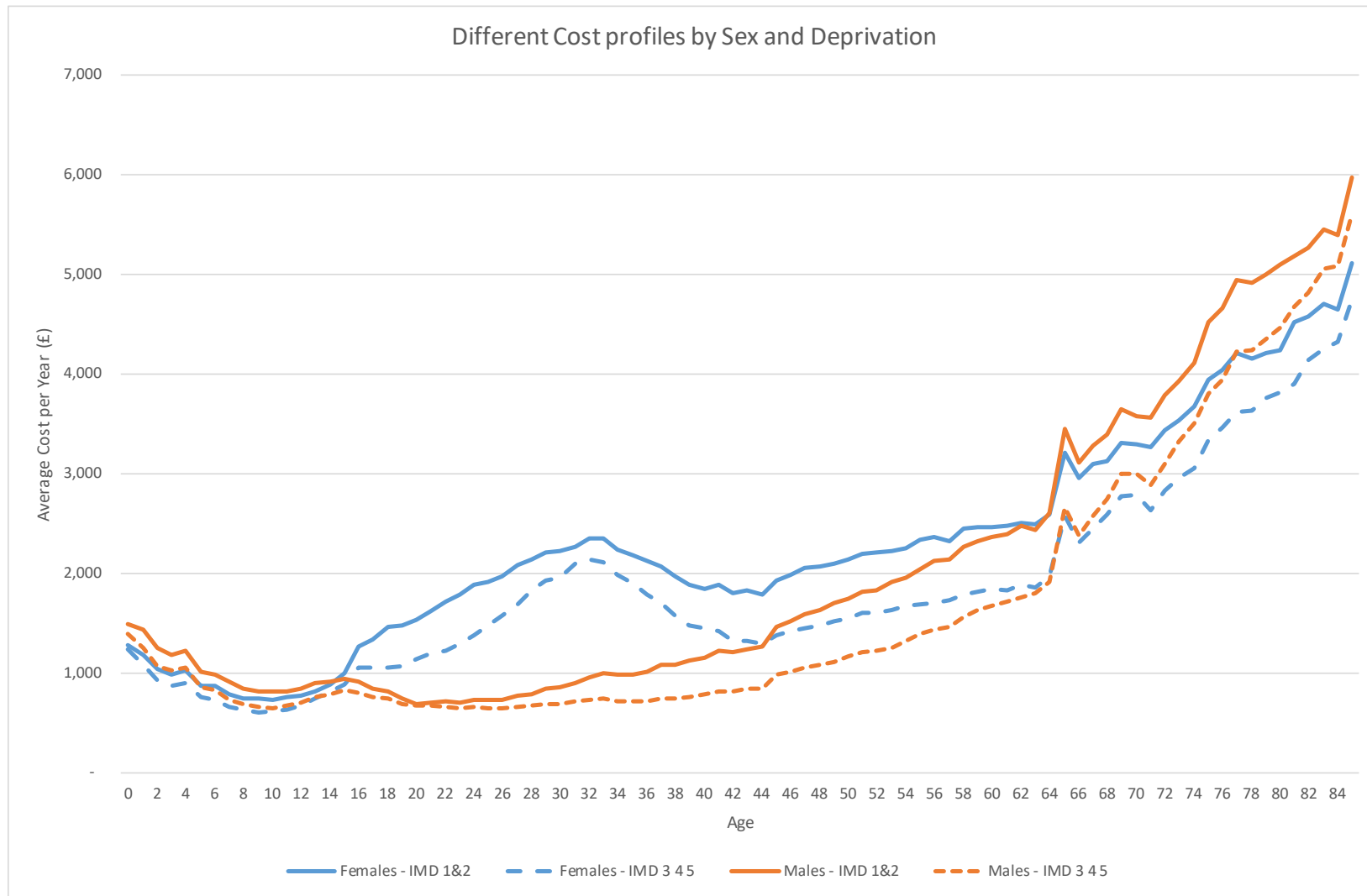


**Chart 1: Comparison of Average Healthcare Costs by Age and Gender – Scotland and England<sup>13</sup>**



<sup>13</sup> Sources are NRAC Cost Index Summary - supplied by ISD 02 May 2019 and Centre for Health Economics Data <https://www.york.ac.uk/che/news/2017/che-research-paper-147/>

**Chart 2: Average Healthcare Costs by Age, Sex and Index of Multiple Deprivation (IMD) for England**



Source: Centre for Health Economics Data, <https://www.york.ac.uk/che/news/2017/che-research-paper-147/>

HIGHER EDUCATION			
	Expenditure in 2019/20	Caseload Target	Caseload Modelled
<b>Higher Education</b>	<p style="text-align: center;"><b>c. £1,182.0 million</b></p> <p>Student Support &amp; Tuition Fees: £305.5m (est.) from bursaries, grants and fees.</p> <p>Nursing and Midwifery bursary plus other transfers from health: £70m</p> <p>Part-time Fee Grant and discretionary funds: £33.7m</p> <p>University Resource Cost: £772.8m</p>	<p>247,000 at University</p> <p>48,500 HND/HNC at College</p>	<p>247,000 at University</p> <p>46,000 HND/HNC at College</p>
<u>Methodology</u>	<p>Our overall approach here is to first identify the correct number of higher education students in Scotland. We then assign higher education spend to these students as detailed below.</p> <p>There are three distinct groups of students in higher education and these are:</p> <ol style="list-style-type: none"> <li>1. Undergraduate students at Scottish universities, studying degrees.</li> <li>2. Postgraduate students at Scottish universities, studying for masters and doctorates, etc.</li> <li>3. Students in colleges studying for Higher National Diplomas (HNDs) and Higher National Certificates (HNCs)</li> </ol> <p><u>Ensuring the right number and age profile of higher education students at University is included in the model</u></p> <p>As the FRS is a survey of private households, only higher education students living at home and in the private rented sector will be included in the survey. Other students living in university halls of residence and private sector halls of residence will be not included in the survey. To compensate for this, we have re-weighted the population in the FRS so that it covers the entire Scottish population as at 30 June 2019. We model all students in Scotland, regardless of their nationality.</p> <p>To determine whether someone is a higher education student at a university - either an undergraduate or postgraduate student - we apply the following rules in this order:</p>		

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1. The individual must not be at school and must be aged 16 or over.
2. We use the “What qualification are you studying for?” question (variable: curqual) in the FRS to determine the current qualification being studied. If degree (curqual=1) then they are a higher education student at university. This gives us 165,000 higher education students at university.
3. If they have an employment status of student (FRS variable empstati=7), we assume they’re a higher education student. This gives a further 29,000 higher education students at university.
4. If they have an employment status of “Other inactive” or a missing employment status we flag them as a possible higher education student. (This pool contains 155,000 possible students). We randomly sample within this pool to choose a further ensure that the overall age profile of higher education students at university matches HESA data.<sup>14</sup> At this stage we select a further 53,000 people to give a total of 247,000 higher education students at university.

The model is run over a number of simulations as random assignment is used. The resulting age distribution is shown below, and compared to higher education university students in Academic Year 2017-18 (AY 2017/18).

Age	HESA	Modelled	Difference (%)
20 and under	91,235	90,430	-1%
21-24	70,710	69,406	-2%
25-29	30,750	30,392	-1%
30 and over	54,400	56,364	4%
Unknown	10		-
<b>Total</b>	<b>247,110</b>	<b>246,592</b>	<b>0%</b>

Figures may not sum to totals due to rounding. AY 2017/18

After discussions with policy colleagues, it was felt that students needed to be differentiated by level of study (postgraduate vs. undergraduate), mode of study (full-time vs. part-time) and domicile (Scottish and EU vs. rUK and Non-EU) in order to accurately model higher education spend across different students. Much of this information is not available on the FRS and therefore we have needed to overcome this challenge.

<sup>14</sup> <https://www.hesa.ac.uk/data-and-analysis/students/table-3>

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### Dividing Higher Education Students at University into different groups

Using data from HESA,<sup>15</sup> the level of study (postgraduate or undergraduate) and mode of study (full-time, part-time) is available and is shown below.

Age Group	Level and Mode of Study - AY 2017/18				Total
	All postgraduate		All undergraduate		
	Full-time	Part-time	Full-time	Part-time	
20 and under	280	30	86,210	4,715	91,235
21-24 years	18,750	1,435	45,745	4,780	70,710
25-29 years	11,995	4,265	9,040	5,450	30,750
30 years and over	8,385	16,485	9,550	19,980	54,400
Age unknown	.	5	-	-	5
<b>All</b>	<b>39,410</b>	<b>22,220</b>	<b>150,545</b>	<b>34,925</b>	<b>247,100</b>

Figures may not sum to totals due to rounding.

The domicile of students is also given –

AY 2017/18		rUK and Non-EU	Scottish and EU	Total	rUK and Non-EU	Scottish and EU	Total
Level of study	Mode of study	Number	Number	Number	Percent	Percent	Percent
All postgraduate	Full-time	20,485	18,925	39,410	52%	48%	100%
	Part-time	6,725	15,500	22,225	30%	70%	100%
All undergraduate	Full-time	35,030	115,515	150,545	23%	77%	100%
	Part-time	2,390	32,535	34,925	7%	93%	100%
<b>Total (ALL)</b>		<b>64,630</b>	<b>182,475</b>	<b>247,105</b>	<b>26%</b>	<b>74%</b>	<b>100%</b>

Figures may not sum to totals due to rounding.

<sup>15</sup> <https://www.hesa.ac.uk/data-and-analysis/students/where-from> and <https://www.hesa.ac.uk/data-and-analysis/students/whos-in-he>

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For our modelling we need to make a link between age, the level of study, mode of study and domicile. These groups are important as they determine the types of support which students are eligible for.

This information is not readily available and so we use the above information above to derive probabilities, so that row and column totals are preserved. For example, we know that 52% of all postgraduate students in full-time study are from rUK or Non-EU countries. We apply this 52% to the 39,410 postgraduate students in full-time study in Scotland, and this gives 20,485 postgraduate students from rUK and Non-EU countries, and therefore 18,925 students from Scottish domiciled or EU students.

Applying this method gives the following distribution of higher education students at university in Scotland.

Number	Scottish and EU				rUK and Non-EU				Total
	All postgraduate		All undergraduate		All postgraduate		All undergraduate		
	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	
20 and under	134	21	66,150	4,392	146	9	20,060	323	91,235
21-24 years	9,004	1,001	35,101	4,453	9,746	434	10,644	327	70,710
25-29 years	5,760	2,974	6,937	5,077	6,235	1,291	2,103	373	30,750
30 years and over	4,027	11,497	7,328	18,613	4,358	4,988	2,222	1,367	54,400
<b>Total</b>	<b>18,925</b>	<b>15,493</b>	<b>115,515</b>	<b>32,535</b>	<b>20,485</b>	<b>6,722</b>	<b>35,030</b>	<b>2,390</b>	<b>247,095</b>

Percent	Scottish and EU				rUK and Non-EU				Total
	All postgraduate		All undergraduate		All postgraduate		All undergraduate		
	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	
20 and under	0%	0%	73%	5%	0%	0%	22%	0%	100%
21-24 years	13%	1%	50%	6%	14%	1%	15%	0%	100%
25-29 years	19%	10%	23%	17%	20%	4%	7%	1%	100%
30 years and over	7%	21%	13%	34%	8%	9%	4%	3%	100%
<b>Total</b>	<b>8%</b>	<b>6%</b>	<b>47%</b>	<b>13%</b>	<b>8%</b>	<b>3%</b>	<b>14%</b>	<b>1%</b>	<b>100%</b>

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As this information is not included in the Family Resources Survey, we model it so that it reflects the above distribution. Using Age Group, we give each record a random number between 0 and 1 and use this to allocate the record to one of eight categories (domicile x level of study x mode of study) depending on the above probabilities. For example, this means that 73% of students aged 20 or under will be full time under-graduates from Scottish and EU countries.

The **modelled** distribution of students is shown below, and closely mirrors the HESA data:

Number	Scottish and EU				rUK and Non-EU				Total
	All postgraduate		All undergraduate		All postgraduate		All undergraduate		
	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	
20 and under	-	-	65,404	3,153	922	-	20,951	-	90,430
21-24 years	8,437	938	34,658	7,505	7,502	-	10,366	-	69,406
25-29 years	5,972	2,543	7,062	4,921	6,525	1,035	2,063	271	30,392
30 years and over	4,049	12,542	7,361	19,578	3,903	5,517	2,291	1,125	56,364
<b>Total</b>	<b>18,457</b>	<b>16,023</b>	<b>114,485</b>	<b>35,157</b>	<b>18,853</b>	<b>6,551</b>	<b>35,671</b>	<b>1,396</b>	<b>246,592</b>

Percent	Scottish and EU				rUK and Non-EU				Total
	All postgraduate		All undergraduate		All postgraduate		All undergraduate		
	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	
20 and under	0%	0%	72%	3%	1%	0%	23%	0%	100%
21-24 years	12%	1%	50%	11%	11%	0%	15%	0%	100%
25-29 years	20%	8%	23%	16%	21%	3%	7%	1%	100%
30 years and over	7%	22%	13%	35%	7%	10%	4%	2%	100%
<b>Total</b>	<b>7%</b>	<b>6%</b>	<b>46%</b>	<b>14%</b>	<b>8%</b>	<b>3%</b>	<b>14%</b>	<b>1%</b>	<b>100%</b>

## HIGHER EDUCATION

### Modelling the Parental Incomes of Higher Education Students at University

Students are typically on a low income whilst they are studying and many appear in the lowest income decile. This presents an issue when allocating higher education spending as inevitably it concentrates expenditure in the lowest income decile. In line with the way in which government reports on access to higher education – based on parental home in SIMD areas – and following discussion with policy and technical colleagues we have modelled parental income and attached this to the student in the model.

To do this we look at the typical socio-economic background of students' parents.<sup>16</sup> For AY 2017/18, the backgrounds look like this:

<b>Social Economic Background of Student's Parents</b>	<b>AY 2017/18</b>
Higher managerial & professional occupations	28%
Lower managerial & professional occupations	27%
Intermediate occupations	14%
Small employers & own account workers	7%
Lower supervisory & technical occupations	5%
Semi-routine occupations	13%
Routine occupations	6%
Never worked & long-term unemployed	1%

We select households with children from the FRS and take their gross household incomes. We then randomly select from this pool in such a way that:

- 28% of our higher education students inherit gross household incomes taken from families with higher managerial & professional occupation
- 27% of our higher education students inherit gross household income taken from families with lower managerial & professional occupation
- and so on.

<sup>16</sup> <https://www.hesa.ac.uk/data-and-analysis/students/whos-in-he#>



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At the same time, higher education students also inherit the equivalised net income from the same household. These inherited income are used to recalculate the equivalised net income deciles. We call these student-adjusted equivalised net income deciles as they re-order where higher education students appear in the income distribution. Equivalised net income deciles are used only in the presentation of results from the model. These deciles are not used implicitly in the allocation of higher education funding.

### Modelling the number of Higher Education students at college studying for HNCs and HNDs

There are around 50,000 students in higher education who study at colleges for HNCs and HNDs.<sup>17</sup> The age profile of higher education students at college, and whether they are full-time or part-time is shown below.

<b>Age of student (at 31st December) AY 2017-18</b>	<b>FT</b>	<b>Part-Time</b>	<b>Total</b>
under 16	-	56	56
16	94	207	301
17	1,696	631	2,327
18-19	12,503	1,369	13,872
20-24	9,514	3,459	12,973
25 & over	8,662	10,316	18,978
<b>OVERALL</b>	<b>32,469</b>	<b>16,038</b>	<b>48,507</b>

To determine whether someone is a higher education student at a college - studying an HNC or HND - we apply the following rules in this order:

<sup>17</sup> [Scottish Funding Council Infact Database](#). Number of students BY Mode of attendance (FT, PT, DL, WBL, etc.) BY Age of student (at 31st December) for year 2017-18  
Where :- Level of Study (Further or Higher Education) = Higher Education

## HIGHER EDUCATION

1. The individual must not be at school.
2. They must not be a higher education student at university.
3. We use the “What qualification are you studying for?” question (variable: curqual) in the FRS to determine the current qualification being studied. If Diploma in HE/HNC/HND (curqual=2 or 3) then they are a higher education student. This gives us 31,000 higher education students at college.
4. We use age to randomly assign further people to full-time or part-time so that the above distribution is preserved - this adds a further 15,000 students.

The modelled distribution of HND and HNC students - average over five runs - is given below.

Age of student (at 31st December) - Modelled	Full Time	Part-Time	Total
under 16	-	90	90
16	234	187	243
17	1,658	564	2,223
18-19	12,123	1,430	13,553
20-24	9,020	3,464	12,484
25 & over	8,295	9,205	17,500
<b>OVERALL</b>	<b>31,191</b>	<b>14,831</b>	<b>46,021</b>

### Allocating Costs of Higher Education to Higher Education Students

From the Scottish Budget, Funding for Higher Education is broken down as follows:

<b>BUDGET LINES: Higher Education Funding in Financial Year 2019/20</b>	<b>£m</b>	<b>%</b>
Higher Education Resource	1,025.3	77%
Student Support & Tuition Fee Payments	301.6	23%
<b>Total</b>	<b>£1,326.9</b>	<b>100%</b>

## HIGHER EDUCATION

- Higher Education Resource

We split the higher education resource budget down into University Teaching, University Research and University non-core funding.<sup>18</sup> These proportions are determined by the split in Universities – Final Guidance for AY 2018-19 and AY 2019-20.<sup>19</sup> To convert academic year budgets to financial years, we take 57% of the current year and 43% of the previous year.<sup>20</sup> We then scale the result to match the 2019/20 budget.

<b>Higher Education Funding</b>	<b>AY 2018/19 £m</b>	<b>AY 2019/20 £m</b>	<b>43% AY 2018/19 + 57% AY 2019/20</b>	<b>FY 2019/20 £m</b>
<b>Higher Education Resource</b>	<b>1,034.1</b>	<b>1,032.2</b>	<b>1,033.0</b>	<b>1,025.3</b>
University Teaching	713.0	713.6	713.3	708.0
University Research	296.2	284.7	289.6	287.4
<i>(Of which Research Postgraduate Grant)</i>	<i>35.2</i>	<i>35.3</i>	<i>35.3</i>	<i>35.0</i>
University Non-Core	24.9	33.9	30.0	29.8

In keeping with our approach on page two, as the benefits to the public of research are unlikely to be realised in the same year of funding, most of the funding (£287m) has been excluded from the modelling. However, we do include the £35m which makes up the research postgraduate grant.

- Student Support & Tuition Fee Payments

We take the number of higher education students estimated earlier as our starting point. Scottish and EU students are awarded tuition fees. Not all undergraduate students complete their course. Looking at the difference between the number of students enrolled in the HESA data for AY2018-19, and the number of

<sup>18</sup> Annex A - Funding Allocations to Universities for AY 2019-20 [XLS]. Available at: <http://www.sfc.ac.uk/publications-statistics/announcements/2019/SFCAN092019.aspx>. Non-core funding includes: Small Specialist Institution Grant, Widening Access and Retention Fund, Accelerated Provision, Upskilling / Skills Shortages and Disabled Students Premium.

[Autumn Budget 2019-20: supporting document.](#)

<sup>19</sup> <http://www.sfc.ac.uk/funding/funding-allocations/funding-allocations.aspx>

<sup>20</sup> See Annex D - [Profile of monthly payments for main grants for AY 2019-20](#). We use the monthly payments of SFC core formula-based grants. For FY 2019/20, 57% comes from AY 2019/20 and 43% comes from the AY 2018/19 AY.

## HIGHER EDUCATION

students supported by SAAS, we estimate that 12% of students drop-out.<sup>21</sup> This figure is applied to tuition fee payments for undergraduates and those studying for HNDs and HNCs. Generally, students don't repay tuition fees but SAAS do not pay fees to colleges and universities on behalf of students who drop out before 1 December for autumn start courses (1 March for Jan/Feb start courses). Bursaries and grants are split between colleges and universities in the same proportion as in AY 2017/18. More recent data is unavailable.

In detail, the funding streams are allocated as follows:

- **University Teaching:** This is divided equally amongst Scottish and EU Undergraduates. Part-time students receive half the value of full-time students. It does not include HND and HNC students – as they are taught in colleges.
- **University Research:** The research postgraduate grant is divided equally amongst all postgraduates. Part-time students receive half the value of full-time students.
- **University Non-core:** This is divided equally amongst Scottish and EU Undergraduates only living in the 40% most deprived areas of Scotland. Part-time students receive half the value of full-time students. As this is a university funding stream, HND and HNCs are excluded.
- **Undergraduate Tuition Fees:** Scottish and EU Undergraduate full-time students are awarded tuition fees at the rate given by SAAS,<sup>22</sup> depending on whether they are studying for a degree or HND/HNC. Whilst HESA has a non-continuation rate of 6%,<sup>23</sup> SAAS only support around 130,000 full-time students each year, rather than the 147,000 full-time undergraduate,<sup>24</sup> HND/HNC students. This suggests the number of supported students is approximately 12% lower than the total number of full-time undergraduate, HND and HNC students.
- **Postgraduate Tuition Fees:** These are awarded to c. 2,500 Scottish and EU postgraduate students, studying full-time and chosen at random to reflect those in teacher training.
- **Part-time Fee Grant:** These are awarded for fees to c. 21,000 Scottish and EU undergraduate studying part time undergraduate or HND/HNC courses. These cover fees only. Those with individual incomes of more than £25,000 are not eligible for this grant.

<sup>21</sup> With 115,000 FT EU and Scottish undergraduates, and 32,000 FT HND/HNC students, we apply a 12% drop out rate so that the total amount of undergraduate tuition fees comes to around £220m, in line with previous academic years.

<sup>22</sup> [https://www.saas.gov.uk/full\\_time/ug/young/funding\\_available.htm](https://www.saas.gov.uk/full_time/ug/young/funding_available.htm)

<sup>23</sup> <https://www.hesa.ac.uk/news/07-03-2019/non-continuation-summary> Table D.

<sup>24</sup> <https://saas.gov.uk/files/423/saas-statistics-2018-19-excel.xlsx>. Table FT.1.

## HIGHER EDUCATION

- **Nursing and Midwifery:** These are awarded to c. 9,000 Scottish and EU undergraduate students, studying full-time and chosen at random to reflect those in training to be nurses or midwives.
- **Discretionary and Childcare funds:** We randomly award people this grant so that we have 13,000 students in receipt.
- **Bursaries and Grants:** Around seven different types of grants and bursaries are available for full time students through SAAS.<sup>25</sup> These are: Dependant's Grant, Care Experienced Bursary, Ad hoc payments, Lone Parent's Grant, Disabled Student's Allowance, Independent Student's Bursary and Young Students' Bursary. In total, these schemes awarded around £80 million to 55,000 students in 2018/19. For simplicity, we model all bursaries using the Young Student's bursaries scheme, awarding on the basis of inherited gross household income as follows:

Household income	Bursary (£)
£0 to £20,999	2,000
£21,000 to £23,999	1,125
£24,000 to £33,999	500
£34,000 and above	0

Only full time EU and Scottish students are given bursaries and grants. Awards are scaled up to match the totals for full-time undergraduate (£52.6m), full-time HND/HNC (£25.9m) and full-time postgraduates (£1.8m). The total is £80.3m.

<sup>25</sup> <https://www.saas.gov.uk/forms/statistics-1819.pdf>

## HIGHER EDUCATION

Student Support & Tuition Fee Payments	Expenditure AY 2017/18	Expenditure AY 2018/19	Estimated Expenditure FY 2019/20	Scottish and EU Students Supported
	£m	£m	£m	Number
<b>Undergraduate</b>	<b>293.5</b>	<b>296.9</b>	<b>298.9</b>	
• Tuition Fees (Undergraduate)	219.3	218.4	220.4	
○ University (@£1,820 each, 12% reduction in students)			184.2	115,000 FT – 12%
○ HND/HNC (@£1,285 each, 12% reduction in students)			£36.2	32,000 FT – 12%
• Bursaries and Grants	74.2	78.5	78.5	53,000 FT
○ University	49.4 (67%)		52.6	35,000 FT
○ College	24.8 (33%)		25.9	17,000 FT
<b>Postgraduate</b>	<b>6.1</b>	<b>6.3</b>	<b>6.3</b>	
• Tuition Fees (postgraduate)	£4.3	£4.5	4.5	2,500
• Bursaries and Grants (postgraduate)	£1.9	£1.8	1.8	1,400
<b>Other</b>		<b>£103.7</b>	<b>£103.7</b>	
• Part-time Fee Grant (PTFG)	£15.7	£17.2	£17.2	20,700 PT
• Nursing and Midwifery	£67.2	£70	£70	9,200
• Discretionary and Childcare funds	£16.6	£16.5	£16.5	13,000
<b>Total: Undergraduate + Postgraduate + Other</b>	<b>399.1</b>	<b>£406.9</b>	<b>£408.9</b>	

NB: Undergraduate Bursaries and Grants split between university and colleges using AY 2017/18 data is unavailable for AY 2018/19. Split for FY 2019/20 is derived using the AY 2017/18 shares. Results in this table are based a single run of the model.

## HIGHER EDUCATION

	<p>We compare our estimate of the FY 2019/20 budget, driven by student numbers, with most recent data available. In the 2019/20 Scottish Budget, originally £301.6m was set aside for student support and tuition fee payments. During the Autumn budget 2019-2020,<sup>26</sup> the budget was revised and an additional £34.3 million was made available for Higher Education Student Support. In addition, Health transferred the funding for nurse and midwifery training<sup>27</sup> (£70m), taking the total Higher Education Student Support budget to <b>£403.4 million</b>. This compares well with our estimates of <b>£408.9 million</b> for student support, based on estimated student numbers in the table above.</p> <p>When we run ten simulation of the public service model, total student support averages out as £409.2 million. The use of random numbers in assigning records to be students results in the number of students varying slightly over each run. And this has a knock on impact on the number of students eligible for student support.</p>
<p><u>Quality Assurance</u></p>	<p>In 2018/19, SAAS awarded around 55,000 bursaries and grants to all full-time students in higher and further education.<sup>28</sup> These averaged £1,470 per student.</p> <p>In contrast, we have modelled 59,000 higher education students as receiving bursaries and grants, with an average award of £1,364.</p> <p>Our modelling of the scheme has shared the £80.3m pot over a slightly larger number of students, resulting in a smaller average award.</p>
<p><u>Data sources used</u></p>	<p>HESA statistics on age<sup>29</sup> and domicile.<sup>30</sup> SAAS Statistics.<sup>31</sup></p>

<sup>26</sup> <https://www.gov.scot/publications/scotlands-budget-documents-2019-20-autumn-budget-revision-budget-scotland-act-year-ending-31-march-2020/pages/14/>

<sup>27</sup> Nursing and Midwifery [https://www.saas.gov.uk/forms/backgroundpolicy\\_1819.pdf](https://www.saas.gov.uk/forms/backgroundpolicy_1819.pdf)

<sup>28</sup> <https://www.saas.gov.uk/forms/statistics-1819.xlsx> Table FT.1

<sup>29</sup> <https://www.hesa.ac.uk/data-and-analysis/students/table-3>

<sup>30</sup> <https://www.hesa.ac.uk/data-and-analysis/sb254/figure-16>

<sup>31</sup> [https://www.saas.gov.uk/about\\_us/statistics.htm](https://www.saas.gov.uk/about_us/statistics.htm)

## HIGHER EDUCATION

### Exceptions

Net student loans advanced have a value of £550m for 2019/20.<sup>32</sup> Loans are problematic as they are 'debt funding' and a significant proportion of them (between 31% to 45%) are anticipated to be written off – this is known as the RAB charge.<sup>33</sup> We have decided to exclude them from the model as:

- We would need to make too many assumptions in deciding which students benefit most from student debt write-offs in the future.
- Student loans would need to be treated as negative income and this would have an impact on the income distribution. We have not included debt in gross income calculations elsewhere in the model.

Student loans come from the AME budget and the Cost of Providing Student Loans (RAB Charge) (Non-Cash) comes from the RAB budget. As neither of these budgets is included in resource funding, we exclude these from our modelling.

<sup>32</sup> <https://www.gov.scot/publications/scottish-budget-2019-20---amendments-following-passage-of-the-budget-scotland-no.3-bill/> See Table D.

<sup>33</sup> <https://fullfact.org/education/about-17-students-are-forecast-fully-pay-back-their-loans/>



<b>FURTHER EDUCATION</b>			
	<b>Expenditure in 2019/20</b>	<b>Caseload Target</b>	<b>Caseload Modelled</b>
<b>Further Education</b>	<b>£575.0m</b> College Resource (£457.8m) College Student Support (£117.2m)	200,000	200,000
<u>Methodology</u>	<p>Our overall approach here is to first identify the correct number of further education students in Scotland. We then assign further education spend to these students as detailed below.</p> <p><u>Ensuring the right number and age profile of further education students is included in the model</u></p> <p>It is assumed most further education students live either with their parents or in their own home. Therefore, most further education students will live in households surveyed by the FRS.</p> <p>To determine whether someone is a further education student we apply the following rules in this order:</p> <ol style="list-style-type: none"> <li>1. They must not be in Higher Education at university or college.</li> <li>2. We use the “What qualification are you studying for?” question (variable: curqual) in FRS to determine the current qualification being studied. If curqual is between 4 and 9 then we assume they are a further education student. (This gives us 10,000 further education students).</li> <li>3. If they have an employment status of “Other inactive” or a missing employment status we flag them as a possible further education student. (This pool contains 135,000 possible students).</li> <li>4. We randomly sample from the remaining population to ensure we have a total of 200,000 further education students in total, and that these further education students mirror overall age profile of further education students matches in Scottish Funding Council data.<sup>34</sup> In this way people who are working can also be counted as in further education – perhaps through taking part in part time courses.</li> </ol>		

<sup>34</sup> Analysis of Further Education Awards for year 2017-18. Number of students BY Age of student (at 31st December) BY Student category (school, SWAP, MA, etc.) for year 2017-18. Where :- Level of Study (Further or Higher Education) = Further Education Produced by Infact on 24 Jan 2020 at 11:19 AM

## FURTHER EDUCATION

The model is run over a number of simulations as random assignment is used. However, a typical age distribution for further education students is given below. We generally get reasonable agreement if we compare the modelled data with Scottish funding Council data for AY 2017-18.<sup>35</sup>

Age	Number of Students		Full-time Equivalent (FTE)	
	Number	Percent	Number	Percent
under 16	34,249	17%	4,174	5%
16	13,768	7%	8,153	9%
17	15,902	8%	11,970	13%
18-19	24,122	12%	21,279	23%
20-24	26,254	13%	16,207	18%
25 & over	86,784	43%	30,648	33%
<b>OVERALL</b>	<b>201,079</b>	<b>100%</b>	<b>92,432</b>	<b>100%</b>

The model is run over a number of simulations as random assignment is used. The age distribution averaged over five runs is given below. We generally get reasonable agreement if we compare the modelled data with Scottish funding Council data.<sup>36</sup>

<sup>35</sup> <https://stats.sfc.ac.uk/infact/QueryBuilder/TwoWay>

<sup>36</sup> <https://stats.sfc.ac.uk/infact/QueryBuilder/TwoWay>

## FURTHER EDUCATION

<b>Number of Further Education Students Modelled</b>			
<b>Age</b>	<b>Scottish Funding Council (AY 2017-18)</b>	<b>Modelled</b>	<b>Difference</b>
Under 16	34,249	34,476	1%
16	13,768	14,318	4%
17	15,902	17,036	7%
18 to 19	24,122	24,432	1%
20 to 24	26,254	26,683	2%
25 & over	86,784	82,328	-5%
<b>Total</b>	<b>201,079</b>	<b>199,273</b>	<b>-1%</b>

**The Income of Further Education students:** It is assumed most younger further education students live with their parents, and that older students are self-supporting or live with their partner. In contrast to modelling for higher education students no adjustment is made for parental income.

### **Funding for Further Education**

Under the Net College Resource line, funding for Further Education was £606.5m in financial year. The college revenue funding for academic year 2019/20 was £613.6m, and £603.9m, the year before. To get a financial year figure for 2019/20, we take 43% of AY 2018/19 and 57% of 2019/20, the same split as for universities. The result is scaled so that it sums to £606.5m. Omitting the other category, gives a total of £575.0m

<b>Further Education</b>	<b>AY 2018/19 £m</b>	<b>AY 2019/20 £m</b>	<b>43% AY 2018/19 + 57% AY 2019/20</b>	<b>FY 2019/20 £m</b>
<b>Net College Resource</b>	<b>603.9</b>	<b>613.6</b>	<b>609.4</b>	<b>606.5</b>
Teaching	454.7	464.1	460.1	457.8
Student Support	111.0	122.8	117.7	117.2
Other	38.1	26.7	31.6	31.5

## FURTHER EDUCATION

The funding streams are allocated as follows:

- **Teaching:** This is divided equally amongst all further education students and HND/HNC students (as their education is provided in colleges), but using a weighting which depends on full-time equivalent (FTE) students. For example, under 16s make up 17% of all students but only 5% of all FTE students.
- **Student Support:** Colleges run a common bursary scheme as set out in Scottish Funding Council guidance.<sup>37</sup> Student support is given to further education students. HND & HNC students are not included in this figure as they receive support from SAAS. The scheme itself is very complex. Therefore, we have modelled a simplified version of the scheme as follows, ensuring that awards are made to lower income households:

Student award = typical award – (household gross income – threshold)/taper

Variable	Bursary (£)
Typical Award	1,500
Students under 18: parental income threshold	20,351
Parentally supported students: parental income threshold	24,275
Partner supported students: partner income threshold	20,643
Taper	8

Awards are scaled up to match the budgeted total of £119.4m. In total this gives 90,000 students receiving average awards of around £1,317 per year.

Data sources used

SFC Statistics.<sup>38</sup> SAAS Statistics.<sup>39</sup>

<sup>37</sup> [www.sfc.ac.uk/web/FILES/guidance\\_sfcgd092019/SFCGD092019\\_Award\\_Assessment\\_2019-20.pdf](http://www.sfc.ac.uk/web/FILES/guidance_sfcgd092019/SFCGD092019_Award_Assessment_2019-20.pdf)

<sup>38</sup> Available at: <https://stats.sfc.ac.uk>

<sup>39</sup> [https://www.saas.gov.uk/about\\_us/statistics.htm](https://www.saas.gov.uk/about_us/statistics.htm)

SCHOOLS			
	Expenditure in 2019/20	Caseload Target	Caseload Modelled
<b>Total</b>	<b>£4,712.8m</b>		
<b>Primary Education</b>	£2,099.2m	400,276	396,584
<b>Secondary Education</b>	£2,022.9m	286,152	284,604
<b>Special education</b>	£590.6m	6,823	n/a
<u>Methodology</u>	<p>The primary education budget is divided equally across children aged 5 to 11 years inclusive, who report that they are in a state primary school. Note that school spending is not spread across all children as those receiving private education are excluded from the modelling.</p> <p>The secondary education budget is divided equally across children aged 12 to 17 years inclusive, who report that they are in a state secondary school.</p> <p>Following feedback from colleagues, there are data quality concerns about how the special education budget is reported in the Provisional Outturn and Budget Estimates (POBE) returns. Rather than treating this as a category in its own right, the special education budget is shared in proportion across the primary and secondary education budgets.</p> <p>The FRS variable typed (values 2 to 6) is used to identify attendance at a state school.</p>		
<u>Data sources used</u>	School Level Pupil Numbers by Stage 2018 <sup>40</sup>		

<sup>40</sup> <https://www2.gov.scot/Topics/Statistics/Browse/School-Education/RollsByStage/pupilnumbers2018>

<b>SOCIAL WORK</b>			
	<b>Expenditure in 2019/20</b>	<b>Caseload Target</b>	<b>Caseload Modelled</b>
<b>Total</b>	<b>£3,244.3m</b>		
Children and Families	917.3m	c.17,000	c.16,000
Homecare	511.3m	c.60,000	c.60,000
Telecare	30.2m	c.129,000	c.128,000
Direct payments	153m	c.8,000	c.7,000
Care Homes	854.4m	c.34,000	c.37,000
Other	778m		c.165,000
<u>Methodology</u>	<p>The Local Government Finance Provisional Outturn and Budget Estimates (POBE) breaks down the social care budget into six categories as shown above. With the exception of children and families, expenditure is further divided to focus on spending for people aged 18-64 years, and older people (those aged 65 and over).</p> <p>The following section details how we have identified the people in receipt of these funds, and the method used to allocate funds to them.</p> <p><b>Children and Families</b></p> <p>Approximately 2% of all children are ‘looked after’ or on the child protection register. The challenge for the work is to identify which children this relates to in the Family Resources Survey (FRS), given that there is no flag in the survey to identify them. Research by Bywaters et al. (2017)<sup>41</sup> suggests there is a deprivation gradient to these numbers, where children in the most deprived 10% of small neighbourhoods in Scotland are nearly 20 times more likely to be ‘looked after’ in care or on the child protection register than children in the least deprived neighbourhood.</p>		

<sup>41</sup> <https://www.nuffieldfoundation.org/sites/default/files/files/BRIEFING%20PAPER%204%20FINAL.pdf>

## SOCIAL WORK

Looked After Children and Child Protection Register Rates per 10,000 Children, by neighbourhood deprivation decile, Scotland sample 2015 (Table 1, taken from Bywaters et al, 2017).

<b>SIMD Decile</b>	<b>1 (most deprived)</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10 (least deprived)</b>
All Looked After Children (LAC) Rate	485	272	206	156	96	89	65	50	37	25
Child Protection Register(CPR)	76	46	34	27	27	20	11	10	6	4
Average LAC Rate	280					60				

Using the modelled SIMD we developed for the health allocation, where we modelled the split of households in the 40% most deprived areas and 60% least deprived areas, we have taken the average of looked after children in the 40% most deprived areas and the 60% least deprived areas We use this average as a proxy for the distribution of both looked after children and children on the child protection register (CPR). This is because whilst the numbers on the CPR are much smaller and follow a similar pattern, we can't add the rates together for both as this might lead to double counting – children may be both looked after and also on the Child Protection Register.

We randomly allocated from our child population so that we have the right number and the right distribution of 'looked after' children and children on the child protection register across modelled SIMD areas.

### **Homecare, Telecare and Direct Payments**

From the POBE return, these categories are further divided into people aged 18-64 with disabilities, and adults aged 65 or over (and assumed to have a disability also). Recipients are chosen at random from within target groups (e.g. disabled adults aged 18 to 64) so that number in receipt matches the number and characteristics in caseload data.

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Expenditure is divided equally amongst the caseload for that expenditure (e.g. telecare expenditure for 65+ is divided equally amongst telecare user aged 65+).

### Care Homes

None of the people responding to the FRS will actually be in a care home as it is a survey of private households. To address this, we've re-weighted the FRS private household population to equal the total population for Scotland, so that we have sufficient older people in the Scottish population.

To identify care home residents, we use the Care Home survey to get the age and sex of people in care homes. There are currently a total of 34,000 residents. We select people at random from the Scottish population so that the age and sex of the people chosen matches the care home population.

In an external review by IPPR Scotland, they did not think this approach was appropriate and said:

*"In the case of people in care homes, as they are a distinct group with distinctive characteristics – it is not appropriate to assign existing people in the survey a 'care home marker' (since we know for a fact the probability they are in a care home is zero) and their characteristics likely differ from those of people in the survey – so it is most likely that this group will need to be excluded".*

Our view is that they are sufficiently similar over the characteristics of interest for us – age, sex, disability, and income – for this method to be used. Given that they are not included in the FRS, we need to come up with some method of creating them within the FRS so that we can assign the care home expenditure to them. Otherwise care home expenditure could not be included in the model as there would be no-one to assign it to.

### Assigning Spend to Care Home Residents

Around two thirds of care home residents receive financial help from their local authority for the costs of being in a care home (local authority funded residents). People who receive no assistance from their local



## SOCIAL WORK

authority are called self-funders. Whether a person receives help depends on the amount of assets that they have.

The financial assessment is detailed and those with assets above a threshold have to pay for some or all of their care. In later life, property is often people's most significant asset. However, property is be disregarded if it is occupied by a spouse, partner or civil partner.<sup>42</sup> However, for single pensioners it will be taken into account. Therefore, looking at older households, their household status (whether or not they are in a couple) and tenure (whether or not they own their own home) is a good proxy for being a self-funded resident.

The FRS has very limited information on assets and so our modelling of the financial assessment for care home is necessarily simplistic. We assume that single pensioners who are homeowners are self-funders, and anyone else is local authority funded. This gives us the required split of approximately 30% self-funded individuals and 69% LA-funded individuals. In reality, the situation will be more nuanced than we have modelled.

Self-funded individuals do receive some financial assistance through free personal and nursing care (FPNC), and we assign the value of this to self-funders. In 2017/18 £126 million went to self-funders in a care home setting.<sup>43</sup> FPNC is already accounted for within homecare and LA-funded care home expenditure.

### **“Other Expenditure”**

The definition of other expenditure is vague - “Other expenditure” on the POBE return includes assessment and care management (£215.7m), day care (£165m) and other expenditure (£397.2m). The total £778m in this category is divided equally amongst the 165,000 people receiving homecare/telecare/direct payments/care homes.

<sup>42</sup> <https://careinfoscotland.scot/topics/care-homes/paying-care-home-fees/property-disregard/>

<sup>43</sup> <https://www.gov.scot/publications/free-personal-nursing-care-scotland-2017-18/>

## SOCIAL WORK

<u>Data sources used</u>	Expenditure figures taken from POBE 2019 Workbook <sup>44</sup> and free personal and nursing care in Scotland 2017-2018. <sup>45</sup> Caseload figures from: Social Care Survey Dataset 2017 <sup>46</sup> Looked after Children Statistics <sup>47</sup> Care Home Census <sup>48</sup>
<u>Questions</u>	1. Is there a better way to allocate the “other” social care expenditure? At the moment this goes to 19,000 disabled people aged under 65, and 111,000 aged 65+. It could be widened to include all disabled people in Scotland (739,000 aged under 65, 473,000 aged 65+).

<sup>44</sup> <https://www2.gov.scot/Topics/Statistics/Browse/Local-Government-Finance/PubScottishLGFStats/POBE2019-20>

<sup>45</sup> <https://www.gov.scot/publications/free-personal-nursing-care-scotland-2017-18/pages/1/>

<sup>46</sup> <https://www2.gov.scot/Topics/Statistics/Browse/Health/Data/HomeCare/SocialCareDataSets2017>

<sup>47</sup> <https://www.gov.scot/publications/childrens-social-work-statistics-2017-2018/pages/1/>

<sup>48</sup> <https://www.isdscotland.org/Health-Topics/Health-and-Social-Community-Care/Publications/data-tables2017.asp?id=2239#2239>

## APPRENTICESHIPS

	Expenditure in 2019/20	Caseload Target	Caseload Modelled
<b>Total</b>	<b>£88m</b>	40,000	38,000
<u>Methodology</u>	<p>There are three types of apprenticeships in Scotland as follows:</p> <ul style="list-style-type: none"> <li>• <b>Modern Apprenticeships</b> provide industry recognised training while in work. Training can be delivered entirely on the job, or some elements can be delivered in a college or a private/ independent training providers' premises. Expected duration is between one and four years depending on the framework.</li> <li>• <b>Foundation Apprenticeships</b> are delivered in the senior phase of school and are delivered in school or college (tends to be college) and employer premises. Some training may be delivered in private/ independent training providers' premises. FAs are not employed. FAs are generally delivered over two years, although a short duration model of one year is currently being trialled.</li> <li>• <b>Graduate Apprenticeships</b> provide degree level qualifications while in work. The GA will split time between university and time in the workplace, with approx. 80% of their time in the workplace. Time spent in university varies depending on the institution – it could be one day a week, one week per month etc. Duration ranges from 2 to 5 years depending on the framework (e.g. Honours degree level tends to take 4 years, Masters degree level tends to be 2 years.)</li> </ul> <p>Information on the number of students currently in training and the budget for each type of apprenticeship is given below:</p>		

## APPRENTICESHIPS

Apprenticeship Type	In Training	Funding 2018/19 <sup>49</sup>
<b>Modern Apprenticeships</b>	<b>37,765</b> people (81% Male, 29% Female) <sup>50</sup>	£79.2m
<b>Foundation Apprenticeships</b>	<b>2,171</b> school age pupils, <sup>51</sup> estimated to be split 45% male, 55% female.	£6.8m
<b>Graduate Apprenticeships</b>	<b>1,099</b> employees, <sup>52</sup> estimated to be split 70% male, 30% female.	Cost information unavailable, although likely to be in the region of c £2,000, based on other apprenticeships. Total funding would be around £2m.  SDS pays learning costs only. No direct payments are made to employers. <sup>53</sup>

<sup>49</sup> <https://www.skillsdevelopmentscotland.co.uk/media/45803/annual-procurement-report-2018-19.pdf> See chart on page 2.

<sup>50</sup> MA Starts, In training, Leavers and Achievements broken down by Framework and Local Authority. - <http://www.skillsdevelopmentscotland.co.uk/media/45690/modern-apprenticeship-supplementary-tables-quarter-4-2018-19.xlsx>

<sup>51</sup> See <https://www.skillsdevelopmentscotland.co.uk/media/45251/fa-progress-report.pdf> . From cohort 1, there are zero people still in training. The figures for cohort 2 and cohort three are 657 and 1,514 respectively. For cohort 2, there are 325 males and 332 females. For cohort 3, 43.5% of starts were males and 56.5% were female. We apply these proportions to the cohort 3 in-training figure.

<sup>52</sup> <https://www.skillsdevelopmentscotland.co.uk/media/45882/ga-report-2019.pdf> . See page 6 and 13.

<sup>53</sup> <https://www.apprenticeships.scot/for-employers/graduate-apprenticeships/frequently-asked-questions-about-gas-employers/> SDS will pay the full fees of those apprentices starting in 2017 and 2018 but employers will not receive any direct payments for taking on a Graduate Apprentice.

## APPRENTICESHIPS

	<p>Funding for apprenticeships are allocated as follows:</p> <ul style="list-style-type: none"> <li>• Modern Apprenticeships – We randomly pick employees based on age and gender to match the c.38,000 modern apprentices. Funding is divided equally.</li> <li>• Foundation Apprenticeships - We randomly pupils based on age (S4 and S5 approximately equates to ages 15 through to 16) and gender to match the c.2,000 foundation apprentices. Funding is divided equally.</li> <li>• Graduate Apprenticeships – We randomly pick employees in aged 18 to 21 and use gender. Funding is divided equally.</li> </ul>
<p><u>Data sources used</u></p>	<p>Skills Development Scotland Group of companies' accounts to identify training budget.<sup>54</sup></p>

<sup>54</sup> <https://beta.companieshouse.gov.uk/company/SC202659/filing-history>.

EARLY LEARNING AND CHILDCARE (ELC)			
	Expenditure in 2019/20	Caseload Target	Caseload Modelled
<b>Total</b>	<b>£712.2 million</b> (estimate)	As at September 2019, the midpoint of the financial year, 96,000 children were registered for childcare places. This figure will undercount the number of children in receipt of ELC over the whole year.	Around 130,000 eligible children throughout the year
<u>Methodology</u>	<p>There is currently high uptake of funded ELC in Scotland. The latest ELC census data shows near universal uptake of funded ELC by 3 and 4 year olds. Approximately 10% of 2 year olds are registered for funded ELC (compared to the roughly 25% that are eligible).<sup>55</sup>The eligibility for criteria for two years olds is based on parental benefit receipt.<sup>56</sup></p> <p>Work undertaken to assess the impact of extending the future use of childcare from 600 hours per year to 1140 hours per year (approximately 30 hours a week for 38 weeks),<sup>57</sup> suggests that:</p> <ul style="list-style-type: none"> <li>• 75% of parents would use the full entitlement for a 3 or 4-year-old, compared to 67% for a 2-year-old.</li> <li>• 10% of parents with eligible children who would not expect to use any additional hours over the current 600 entitlement, even if the full 1,140 were available and they were able to find suitable provision. Parents were more likely to indicate this for a 2-year-old (18%).</li> </ul>		

<sup>55</sup> <https://www.gov.scot/publications/equality-impact-assessment-expansion-early-learning-childcare/>

<sup>56</sup> <https://www.mygov.scot/childcare-costs-help/funded-early-learning-and-childcare/>

<sup>57</sup> <https://www.gov.scot/publications/exploring-parents-views-use-early-learning-childcare-scotland/pages/5/>

## EARLY LEARNING AND CHILDCARE (ELC)

This information can be distilled into the following table:

Age	ALL Children	ELC Eligible	Use All Additional Hours	Some Additional Hours	No Additional Hours
2	54,179	25%	67%	15%	18%
3	56,348	100%	75%	15%	10%
4	57,306	100%	75%	15%	10%

When the percentages are applied to the number of two, three and four year olds, this table becomes:

Age	ALL Children	ELC Eligible	Use All Additional Hours	Some Additional Hours	No Additional Hours
2	54,179	13,545	9,075	2,032	2,438
3	56,348	56,348	42,261	8,452	5,635
4	57,306	57,306	42,980	8,596	5,731
Total	167,833	127,199	94,315	19,080	13,803

One of the key drivers of future uptake of expanded hours is the number of hours currently used and we use this as the basis for our modelling. Those currently using the most hours of ELC (both funded or unfunded) are prioritised to take up the additional hours. Where people use only some additional hours, we take the midpoint between their current use and full entitlement of 1,140 hours.

It is important to note that not all children are born at the start of the financial year – the ‘birthday effect’ - and this has an impact on how childcare is distributed. For eligible two years and three year olds, we randomly assign each child a month of birth between 1 and 12. Children with a month of birth of 12 are assumed to have been born at the start of the financial year (i.e. in April) and receive childcare for 12 months of the financial year. Children with a month of birth of 1 are assumed to have been born in March and receive only one month of childcare in the financial year.

We allocate expenditure to each child using the same unit cost per hour basis. The unit cost is worked out by dividing the childcare budget by the total number of estimated ELC hours provided.

## EARLY LEARNING AND CHILDCARE (ELC)

Under these assumptions, for a typical run we estimate the childcare budget to be distributed as follows:

	<b>Number of Children</b>	<b>Amount</b>	
<b>Age</b>	<b>N</b>	<b>£</b>	<b>%</b>
2	13,030	48,778,973	7%
3	56,348	229,752,487	32%
4	57,306	433,645,541	61%
<b>All</b>	<b>126,684</b>	<b>712,177,000</b>	<b>100%</b>

Data sources used

Input caseload: Family Resources Survey Childcare table.  
 Admin caseload: ELC Census 2018.<sup>58</sup>  
 Expenditure: Provisional Outturn Budget Estimates for 2019-20, pre-primary expenditure.<sup>59</sup>

<sup>58</sup> <https://www2.gov.scot/Topics/Statistics/Browse/Children/Pubs-Pre-SchoolEducation/ELCAdditionalTables2018>

<sup>59</sup> <https://www2.gov.scot/Topics/Statistics/Browse/Local-Government-Finance/PubScottishLGFStats/POBE2019-20>



<b>TRANSPORT</b>			
	<b>Expenditure in 2019/20</b>	<b>Caseload Target</b>	<b>Caseload Modelled</b>
<b>Total</b>	<b>£477.7 million</b>		
Concessionary Bus Travel	<b>£215.7m</b>	1,378,098	1,387,338
Buses	<b>£109.0</b>		
Rail	<b>£153m</b>		
<u>Methodology</u>	<u>Concessionary Bus Travel</u>  We take people in the Scottish Household Survey (pooled over 6 years) who report having a free bus pass. We perform a logistic regression on this data to predict having a free bus pass using the following predictors: whether over 59, sex, whether disabled, work status (in work / in school or training / other, including unemployed/inactive). Using this model, we predict individuals in the FRS who have a free bus pass, and share out expenditure equally among those predicted to have a bus pass.		

## TRANSPORT

### Buses

Support for bus services comes via the Scottish Government Bus Service Operators Grant (£57.2m) and directly from local authorities (£51.8m).<sup>60</sup>

We use table 28 from the TATIS<sup>61</sup> data to estimate probabilities for bus use by age, gender and annual net household income. As under-16s are missing from the data, we assume children inherit the largest adult probability in the benefit unit. Probabilities are summed over the population and BSOG grant is shared in the same proportion.

Age	Budget			Average Amount (£)		
	Male	Female	All	Male	Female	All
0-15	9,409,937	8,943,419	18,353,356	19.97	19.95	19.96
16-19	3,064,399	3,385,457	6,449,856	26.82	30.94	28.84
20-29	7,084,742	8,085,086	15,169,828	19.34	22.32	20.82
30-39	5,599,322	6,679,883	12,279,205	15.83	18.26	17.06
40-49	5,388,972	6,546,713	11,935,685	16.27	18.77	17.55
50-59	5,916,873	7,266,502	13,183,374	15.39	17.75	16.61
60-69	6,567,650	8,101,082	14,668,732	21.10	24.35	22.78
70-79	4,834,142	6,455,549	11,289,690	21.98	25.36	23.80
80+	2,018,356	3,674,917	5,693,274	19.34	22.32	21.17
<b>Total</b>	<b>49,884,392</b>	<b>59,138,608</b>	<b>109,023,000</b>	<b>18.78</b>	<b>21.15</b>	<b>20.00</b>

<sup>60</sup> <https://www.gov.scot/publications/local-government-revenue-expenditure-financing-2018-19-provisional-outturn-2019-20-budget-estimates/pages/4/>

<sup>61</sup> <https://www.transport.gov.scot/publication/transport-and-travel-in-scotland-results-from-the-scottish-household-survey-1/table-28-bus-and-train-use-adults-use-of-local-bus-and-train-services-in-the-past-month-2018/>

## TRANSPORT

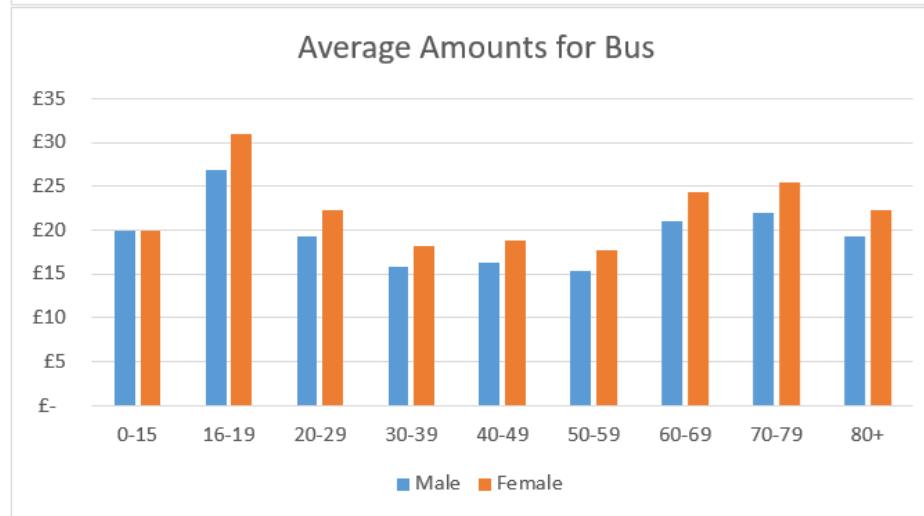
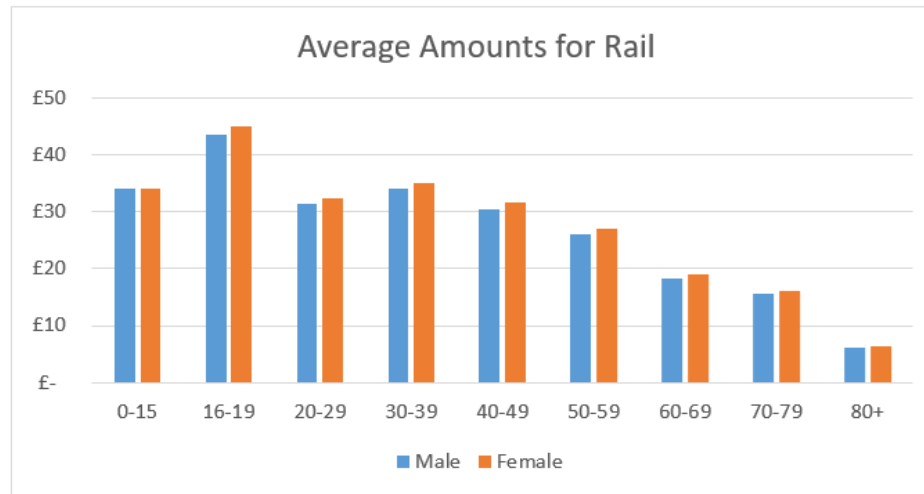
### Rail

Support for rail services comes via the Scottish Government (£153m). We use the same methodology and data source as above to calculate the probabilities for rail use by age, gender and household net income. The rail budget is distributed in proportion to these probabilities. The results are shown below.

Age	Budget			Average Amount (£)		
	Male	Female	All	Male	Female	All
0-15	16,054,749	15,310,198	31,364,947	34.07	34.16	34.11
16-19	4,986,407	4,933,467	9,919,874	43.64	45.09	44.35
20-29	11,507,370	11,760,594	23,267,964	31.42	32.47	31.94
30-39	12,042,033	12,865,471	24,907,504	34.04	35.17	34.61
40-49	10,119,858	11,009,926	21,129,784	30.55	31.57	31.07
50-59	10,068,103	11,073,205	21,141,308	26.18	27.06	26.63
60-69	5,704,141	6,301,092	12,005,233	18.33	18.94	18.64
70-79	3,454,809	4,131,716	7,586,525	15.71	16.23	15.99
80+	637,449	1,039,412	1,676,861	6.11	6.31	6.23
<b>Total</b>	<b>74,574,919</b>	<b>78,425,081</b>	<b>153,000,000</b>	<b>28.07</b>	<b>28.05</b>	<b>28.06</b>

## TRANSPORT

A comparison of average amounts for rail and bus users is shown below.



## TRANSPORT

### Ferries

There are three key ferry companies in Scotland (excluding freight companies) which receive financial support from Transport Scotland<sup>62</sup> and these are:

- Calmac (who operate on the west coast of Scotland, including the Western Isles)
- Serco Northlink ( who service routes between Aberdeen, Orkney and Shetland)
- Isle of Jura Passenger Ferry (this runs during the summer only and has a capacity for 12 passengers at a time, plus bikes).

Support for ferries in 2019/20 was £178.1m. The Serco Northlink route received £223m of support from 2012 to 2018,<sup>63</sup> and so we estimate that this route receives support of around £37.2m per year (20.8% of the 2019/20 budget). Given that the Jura ferry is likely to be a relatively small proportion of the overall budget, we estimate that Calmac receives the remaining £140.9m of the budget (79.2%).

Data on ferry passengers is limited to information about routes and the number of passengers travelling. We do not know how many of these passengers are business travellers or how many are people from outside Scotland. As information on individuals, where they live and any protected characteristics is not available, we have been unable to include ferries within the model.

### Data sources used

Input caseload: Scottish Household Survey (main survey) 2012-2017.  
 Admin caseload: Scottish Transport Statistics 2018 table 2.13.<sup>64</sup>  
 Transport and Travel in Scotland Results from the Scottish Household Survey, 2018. Table 28<sup>65</sup>  
 Expenditure: 2019-20 Budget.  
 Cal Mac Carrying Statistics: <https://www.calmac.co.uk/corporate/carrying-statistics>  
 Serco Northlink Ferry Budget: <https://www.transport.gov.scot/public-transport/ferries/ferry-services/#45751>  
 Serco Northlink Passenger Statistics: 2017-2019:  
<https://www.northlinkferries.co.uk/information/publications/statistics/>

<sup>62</sup> <https://www.transport.gov.scot/public-transport/ferries/ferry-services/#overview>

<sup>63</sup> <https://www.transport.gov.scot/public-transport/ferries/ferry-services/#45751>

<sup>64</sup> <https://www.transport.gov.scot/publication/scottish-transport-statistics-no-37-2018-edition/>

<sup>65</sup> <https://www.transport.gov.scot/publication/transport-and-travel-in-scotland-results-from-the-scottish-household-survey-1/table-28-bus-and-train-use-adults-use-of-local-bus-and-train-services-in-the-past-month-2018/>