Title: **Needs & Redistribution Technical Working Group**

Paper: NR TWG 17-11 Potential approaches to developing a foundation formula by the Department for Communities and Local Government

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Venue: Southwark Council

**POLICY DEVELOPMENT: NOT A STATEMENT OF GOVERNMENT POLICY**

## Introduction

1. This paper sets out the possibility that a new relative needs assessment could be based on either a single 'foundation' formula covering all services, or a foundation formula alongside some service-specific formulas. It sets out how these options could work and some of the issues associated with each.

2. In order to illustrate the effect of these options, we have used correlation and regression analysis. These techniques look to explain relationships between a dependent variable – such as local authority expenditure – and an explanatory variable (or variables) – such as population. A simple explanation of these techniques can be found in Annex A. We would of course welcome views on the analysis presented as well as suggestions on alternative approaches and data. The correlation analysis presented here is based on population, and contains no factors that would account for other cost drivers such as deprivation, rurality or the Area Cost Adjustment.

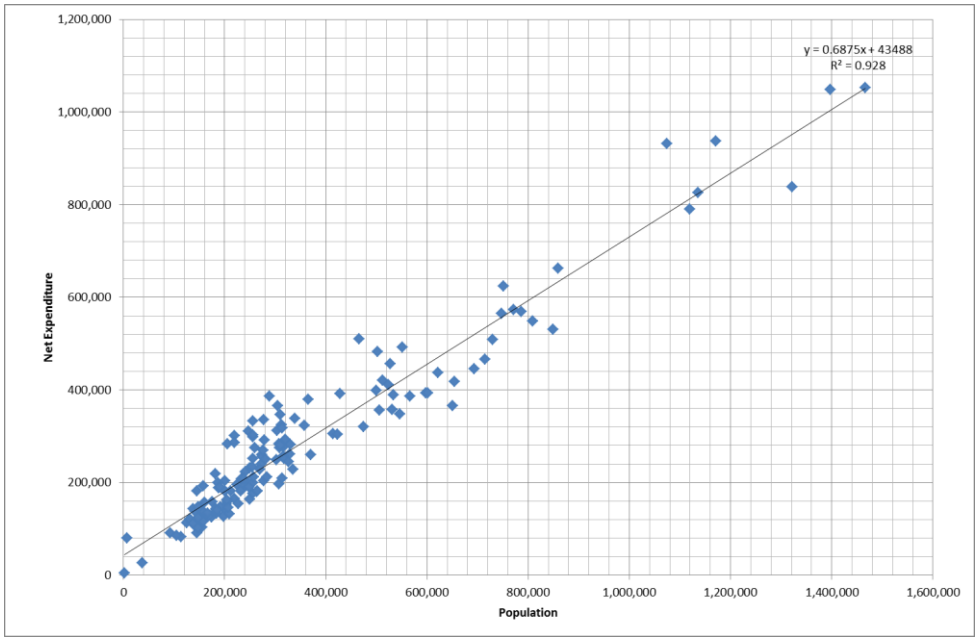
## A single simple foundation formula

3. A 'pure' single foundation formula covering all services could only be provided, in theory, at one geographical level. In order to explore the feasibility of such an option we have chosen to analyse this at the county level. Therefore, services supplied at the district level have been aggregated to the county level; and fire services have been allocated on a per capita basis between the appropriate county / unitary authorities.

4. The chart below illustrates the relationship between local authority net current expenditure and population. The chart shows how much variation can be explained by population alone (note this has been produced using 2011/12 data rather than 2015/16 data to ensure consistency with other data used in this analysis).

5. The chart suggests that population explains 93% of the variation in local authority expenditure suggesting population is a key driver of need. However, it should be noted that the R-squared this is based on places greater weight on the largest observations, so the correlation would be weaker if the lower half of the graph was focussed on.

**Chart 1: 2011-12 Net Current Expenditure for all services except education and police against 2011 population estimates**




6. Although such an approach explains a significant amount of the variation in expenditure, there are a number of authorities where a significant amount of expenditure is not explained by population. Annex B provides two examples of local authority expenditure against population for particular service areas. As for most services, population explains the majority of the variation, though for some services, like children's social care, population alone explains much less of the variation in spending suggesting there are other important cost drivers to consider. There are also large variations within different types of authority.

7. A single funding formula covering all services would therefore result in large distributional changes for some authorities (though this is not to say that large distributional changes per se are necessarily always a weakness of a particular option). The table below sets out the degree of change in absolute and percentage terms for the 10 authorities that experience the biggest increase and biggest reductions under this option.

**Table 1: Top 10 Absolute Winners and Losers**

| Winners | Losers |
|---|---|
| £125m | -£149m |
| £114m | -£147m |
| £97m | -£145m |
| £76m | -£114m |
| £75m | -£113m |
| £71m | -£107m |
| £68m | -£101m |
| £64m | -£98m |
| £61m | -£98m |
| £58m | -£94m |

**Table 2: Top 10 Percentage Winners and Losers**

| Winners | Losers |
|---|---|
| 158% | -37% |
| 58% | -35% |
| 48% | -35% |
| 46% | -34% |
| 42% | -32% |
| 42% | -31% |
| 42% | -31% |
| 36% | -30% |
| 34% | -29% |
| 32% | -28% |

8. A particular difficulty with having a single formula for all services is that there **would need to be some method for 'splitting' the formula results between the different tiers of authorities and there is no obvious methodology that could be used to do this.**

***Question: What are the group's views on a single formula covering all services, perhaps explained by a single cost driver (population)? What approach could be taken for 'splitting' formula results between different tiers of authority?***

9. An alternative approach is to include more cost drivers in the analysis of local authority need to help explain more of the variation in local authority expenditure. Examples include deprivation and rurality or sparsity. We could undertake regression analysis or use another suitable technique to help determine the significance of these different cost drivers in terms of explaining local authority expenditure (a possible proxy for local authority need).

10. This approach, in the context of a single formula covering all services and tiers, is extremely complex. For example, cost drivers that were applicable to social care would need to be split between county councils, district councils and fire and rescue authorities as they are explaining variation in expenditure from across all tiers. Our preliminary regression analysis suggests that adding further explanatory variables to the regressions does not significantly increase the explanatory power of the model (though such variables will be particularly significant for particular authorities).

11. Therefore, for additional variables to be included in a single formula an alternative analytical approach would need to be developed or there may need to be some form of judgement on appropriate weightings for such variables. In effect, judgement would involve selecting the importance of particular cost drivers like population compared to other variables and would therefore be, to some extent, subjective.

***Question: What are the group's views on a single formula covering all services, which includes an element of judgement rather than weighting cost drivers purely through analytical techniques? Do the group have any suggestions on alternative analytical techniques that could be used to weight additional cost drivers?***

**A single simple foundation formula by tier**

12. An alternative approach could be to create three single tier-level foundation formulas. This would mean that all cost drivers relating to upper-tier services, for example social care, would be assigned to the upper-tier formula. These would not affect the distribution of either fire authorities or shire districts.

13. As the chart below illustrates, the majority of the variation in local authority expenditure can be explained by population (particularly for upper tier authorities). There are also large differences between the value of net expenditure for some authorities and the plotted line suggesting such an approach will result in large distributional changes for some authorities (again, this has been produced using 2011/12 data rather than 2015/16 data to ensure consistency with other data used in this analysis).

**Chart 2: Net Current Expenditure by Tier of Service (Upper - blue and Lower - red) against 2011 population**

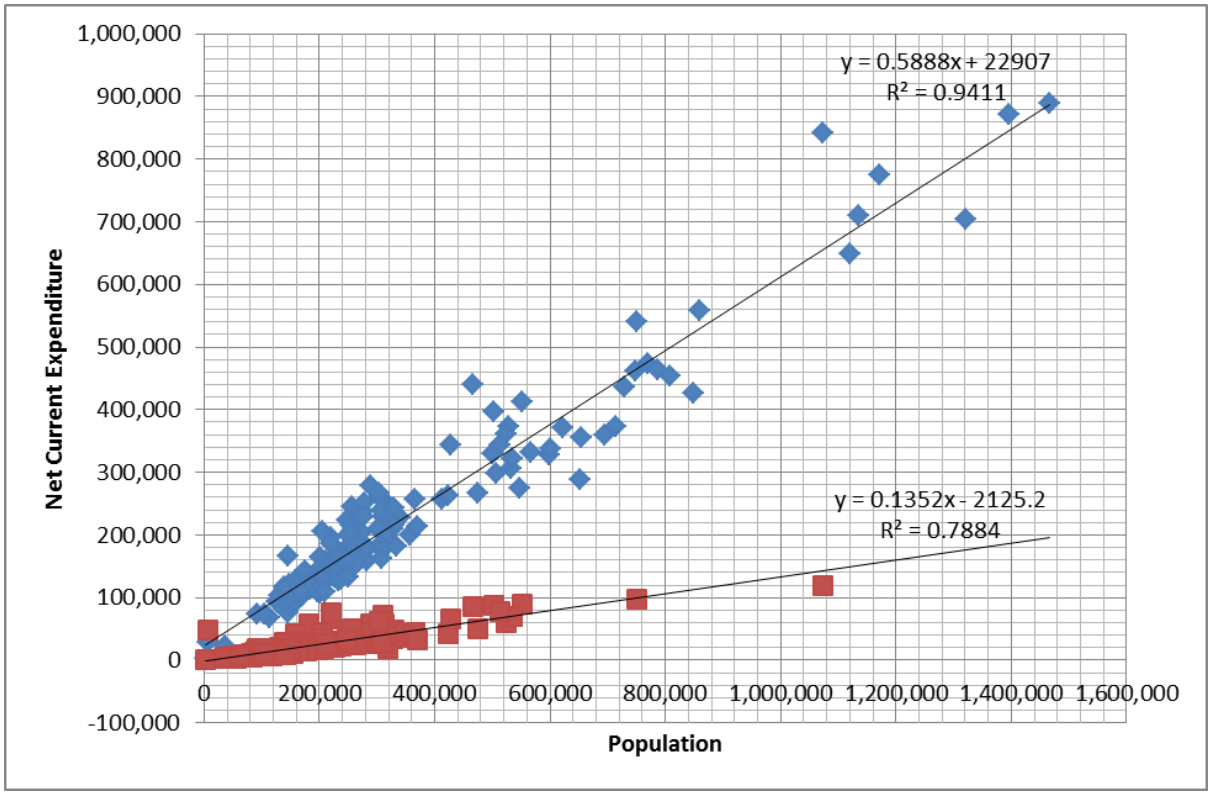



**Table 3: Top 10 Absolute Winners and Losers at Upper-Tier Level**

| Winners | Losers |
|---|---|
| £117m | -£186m |
| £98m | -£143m |
| £98m | -£86m |
| £73m | -£78m |
| £71m | -£76m |
| £69m | -£71m |
| £54m | -£68m |
| £48m | -£65m |
| £46m | -£64m |
| £41m | -£64m |

**Table 4: Top 10 Percentage Winners and Losers at Upper-Tier Level**

| Winners | Losers |
|---|---|
| 108% | -35% |
| 41% | -33% |
| 40% | -31% |
| 34% | -30% |
| 34% | -29% |
| 31% | -25% |
| 30% | -25% |
| 28% | -24% |
| 27% | -22% |
| 26% | -22% |

**Table 5: Top 10 Absolute Winners and Losers at Lower-Tier Level**

| Winners | Losers |
|---|---|
| £24m | -£50m |
| £23m | -£47m |
| £15m | -£38m |
| £14m | -£36m |
| £13m | -£32m |
| £12m | -£24m |
| £12m | -£24m |
| £10m | -£23m |
| £9m | -£22m |
| £9m | -£21m |

**Table 6: Top 10 Percentage Winners and Losers at Lower-Tier Level**

| Winners | Losers |
|---|---|
| 130% | -63% |
| 90% | -61% |
| 85% | -58% |
| 85% | -55% |
| 79% | -45% |
| 74% | -44% |
| 63% | -43% |
| 60% | -40% |
| 54% | -38% |
| 53% | -38% |

14. As with the regression analysis undertaken for a single formula covering all services for all tiers, our preliminary analysis suggests that the additional explanatory power from adding further explanatory variables is limited (though as mentioned in paragraph 10, these variables may be significant for particular authorities). Therefore, it may be that in order for a single formula to work for all services and split by tier, and which includes more than just population as a cost driver, there needs to be some form of judgement on the weights of these cost drivers.

***Question: What are the group's views on a single formula covering all services split by tier? What are the group's views on the use of an element of judgement rather than weighting cost drivers through analytical techniques? Are there alternative analytical techniques that could be used to weight cost drivers?***

**Foundation formulas alongside service specific formulas**

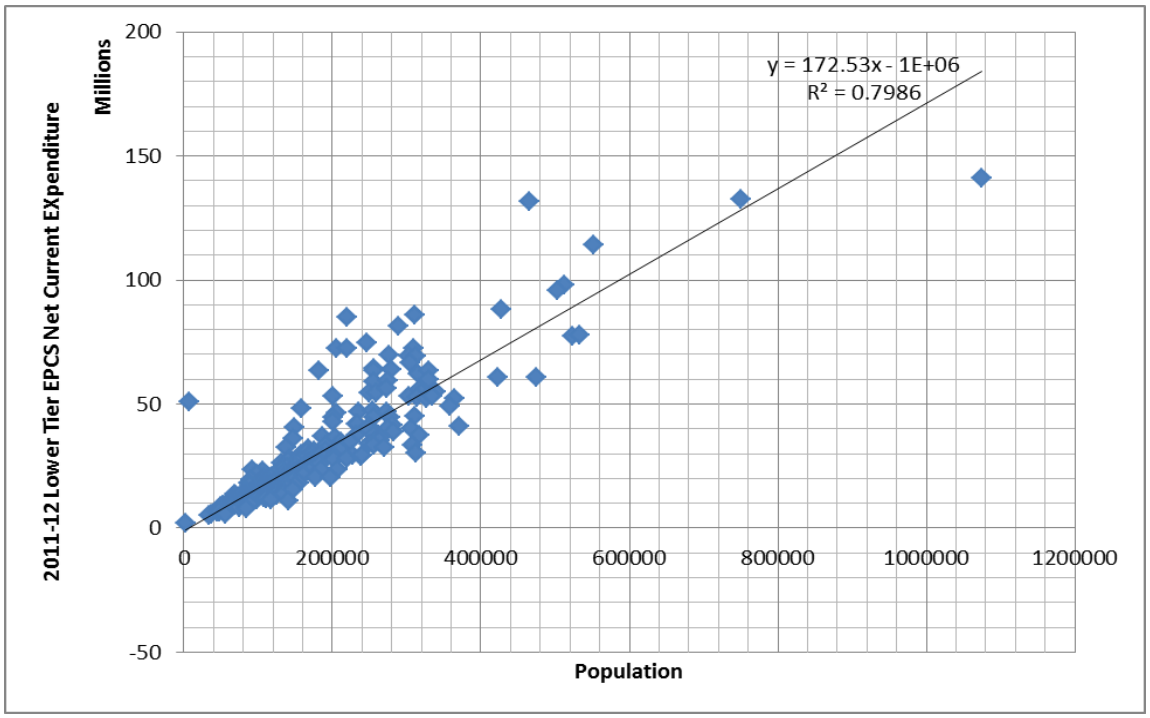
15. Rather than a foundation formula that attempts to look at all services, an alternative approach could be to have a foundation formula alongside several service specific formulas.

16. The foundation formulas would need to cover all the services that do not have specific formulas. Such an approach would inevitably result in a distributional change for some of the existing services, particularly for areas which previously had their own formulas within the system. However, such a change is likely to be less significant than a foundation formula covering all services (as the foundation formula alongside a service specific set of formulas would be applicable to a smaller amount of expenditure).

17. Formulas which no longer had a specific formula would either need to be subsumed within the foundation formulas, or alternatively within one of the other service formulas e.g. children's services or adult social care for example.

18. Chart 3 below looks at the relationship between population and net local authority expenditure for lower tier Environmental, Protective, and Cultural Services (EPCS) (again, this has been produced using 2011/12 data rather than 2015/16 data to ensure consistency with other data used in this analysis). Around 80% of the variation in net local authority expenditure can be explained by population. Again, population is a significant driver of need and an allocation which uses only population would result in a significant change for some local authorities, though this would be less than a single formula covering all services.

**Chart 3: Net Current Expenditure on EPCS Services against 2013 Population Estimates**




19. The above approach could be applied either for all authorities or by tier. For lower tier authorities, an approach based on population would result in the following distributional impact.

**Table 7: Top 10 Absolute Winners and Losers at Lower-Tier EPCS Services**

| Winners | Losers |
|---|---|
| £43m | -£53m |
| £23m | -£48m |
| £22m | -£38m |
| £20m | -£36m |
| £19m | -£33m |
| £16m | -£33m |
| £13m | -£33m |
| £13m | -£33m |
| £12m | -£23m |
| £12m | -£22m |

**Table 8: Top 10 Percentage Winners and Losers at Lower-Tier EPCS Services**

| Winners | Losers |
|---|---|
| 114% | -57% |
| 75% | -52% |
| 69% | -52% |
| 68% | -49% |
| 64% | -46% |
| 60% | -44% |
| 58% | -40% |
| 55% | -40% |
| 55% | -39% |
| 55% | -39% |

20. A similar approach can be taken for **upper-tier EPCS services**. For upper-tier services, population explains around 82% of the variation for these services.

**Chart 5: Net Current Expenditure for Upper-Tier EPCS Services by 2013 Population Estimates**

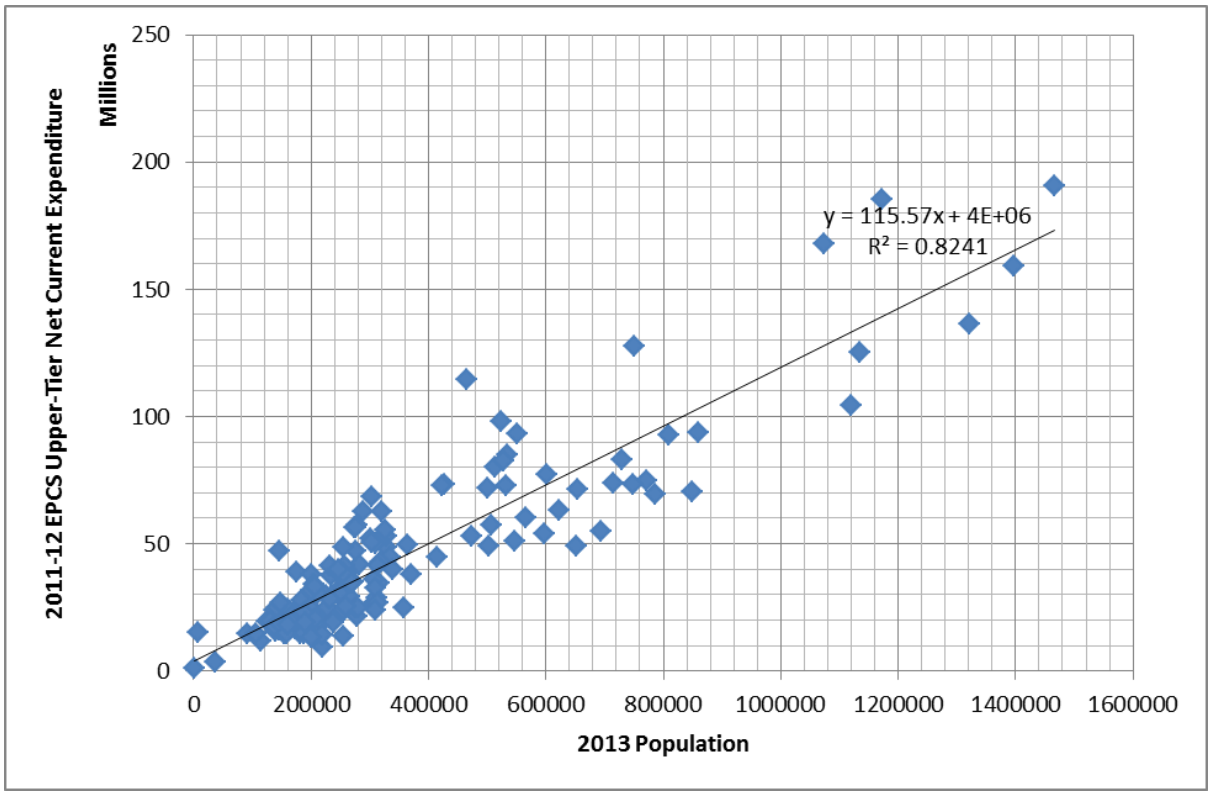


**Table 9: Top 10 Absolute Winners and Losers at Upper-Tier EPCS Services**

| Winners | Losers |
|---|---|
| £31m | -£57m |
| £30m | -£46m |
| £29m | -£40m |
| £29m | -£37m |
| £25m | -£34m |
| £20m | -£30m |
| £20m | -£27m |
| £20m | -£26m |
| £19m | -£25m |
| £19m | -£22m |

**Table 10: Top 10 Percentage Winners and Losers at Upper-Tier EPCS Services**

| Winners | Losers |
|---|---|
| 24% | -31% |
| 20% | -22% |
| 15% | -21% |
| 15% | -17% |
| 14% | -15% |
| 14% | -15% |
| 11% | -14% |
| 11% | -14% |
| 11% | -13% |
| 11% | -13% |

As shown by the table above, a key point is that the size of the distributional change – in absolute terms - is significantly smaller compared to a single formula approach which is based on a larger amount of expenditure. In addition, as discussed previously, this correlation analysis is based on population, and contains no factors that would account for other cost drivers such as deprivation, rurality or the Area Cost Adjustment.

***Questions:***

***What are the group's views on a foundation formula split by tier alongside several service-specific formulas?***

***What are the group's views on the use of an element of judgement in a foundation formula alongside several service-specific formulas?***

**Annex A – Simple explanation of regression**

Regression analysis against past expenditure has been used at least since the introduction of council tax to derive the weights attached to different indicators within the needs formulae. Past expenditure for each local authority is divided by the client group, generally the appropriate measure of population relating to the consumers of the service, and deflated by the Area Cost Adjustment (ACA). This then forms the dependent variable in the regression. Regression analysis is used to derive the weights of appropriate independent variables that explain the greatest proportion of differences between authorities.[1]

Regression models work by measuring how a dependent variable (the concept that you are interested in predicting) changes in relation to a series of independent variables. A relative needs assessment for local government attempts to predict the 'need to spend', which represents the dependent variable in this case. The independent variables that affect the 'need to spend' are the cost drivers. There is no one measure of a local authority's 'need to spend' and the most commonly used proxy has been spending per head.

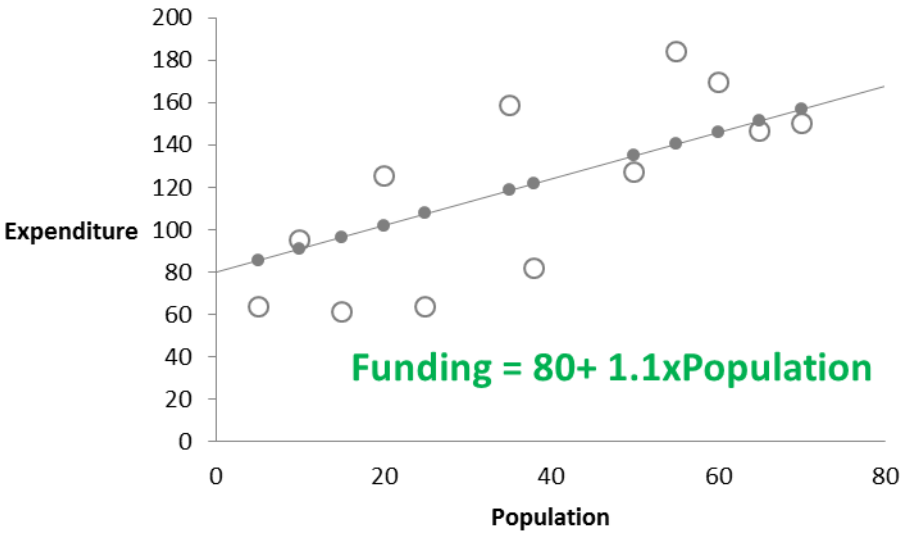
A regression model will quantify the average relationship between each cost driver and the 'need to spend' across all local authorities. This is expressed as a coefficient for each cost driver. This coefficient can be interpreted as the change in 'need to spend' for every additional unit of each cost driver. For example, on average and taking into account the effects of other cost drivers, how much extra needs to be spent on each additional person or on each additional mile of road, and so on.

The chart below presents a simple example using a single cost driver; population. The clear circles in the chart represent the level of expenditure for different councils with different population sizes. The straight line shows the relationship between expenditure and population size. The point where the straight line touches the y axis (expenditure) is the basic amount all authorities would receive - in this example 80. The gradient of the straight line then tells you the additional amount you get for each additional person in a population; in this example that amount is 1.1.

What this means is that each council would be funded in the same way regardless of their expenditure the previous year, and their allocation is directly determined by their local characteristics for the relevant cost driver. So in the example below, if your population was 50 your funding would be 80 + 1.1 x 50 = 135. The dark circles on the straight line show the level of funding each council would receive the following year.

[1] The dependent variable could also be past expenditure deflated by the ACA but with population featuring as an explanatory variable in the regression

**Chart A1: A simple regression model**

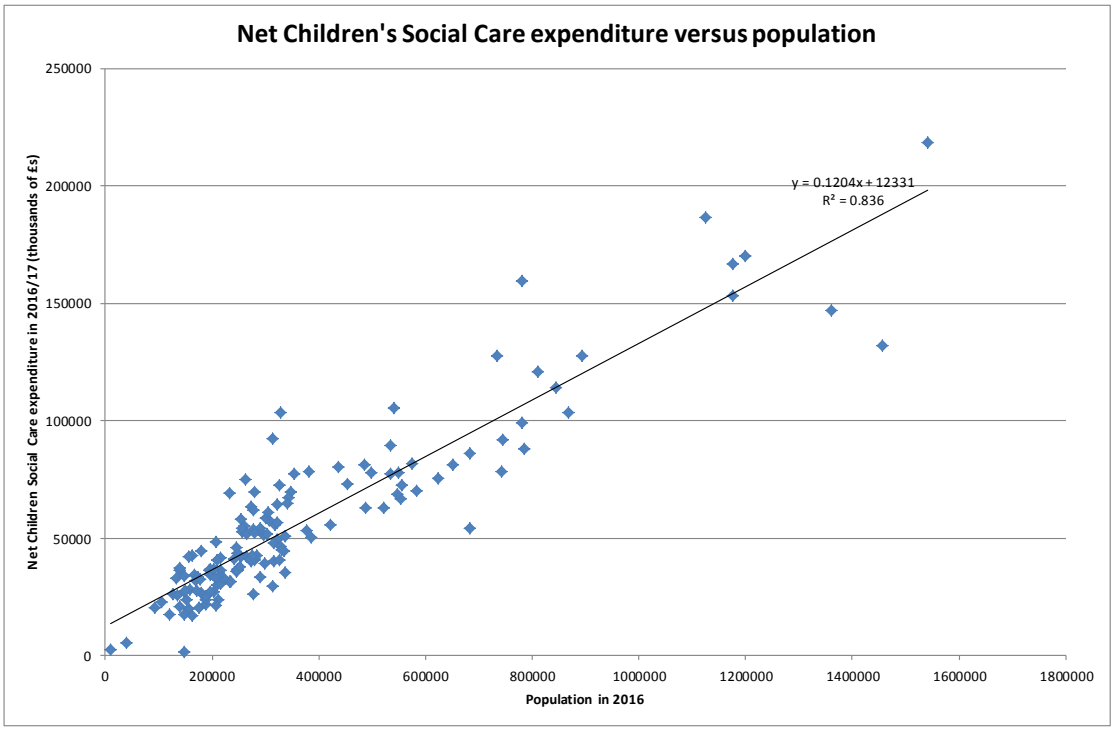



The simple example shown in the chart above only explains a small part of the variation in spending as lots of the data points are a long way from the straight line. Adding more variables would explain more of the variation, but would also complicate the model. It is possible to use statistics to define a threshold for including additional cost drivers. This threshold means that variables which do not change the position of the straight line by more than this threshold amount will not be included in the model.

It is important to note that the statistical technique that is selected does not in itself result in a good model. A good regression model does not imply a causal relationship between the independent and dependent variables. This is a problem shared by all statistical techniques under consideration, and is a main reason that the Government recognises that consultation with the sector to identify relevant cost drivers is as important, if not more so, than the selection of an analytical technique

## Annex B – Local authority expenditure on particular services versus population levels

### Chart B1: Net Children's Social Care expenditure in 2016/17 compared to population




### Chart B2: Highway Maintenance and Transport Services expenditure in 2015/16 against 2016 Population Estimates