NRCN

National Rural Crime Network

Fair Funding for Rural Policing

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and the University of Plymouth

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Executive Summary

Context

In recent years, as Police and Crime Commissioners (PCCs) have listened to their rural constituents, awareness of the impact of rural crime has increased. It is slowly being recognised that rural areas, with isolated, sparsely populated areas and limited access to support services, need an appropriate policing approach.

The National Rural Crime Network (NRCN) was formed to address these concerns. It consists of 30 PCCs plus rural stakeholders who recognise, and are working to improve, the response to this demand. In an environment of smaller budgets and shifting response models, it is vital that Government provide fair funding for forces with rural demands, some of which have only recently been identified.

A survey conducted by the NRCN in 2015 shows that the demands and impact of rural crime on a dispersed population put it on a par with the challenges of tackling crime amongst dense urban populations. On average, rural communities foot a crime bill of up to £800 million every year, and have only half the confidence in the police's ability to respond to their needs compared to the nation as a whole. That only a quarter of people surveyed for the Crime Survey for England and Wales are from rural areas, gives an indication as to why rural concerns may not have been well understood until recently.

The central recommendation of the NRCN survey report was the need for a review of funding allocations to ensure fair funding for rural forces. In July 2015 the Home Office presented a new police funding formula for consultation, but, to the dismay of NRCN members, this formula seemed likely to reduce funding for rural forces over and above losses seen by urban forces.

Aim

The NRCN therefore commissioned this report to look at the funding needs of rural forces in the light of rural demands. Its purpose is to build an evidence base to ensure that the needs of rural communities are appropriately and fairly met by any newly proposed funding formula or arrangement.

Whilst this report was being written the Home Office withdrew its proposal after serious concerns were raised during consultation. However, with the funding formula still under review, the NRCN considers the findings of this report as important considerations for any future proposal.

The proposed funding formula evaluated its approach using count-based correlation coefficients based on reported crime, rather than correlations based on crime rates per head of population. This heavily skewed their findings dependent on population size and density, and by higher volume crimes predominant in urban areas. This also negates the far greater amount of police time spent on non-crimes. This report therefore sets out to demonstrate why and how this analysis needs to be revised in future to better reflect complex crime patterns across all areas of the country.

The report also looks to raise awareness of the additional costs associated with rural policing which occur in sparsely populated areas. Pressures from gaps in the delivery of other services and seasonal movement from urban areas are more significant for rural forces, for example. A fair funding formula must account for these aspects.

Importantly this is not to say that urban forces do not have their share of problems; nor that rural forces should be treated as special cases. Simply, complex and varied demands on police officers and budgets in different areas and contexts must be taken into account to ensure fair funding.

Key Findings

Demand-based allocation models must be carefully constructed to reflect complex crime patterns

- Analysis which relies on reported crime statistics is heavily biased by volume crimes. Theft, and therein shoplifting, dominates these statistics, but relates closely to urban deprivation, skewing funding towards urban areas. Theft also requires a low resource-intensive response compared to other crimes. The pattern of theft crimes does not reflect that of other crimes, such as Child Sexual Exploitation, their demands, drivers, distribution, or resourcing requirements, and therefore will not capture variations in costs between urban and rural forces.
- Moreover, count-based correlation coefficients used by the Home Office, which respond to variations in population size, do not capture or predict demands from non-crimes when based on reported crime statistics. Non-crimes, such as road traffic incidents (RTIs), anti-social behaviour (ASB), public safety and welfare (such as missing from home cases) and mental health incidents, require different and often resource-intensive responses. Rural forces have much higher rates of RTIs than urban forces. Urban areas see a concentration of mental health issues, especially amongst the young, but have larger support service resources. Rural areas see a prevalence of mental health issues amongst the old, but the police often have to take on support service responsibilities out of hours or in isolated locations.
- In consequence of these findings, the proposed funding formula inadequately maps demand, and is likely to increase the disparity in funding. Forces which currently receive less than average *per capita* allocations will see those allocations fall further, whilst forces with higher than average *per capita* allocations will see them rise. Whilst the current proposal has been dropped, a comprehensive review of the statistical mapping and analysis methodology is required before any future formula also fails to readdress such discrepancy.

The additional costs of policing rural areas are unavoidable and have a significant impact on service delivery

- Fixed, non-staff costs are higher amongst rural forces which cannot benefit from economies of scale due to the need to serve more dispersed, low density populations. For example, this equates to £32.1 million across the 10 smallest forces (by population), the equivalent of over 600 officers. Given that rural forces generally have smaller workforces than urban forces, this has implications for service delivery.
- Significantly higher round-trip distances are found in forces serving low-density populations, increasing costs. As rural forces have lower officer numbers, the burden per officer is also higher by up to 65 per cent. These two factors combined again represent implications for service delivery, as well as officer welfare.
- All forces experience seasonal variations, but the minimum-relative-to-maximum variation, especially for daily crime and ASB is far greater in rural forces, especially those with National Parks and coastal areas attracting holiday-makers. The seasonality of demand must be recognised not only to ensure geographic equity, but also that minimum levels of service can be maintained throughout the year.
- As mentioned above, rural forces see a greater responsibility for other services, often having to deal with service provision out of hours or in isolated areas. This is intensified by lower levels of third sector support outside cities. Mental health responsibilities are particularly noticeable, particularly with regard to dementia and missing person cases due to elderly populations.

- These additional costs, being largely non-crime related, fail to be accounted for by the proposed funding formula, significantly disadvantaging rural forces.

Policy Recommendations

Fair funding must account for the complexity of policing

The future funding formula must account for the fact that policing goes far beyond crime-based activity. In fact, crime related demand accounts for a quarter of policing work in any given period of time. Equally, crime volume does not account for the demands placed upon officers for complex and non-crime cases. In the current climate this also does not account for increased pressures placed upon police both as other services contract and as pressures on estate maintenance increase the complexity of policing dispersed populations. Rurality/sparsity is a substantive issue and further research is needed to ensure that any future funding formula meets the needs of police forces across all parts of the country.

The Home Office should:

- Work with the College of Policing to undertake a more comprehensive review of policing demands in advance of and future revision of the funding formula.
  - Use detailed geo-located Command and Control data drawn from across all forces to investigate (a) patterns of police demand across the country as a whole, (b) variations in the prioritisation of incidents and subsequent response times in different environments, and (c) develop funding formula to ensure that the specific difficulties faced by forces serving dispersed communities and large rural hinterlands do not result in an unacceptably lower police service.
  - Investigate the cost of policing in response to the complexity of partnership landscapes, encompassing an analysis of how costs vary relative to 'legitimate' contextual factors over which forces have no effective control, and how the allocation process itself may be used to explicitly support partnership working.
  - Use operational Command and Control data to test whether the seasonality in RTIs and crime/ASB is accompanied by unacceptable variations in service provision. If so, rather than using a population metric based on each force's annual 'average' population, it may be appropriate to use a population metric that reflects each force's peak population.
  - Investigate whether there are identifiable fixed costs that apply to all forces and, if so, (a) introduce an initial fixed funding quanta to be awarded to all forces *prior* to the application of population and needs-based formulae, and (b) investigate whether larger forces are able to exploit economies of scale unavailable to smaller forces and, if so, introduce a suitable mechanism to dampen the effect and thereby ensure a genuinely equitable distribution of available resources.
- Be consistent in making exceptions. London is considered an exception because of its position as the capital, and also because its far larger population size makes it a statistical outlier. But rural, low-density forces are also statistical outliers for different reasons and this should be taken into account. 'Geographic service equity', for example, should be accepted as a formal funding formula objective.
- Encourage investment around policy objectives, especially around public protection, crime prevention and demand reduction, and new types of criminal activity so that resource allocation is distributed according to underlying need rather than historic activity.

Police forces and PCCs should:

- o Conduct further research to provide more detailed evidence of the impact of rurality and sparsity on service costs. The evidence that exists to date is small-scale and national data is needed to provide an indisputable case.
- o Engage with the current 'Specialist Capabilities' review to ensure the analytical methodologies and demand profiling work takes sparsity and other rural factors into account.

The Home Office should learn from other Government departments dealing with similar complexity

Given the general consensus that the current and proposed formulae are unsuitable, this report recommends that the Home Office consider processes and expertise developed by other departments, such as the NHS, for determining funding for complex demand patterns. While not free of criticism, cross-departmental engagement with NHS in-house analysts may provide improved methodologies that would benefit the policing formula. Consideration of the benefits of the advisory groups that oversee the NHS funding mechanism may also be beneficial for transparency and scrutiny to avoid future inadequate provision.

The Home Office should:

- Actively consider other service funding formula experiences, processes and scrutiny practice to draw on increasing expertise, particularly to be found within the NHS, and improve transparency.
- Ensure that any future funding formula has high technical quality. Better consideration of which data, measures, weightings and indicators should be used, and investigation of possible biases and the impact of dominant statistics on their output, must be competently exercised. The proposed formula cannot be adapted to be fit for purpose.

Police Funding Arrangements in England and Wales: Report to the NRCN

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1 Introduction

1   In mid-2015 the Home Office presented for consultation its proposed Revised Funding Formula Model for policing. In the face of serious concerns raised by Police and Crime Commissioners (PCCs) and other stakeholders, the Home Office has subsequently withdrawn its proposal.

2   This research was commissioned by the National Rural Crime Network (NRCN) to consider the proposed formula in the light of the demands of rural policing. Its purpose is to provide an evidence base that will ensure that the policing needs of rural communities are appropriately and fairly met by any new funding formula or arrangement.

3   We present this evidence in three sections. The first examines demand (crime and non-crime) on police forces and how well this is predicted by the proposed Revised Funding Formula Model. The second considers evidence of the ways in which rurality and sparsity are associated with unavoidable additional policing costs. The third assesses the process taken to develop the funding formula, its ability to promote policy objectives and possible avenues to aid improvement.

4   We find that the proposed formula is inadequate to respond to, and reflect, the demands of complex national crime patterns and the variations in demand and rates of crime and non-crime between urban and rural forces. It also does not respond to other considerations, such as seasonality, which can have significant cost implications. The proposed formula may also hinder innovation and development being based on historic data rather than assessing and promoting police response to policy objectives and underlying demands.

5   Our opinion is that the formula cannot simply be adapted to be fit for purpose and needs comprehensive revision. Our analysis shows that poor choices have been made regarding the data, measures, weightings and indicators used to develop the formula. As such it is unlikely to deliver fair funding for police forces across the country.

6   We conclude that the Home Office should draw on expertise in other government departments, such as the NHS, which have improved their technical expertise and scrutiny structures. Greater technical quality is required to ensure that any future formula provides fair funding, and learning from the experiences of organisations that have already been through these processes will improve the credibility and suitability of future proposals.

2 Understanding demand on police forces

2.1 Introduction

8 The underlying logic of the proposed reform is that a formula that is essentially based on population volume, deprivation and bar volume/density can capture variations in the underlying demands placed on police forces. Given the complexity of police work, it is reasonable to question whether such an approach "is just too simple to adequately reflect a service which ranges from mental health to child exploitation, from fraud to human trafficking and drugs offences to community liaison; all across the hugely diverse geography and demography that make up England and Wales."[1]

9 The formula also assumes that crime, and therefore demand for policing, are essentially urban phenomena. There is, however, no logical basis for assuming that all police demand is synonymous with urban deprivation. Some crimes, such as cyber and cyber-enabled crime are not bounded by geography. Indeed, domestic violence and modern slavery may be *enabled* by geographical isolation. Furthermore, non-crime demand (which accounts for the vast proportion of policing) cannot be summarised through such crime-oriented indicators.

10 In its report on *Estimating Demand on the Police Service*, the College of Policing found that, for forces that sent in returns relating to their incident data, Public Safety and Welfare (PSW) represented the largest category (larger than crime and anti-social behaviour incidents)[2]. PSW comprises incidents involving animals or wildlife, civil disputes, concerns for safety, domestic incidents (that fall outside the definition of domestic abuse), firearms, industrial incidents, missing persons, natural disasters, protests or demonstrations and suspicious circumstances/ objects. It is extremely unlikely that this diverse range of incidents is subject to the same drivers and characterised by the same distribution, not least because it includes rare events.

11 We therefore disagree with the Home Office that its set of indicators can "capture the breadth of police demand, both crime and non-crime, and that there is no analytical justification for including additional, specific non-crime indicators."[3] In this paper, we present empirical evidence that suggests that their analysis is flawed, and that technical errors mean the model will not capture variations in different crime-related demands and costs.

12 With respect to non-crime demands, we have undertaken analysis for incidents where publicly available data are available (road traffic incidents (RTIs), calls for assistance, A&E coded assaults, antisocial behaviour (ASB), non-crime command and control (C&C) calls and

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[1] PACCTS (2015). *Consultation on Reform of Police Funding Arrangements in England and Wales*. (http://lancashire-pcc.gov.uk/wp-content/uploads/2015/11/20150915-PACCTS-to-Z-McD-Re-Consultation-on-reform-of-police-funding-arrangements-in-England-and-Wales.pdf)

[2] College of Policing (2015). *Estimating demand on the police service*. (http://www.college.police.uk/Documents/Demand_Report_21_1_15.pdf)

[3] House of Commons Home Affairs Committee (2015*). Reform of the Police Funding Formula. Fourth Report of Session 2015–16. Report, together with formal minutes relating to the report*. HC 476. London: The Stationery Office Limited, p.25

MARAC cases). We find that the strong correlations found by the Home Office between socio-economic indicators and variations in non-crime activity do not stand up to scrutiny, or reflect how the burden of these activities varies between forces.

13   Finally, it is worth noting that a formula derived from recorded crime statistics has to assume that they are immune to illegitimate influences of unmet need and/or unjustified supply. If, however, variations in crime recording reflect variations in, for example, historic expenditure, this would undermine the analysis on which such a funding model is based. Existing variation in, for example, officers per crime or officers per Road Traffic Incident (RTI) across police forces suggests that some areas are clearly managing demands with less staff. If there are systematic (for example rural-urban, socio-economic) differences in the ratio of police officers to incidents, reading 'need' for policing from an analysis of factors associated with existing activity will run the risk of embedding systematic inequalities into future allocations. This is an issue which requires additional investigation, including a formal categorisation of data on the basis of the extent to which it is likely to respond to supply effects, but for the purposes of this study we must accept that recorded crime (and recorded non-crime activity) data currently offer the best metrics against which to measure the utility of the proposed funding model.

2.2   Demand Drivers: Police Force Level Analysis

2.2.1   *Police force populations as the principal driver of demand*

14   A key feature of the 43 police forces in England and Wales is how much they vary in terms population size; from the City of London (with a resident population of 8,072 people and daily working population of 319,200 people) to the Metropolitan Police Service which serves 8.53 million people. Leaving aside these two London forces, populations range from just under ½ million (Cumbria) to 2.8 million (West Midlands). As a direct result of this huge variation, the single most important factor in the current police funding formula is population size, as illustrated in Figure 1 below. This will inevitably be the case in any new formula and, as such, it is crucial that the formula uses an appropriate population denominator(s).

15   The Home Office's October 2015 'technical note' states that "we considered sub sets of the population [...but...] shares for age groups are broadly consistent with those already used for total population for the majority of force areas although we recognise there are some differences in some force areas"[4]. In fact, as discussed below, the choice of population denominator is far less obvious than this implies; police forces do differ significantly in terms of their demographic profiles.

16   First, however, Figure 1 draws attention to the way the Home Office appears to distort its analysis – or at least the presentation of its analysis – regarding the validity of its chosen

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[4] Home Office, *Refined Police Funding Model Technical Note*, 29 October 2015, p4 (Para 6). Henceforth '*Funding Model Technical Note*'. (Available via http://lancashire-pcc.gov.uk/wp-content/uploads/2015/11/20151028-Home-Office-to-PCC-for-Lancashire-Refined-Police-Funding-Model-Technical-Note.pdf)

model indicators; specifically, the way it uses correlation to show how strongly those indicators relate to one another and with non-crime indicators (Annexes A and F of the Technical Note). The latter is particularly important as it is used to counter responses to the consultation which argued that a formula devised with respect to crime data ignores a wide range of non-crime related police activity which, overall, would account for the majority of police time and resource.

Figure 1   Police Force Populations and Total Financing Provision, 2014/15 - All Forces
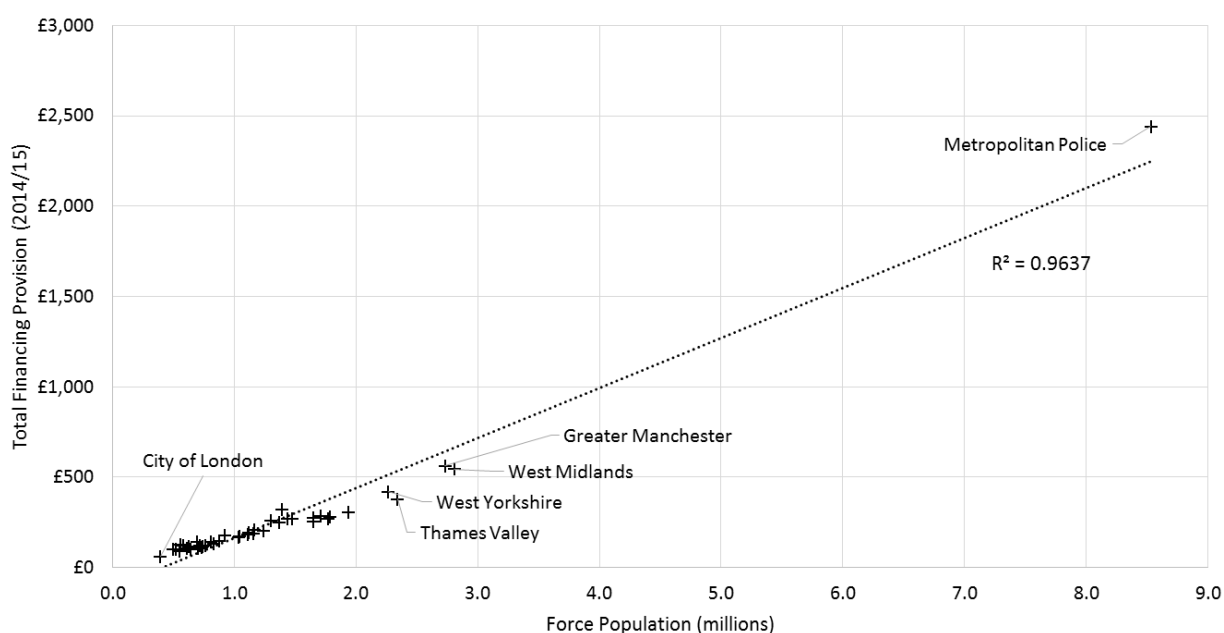
Divergent perspectives from count-based and rate-based correlations

17 In presenting what appear to be very strong correlation coefficients, the Home Office uses the evidence replicated in Table 1 below to assert that, except with respect to non-statutory MARAC cases which are heavily influenced by local decision making, "all of the remaining non-crime indicators are highly correlated with the existing indicators in the model" and that "this means the existing indicators in the model already capture the relative risk of this type of demand for each PFA"[5]. The problem is that, given the hugely varying sizes of the 43 police forces (as illustrated in Figure 1 above), high correlation coefficients are almost inevitable if they are based on count data[6]. In other words, a high degree of correlation between, for instance, the number of 'households with dependent children but no adults in employment' and 'Total MAPPA offenders' is simply because you will tend to have large number of both in areas with large populations, and small numbers of both in areas with small populations.

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[5] *Funding Model Technical Note*, p9 (Para 28).

[6] With the possible exception of the 'Volume and density of bars' measure which, without sufficient exposition provided in the consultation document and subsequent October 2015 'technical note', we have been unable to fully understand and have been unable to replicate.

Table 1   Correlations between model indicators and non-crime indicators[7]

	Population	Households with dependent children where no adults in employment	Acorn 5: Urban Adversity	Volume and density of bars
Total MAPPA offenders	0.978	0.991	0.958	0.966
MAPPA - total level 2 and 3 (management of offenders)	0.870	0.870	0.779	0.888
MARAC cases (high risk cases of domestic abuse)	0.376	0.382	0.443	0.306
Children looked after at 31 March 2014	0.940	0.970	0.967	0.924
Children in need at 31 March 2014	0.984	0.990	0.960	0.963
Children who were the subject of a child protection plan at 31 March 2014	0.968	0.974	0.961	0.942
Finished mental health admissions episodes	0.949	0.939	0.884	0.945
A&E alcohol - related hospital admissions	0.933	0.937	0.929	0.892
Missing persons	0.905	0.919	0.895	0.903

18   To understand whether the non-population model indicators are providing any additional information it is necessary to take account of variations in population size, that is, to focus on per capita rates and not on raw counts. We do not have the same non-crime datasets used by the Home Office, and we have been unable to replicate with any confidence the 'Volume and density of bars' measure, but we can illustrate the impact of shifting from a count-based to a rate-based analysis with respect to non-crime indicators for which we do have data. Thus, as shown in Table 2 below, a series of apparently impressive count-based correlation coefficients invariably become far less convincing once the effect of population is discounted. Indeed, in some cases the direction of the relationship actually reverses; such as with respect to RTIs where strong positive count-based correlations are associated with small negative rate-based correlations.

19   In other words, although police force areas with large *numbers* of people in 'Urban Adversity' postcodes also tend to have large *numbers* of RTIs, areas with large *proportions* of people in 'Urban Adversity' postcodes tend to have a lower *per capita* rate of RTIs. Once the effect of population is discounted, the non-population model indicators are far less adequate measures of non-crime police activity than the Home Office suggests, and in some cases are misleading. The model's indicators (and, by implication, the funding formula) thus cannot adequately capture variations in non-crime demand.

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[7] *Funding Model Technical Note*, p17 (Annex F). It is possible, though it is not stated, that these correlation coefficients have been derived using smaller units, perhaps Local Authority/Community Safety Partnership areas. The same point applies, however, as these units also have very different populations.

Table 2   Count-based and rate-based correlations between non-population model indicators and selected non-crime indicators

		Total (n)	National Annual Rate per 1000	ACORN 5: Urban Adversity		Households with children & no employed adults	
				Count-based Correlation	Rate-based Correlation	Count-based Correlation	Rate-based Correlation
HES data; 2012/13-2014/15	A&E Episodes: Assault	526,419	9.1	0.962	0.607	0.952	0.315
	Inpatient Episodes: Assault	117,350	2.0	0.954	0.686	0.944	0.418
PEEL assessment data	Calls for assistance 12 months to March 2015	20,109,213	348.0	0.823	0.167	0.863	0.330
POA Annual Data Return 2014/15; Emergency & Priority Incidents	Total ASB	957,994	16.6	0.867	0.309	0.866	0.411
	Notifiable, Classified C&C Crimes	1,548,303	26.8	0.959	0.451	0.952	0.559
	All Other C&C Incidents	4,625,124	80.0	0.908	0.366	0.911	0.515
NSIR ASB incidents: 2013/14	Personal	585,217	10.1	0.659	0.188	0.647	0.256
	Nuisance	1,389,050	24.0	0.958	0.390	0.948	0.433
	Environmental	128,433	2.2	0.776	-0.164	0.770	-0.070
	Total	2,102,700	36.4	0.970	0.378	0.958	0.459
Crime Inspection Data, 2014	MARAC cases presented in 12 months to 31 July 2014	46,511	0.8	0.921	0.327	0.895	0.359
Road Safety Data, 2012-14	Fatal & Serious RTIs (Attended)	55,426	0.3	0.870	-0.357	0.880	-0.322
	All RTIs (Attended)	329,244	1.9	0.947	-0.178	0.947	-0.142

Sources: **HES data**: extracted from Hospital Episode Statistics 2012/13-14/15 (3 years). All A&E admissions with AEPATGROUP (reason for an A&E episode)='Assault', and all inpatient admissions with any ICD10 diagnosis code = 'X85'-"Y09" inclusive, i.e. 'assault' by specified or unspecified means. (http://www.hscic.gov.uk/hes)

PEEL assessments data: Police Effectiveness 2015 data (http://www.justiceinspectorates.gov.uk/hmic/data/peel-assessments/)

POA ADR (Annual Data Return) 2014/15: ADR 342 - Emergency and Priority Incidents in Value for money profile data, 2015 (http://www.justiceinspectorates.gov.uk/hmic/data/value-for-money-data/)

NSIR Anti-social behaviour incidents: 2013/14: Available via https://data.police.uk/data/annual-data-requirement/

Crime Inspection Data 2014: http://www.justiceinspectorates.gov.uk/hmic/data/crime-inspection-data/

Road Safety Data 2012-14: RTIs extracted from Road Safety Data Accident data from 2012, 2013 & 2014 (see https://data.gov.uk/dataset/road-accidents-safety-data)

2.2.2 Aggregate Recorded Crime Data: a poor proxy for crime-related demand

20   A deeper problem is that our analysis suggests that these model indicators are also likely to be relatively poor predictors of crime-related demand. Despite poor methodological transparency, it appears that potential socio-economic indicators were initially selected (presumably, but not necessarily, with formal regression-based model fitting techniques) using police force level recorded crime data. The Home Office indicates that:

> *"A broad range of factors were examined to identify which most closely describe differences between forces in terms of variations in crime. A statistical technique,*

known as reliability analysis, was then used to trim down this range of factors to a smaller number which explained most of the variation between the larger set. […] Using this process, two socio-economic factors that are closely correlated with the patterns of crime seen between different areas over time were identified. These are: households with no working adult and dependent children; and a 'hard pressed' population indicator."[8]

Table 3   Recorded crime (2014-15) with average detection rates (2012/13 – 14/15) , by crime type

	Crime Category	Number of Crimes	Percent of all crimes	Detection Rate (%)	Detailed Category [Detection Rate]
Victim-based crime	Violence against the person	772,217	21.84%	62.6%	Homicide Violence with injury Violence without injury
	Sexual offences	87,183	2.47%		Rape Other Sexual Offences
	Robbery	49,889	1.41%	26.9%	Robbery of Business Property Robbery of Personal Property
	Theft offences	1,733,248	49.02%	21.9%	Domestic burglary Non-domestic burglary } [13.7%] Vehicle offences [10.3%] Theft from the person [7.7%] Bicycle theft [8.6%] Shoplifting [61.6%] All other theft offences [16.2%]
	Criminal damage and arson	499,210	14.12%	23.6%	Criminal Damage Arson
Other crimes against society	Drug offences	167,697	4.74%	94.0%	Trafficking of Drugs Possession of Drugs
	Possession of weapons offences	21,533	0.61%	89.3%	
	Public order offences	152,945	4.33%	65.7%	
	Misc. crimes against society	51,767	1.46%	71.3%	
	Total Crimes	3,535,689			

21   The key problem is that recorded crime data (which excludes fraud) is heavily skewed towards a particular type of crime and, moreover, towards a type of crime that is likely to consume relatively little police time. Table 3 above shows the standard classification of crimes and the number (and percent) of such crimes recorded in 2014/15[9]. Very nearly half all recorded

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[8] Home Office, *Consultation on reform of police funding arrangements in England and Wales Consultation*, July 2015, p23 (Para 6.2). Henceforth '*Consultation*'. See https://www.gov.uk/government/consultations/reforming-police-funding-arrangements-in-england-and-wales.

[9] Police recorded crime by offence group and police force area, English regions and Wales, number of offences, 2014/15. Extracted from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/511307/rec-crime-pfa-2003-2015.ods.

crimes were theft offences and, although we have been unable find explicit data on how much police time and resource is, on average, committed to each of the different crime types, it seems highly likely that responding to, investigating, and prosecuting theft offences will tend to take less time than most other categories of crime.

22 Certainly theft offences have relatively low detection rates (21.9% overall and just 14.1% if shoplifting is excluded[10]) and are given a relatively low weighting according to the Cambridge Crime Harm Index (CHI)[11]. It is likely that the introduction of THRIVE (Threat/Harm/Risk/ Investigation/Vulnerability/Engagement) style incident management models will encourage a further shift of emphasis away from theft offences and towards other more 'serious' crimes. This was reported in Bedfordshire, where "victims of burglary and theft […are…] now having to make an appointment to get their crime investigated" and police "will now only provide an emergency response if people are under threat of violence, injured, or when a crime scene needs to be preserved"[12].

23 Selecting model indicators using aggregated recorded crime data that are heavily skewed towards the prevalence of theft offences would not be a problem if such offences provided a reasonable proxy for all crime, but they do not. As illustrated in Table 4 below, the various different crime types are all (to lesser or greater extent) correlated with one another and with total crime, but in many cases the relationship is not particularly strong. As might be expected given the foregoing discussion, total recorded crime is most closely correlated with theft offences (r=0.922), and much less well correlated with the remaining top-level crime types. Thus whereas total recorded force-level crime rates 'explain' 85% of the variation in *per capita* theft offences, total recorded crime explains less than 50% of the *per capita* variation of most other crime types. In terms of detailed crime types (not included in the table) – many of which are inevitably associated with a significant input of police time and resource – total recorded crime explains very little variation; e.g. 42%, 39%, 32% and 15% for rape, other sexual offences, trafficking of drugs and homicide respectively.

24 It seems inherently unlikely, therefore, that unweighted 'total recorded crime' data can provide a reliable measure of the burden of crime on police forces. We have no evidence that the Home Office has attempted to weight the crime data. Indeed, given that it used count-based (rather than rate-based) correlations to defend its claims that formula failed to capture variations in non-crime demand, we strongly suspect the Home Office has similarly used count-based correlations to satisfy itself that 'total recorded crime' data provides a reasonable basis for analysis. For instance, although only 15% of the variation in homicide rates is predicted by force-level variation in overall crime rates, no less than 94% of the

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[10] Detection rates for different crime types calculated using custom data downloads (including outcomes data) for the three years 2012/13-2014/15 from https://data.police.uk/data/.

[11] Sherman, L, Neyroud, P.W. and Neyroud, E. (2016). The Cambridge Crime Harm Index: Measuring Total Harmfrom Crime Based on Sentencing Guidelines. *Policing* doi: 10.1093/police/paw003

[12] Cambridge News, Bedfordshire Police to deal with theft and burglaries by appointment under new model, 22 June 2015. (http://www.cambridge-news.co.uk/Bedfordshire-Police-deal-theft-burglaries/story-26744426-detail/story.html).

variation in the *number* of homicides is predicted by variations in the total *number* of recorded crimes. As detailed above, this simply reflects the impact of population size in an analytical dataset (that is the 43 police forces) which varies greatly in population size[13].

Table 4   Correlation coefficients [and percentage variation explained] between per capita rates of total recorded crime and rates of various top level crime types

	Violence against person	Sexual offences	Robbery	Theft offences	Criminal damage and arson	Drug offences	Possession of weapons offences	Public order offences	Misc. crimes against society
Total recorded crime	0.827 [68.4%]	0.668 [44.6%]	0.666 [44.4%]	0.922 [85.0%]	0.764 [58.4%]	0.317 [10.0%]	0.681 [46.4%]	0.604 [36.5%]	0.584 [34.1%]
Violence against the person	1	0.693 [48.0%]	0.516 [26.6%]	0.596 [35.5%]	0.620 [38.4%]	0.297 [8.8%]	0.553 [30.6%]	0.663 [44.0%]	0.570 [32.5%]
Sexual offences		1	0.299 [8.9%]	0.495 [24.5%]	0.639 [40.8%]	0.232 [5.4%]	0.573 [32.8%]	0.394 [15.5%]	0.431 [18.6%]
Robbery			1	0.710 [50.4%]	0.145 [2.1%]	0.247 [6.1%]	0.577 [33.3%]	0.389 [15.1%]	0.325 [10.6%]
Theft offences				1	0.609 [37.1%]	0.122 [1.5%]	0.596 [35.5%]	0.387 [15.0%]	0.428 [18.3%]
Criminal damage & arson					1	0.213 [4.5%]	0.520 [27.0%]	0.391 [15.3%]	0.458 [21.0%]
Drug offences						1	0.342 [11.7%]	0.456 [20.8%]	0.361 [13.0%]
Possession of weapons							1	0.392 [15.4%]	0.481 [23.1%]
Public order offences								1	0.576 [33.2%]

25   In assessing the appropriateness of the Home Office's use of total recorded crime data, perhaps even more important than the extent to which different crime types are correlated is the underlying nature of the relationship; by which we principally mean by how much rates vary between forces. Force-level 'total recorded crime' rates vary by a factor of 6.1 (or by a factor 2.2 if the City of London is excluded), but the major categories of crime vary by as much as a factor of 42.8 (for 'Robbery') to as little as a factor of 2.9 (for 'Miscellaneous crimes against society'). In other words, a formula designed to capture variations in 'total recorded crime' will massively underestimate the extent to which Robbery varies between forces, and will significantly overestimate the extent to which 'Miscellaneous crimes against society' vary. This will distort any understanding of the relative burden of different types of crime in each force area and, in turn, result in an inequitable allocation of resources.

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[13] We are, as no detail is given, of course unaware of the units used by the Home Office in its analyses. But all administrative units tend to vary considerably in size and thereby render count-based correlations deeply problematic. Local authorities (n=350), for instance, vary from just a few thousand (Isles and Scilly and the City of London) and then from 34,000 (West Somerset) to 1.1 million (Birmingham).

26 We can illustrate this graphically by examining the extent to which the three principal Home Office indicators predict force-level variations in (a) total recorded crime rates, and (b) criminal damage and arson rates. To that end we have fitted a Poisson generalised linear regression (GLM) model to count data using, as predictor variables, (i) 'the proportion of households with dependent children but no adults in employment' and (ii) the 'proportion of the population in postcodes classified 'Urban Adversity'. The 2014 mid-year population is included in the model as offset. This does not attempt to replicate the proposed formula – as previously stated, too little information is provided for us to be able to do this with confidence – but, insofar as the formula *should* capture the relative impact of population and the two socio-economic indicators, then this Poisson GLM should provide a reasonable proxy.

27 Reasonable fits are returned in each case, with r=0.8107 (r^2=0.7245) and r=0.6999 (r^2=0.4898) when predicting variations in 'total recorded crime' and 'criminal damage and arson' respectively. The use of the particular socio-economic indicators chosen by the Home Office following its analysis of total record crime data does have important consequences for some individual forces – notably with respect to the significant overestimation of criminal damage and arson in the Metropolitan Police Force area – but it is the very different slopes of the two 'best-fit' regression lines which is most notable (Figure 2). The regression slope for total recorded crime is close to 45 degrees – showing that the model is broadly predicting the degree by which rates vary between force areas. The regression slope for criminal damage and arson is much flatter, suggesting that the Home Office model will significantly underestimate the degree by which criminal damage and arson varies between force areas.

Figure 2   Using Home Office variables to predict force-level variations in (a) Total Record Crime and (b) Criminal Damage and Arson
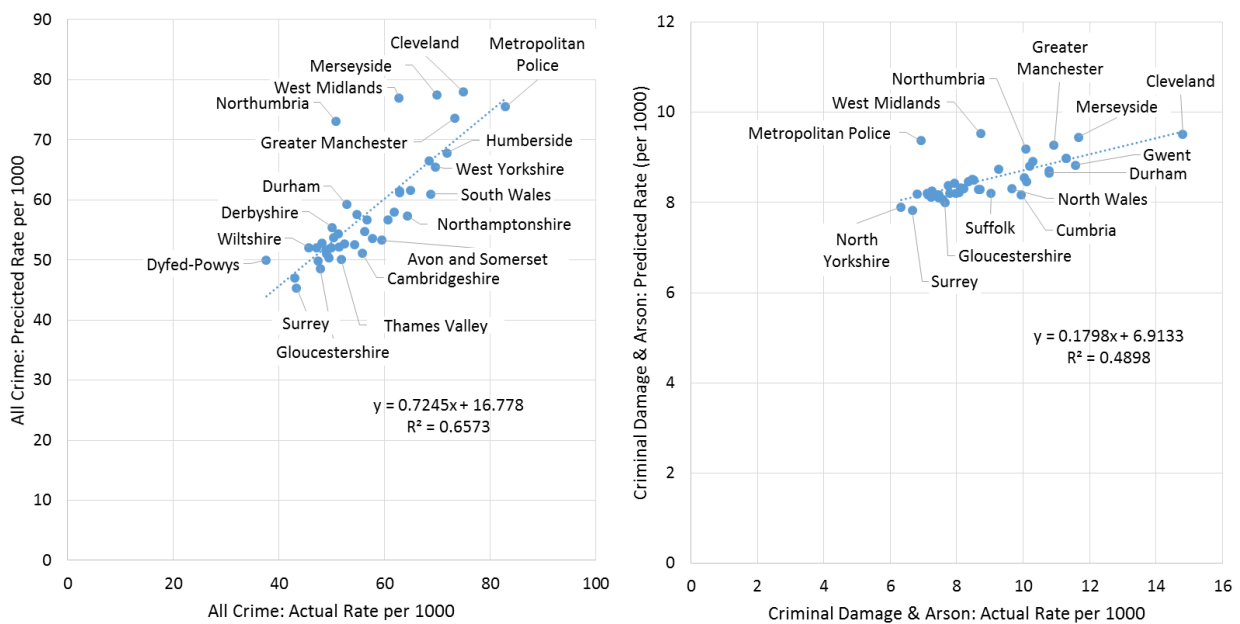
28 In fact, a far better prediction of variation in 'criminal damage and arson' rates can be obtained using Department of Work and Pensions claimant data and 2011 Census data on the

proportion of people obtaining Level 4 and above educational qualifications, but such insights cannot be utilised if a single formula (derived from an analysis of total recorded crime) is used to describe how all types of crime varies. And the profound impact of doing this is illustrated by Figure 3 below, in which we compare force-level predicted 'criminal damage and arson' rates using the two models described above. In this figure (note the use of a non-zero origin for clarity) the horizontal-axis gives the predicted force-level rate if the model is fitted to actual 'criminal damage and arson' data, whilst the vertical-axis gives the rate if the model derived using total recorded crime data has been used.

Figure 3   Alternative perspectives on force-level rates of 'Criminal Damage and Arson'
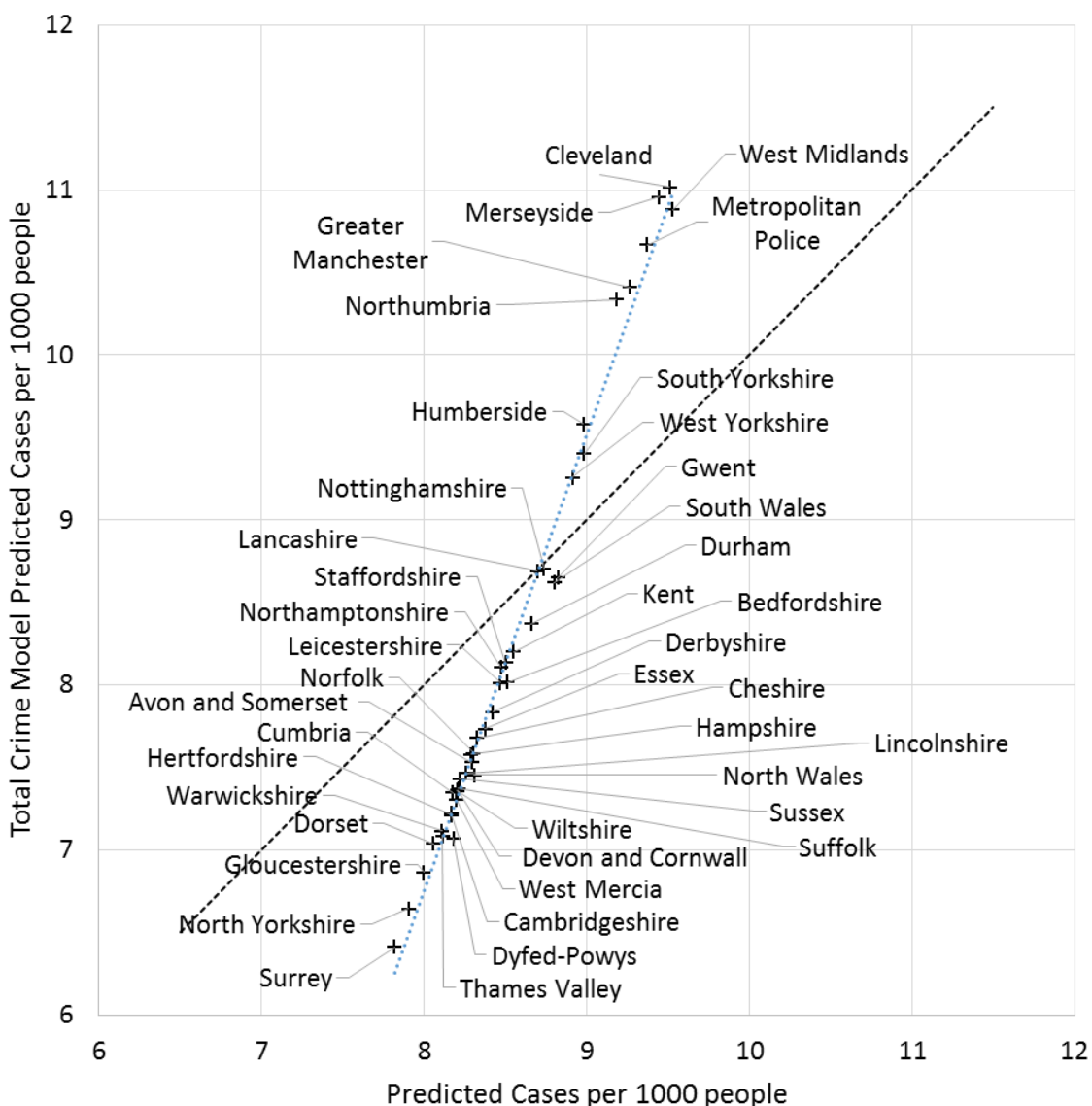
29 The same socio-economic and population data is used in both models, but only for Nottinghamshire and Lancashire do the two models converge. For all forces below them (i.e. from Gwent and South Wales down to Surrey) the model based on 'total recorded crimes' data underestimates the burden of criminal damage and arson, whilst for all forces above the convergence point (all of which are 'predominately urban') the 'total recorded crimes' model overestimates the burden. And at the extremes the error is very significant; with the Surrey
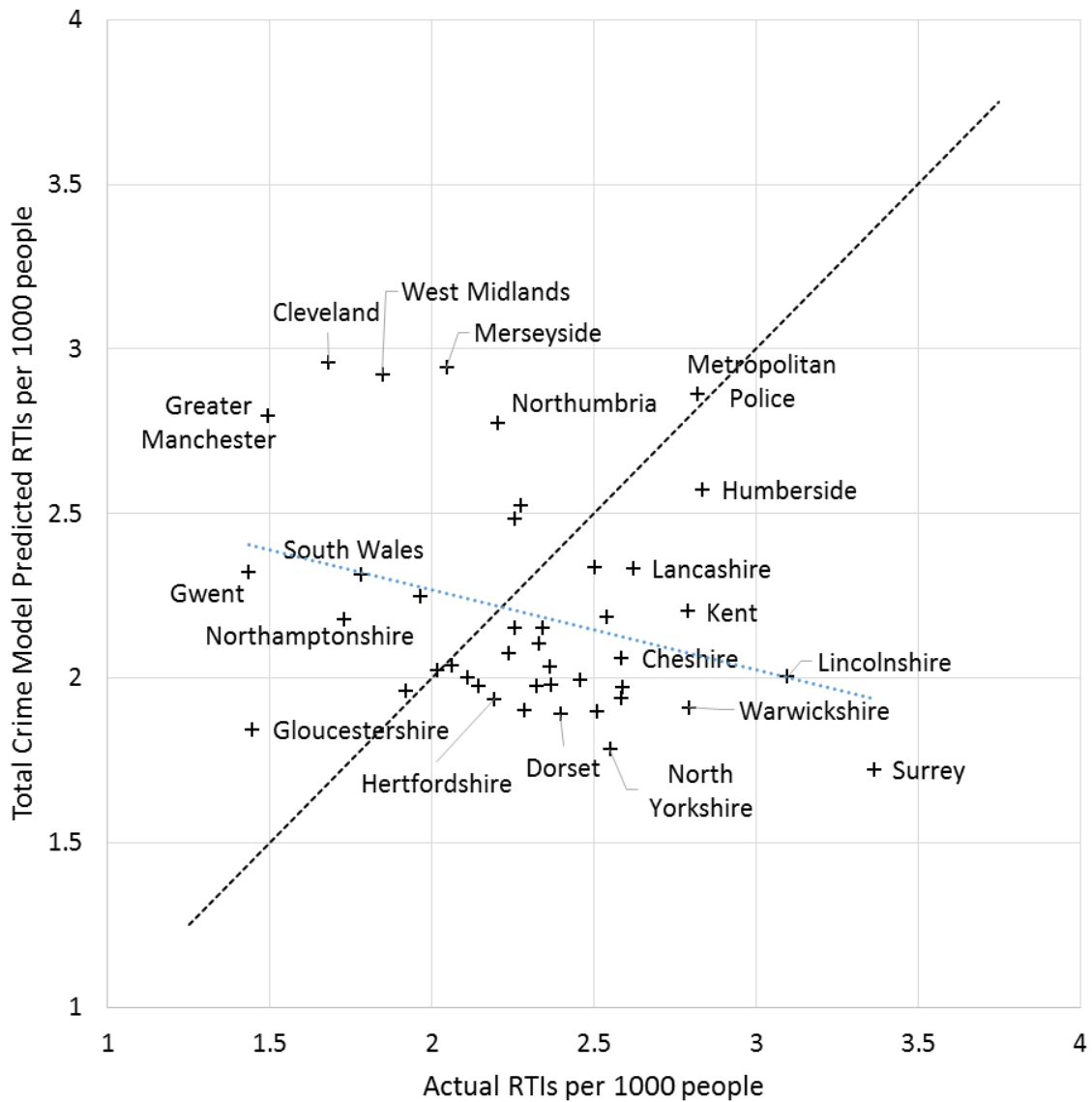
estimate being 18% too low, and the Cleveland and Merseyside estimates being 16% too high, even though, and this is the crucial point, the different sets of estimates are extremely well correlated (r=0.994; r^2=0.989).

30 The problem, then, is that the Home Office appears to base its model of demand on a metric (total recorded crime count data) which is dominated by a particular type of crime (theft) that is neither particularly representative nor particularly resource intensive. This badly distorts the extent to which the model can capture variations in other crimes that are often far more resource intensive.

2.2.3 Aggregate Recorded Crime Data and non-crime-related demand

31 Moreover, the model provides a very inadequate guide to variations in non-crime activity. For instance, in Figure 4 below we plot actual *per capita* rates for RTIs attended by police officers against rates predicted using our Poisson regression model of 'total recorded crime' using (i) 'the proportion of households with dependent children but no adults in employment', (ii) the 'proportion of the population in postcodes classified 'Urban Adversity' as predictor variables, and (iii) the 2014 mid-year population as a model offset.

32 There is clearly no meaningful relationship between what the 'total recorded crime' based model predicts and actual RTIs; with urban forces such as Greater Manchester, Cleveland, the West Midlands and Merseyside having far lower rates than predicted (by factors of 47%, 43%, 37% and 31% respectively), and more rural forces such as North Yorkshire, Warwickshire, Lincolnshire and Surrey having far higher rates than predicted (by factors of 43%, 46%, 54% and 95% respectively).

33 If *per capita* rates of attended RTIs can be taken as a reasonable proxy for the relative burden (over and above population) placed on different police forces for policing roads, then it is clear that the use of the Home Office's preferred indicators will fail to capture how that burden varies between forces. And this constitutes only one of any number of indicators of non-crime activities which, to greater of lesser degree, are poorly predicted by any model derived from the analysis of variations in total recorded crime. Figure 5 below plots (on horizontal axes) *actual rates* (per 1000 people) relating to a number of measures which cover various aspects of the broader range of police activity. These represent a subset of the non-crime indicators detailed in Table 2 above. In each case the vertical axis represents the rate predicted using our Poisson regression model of total recorded crime and it is clear that, even when there is some degree of correlation between actual and predicted rates, using such a model fails to capture how the burden of these activities varies between forces.

Figure 4   Home Office estimates of force-level rates of attended RTIs against actual rates

Figure axes: Y-axis "Total Crime Model Predicted RTIs per 1000 people" (1 to 4), X-axis "Actual RTIs per 1000 people" (1 to 4). Labelled points include: Cleveland, West Midlands, Merseyside, Greater Manchester, Metropolitan Police, Northumbria, Humberside, South Wales, Gwent, Lancashire, Kent, Northamptonshire, Cheshire, Lincolnshire, Gloucestershire, Warwickshire, Hertfordshire, Dorset, North Yorkshire, Surrey.

34 This all argues for a far more nuanced approach which recognises the very different, and often quite divergent, demands placed on police forces serving different populations in different areas. This would inevitably require a more complex formula which aggregates a range of separate sub-allocations, each of which seeks to predict demand with respect to defined areas of policing: and this, of course, takes us back to the underlying structure of the current formula.

35 Described by the Home Office as 'complex, opaque and out of date'[14], the current police funding formula has separate allocations for seven crime types (defined as 'more serious violence/sexual offences', 'less serious violence', 'robbery', 'vehicle crime', 'domestic burglary', 'other crime (high cost)' and 'other crime (low cost)') and four additional categories (defined as 'providing reassurance to the public', 'providing assistance at or reducing road traffic accidents', 'providing assistance with non-crime incidents', and 'policing special events'). This may seem unduly complex, but the problem is that although funding formulae

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[14] *Consultation*, p6 (Para 1.1).

should aim for simplicity (as well as transparency, stability and the other principles identified in the consultation[15]), *this must not be at the expense of fairness*.

36 Fairness is not listed by the Home Office as one of its 'guiding principles', but it clearly lies at the very heart of the proposed funding model which "must be based on an understanding of the drivers of crime and police demand [… in order to …] ensure that funding is allocated according to need"[16]. The proposed formula clearly fails in this respect. In part this is because, seeking a simple model, it has been assumed that variations in total crime provides a suitable proxy for need, but it is also due to the methodology used to calculate the funding model.

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[15] *Consultation*, pp14.15 (Paras 3.5 et seq.).

[16] *Consultation*, p20 (Para 5.1).

Figure 5   Actual rates of various non-crime indicators (x-axes) against rates predicted using a model derived from an analysis of 'total recorded crime' (y-axes)
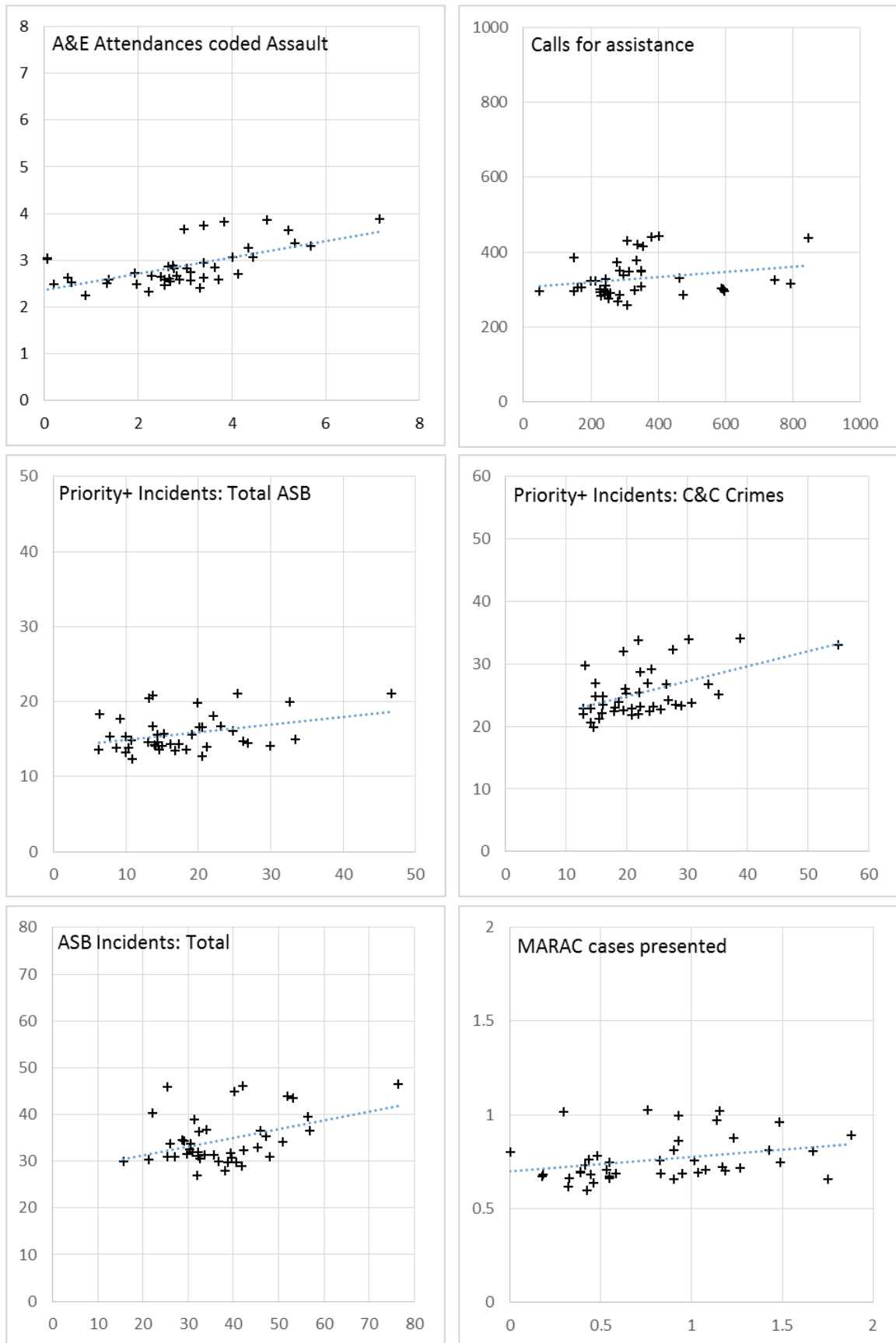
2.2.4 Other non-crime related demand

37 While we have been able to perform analysis on a limited set of measures of non-crime demand, there are other important demands for which we have no national data. Demands associated with public protection (such as dealing with vulnerable people, people with mental health problems and with missing persons; child protection and safeguarding and public reassurance and protection) tend to be complex and resource intensive. Devon and Cornwall PCC & Constabulary estimate that each missing person incident takes an average of 18 hours of police time to resolve. A case assessment undertaken in two UK forces also suggests that missing person investigations are a bigger drain on police resources then either theft or assault[17].

38 Public Safety and Welfare (PSW) appears to be giving rise to particularly large increases in demand. This is likely to reflect the impact of cuts in other public services and charities working with vulnerable people which have been linked to 'mission creep' for the police who are regularly the first point of contact for those in mental distress[18]. Mental health problems are a key factor in this increased demand.

The distribution of mental health problems

39 The NSIR enables forces to use mental health qualifiers on their systems to flag incidents that may be linked to mental health. Unfortunately, national data on the use of mental health qualifiers are not available. A Freedom of Information request raised by the Guardian[19], to which a total of 35 forces in England, Wales and Northern Ireland responded, found that the overall number of incidents with a mental health aspect rose by 33% between 2011 and 2014. Work undertaken by the Metropolitan Police Service has estimated that 15%-20% of incidents are linked to mental health[20]. In the Guardian research, the highest rate of mental health qualifiers was found in Suffolk, where, over a month of recording, 37% of officers' time was devoted to dealing with incidents involving some mental health aspect.

40 There is no evidence to date to suggest that incidents related to mental health are closely correlated to levels of deprivation. Indeed, research conducted for the Department of Health which modelled the mental health resource needs of general practices (using an existing case-mix classification of mental health resource use superimposed onto Health Survey for England data) found a complex geography of needs. These were generally much higher in northern England. Prevalence was also greater in the major cities, from Tyneside through the Liverpool-

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[17] Shalev Greene, K. and Pakes, F. 2013. The cost of missing person investigations: Implications for current debates, *Policing: A Journal of Policy and Practice*, 8 (1), 27–34. doi: 10.1093/police/pat036

[18] Carol Hayden & Karen Shalev-Greene (2016). The blue light social services? Responding to repeat reports to the police of people missing from institutional locations, *Policing and Society*, DOI: 10.1080/10439463.2016.1138475

[19] Quinn, B., Laville, S. and Duncan, P. (2016). Mental health crisis takes huge and increasing share of police time. The Guardian, 27th January, 2016

[20] College of Policing (2015). Estimating demand on the police service.
http://www.college.police.uk/Documents/Demand_Report_21_1_15.pdf

Manchester and Leeds-Sheffield axes, down to inner city London. However, there was also a notable coastal fringe of 'high-need' practices[21].

41   The results revealed a complex (but intuitively coherent) relationship between mental health needs, age and deprivation. Among the pre-retired population, socio-economic differentials in risk are associated with higher levels of prevalence in major cities. However, there is also an increased prevalence of mental health problems in seaside towns where declines in tourism and the subsequent release of cheap accommodation (as former hotels and boarding houses have been converted into shared housing or bedsits) have been linked to the movement of less economically active people[22]. There is also evidence that local authorities have taken advantage of low-cost housing by placing vulnerable people – such as children in care and ex-offenders – into such areas. Such groups often grapple with a range of problems - physical, emotional, psychological, financial and social, including problems related to substance misuse and present additional demands on statutory services, including the police.

42   After the age of 65, socio-economic differentials in mental health become less pronounced, particularly for those aged 85 or more. By this point in the life course, morbidity (particularly risk of degenerative organic brain syndromes such as dementia) is dominated by age itself. Dementia is an important risk factor in missing person cases and would thus be predicted to be a significant determinant of workload in rural and coastal areas which have the oldest demographic profiles. In its response to the Home Office's 2015 Consultation, Devon and Cornwall PCC & Constabulary noted that, according to College of Policing demand profiles, it experienced significantly more missing persons than the average force (22 per day compared to a national average of 12 per day)[23].

Critical public safety events

43   PSW comprises a diverse array of incidents (e.g. involving animals or wildlife, civil disputes, concerns for safety, domestic incidents (that fall outside the definition of domestic abuse), firearms, industrial incidents, missing persons, natural disasters, protests or demonstrations and suspicious circumstances/objects). Targeting funding to this wide range of demands is challenging first because their various distributions would be expected to differ and second because they include rare events. As a letter from the Chief Constable of Cumbria Constabulary to the Policing Minister noted:

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[21] Asthana, S., Gibson, A., Bailey, T., Hewson, P., Dibben, C. (2010). *Developing a Person Based Resource Allocation Formula for Setting Practice-Level Mental Health Budgets: 2009/10 and 2010/11*. Report to the Department of Health/NIHR (Policy Research Programme). University of Plymouth. 240pp.

[22] House of Commons Communities and Local Government Committee (2007). *Coastal Towns. Second Report of Session 2006–07*. Report, together with formal minutes, oral and supplementary written evidence. London: the Stationery Office; ONS (2013). *A Profile of Deprivation in Larger English Seaside Destinations, 2007 and 2010*. London: ONS

[23] Consultation on reform of police funding arrangements in England and Wales. Joint Response from the Police and Crime Commissioner for Devon and Cornwall and the Isles of Scilly and the Chief Constable of Devon and Cornwall Constabulary. http://7f81ff6114e21659b84a-cde1435c149cc037d22b329c27ad88ee.r2.cf3.rackcdn.com/Documents/Our%20information/Responses%20to%20consultation/FORMULA%20CONSULTATION%20RESPONSE%20DEVON%20AND%20CORNWALL%20-%20SUBMITTED%20FINAL%20090915.pdf

"Over the past 15 years, we have dealt with a significant foot and mouth outbreak, two major floods, a rail crash and the West Cumbria shootings, all public safety and critical incidents which have required significant, specialised resources and had resourcing impacts for a long time after"[24].

44   Events such as these cannot be predicted using standard classification or regression methods. However, as we know that the budgetary risk associated with responding to rare events increases as the size of the population (and associated funding) decreases, small forces such as Cumbria would benefit from some clear risk sharing arrangements.

2.2.5 Constructing the funding model

45   Little technical discussion was released in either the original July *Consultation* or the subsequent October *Technical Note*. This makes it difficult for us to understand or replicate the analysis. From what is available, it is clear that the Home Office decided that 'three broad elements … capture the drivers of crime and demand on a police force' and that metrics for each should be determined. These broad elements were (i) population levels, (ii) the underlying characteristics of local populations – which, following a process of modelling and factor reduction, was defined in terms of (a) households with no working adult and dependent children, (b) a 'hard pressed' (later becoming an 'Urban Adversity') ACORN population indicator, and (iii) the environmental characteristics of police force areas – referred to as 'bar [drinking establishment] density and volume'. Finally, 'factor loadings' derived from a technique known as Principal Component Analysis (PCA) were then used to weight the contribution that each of what were now four model components should make to the final formula, as summarised in Table 5 below.

Table 5   Model Indicators and Weightings

| Drivers of Need	Model Components	Weighting
Population Levels	3 year average population estimates; ONS and StatsWales	30%
The underlying characteristics of local populations	Households with no adults employed and dependent children; 2011 Census	31%
	Households or Population in postcodes (or perhaps simply number of postcodes?) classified as 'Urban Adversity' in CACI Ltd's ACORN Consumer Classification[25].	31%
The environmental characteristics of police force areas	Stated to be based on 'units of bars' as defined by the 2007 SIC 56.3 (ONS Inter-Departmental Business Register) and 'area' in hectares (ONS) – but are unsure how the measure is actually constructed.	8%

46   We believe that the two 'underlying characteristics of local population' were informed by formal statistical modelling, based, we think, on regression analysis to identify potential

[24] http://www.cumbria-pcc.gov.uk/media/39511/CC%20Response.pdf

[25] CACI Ltd., *The Acorn User Guide: The Consumer Classification*, 2014. (http://www.acorn.caci.co.uk/downloads/Acorn-User-guide.pdf)

predictors of force-level variations in recorded crime, followed by factor reduction using a technique known as 'reliability analysis'. We have questioned at length the appropriateness of using 'total recorded crime' data as a single proxy for the diversity of police activity, but in this context the issue is that the selection of these two factors appears to have been undertaken independently of the contribution of the other factors in the model, namely population and 'bar density and volume'. It is asserted that 'total population' is the appropriate population metric and that 'shares for age groups are broadly consistent with those already used for total population' – in spite of clear evidence to the contrary (Figure 6 below)[26]. It is also asserted that 'a strong relationship between the density of bars within a force area and the drivers of crime and demands on the police has been identified'[27]. No evidence is adduced to support either assertion and, so far as we can tell, no other 'environmental' factors have been seriously investigated. The key issue, however, is that the various factors have been identified with little regard to how they interact with one another, and have been brought together using a method which is unsuited for the purpose.

Figure 6   Percentage Police Force Populations aged 15-24
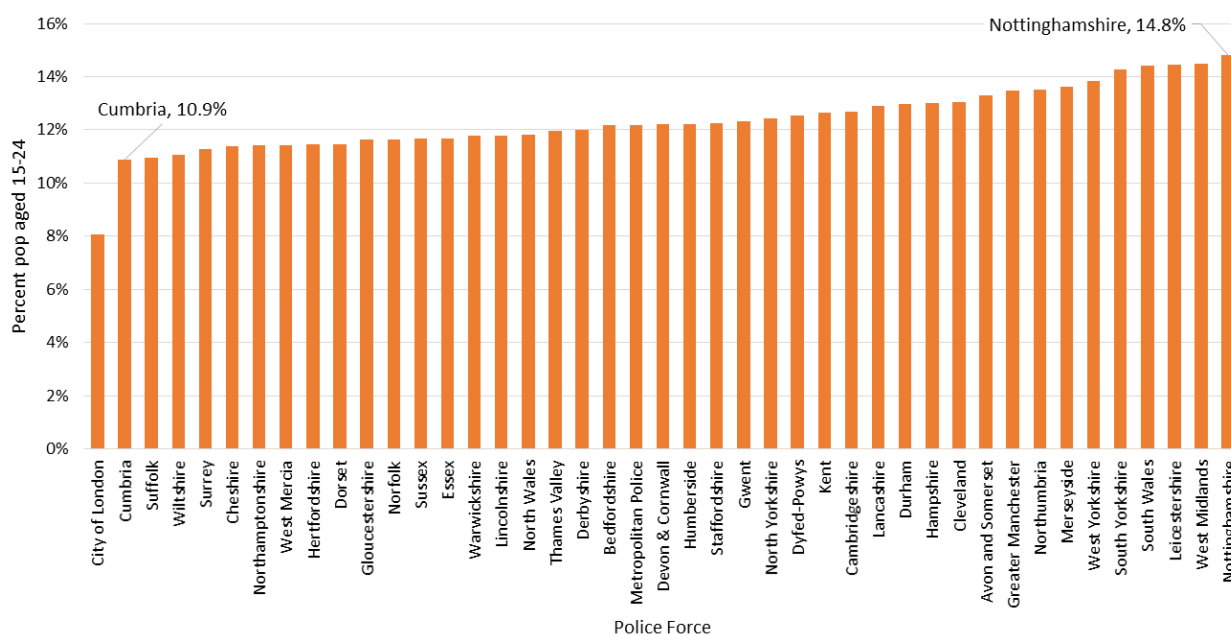
47   Rather than use the four components to construct a multivariate model that uses the available data to best predict need (however that might be measured), the four components were weighted using a technique known Principal Component Analysis (PCA). Using PCA 'factor loadings' to weight the four components has been described as 'without any logical justification'[28] and as one of the "statistical techniques used in the process [which] do not

[26] *Funding Model Technical Note*, p4 (Para 6).

[27] *Consultation*, p23 (Para 6.9).

[28] Mervyn Stone, *A nonsensical formula for the differential funding of police forces,* Opinion Piece for Public Finance, 9 Nov 2015 (http://www.publicfinance.co.uk/opinion/2015/11/nonsensical-formula-differential-funding-police-forces)

bear academic scrutiny'[29]. The fundamental problem is that PCA, in effect, assumes that the 'observed' variables under consideration jointly reflect some underlying phenomenon, and it provides a statistical mechanism for reducing the observed variables into a smaller set of artificial variables (called 'principal components') which account for most of the variance in the observed variables – and thus in the underlying phenomenon which, together, they describe. In the present instance it is assumed that the four formula components reflect underlying need, but this is just that – an assumption.

48   It does not follow that applying PCA-derived weightings to the four model components will *necessarily* result in a sensible allocation, even if one agreed with the initial choice of model components. It is instructive, therefore, to consider how the 2016/17 Police Core Settlement of £4,112 million would be distributed using the proposed weightings compared to the distribution that would follow using a Poisson regression model which relates the four model components with 'total recorded crime' – a metric which the Home Office argues (albeit wrongly) is a reasonable proxy for the resource burden placed on different police forces. Thus, in Figure 7 below, the horizontal axis shows the allocation each force would receive using the Poisson model, whilst the vertical axis shows the allocation that would be received using the proposed Home Office formula. The latter has been calculated using the indicator shares and weightings published as Annex B of the Technical Note[30]; which excludes the City of London.

49   In fact, all this scatterplot purports to show is that, using the same four model components, allocations obtained using the Home Office's PCA-based weightings approach are often very different to those based on a model which predicts variations in 'total recorded crime'. This may not be the best measure of need, but at least it reflects one key aspect of into inter-force variation in police activity. PCA-based weights show each model component's contribution to an assumed underlying latent variable, but there is no necessity that this variable should reflect need.

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[29] Anon, Funding formula consultation 'completely bankrupt', Police Professional, 06 Nov 2015
(http://www.policeprofessional.com/news.aspx?id=24758)

[30] *Funding Model Technical Note*, Annex B, p13.

Figure 7   Per capita allocations based on multivariate (Poisson) model versus allocations based on PCA-based weightings
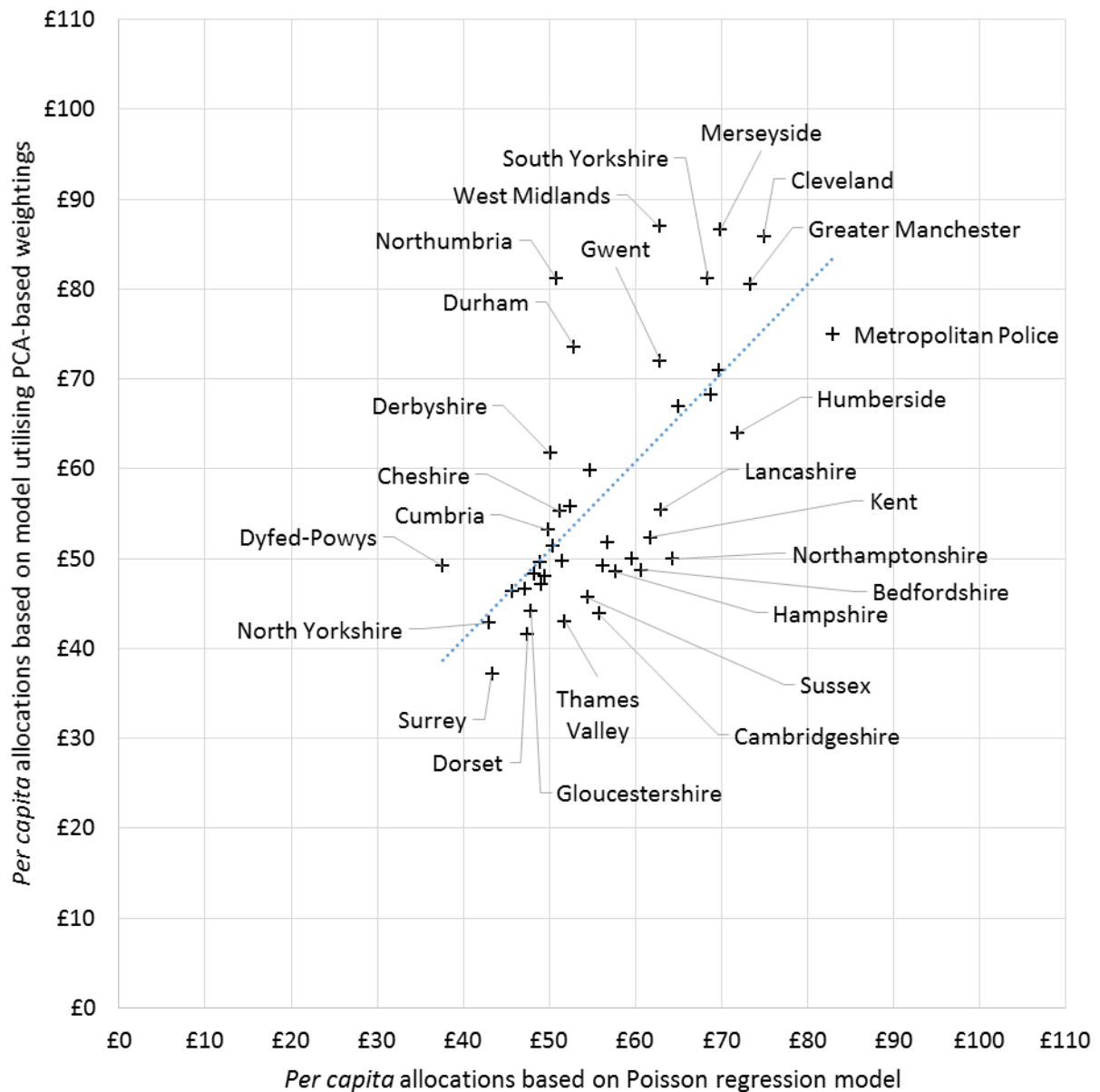
2.2.6 Funding implications of the 'revised' model

50   Our analysis shows, therefore, a range of key shortcomings in how the revised model has been constructed, and raises serious doubts as to its fairness as a measure of the burden of need faced by different police forces. In view of this, the scale and systematic nature of the re-allocation that would follow its implementation is equally worrying.

51   Thus Figure 8 below contrasts the current (2016/17) force-level allocation of the Police Core Settlement (of £4,111 million)[31] with the allocations that would be made to forces if the indicator shares and model component weighting detailed in Annex B of the Technical Note

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[31] Home Office, *The Police Grant Report (England and Wales) 2016/17*, February 2016. HC 753.
(https://www.gov.uk/government/publications/the-police-grant-report-england-and-wales-2016-to-2017)

(with appropriate Area Cost Adjustments) were used to distribute this sum. The most notable aspect of the implied reallocation is that, as a rule, forces which currently receive less than average *per capita* allocations will see those allocations fall further, whilst forces with higher than average *per capita* allocations will see them rise. The 45-degree line cutting from bottom-left to top-right marks the break-even point, with forces above and to the left seeing funding increases, and forces below and to the right seeing funding decreases. For some forces these will be substantial, with Sussex, Devon & Cornwall and Dorset likely to lose 13.4%, 14.0% and 15.1% respectively, and Northumbria, Durham and South Yorkshire likely to gain 18.6%, 19.1% and 22.3% respectively. The overall geographic pattern of 'winners' and 'losers' is also quite distinctive, as illustrated by Figure 9.

Figure 8   Current and 'revised' per capita allocations of the current (2016/17) Police Core Settlement
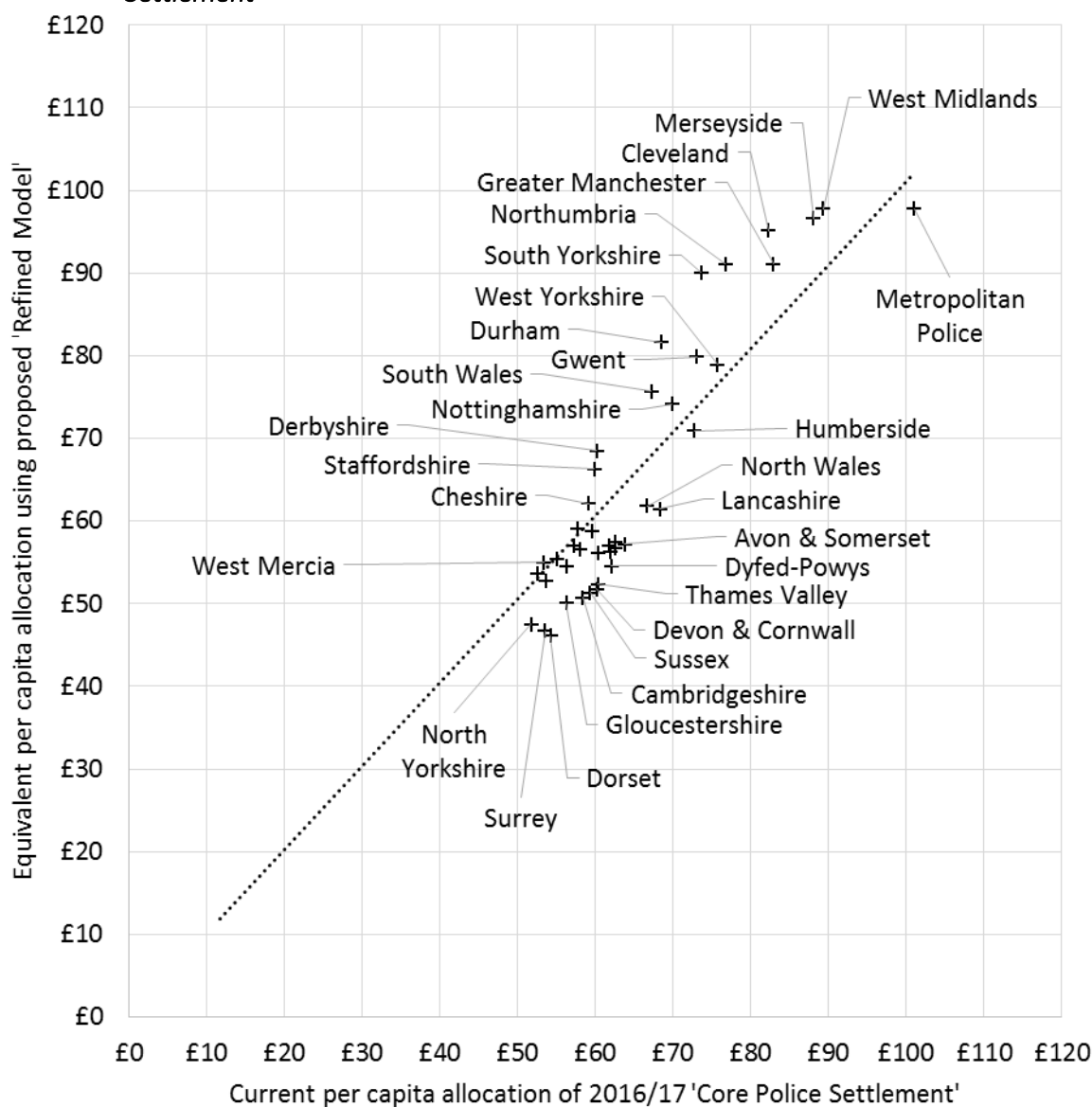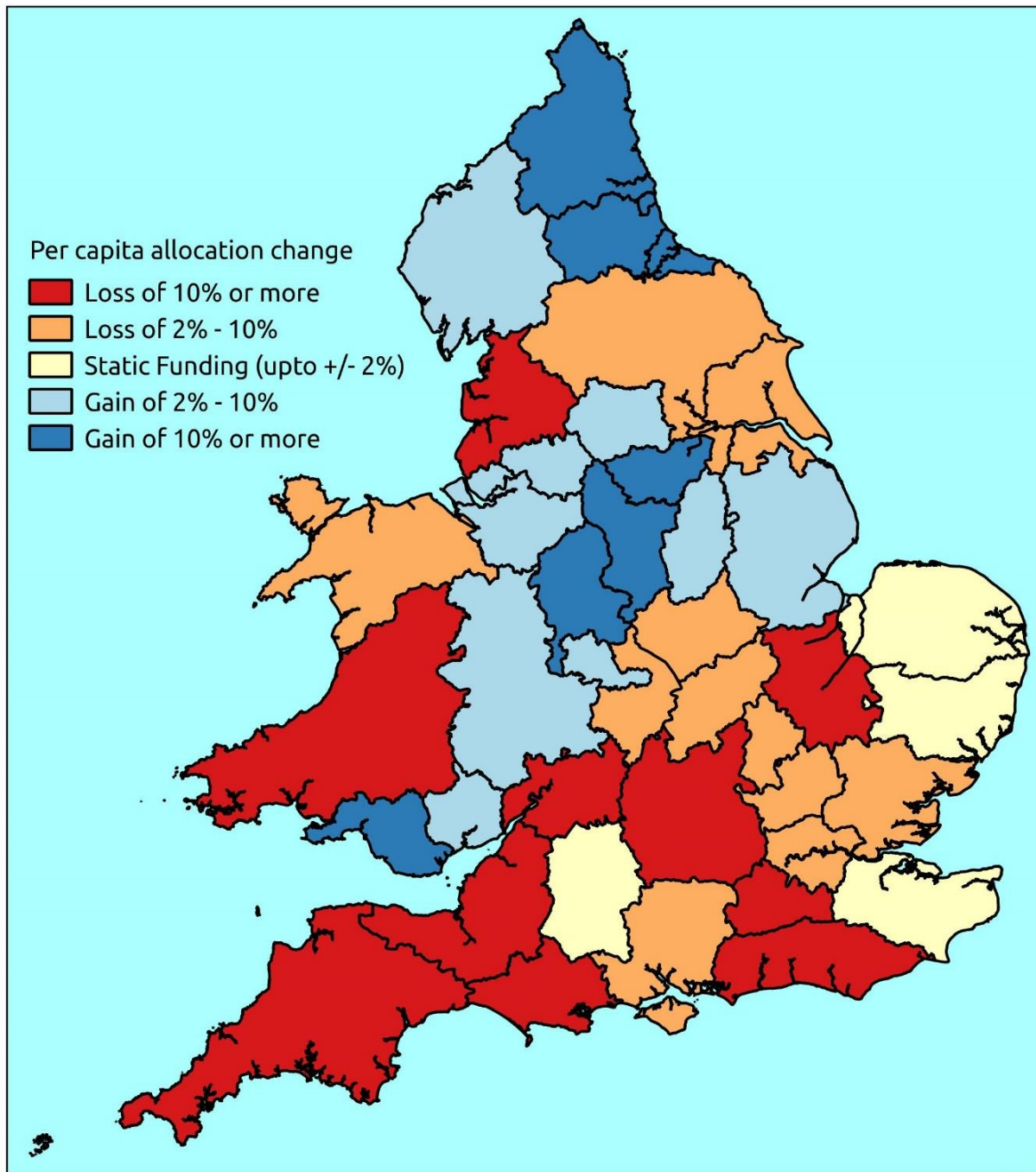
Figure 9   'Winners' and 'Losers' on the introduction of the proposed revised formula funding model


52   This redistribution applies to the 'Core Police Settlement' and excludes the impact of how Legacy Council Tax Grants, DCLG Formula Funding and various other funding streams, including National and International Capital City (NICC) grant. But it illustrates the 'direction of travel' that would follow the introduction of the proposed revised funding formula model. Whether or not this represents an appropriate shift in resources depends, of course, on the extent to which the current formula has been able to accurately capture variations in need. Unfortunately, to explore this issue adequately would require far more time than we have available. That said, there is good reason to doubt whether the Revised Model will do

anything to redress some fairly substantial disparities in the number of officers different police forces currently deploy.
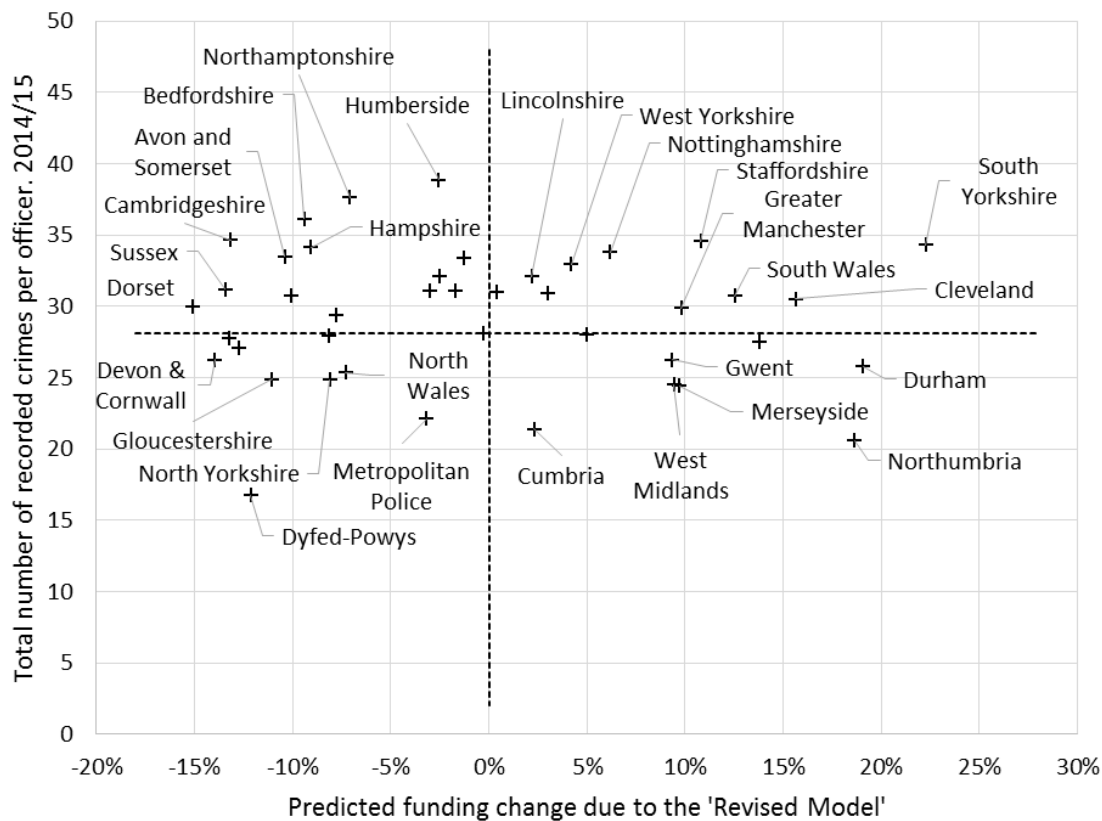
53 Focusing on just one staffing indicator ignores the complexity of how different forces choose to deploy their resources, but it is nevertheless instructive to examine the potential funding impact of the proposed introduction of the revised model vis-à-vis the current burden on officers. Thus in Figure 10 below we plot the number of Emergency and Priority Incidents per police officer in each force (except the City of London) for the year to 31 March 2015 against our estimate of the impact (as a percentage) of introducing the 'Revised Model'. In Figure 11 we again have the estimated percentage funding change as the horizontal axis, but this time the vertical axis represents the number of 'total recorded crimes' per police officer.

Figure 10 Emergency and Priority Incidents per officer, 2014/15, against estimated funding change on the introduction of the Revised Funding Model
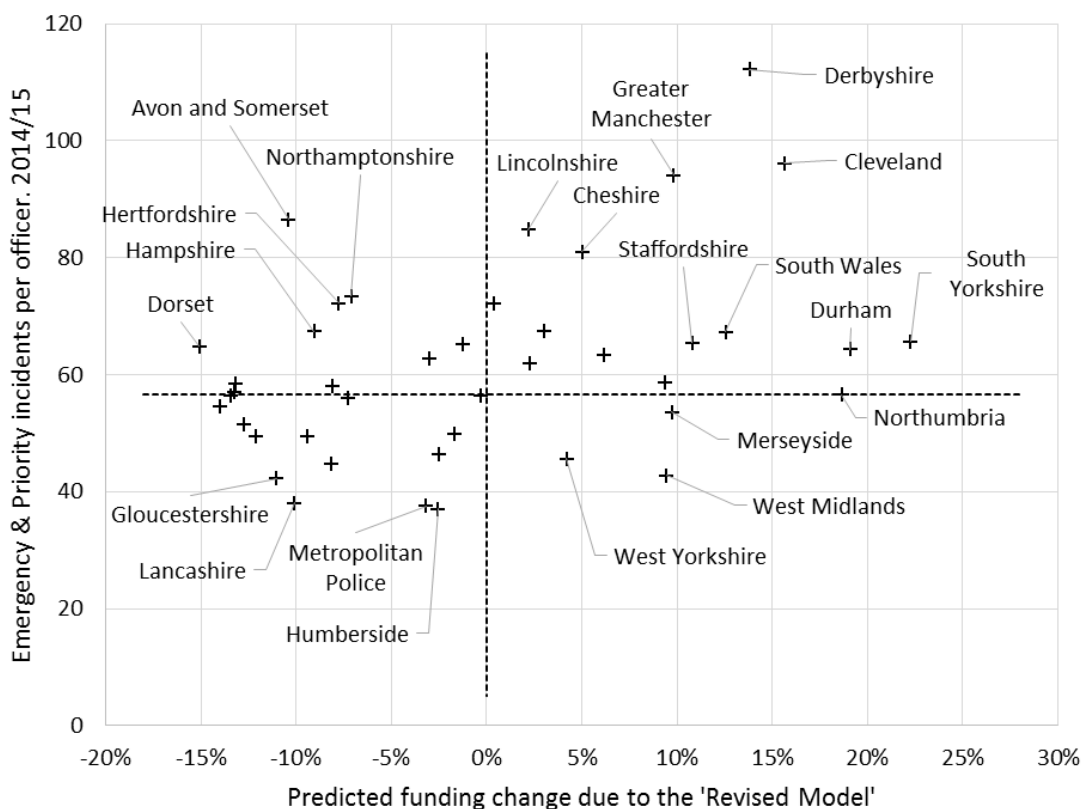
Figure 11 'Total recorded crimes' per officer, 2014/15, against estimated funding change on the introduction of the Revised Funding Model

Total number of recorded crimes per officer. 2014/15 (y-axis, values 0–50)

Predicted funding change due to the 'Revised Model' (x-axis, -20% to 30%)

Chart labels: Northamptonshire, Bedfordshire, Humberside, Lincolnshire, West Yorkshire, Nottinghamshire, Avon and Somerset, Staffordshire, Greater Manchester, South Yorkshire, Cambridgeshire, Hampshire, South Wales, Cleveland, Sussex, Dorset, Devon & Cornwall, North Wales, Gwent, Durham, Gloucestershire, Merseyside, North Yorkshire, Metropolitan Police, Cumbria, West Midlands, Northumbria, Dyfed-Powys

54 The point here is that, whether measured in terms of 'incidents per officer' or 'crimes per officer', there is currently great disparity between forces. Many other indicators could have been examined, and not all are consistent with one another: possibly because of different recording practices and/or data quality issues; possibly because of case-mix issues. Either factor may explain the inconsistency between these two scatterplots; namely the fact that Humberside has one of the lowest 'incident per officer' rates, but one of the highest 'crimes per officer' rates. Other forces show similar, if less pronounced, differences between the two measures and there is much, in other words, that would need to be done to derive a satisfactory measure of the overall burden being placed on police officers in different force areas. Yet the overall message to be drawn from these scatterplots is that it is very unlikely that the proposed shift in resources will do anything to address existing disparities in the number of officers relative to 'need', however defined. For instance, Avon and Somerset, Northamptonshire, Hertfordshire, Hampshire and Dorset are all likely to be substantial losers if the revised funding model is introduced, yet all are currently having to deal with often much higher than average numbers of incidents and crimes per officer. Conversely, the West Midlands, Merseyside and Northumbria are likely to receive substantial additional funding, but they all deal with average, or below average, numbers of incidents and crimes per officer.

55 In fact, given our analysis of the development of the new funding formula, and of the composition and construction of the 'Revised Model' itself, we would have been surprised if the resulting reallocation were to address any current disparities in the resources available to different forces.

56   Indeed, we propose that live births would have been an equally useful indicator. Allocations based on the number of births in each force area[32] are more strongly correlated with 'total recorded crime' (r=0.9951) than are the allocations that would flow from the indicator shares and weightings of the Revised Model as detailed in Annex B of the October Technical Note (r=0.9849).

57   It is, of course, nonsensical to suggest allocating the police settlement on the basis of live births, but this is the fundamental point. In this era of 'big data analytics', there now exists a wealth of operational data and contextual information about people and places which could be deployed to inform a genuinely equitable funding formula. This would require a detailed programme of research and analysis supported by full engagement with the 43 forces in England and Wales. To continue in the current direction is to make police funding a lottery.

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[32] Aggregated using 2014 ONS local authority level *Birth Summary Tables - England and Wales*.
(http://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/datasets/birthsummarytables)

3 Additional Costs in Rural Policing

3.1 Understanding the additional costs of policing rural areas

58 Although sparsity top-ups have been introduced to several funding formulae (including the existing Police Allocation Formula), there are concerns that rural communities have access to fewer public services than their urban counterparts[33]. This may in part reflect the difficulties rural authorities (across different departments) have experienced in evidencing the additional costs of providing services in rural and or sparse areas. The little evidence that exists is small-scale or anecdotal (which tends to be less of a reflection of negative results than a failure to commission research in the first place). This lack of quantitative evidence on the potential impact of rurality and sparsity on service costs has failed to convince government officials of the need to make significant adjustments to funding.

59 Part of the problem lies in the way in which officials have come to conceptualise the issue. The use of regression modelling of historic activity/expenditure to identify service 'needs' is now the mainstream approach to formula funding and, problematically, it has also been applied to attempts to capture unavoidable additional costs. Thus, the Advisory Committee on Resource Allocation (ACRA) recommended that no adjustment should be made to the NHS formula for rurality because measures of rurality have not been found to be significantly associated with levels of hospital use, when either controlling or not controlling for supply[34]. Similarly, in 2014, DLCG/DEFRA commissioned research that sought to determine differences between rural and non-rural costs through a regression analysis of unit costs for local authority services[35].

60 The problem with this approach is that fundamental difficulties exist in disentangling true unit costs from differential investment or indeed service quality. For example, the DLCG/DEFRA funded research found that the unit costs associated with the provision of public transport and traffic management and road safety were inversely, and statistically significantly, correlated with sparsity. This does not seem credible. It is quite plausible, however, that under-funding has resulted in limited public transport services in rural areas and that this, in turn, results in less being spent per capita on public transport in rural areas than elsewhere.

61 It is important that well-founded concerns that rural authorities face additional and unavoidable costs in delivering services are not undermined by poor statistical analyses of the relationship between sparsity and service expenditure. Until more robust evidence is

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[33] All-Party Parliamentary Group on Rural Services (2010). The implications of national funding formulae for rural health and education provision; House of Commons Environment, Food and Rural Affairs Committee (2013). *Rural Communities Sixth Report of Session 2013–14 Volume I Volume I: Report, together with formal minutes, oral and written evidence*. HC 602. London: The Stationery Office

[34] DH (2008*) Report of the Advisory Committee on Resource Allocation*. London: Department of Health Publications. (http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/ PublicationsPolicyAndGuidance/ DH_091484)

[35] LGFutures (2014). *Research into Drivers of Service Costs in Rural Areas*. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/388587/Rural_summary_report.pdf

available, government departments should make efforts to recognise plausible drivers of additional costs and to consider experiential evidence.

62 Theoretically, the case for unavoidable differences in service costs is provided by the private market. When the market is left to work in rural areas, there tends to be limited provision. Retail outlets are sparsely distributed and there are declining numbers of village shops. Rural transport, never widely available, has retreated even further since the deregulation of the industry and there is a far more restricted choice of jobs than in an urban setting[36].

63 Geographical variation in the distribution of privately-provided services reflects the difficulties of fulfilling basic threshold requirements in rural areas. However, although public service providers face the same difficulties, provision of public goods has not been primarily influenced by market considerations in England and Wales. Even if rural areas have lower levels of demand than urban settings, public services still have to be provided, without the economies of scale that can be achieved for urban provision. Thus, for public authorities charged with making services available to all – or providing services according to need – higher unit costs for lower catchment populations will be unavoidable.

64 If difficulties in achieving economies of scale cannot be addressed through increasing resources, rural areas face difficult choices about how to configure services so as to maintain service quality. In Social Care, lower unit costs have been achieved by commissioning short (15-minute) visits to those requiring home care, placing workers on zero hour contracts, or failing to compensate them for the time and money spent travelling (many payments only relate to contact time with users, raising questions about to whom these costs are being shifted)[37]. The point is that a failure to compensate for unavoidable additional costs can run the risk of legitimising poor practice.

65 Evidence of urban-rural differences in service configuration and quality is also found in the NHS. NHS Information Centre figures show large variations in the proportion of unregistered clinical support workers employed by acute trusts. In 2010, more than 37% of all nursing and support staff fell into this category in Taunton and Somerset, Mid Cheshire and United Lincolnshire NHS Trusts - over three times the proportion as in the Royal Brompton and Harefield and Royal Marsden NHS Foundation Trusts. NHS Trusts serving rural catchments were the most likely to rely on healthcare assistants; London hospitals the least (14 of the 20 best performing hospitals are located in the capital).

66 Rurality is also associated with additional travel costs. In the absence of an adequate public transport system, travel is inevitably by car, which incurs both fixed and fuel costs. More time

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[36] Asthana, S., Halliday, J., Brigham, P. and Gibson, A. (2002). *Rural Deprivation and Service Need: an Assessment of Indicators for Rural Service Planning*. vi + 41 pp. Report published by South West Public Health Observatory. ISBN 0-95413595-4

[37] Hussein, S. (2011). Estimating probabilities and numbers of direct care workers paid under the national minimum wage in the UK: A Bayesian approach. Issue 16, Social Care Workforce Research Unit, King's College, London.

spent travelling results in higher levels of unproductive staff time. Consequently, staffing levels may need to be higher in rural areas to provide a basic standard of service.

67 Empirical studies which directly capture unit costs tend to be small in scale but confirm that travel-related unit costs differ significantly between urban and rural areas:

- The average mileage of urban occupational therapists in Dorset was found to be 1,952 miles, compared to 4,880 for rural OTs[38].
- The travel-related unit costs per head of providing domiciliary care in England varied from £94 in Birmingham to £210 in North Yorkshire[39].
- The cost of providing similar domiciliary care packages in East Riding of Yorkshire was 97% higher for rural clients receiving 3 hours of care and 110% higher for rural clients receiving 5.5 hours of care than for their urban counterparts[40].
- Assertive Outreach workers (mental health) in Plymouth had an average monthly mileage of 429 miles compared to 1,139 in North and East Cornwall. The costs of transport per service user were respectively £393 and £1,102[41].
- The Arbuthnott review of resource allocation in the Scottish NHS found that using a relative costs model with Scotland equal to 100, health visiting and district nursing in urban Glasgow was 5.3% below the national average, while the rural area of Argyll and Clyde was 3.3% above[42].
- Examining the effect of population distribution and settlement patterns on the cost and performance of 10 local authority services, research by SECTA for the Countryside Agency found the cost per head of population in the 'mainly rural' districts to be around 77% higher than in the 'mainly urban' districts[43]
- Refuse collection costs were found to incur a rural premium of 72% in East Riding and 90% in South Shropshire, due to the lower number of properties in sparsely populated rural areas[44].
- In three LAs for which data were available, the 'rural cost penalty' of waste collection/recycling was identified as varying between 123% and 224% for village, hamlet & isolated dwellings compared to urban areas within the same local authority area. This compared with the 4% sparsity allocation within the funding system for the EPCS District Services sub-block[45].
- Predominantly rural Fire and Rescue Authorities' transport costs were 35% higher than those of predominantly urban authorities in 2009/10. Transport costs in predominantly

[38] Galuschka, J. (1999) Occupational Therapists (OTs) mileage in urban and rural Dorset, Dorset Social Services.

[39] County Councils Network (1998). *Population Sparsity and the Personal Social Services*. A Report from the Social Services & Sparsity Steering Group.

[40] Hale, R. (2006). *Costs of Services provided for Rural Communities*. London: Rita Hale Associates.

[41] Brigham, P. and Asthana, S. (2003). *Mental Health Assertive Outreach: Additional Cost implications in Rural Areas*. Report for the Rural Health Allocations Forum. University of Plymouth.

[42] SHED (Scottish Executive Health Department) (1999) *Fair Shares for All: Report of the National Review of Resource Allocation for the NHS in Scotland*. Edinburgh: Scottish Executive Health Department

[43] SECTA/MSA Ferndale (2004). *Developing Indicators of Population Distribution and Settlement Patterns*. Report for the Countryside Agency. London: SECTA

[44] Hale, R. (2006). *Costs of Services provided for Rural Communities*. London: Rita Hale Associates.

[45] Ranasinghe, J. (2011). *Costs of Providing Services in Rural Areas*. Report for Sparsity Partnership for Authorities Delivering Rural Services (SPARSE-RURAL). Milton Keynes: LG Futures.

rural authorities represented, on average, 4.7% of the total budget compared to 3.5% in predominantly urban authorities[46].

68   There are also less obvious increased rural cost issues[47], such as those associated with training requirements and inter-agency working. Rural authorities may need to employ a greater proportion of their staff on higher grades due to longer service and the need to employ staff who are sufficiently qualified to work with flexibility (e.g. to substitute for other professionals) and autonomy. It can be more difficult and costly to recruit staff – due to lack of choice. Rural staff may also have higher costs of living. According to Minimum Income Standard research commissioned by CRC and the Joseph Rowntree Foundation, people in rural areas typically need to spend 10-20% more on everyday requirements that those in urban areas. The more remote the area, the greater these additional costs[48]. Despite this, Labour Cost Adjustments normally capture the low pay effect in rural areas.

69   Even when the case for a rural premium has been accepted, this usually represents a very small proportion of overall funding and bears little relation to the actual additional rural costs[49]. Typically, small sparsity adjustments have been cancelled out by the inclusion of factors that are biased towards urban areas. A good example of this within the Police Allocation Formula has been the use of bar density rather than number of bars in a force area. In its response to the Home Office's 2015 Consultation, Devon and Cornwall PCC & Constabulary noted that, while Devon and Cornwall had around the same number of bars and pubs as West Yorkshire, the force stood to receive £24 million less, by virtue of it being a large geographical area[50].

70   The 2015 consultation provided an opportunity for forces such as Devon and Cornwall and Hampshire to make a strong case for Whitehall to acknowledge the different challenges faced by rural areas. However, as the Home Affairs Committee noted, the Home Office's approach to the consultation reflected an assumption that police forces could only consider funding arrangements on the basis of their own vested interests[51]. Given the fundamental problems with the existing and proposed approach to police funding and the lack of evidence about urban-rural differences in unit costs, the concerns expressed by such forces should not be dismissed as special pleading for rural areas. Nevertheless, acknowledging that the lack of quantitative evidence has

[46] Op Cit

[47] Asthana, S., Gibson, A., Moon, G. and Brigham, P. (2003) Allocating resources for health and social care: the significance of rurality. *Health and Social Care in the Community*, 11(6):486-93.

[48] Smith, N., Davis, A. and Hirsch, D. (2010). *A minimum income standard for rural households*. London: Joseph Rowntree Foundation and Commission for Rural Communities.

[49] Hindle, T., Spollen, M., Dixon, P. (2004). Review of the Evidence on Additional Costs of Delivering Services to Rural Areas. London; SECTA.

[50] Consultation on reform of police funding arrangements in England and Wales. Joint Response from the Police and Crime Commissioner for Devon and Cornwall and the Isles of Scilly and the Chief Constable of Devon and Cornwall Constabulary. http://7f81ff6114e21659b84a-cde1435c149cc037d22b329c27ad88ee.r2.cf3.rackcdn.com/Documents/Our%20information/Responses%20to%20consultation/FORMULA%20CONSULTATION%20RESPONSE%20DEVON%20AND%20CORNWALL%20-%20SUBMITTED%20FINAL%20090915.pdf

[51] House of Commons Home Affairs Committee (2015). Reform of the Police Funding Formula. Fourth Report of Session 2015–16. Report, together with formal minutes relating to the report. HC 476. London: The Stationery Office Limited, p.14

been a barrier to understanding the needs of rural police forces, we present exploratory analysis below.

3.2 Quantitative evidence on the potential impact of rurality and sparsity on the cost of policing

71 The 39 English and 4 Welsh Police Forces vary hugely in size and serve profoundly different geographic areas; from City of London Police which serves a resident population of less than 8,000 people in the 290-hectare heart of a 'world city', to Dyfed-Powys Police which serves a resident population of over ½ million people spread across over a million hectares of largely dispersed towns and villages[52].

72 It is difficult to conceive of a simple formula that can encompass such a range of circumstances and, indeed, the specific needs of the City of London and Metropolitan Police Forces have long been recognised; primarily through the National and International Capital City (NICC) grant. The consultation document states this additional funding arrangement will continue, and may be enhanced as "the current funding arrangements do not appear to fully capture the challenges these forces face"[53].

73 The NICC grant ostensibly "addresses the costs of unique or additional policing activities which […] arise because of London's status as the capital city of the United Kingdom"[54] but, as the consultation makes clear, it is also necessary because "the funding allocations for London forces cannot easily be estimated accurately in any model covering England and Wales"[55]. This is undoubtedly the case, not least because of the analytical difficulties which flow from the fact the City of London (with a resident population of 8,072 people and daily transient population of 319,200 people) and the Metropolitan Police Service (serving 8.53 million people) are distinct outliers in a set of force populations which otherwise range from 0.5 to 2.8 million. The particular case made in the consultation document, however, is that London is in some way fundamentally different to other parts of the country: noting, for instance, that "there are 32 local authorities within Greater London and 28 of these are statistical 'outliers'. This means that they are very different to other areas on one or more key socio-economic indicators used in the current PAF"[56]. The only specific given in the consultation document is that 20 of the 22 local authorities where the number of overcrowded households is 'very different' to the rest of the country are to be found in London. This may well be true, but other parts of England and Wales are outliers for other reasons – notably because they serve often small populations dispersed across very large rural areas.

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[52] See 00_RuralPoliceProject\00_Report\ForceSize.xlsx for collated figures on PFA area, pop and density – along with associated graphs.

[53] Home Office, *Consultation on reform of police funding arrangements in England and Wales Consultation*, July 2015, p31 (Para 8.7). Henceforth '*Consultation*'. See https://www.gov.uk/government/consultations/reforming-police-funding-arrangements-in-england-and-wales.

[54] *Consultation*, p31 (Para 8.4 - quoting the definition of the NICC grant).

[55] *Consultation*, p31 (Para 8.1)

[56] *Consultation*, p31 (Para 8.2)

74 The original consultation document did not engage with rurality/sparsity at all, and the post-consultation Technical Note merely asserts that "a specific indicator for sparsity did not generally benefit force areas with more sparsity, i.e. more rural forces" and that "data on roads is not collected at a sufficient level of aggregation to ensure statistical robustness as it is only available at upper tier local authority level"[57]. As we show below, not only is the latter manifestly not the case, but it is clear that aspects of rurality/sparsity incur additional costs and, moreover, there is now ample evidence upon which to develop both a better understanding of the drivers of those additional costs and how they can be incorporated within a genuinely equitable funding formula.

75 There are five key interrelated aspects of rurality and sparsity which have been claimed, in different ways and to varying degrees, to impact on policing costs: (a) the additional distances that must be covered to provide an appropriate service with an associated reduced capacity for cross-border policing, (b) the complexities of dealing with multiple partner organisations across wide areas, (c) seasonality and high peak resource needs, (d) the need for a more flexible and generally higher-grade workforce, and, with many rural areas served by smaller police forces, (e) a lack of capacity for economies of scale. Time constraints and a lack of access to individual police force data precludes a formal evaluation of the additional costs associated with each of these factors, but it is often possible to quantify the nature and scale of the problems faced by authorities serving sparse and dispersed rural populations. Our goal here is to demonstrate that rurality/sparsity is a substantive issue and that the Home Office needs to undertake further research to ensure that the proposed new funding formula meets the needs of police forces across all parts of the country.

Policing incidents in rural/dispersed communities

76 The issue here concerns the size and shape of the areas some forces are required to police, and particularly the distances they must travel to deal with Public Safety and Welfare (PSW) and transport incidents. It responds to how populations and roads are distributed across those areas as well as to how well-connected a force is to its neighbours. Thus a population in a small compact PFA centred on a single city will make less demands on travel time than one in a large irregular PFA with multiple population foci. Moreover, a small compact force which shares its boundaries with other forces (or, like the City of London, lies entirely within another force area), is better able to implement cross-border policing arrangements – including sharing key resources – than forces which, like Cumbria, North Wales and Devon & Cornwall, have extensive coastlines and only limited physical contact with other forces. Unfortunately, whilst information on the areas and populations covered by each force is readily available, it is more difficult to quantify precisely what this means in practical terms; not least because one must assume how personnel are deployed in different areas and this, of course, is subject to local discretion. Nevertheless, by using detailed statistics recording the locations of almost all

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[57] Home Office, *Refined Police Funding Model Technical Note*, 29 October 2015, p7 (Para 23). (Available via http://lancashire-pcc.gov.uk/wp-content/uploads/2015/11/20151028-Home-Office-to-PCC-for-Lancashire-Refined-Police-Funding-Model-Technical-Note.pdf)

(98.7%) recorded crime and anti-social behaviour (ASB), and the locations of all RTIs attended by police officers during 2013/14 and 2014/15[58], and measuring the average distance between those incidents and existing police stations[59], it is possible to derive a reasonable initial measure of service accessibility for each police force. This is reported in Table 6 below, with 'to crime/ASB' and 'to RTI' distances varying respectively from 0.96km and 1.02km (in the City of London) to 24.47km and 25.85km (in Warwickshire). The table is ordered from low to high 'to crime/ASB' distances, and all distances refer to round trips from the nearest police station in the police force area in which each incident takes place.

77 Importantly it should be noted that this does not account for a more complex staffing picture, such as hubs for specialist units such as roads policing, police stations which are voluntarily staffed, and patrolling officers. However with the information and time available to us this was the best approximate picture available to us.

78 These statistics provide, in general terms, a reasonable initial proxy for distance-related additional costs of policing different types of area due to rurality and sparsity. It does suffer, however, because (a) we must assume the OS Points of Interest database of police stations represents a reasonable proxy for the deployment of officers, (b) we only have access to detailed geo-located crime/ASB data and, excepting for North Yorkshire as discussed below, we do not have equivalent data for the full range of incidents to which the police are required to respond, and (c) we have not been able to take account of cross-boundary policing arrangements. For this reason, for instance, the very high distances recorded for Warwickshire are undoubtedly misleading for, as illustrated in Figure 12, the irregular shape of the Warwickshire police force area means that cross-boundary policing would be able to significantly improve coverage. This force is also unusual in terms of the number of formal police stations recorded by the OS Points of Interest database; with just 4 stations covering a population of 548,729 (a rate of 137,182 people per station which compares, for instance, with Thames Valley's 55 stations serving, on average, just 42,115 people each).

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[58] Crime data has been extracted for April 2013 – March 2015 (2 years) using the custom downloads facility at https://data.police.uk/data/. The street-level crime files contain latitude/longitude data on 98.7% of all recorded crime, although for confidentiality reasons these refer one of 750,000 local 'anonymous' map points rather than precise locations (see https://data.police.uk/about/#location-anonymisation). Road accident data has been extracted for the calendar years 2013 and 2014 from https://data.gov.uk/dataset/road-accidents-safety-data. This locational data is accurate to a few metres.

[59] Police station locations have been identified using the OS *Points of Interest* database (Code=6330422). This is a location based directory of all public and privately owned businesses, transport, health, education and leisure services in Britain. See https://www.ordnancesurvey.co.uk/business-and-government/products/points-of-interest.html.

Table 6   Service Accessibility by Police Force: Crime and Road Traffic Incidents

				Combined Data for 2013/14 & 2013/15				
PFA13NM	Force Area (Hectares)	Mid-2013 Population	Pop Density (Persons / Hectare)	Recorded Crimes & ASBs (with locations)	RTIs	Police Stations	Ave.dist. to crime incidents (km)	Ave. dist. to RTIs (km)
City of London	290	316,500	1092.2	12,568	616	3	0.96	1.02
Metropolitan Police	156,925	8,408,887	53.6	1,906,009	45,578	72	3.36	3.42
Sussex	378,171	1,633,870	4.3	272,893	7,896	40	3.46	5.32
Humberside	351,728	922,183	2.6	171,642	5,156	24	3.58	6.00
Northumbria	555,307	1,429,383	2.6	298,162	6,108	28	3.79	5.64
Cleveland	59,656	559,745	9.4	167,926	1,838	15	3.82	4.27
Lancashire	307,509	1,468,845	4.8	341,277	7,510	27	3.87	5.68
Cheshire	234,278	1,034,812	4.4	176,733	5,122	21	3.91	6.17
Thames Valley	574,047	2,316,301	4.0	297,364	10,380	55	4.02	5.56
North Yorkshire	830,955	805,182	1.0	134,282	4,050	34	4.03	8.04
Hertfordshire	164,307	1,140,706	6.9	158,925	4,640	22	4.11	5.03
West Midlands	90,164	2,783,475	30.9	491,298	10,230	30	4.13	4.12
Staffordshire	271,373	1,107,234	4.1	176,326	5,608	22	4.52	6.01
Greater Manchester	127,603	2,714,944	21.3	642,943	7,722	23	4.74	4.92
Northamptonshire	236,397	706,647	3.0	150,127	2,414	11	4.75	7.71
Durham	242,354	621,353	2.6	117,244	2,360	13	4.91	6.46
West Yorkshire	202,927	2,252,192	11.1	478,508	9,732	27	4.91	5.18
Derbyshire	262,473	1,027,583	3.9	196,291	4,572	21	5.10	7.08
Bedfordshire	123,543	633,899	5.1	114,575	2,604	9	5.18	7.34
Leicestershire	253,771	1,032,993	4.1	164,195	4,784	14	5.19	7.69
Essex	366,952	1,753,052	4.8	304,750	7,712	25	5.26	6.90
Lincolnshire	592,062	724,453	1.2	113,933	4,620	25	5.27	9.21
Nottinghamshire	215,939	1,107,053	5.1	213,187	5,286	19	5.59	7.73
Kent	373,556	1,764,617	4.7	313,778	9,744	22	5.64	7.89
Gwent	155,152	579,101	3.7	117,034	1,748	14	5.99	5.50
Cambridgeshire	338,962	820,468	2.4	142,202	4,134	14	6.27	8.44
Suffolk	380,018	735,898	1.9	120,496	3,334	19	6.40	8.44
Merseyside	64,488	1,386,589	21.5	303,535	5,310	11	6.79	8.09
Dorset	265,255	754,463	2.8	125,544	3,548	16	7.31	8.71
Gloucestershire	265,325	605,654	2.3	106,328	1,550	8	7.34	10.62
Surrey	166,250	1,152,114	6.9	167,043	7,586	12	7.53	8.56
North Wales	615,007	691,986	1.1	122,605	2,890	29	7.59	9.73
Dyfed-Powys	1,095,492	516,611	0.5	75,689	2,462	40	7.61	9.26
Hampshire	414,941	1,925,724	4.6	326,923	8,950	30	7.62	8.35
Avon & Somerset	477,663	1,630,935	3.4	289,433	6,618	21	7.98	9.83
South Wales	207,861	1,294,714	6.2	250,919	4,690	9	8.17	9.73
South Yorkshire	155,153	1,358,153	8.8	349,959	5,984	7	8.30	9.08
Norfolk	537,056	870,146	1.6	136,168	3,552	11	9.41	13.79
West Mercia	740,787	1,235,274	1.7	214,711	4,512	14	11.22	14.37
Cumbria	676,656	498,070	0.7	94,713	2,452	8	11.29	17.03
Wiltshire	348,544	693,671	2.0	106,888	2,954	6	11.65	14.76
Devon & Cornwall	1,026,949	1,692,872	1.6	245,741	7,848	12	15.65	20.89
Warwickshire	197,508	548,729	2.8	91,849	2,958	4	24.47	25.86

Figure 12   Warwickshire Police Force and Neighbouring Areas: Police Stations and Crime
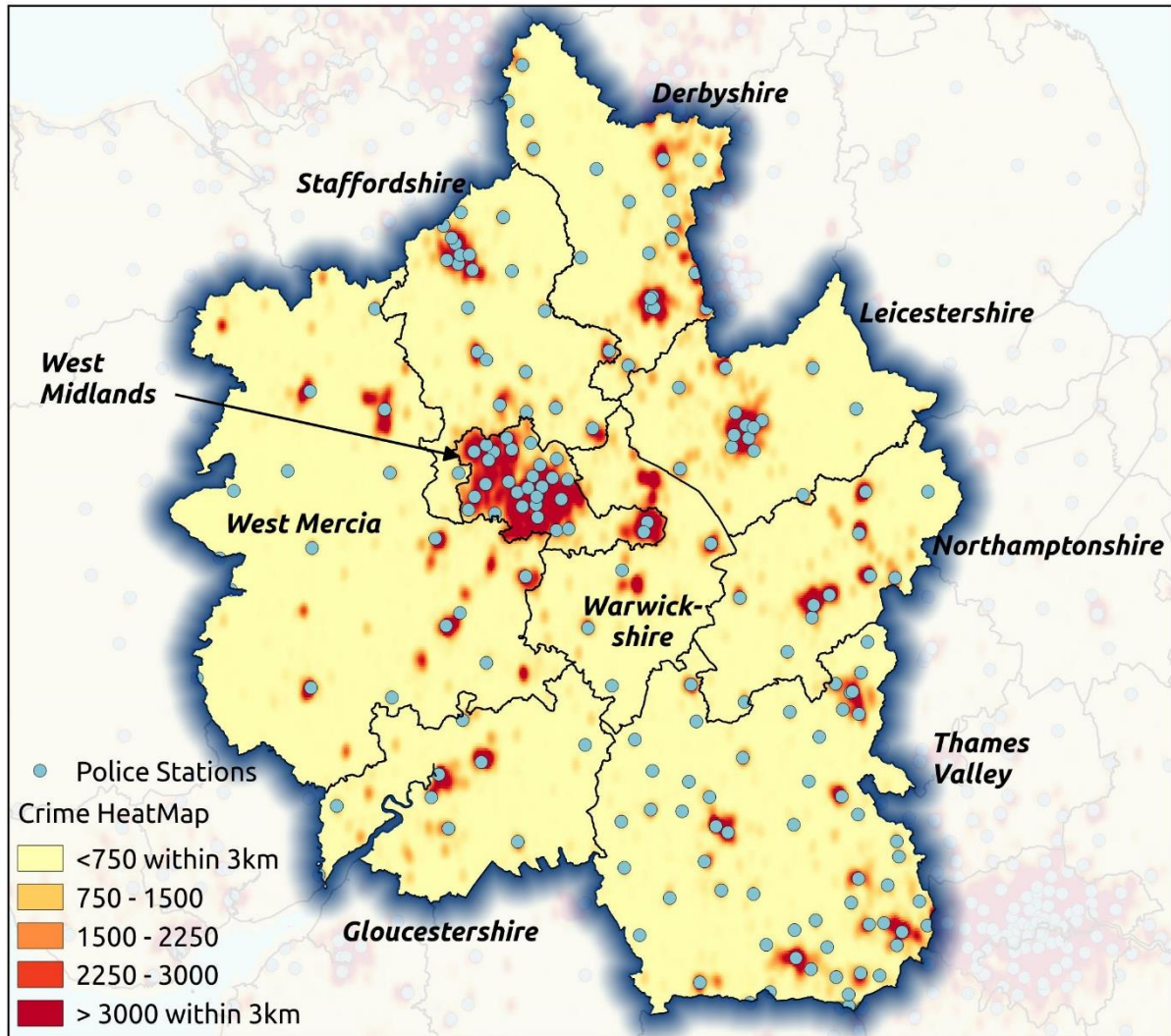
79   Recognising the limitations of this preliminary analysis, it is clear that many of the forces serving low density populations (notably, but not only, West Mercia, Cumbia, Wiltshire and Devon & Cornwall) are faced with considerable additional travel-related costs. The practical implications of this are well-illustrated by Figures 13 and 14, which plot each force's number of police stations against 'to crime/ASB' and 'to RTI' travel distances respectively. Thus, in very approximate terms, Devon and Cornwall Police Force would need about five times as many police stations to achieve similar 'to crime/ASB' and 'to RTI' distances as the Metropolitan Police Service, whilst Cumbria, West Mercia and Wiltshire would require about four times as many police stations; and this would be to serve very much smaller populations, as shown in Table 6 above.

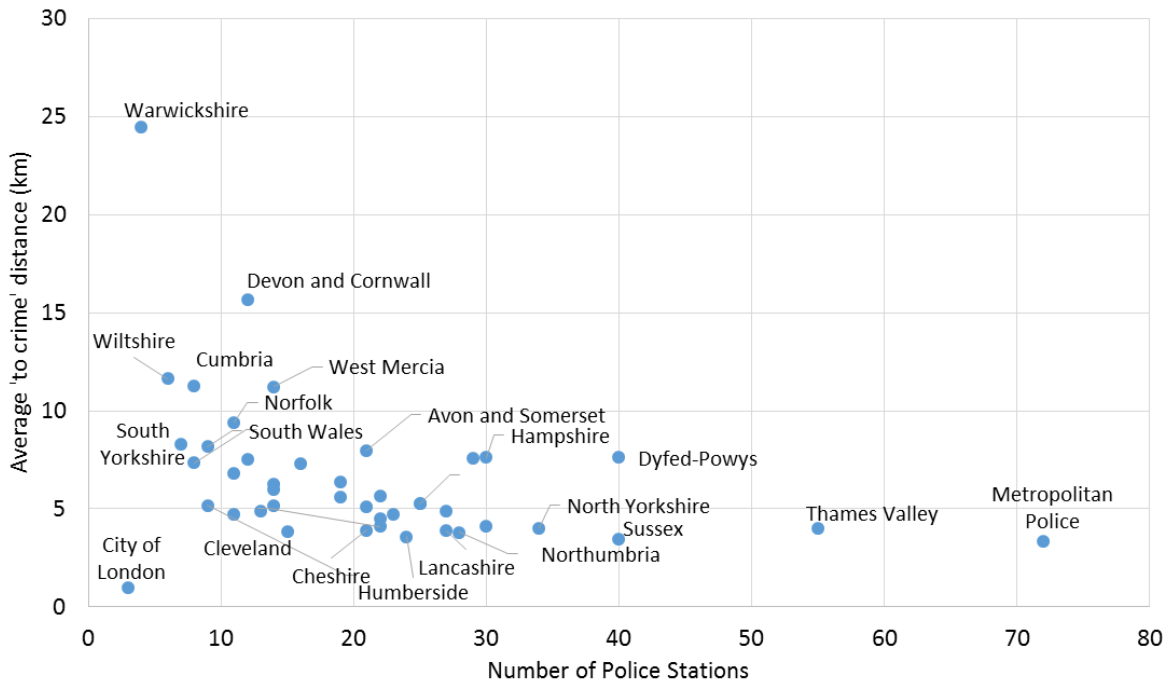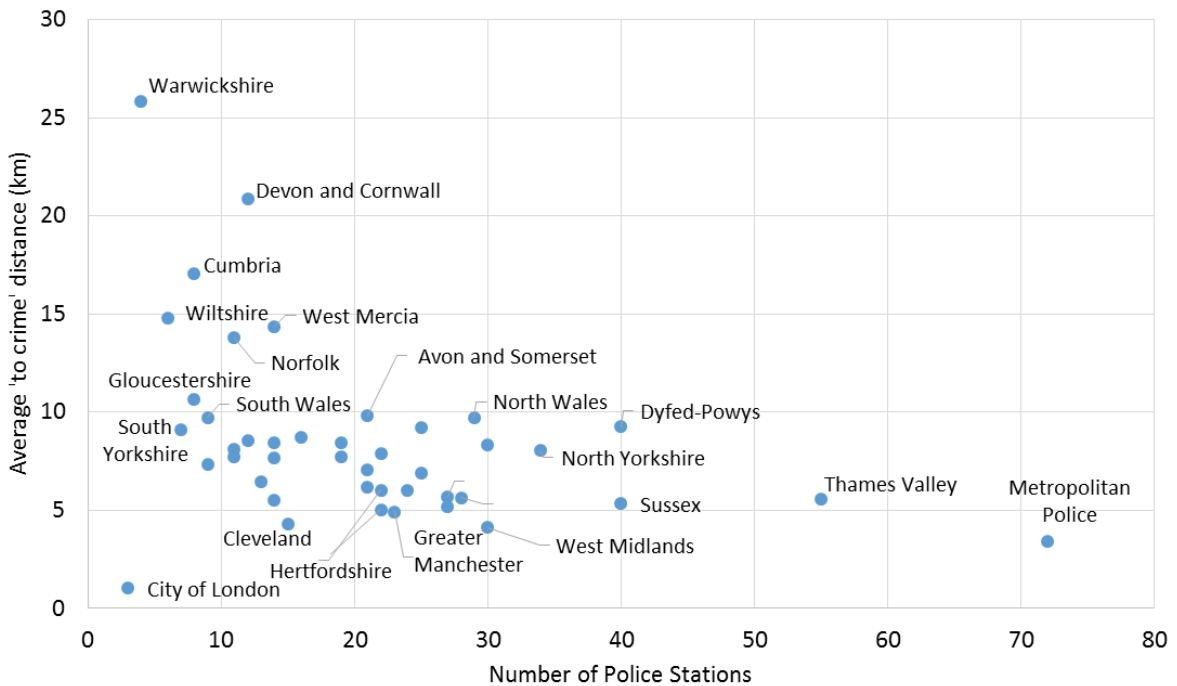*Figure 13 Number of Police Stations and 'to crime/ASB' distances by Police Force*

Figure 14 Number of Police Stations and 'to RTI' distances by Police Force

80 The general point is that real and substantive differences in geography will clearly affect the cost of policing different areas and these differences need to be quantified and incorporated into any future formula. For example, Figure 15 below maps police stations, major roads and crime/ASB density (as a heat map showing the number of crimes/ASBs within 3km during 2013/14 and 2014/15 weighted by the number of police officers) in the Devon & Cornwall and West Midlands Police Force Areas.

Figure 15 Contrasting Geographies: Crime/ASB in Devon & Cornwall and the West Midlands
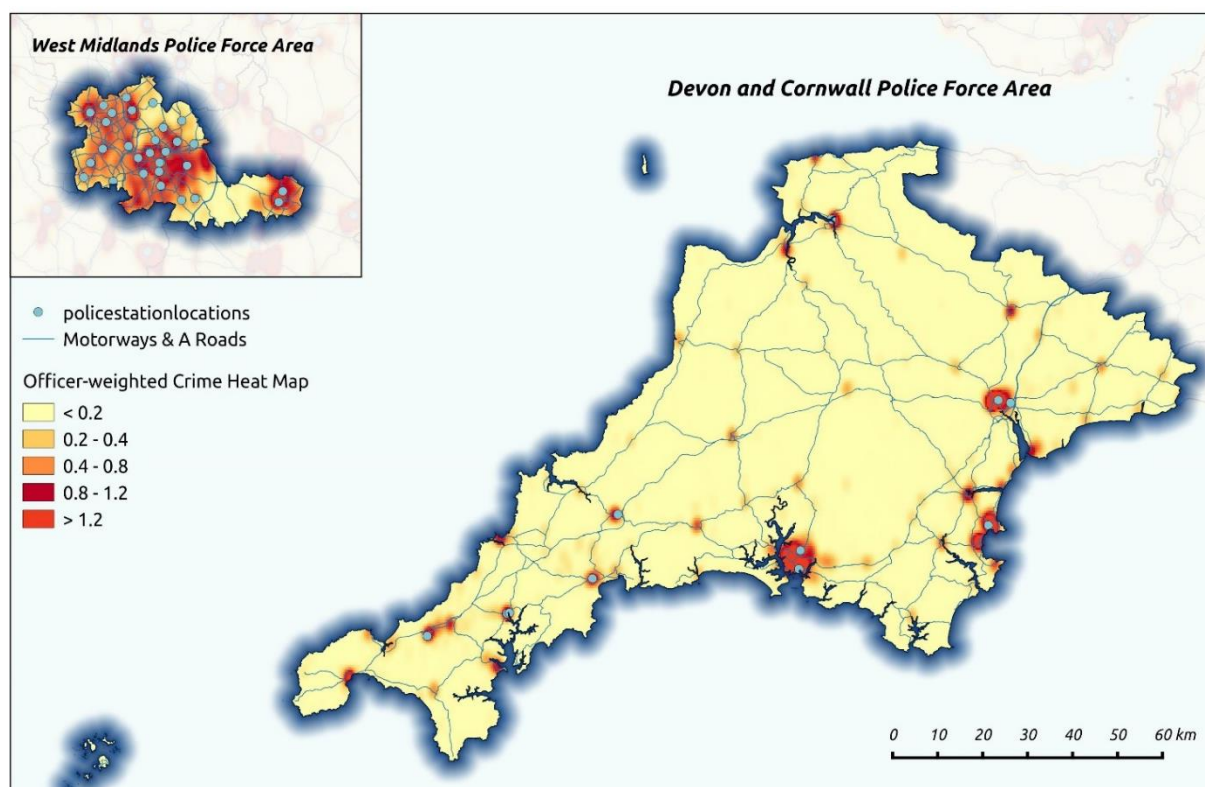

81 Using the same scale for both areas, it illustrates the dispersed nature of crime/ASB incidents in Devon & Cornwall compared to the concentrated pattern of incidents in the West Midlands. Over the two years there were undoubtedly more crimes/ASBs and a higher *per capita* rate in the West Midlands (n=491,298 & 176.5 per 1000 people) than in Devon & Cornwall (n=245,741 & 145.2 per 1000 people), but this is more than made up for by the number of police officers in the two areas. With 7,187 full-time equivalent (FTE) officers (including 3,040 designated 'Local Policing') in the West Midlands, compared to just 3,065 FTE officers (of whom 1,289 FTE were 'Local Policing') in Devon and Cornwall[60], there were significantly more crimes per officer in Devon & Cornwall than in the West Midlands. In terms of overall FTE officers, the figures were 80.2 crimes/ASBs per officer in Devon & Cornwall compared to just 68.4 per officer in the West Midlands, whilst in terms of 'Local Policing' FTE officers the figures were 190.6 and 161.6 respectively. In other words, the 'per officer' burden in Devon & Cornwall is about 18% more crimes/ASBs than in the West Midlands. This burden is, moreover, distributed (albeit not evenly) over a massively larger area; 1,026,949 as opposed to just 90,164 hectares. It seems inconceivable that this will not impact on the nature and/or quality of the service that can be provided in Devon & Cornwall.

82 Figure 16 below, meanwhile, plots (again at the same scale) the distribution of recorded RTIs across the two police force areas during the 2014 and 2015 calendar years, of which there

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[60] POA staffing data from 2014/15 (https://www.justiceinspectorates.gov.uk/hmic/media/value-for-money-profile-2014-poa-data.ods. Devon & Cornwall had 372, and the West Midlands 690, 'Local Policing' Police Community Support Officers (PCSOs; a broadly similar percentage of the underlying number of police officers in each police force (28.9% and 22.5% respectively).

were 10,230 in the West Midlands (across 2,367km of roads spread over 90,164 hectares and policed by 226 'road policing officers'[61]) and 7,848 in Devon and Cornwall (across 10,559 km of roads spread over 1,026,949 hectares policed by just 105 'road policing officers').

Figure 16 Contrasting Geographies: RTIs in Devon & Cornwall and the West Midlands
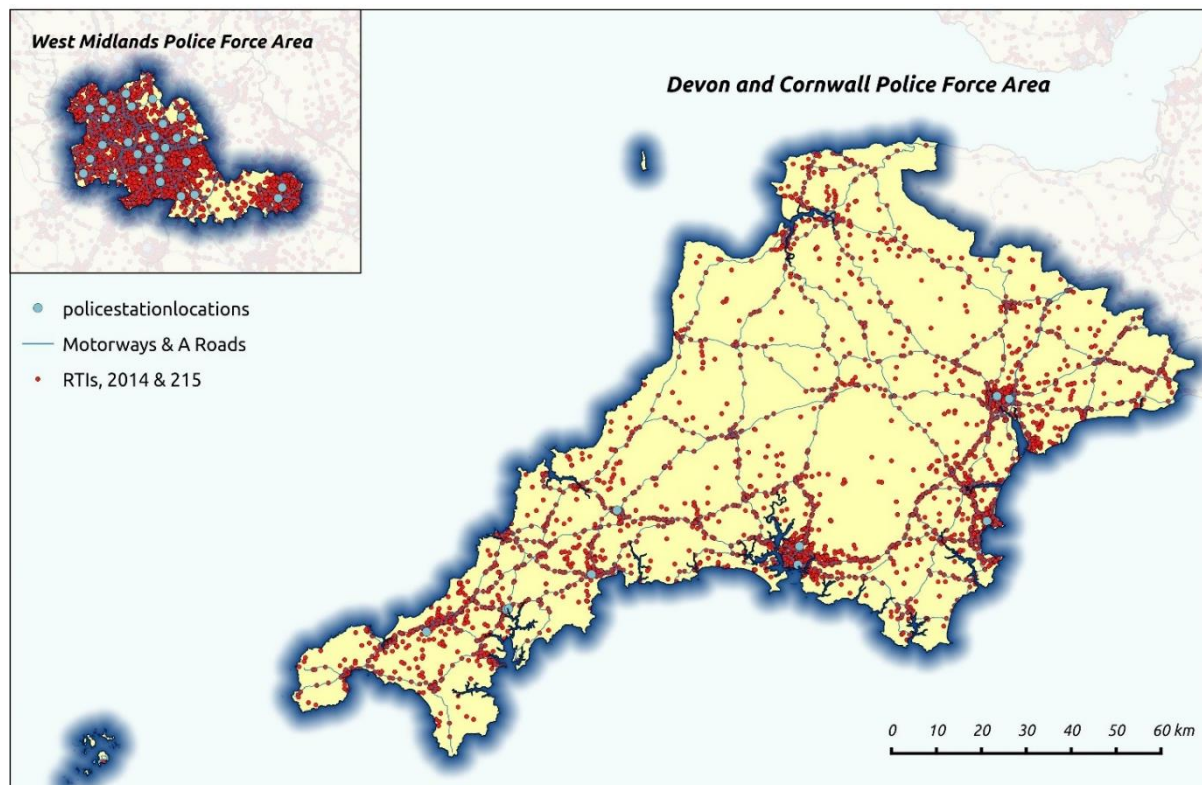
83   This time, although 30% more RTIs were recorded in the West Midlands than in Devon & Cornwall, the *per capita* rate was lower in the West Midlands (3.68 per 1000 people) than in Devon & Cornwall (4.64 per 100 people). The discrepancy between the two forces was even higher in terms of recorded RTIs per FTE 'Road Officer', at 74.7 per officer in Devon and Cornwall and only 45.3 per officer in the West Midlands. The RTI burden on officers in Devon & Cornwall is, in other words, 65% higher than in the West Midlands and, once again, this burden is spread over a very much larger area and over many more kilometres of road. If one additionally allows for the fact that only 10.4% of the Devon & Cornwall force area lies within 10 km of other forces, compared to almost all of the West Midlands Police Force, then it becomes increasingly obvious that the overall 'cost' of policing must be significantly affected by geography.

84   Similarly dispersed patterns of crime/ASB and RTIs can be seen in other police force areas serving areas with dispersed populations and extensive rural hinterlands. In this respect the evidence for North Yorkshire is interesting because, in addition to data on recorded crimes

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[61] POA staffing data from 2014/15 (*op.cit.*) reports 105 'Road Policing Officer' FTEs in Devon & Cornwall and 226 in the West Midlands. These forces had a similar number of 'road policing staff' (35 and 43 respectively). Road lengths have been extracted from the Ordnance Survey *Open Roads* digital resource (https://www.ordnancesurvey.co.uk/business-and-government/products/os-open-roads.html) using QGIS 2.8.2 (QGIS Development Team, 2016. *QGIS Geographic Information System*. Open Source Geospatial Foundation Project. http://qgis.osgeo.org).

and RTIs (Figure 17), we have data extracted from the force's 'Storm' Command and Control system recording Public Safety and Welfare (PSW) and Transport incidents during 2014/15 and 2015/16. Not all these incidents required an immediate or emergency police presence (some could be resolved over the phone), but plotting their locations (Figure 18) illustrates the fact that, although PSW and Transport incidents (like recorded crime) are concentrated in the major towns and cities, only remote moorland is incident-free and the police must be prepared to respond to incidents wherever there are people.

85 And what is true for North Yorkshire is true for England and Wales as a whole. Crime, anti-social behaviour, RTIs and, indeed, all police activity responding to Command and Control incidents is concentrated in more populated areas, and will reflect aspects of the socio-economic and environmental characteristics of those areas, but it occurs almost everywhere. For instance, only 4 of the 34,753 lower super output areas (LSOAs) in England and Wales (which are small units of between 1,000 and 3,000 people) did not experience some recorded crime in 2013/14 and 2014/15. Police forces need to be able to respond appropriately to PSW and Transport incidents wherever they may take place and, as this is more challenging when dealing with dispersed populations in rural areas, the underlying geography of different areas needs to be recognised in any future funding formula.

86 Developing a universally acceptable 'rurality' element in the formula will not be straightforward, but there is certainly sufficient police operational data collected – specifically through force-level Command and Control systems such as 'Storm' – to better understand the impact of geography on the provision of police services. The above discussion provides a *prima facie* case that 'geography matters', but a far more detailed analysis is necessary. We thus strongly recommend that the Home Office use detailed geo-located Command and Control data drawn from across all forces to investigate (a) patterns of police demand across the country as a whole, (b) variations in the prioritisation of incidents and subsequent response times in different environments, and (c) develop funding formula to ensure that the specific difficulties faced by forces serving dispersed communities and large rural hinterlands do not result in an unacceptably lower police service. To avoid 'postcode lotteries' in service provision, we also recommend, that the Home Office accept 'geographic service equity' as a formal funding formula objective, and explore whether such operational data can be used (without encouraging data manipulation or generating perverse incentives) to monitor the extent to which this objective is being met.

Figure 17 Crime Heat Map with RTIs, North Yorkshire
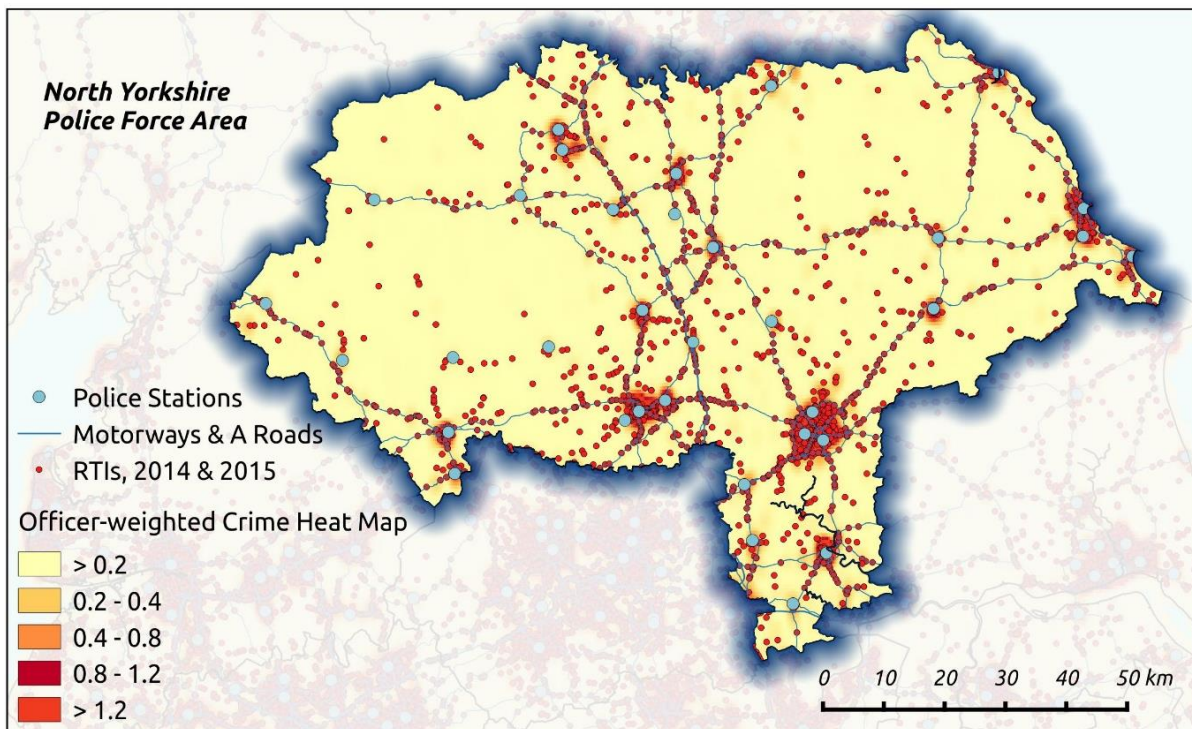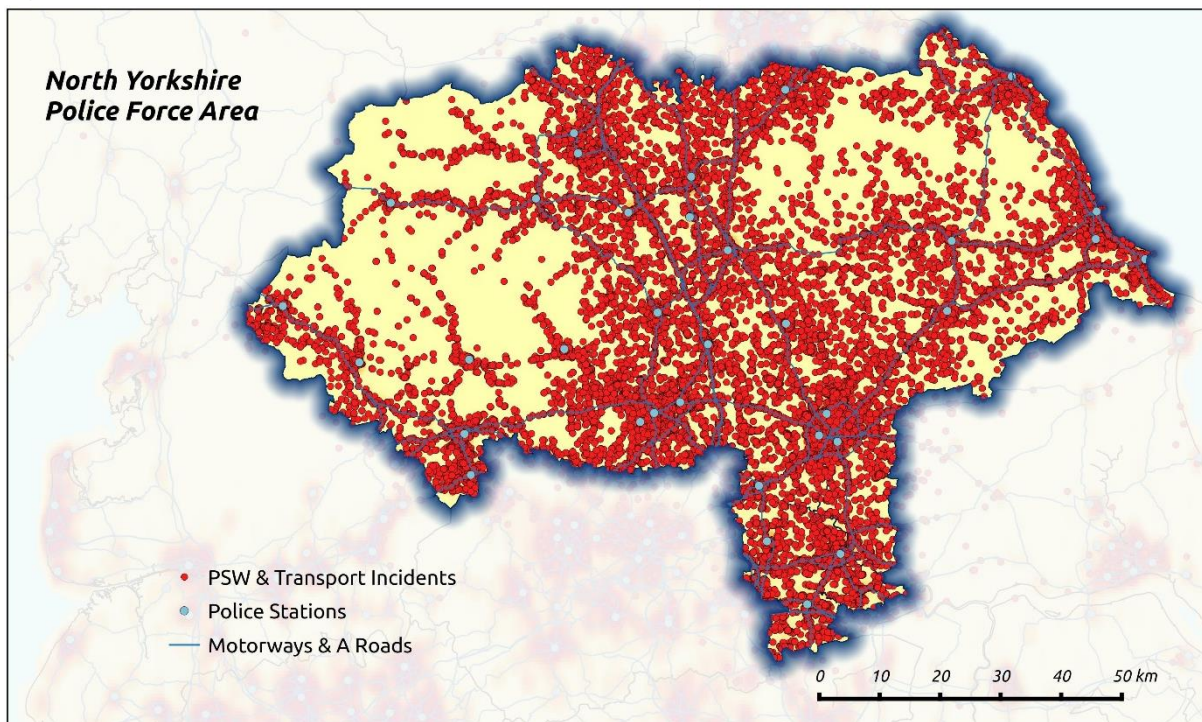

Figure 18 North Yorkshire Police Force Recorded Activity, 2014/15 & 2015/16

Supporting Complex Partnership Landscapes

87   Developing effective partnerships is vital to mitigating the impact of vulnerability on policing demand, and it has been suggested that the complexity of 'partnership landscapes' presents a particular additional challenge to delivering effective policing services, supporting victims and

preventing crime. The Crime Commissioner for Devon and Cornwall, for instance, has suggested the partnership landscape there is particularly challenging; with twelve local authorities, four NHS Care Trusts, two fire services and seven community safety partnerships[62]. Such complexity is not, of course, explicitly linked with rurality *per se*, but it might be assumed that rural forces, because they serve such large areas, may have to maintain partnerships with a wider range of health, social care, local authority and other organisations.

88 In fact, Devon & Cornwall is a somewhat unusual rural force in terms of the number of local authorities (LAs=12) and Clinical Commissioning Groups (CCGs=3) with which it must maintain effective partnerships. More generally there is no evidence that rural areas face particular challenges in this respect. The Metropolitan Police Service (serving 8.53 million people) has, of course, the largest number of partner LAs and CCGs (32 as in London LA and CCG boundaries have been aligned), whilst the City of London has the smallest number as it lies entirely within a single LA and CCG. But even forces serving very large areas, such as Cumbria, North Wales and Dyfed Powys, can have relatively few LA and CCG partner organisations (namely 6, 6 and 4 LAs respectively, and 1, 1 and 2 CCGs respectively).

89 In general, therefore, rural forces are unlikely to face unusually high additional costs associated with the need to maintain effective relationships with a large number of overlapping partner organisations. Indeed, if anything, this will tend to affect forces serving more densely populated urban areas, particularly if the need to build and maintain effective relationships with neighbouring police forces is to be allowed for. The more general issue, though, is that forces have no control over the 'partnership landscapes' within which they must work and, as such, this may be considered a 'legitimate' driver of resource need which should be recognised in the funding formula. This concept goes to the heart of an evidence-based resource allocation system, whereby factors over which recipient organisations have no control (such as the number of people they serve and, so far as they affect needs, the socio-economic characteristics of populations) are incorporated into the allocative process. It is, for instance, purely a matter of administrative history that the Norfolk Police Force must work with 7 local authorities and 5 CCGs, whereas the slightly smaller Bedfordshire Police Force need work with only 3 LAs and 3 CCGs. If, as suggested by the PCC for Devon & Cornwall, partnership working incurs significant costs then these would need to be recognised and incorporated in any equity-based funding formula.

90 Unfortunately, given the time and data available to us we have been unable to adduce evidence upon which to quantify the relative cost of supporting effective partnerships; either relative to the overall cost of policing or in terms of how it varies from force to force in response to the complexity of partnership landscapes. Given the importance of partnership working to both the protection of vulnerable people and in preventing crime, we recommend

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[62] Office of the Police and Crime Commissioner for Devon and Cornwall, *Why the funding formula is unfair. The full story* (Undated; http://www.devonandcornwall-pcc.gov.uk/fair-funding/why-the-funding-formula-is-unfair/).

that the Home Office investigate this matter further. This should encompass an analysis of how costs vary relative to 'legitimate' contextual factors over which forces have no effective control, and how the allocation process itself may be used to explicitly support partnership working.

Seasonality and Peak Resource Needs

91 The proposed use of annual ONS population estimates as one of very few components in the new police funding formula is, as discussed elsewhere, problematic because (a) it ignores both substantial variations in the demographic profile of different populations, and (b) it makes no allowance for the substantial influx of visitors to some police force areas. But areas also vary significantly in terms of how their populations vary over the course of the year, both in terms of absolute numbers and in terms of their demographic profile. It has been suggested that this seasonality has resource implications. In effect, even if forces are funded equitably with respect their 'mid-year' populations, then those which experience large annual variations in population may struggle to provide an adequate service during peak months.

92 For instance, the Police and Crime Commissioner (PCC) for Devon and Cornwall's response to the consultation notes that his area's population increases by up to 21% over the summer months and this results in a 10% increase in both traffic count data and RTIs during the summer months; a 4-6% increase in recorded crime during May and June and a 10% increase in July and August; a slightly higher increase in the number of incidents over the same period; and a 5-7% increase in demand for custody suites[63]. Estimating an 18% increase in demand for policing resources between May and August, the PCC for Devon and Cornwall's principal argument was that tourist visitors should be incorporated in any population metric used for formula funding[64], but the implication is that seasonality itself incurs additional costs.

93 In fact, as illustrated in Figures 19 and 20 below, all forces experience seasonality in terms of both crime/ASB and RTIs – albeit clearly for different reasons. RTIs peak in October and November, except in those areas where the summer influx of visitors outweighs the effect of poorer driving conditions later in the year: namely in the City of London (where RTIs peak in June); North Wales, Dorset, Gloucestershire, North Yorkshire and Cumbria (July); and Dyfed-Powys (August). All forces need to deploy resources seasonally, but this will be far more difficult in Dyfed-Powys (a large rural area serving a highly dispersed population) with a 91% 'maximum-relative-to-minimum' increase in RTIs than in West Yorkshire (a predominately urban area which includes Leeds and Bradford) with only a 27.2% increase in RTIs. Dealing with RTIs represents, of course, only a proportion of the activity of Road Policing Officers but, if RTIs can be assumed to proxy the wider demand on their time, then it is worth noting that,

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[63] Joint Response [to the Home Office Consultation] from the Police and Crime Commissioner for Devon and Cornwall and the Isles of Scilly and the Chief Constable of Devon and Cornwall Constabulary, 9 September 2015. (see http://www.parliament.uk/documents/commons-committees/home-affairs/Annex 2 Devon and Cornwall response to Home Office Funding consultation.pdf)

[64] Office of the Police and Crime Commissioner for Devon and Cornwall, *Why the funding formula is unfair. The full story* (Undated; http://www.devonandcornwall-pcc.gov.uk/fair-funding/why-the-funding-formula-is-unfair/)

in order to maintain an equitable level of service throughout the year, Dyfed-Powys (with 84 FTE Road Policing Officers in 2014/15[65]) would need to deploy 114 officers in August compared to just 60 in February. This is operationally far more challenging than the equivalent figures for West Yorkshire, namely 222 officers in October compared to 177 in March.

Figure 19 Seasonal Variation: Maximum & Minimum Monthly Average Rates of RTIs per Day
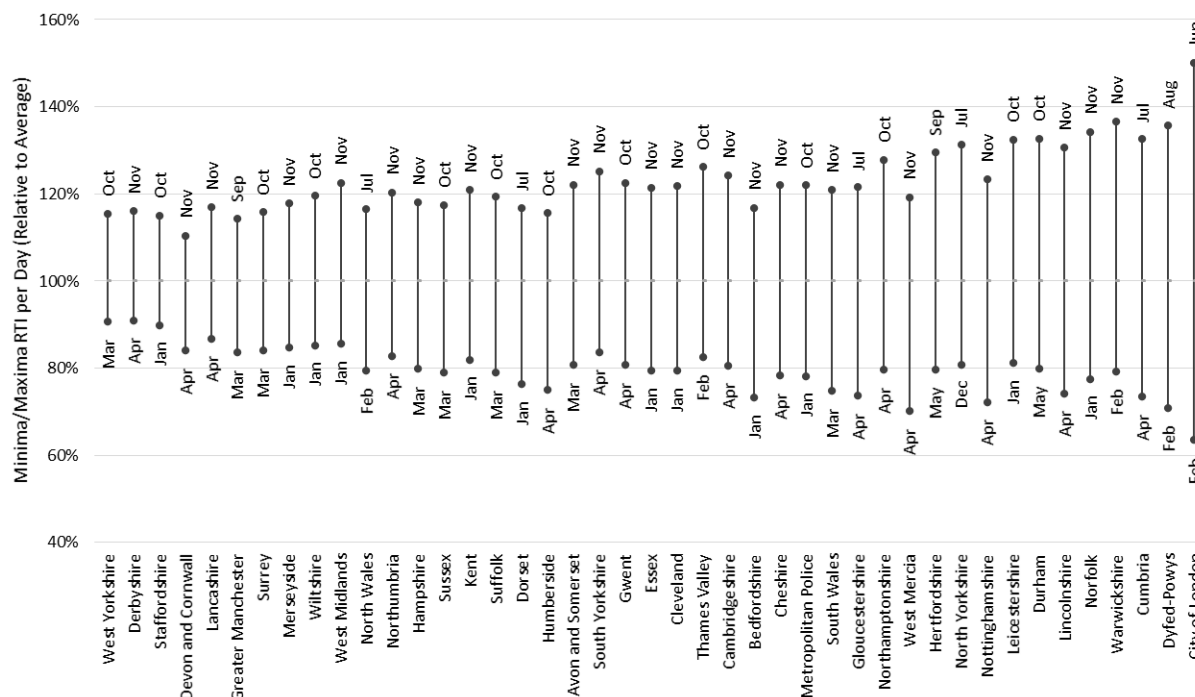

94 Although many of the police forces which must deal with a large seasonal variation in RTIs serve large rural areas (with 8 of the 10 forces with the largest variation in RTIs being either predominately or significantly rural[66]), there is no clear overall pattern – with some rural police forces, such as Derbyshire, Staffordshire and Devon & Cornwall, exhibiting relatively small seasonal variations. However, a much clearer urban-rural pattern emerges with respect to the monthly variation of daily crime and ASB rates (Figure 20), with many rural forces experiencing much higher rates in July and August (when, almost universally, rates are at their highest) than in December or February (when rates are at their lowest). Thus only 5% of the population served by the 10 forces with the smallest 'maximum-relative-to-minimum' seasonal increases in crime/ASB live in rural areas, compared to 33.2% of the population served by the 10 forces with the largest seasonal increases in crime/ASB. This is, of course, less to do with rurality *per se* than the seasonally concentrated arrival of large numbers of visitors to these force areas; with there being, *per capita*, nearly twice as many visitors to the

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[65] POA staffing data from 2014/15 (https://www.justiceinspectorates.gov.uk/hmic/media/value-for-money-profile-2014-poa-data.ods.

[66] English forces as categorised in DEFRA's *2001 Rural Urban Classification of Local Authorities and other geographies* (see https://www.gov.uk/government/statistics/2001-rural-urban-definition-la-classification-and-other-geographies) with Welsh Authorities classified by ourselves, using the 2011 DEFRA classification of LSOAs (see https://www.gov.uk/government/statistics/2011-census-rural-analysis-a-guide-to-nomis), to replicate the English categorisation.

10 force areas with the largest seasonal variation in crime/ASB than to the 10 forces areas with the lowest seasonal variation[67].

Figure 20 Seasonal Variation: Maximum & Minimum Monthly Average Rates of Crime/ASBs per Day
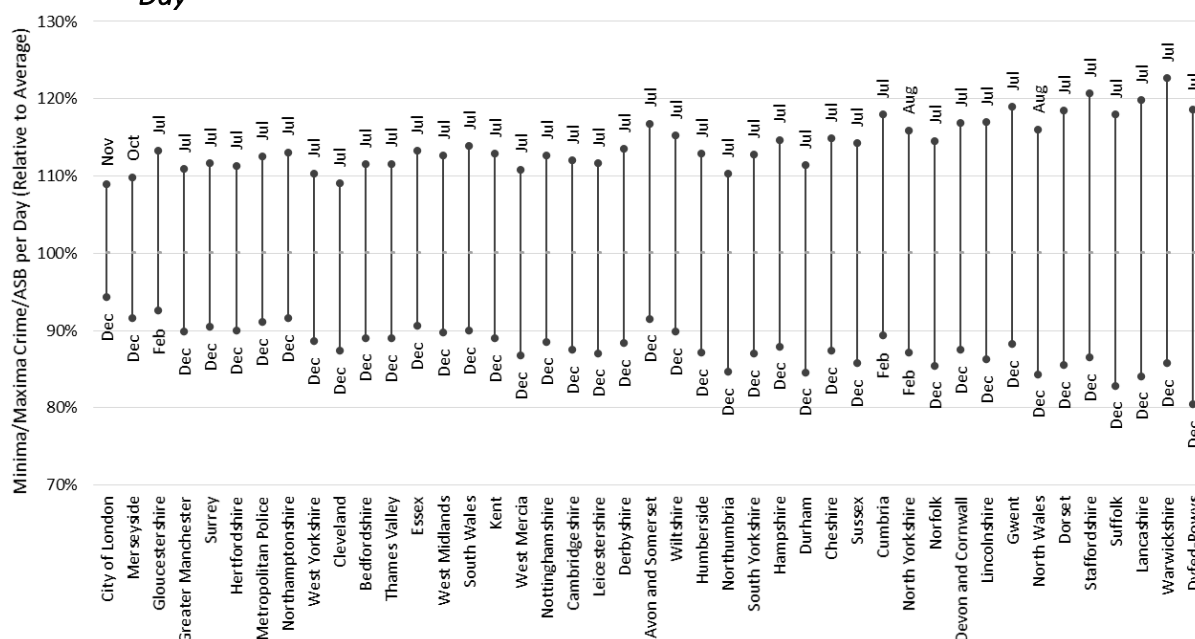
95   The extent to which daily rates of crime and ASB varies across the year is not as large as with respect to RTIs; varying from a 'maximum-relative-to-minimum' increase of 15.5% for the City of London to 47.5% for Dyfed-Powys. Nevertheless, the impact on staff deployment and service provision is still likely to be significant. If the level of crime/ASB can be treated as a proxy for the wider burden on police forces (as is assumed by the proposed funding formula) then, in order to maintain a stable officer per crime/ASB ratio, Dyfed-Powys, with 1,025 operational frontline officers in 2014/15, would need to deploy 1216 officers in July compared to just 817 in December. Whether such variation can be absorbed by normal deployment patterns is at least questionable, and service quality may well be adversely affected by such seasonal variations in demand; particularly in those areas, such as Dyfed Powys, where summer tourism significantly increases RTIs, crime and ASB, and presumably the overall underlying demand on police services.

96   It is not, in other words, simply a case of including visitor numbers in the population metric used in the funding formula; the seasonality of demand must also be recognised. Thus an equitable formula would not only strive to ensure geographic equity, but also that minimum levels of service can be maintained throughout the year. Of course much of this can be achieved through the appropriate deployment of local personnel and resource, and/or through cross-boundary policing arrangements (where these are possible), but an evidence-

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[67] Number of visitors calculated as sum of overnight stays and day visitors. LA-level data, which has been summed to force level, is available from *Volumes and Values of Domestic Tourism in Great Britain – 2014* (http://tinyurl.com/jmsbhtl) and *2015 Great Britain Day Visits Survey* (http://tinyurl.com/hw42p3w) respectively.

based resource allocation mechanism needs, at the very least, to investigate whether in some areas response times and other performance metrics are being adversely affected by seasonality of demand. Without access to appropriate data we have been unable to do this, but we recommend that the Home Office use operational Command and Control data to test whether the seasonality in RTIs and crime/ASB reported above is accompanied by unacceptable variations in service provision. If so, the Home Office should investigate whether, rather than using a population metric based on each force's annual 'average' population, the population metric should better reflect each force's peak population.

Workforce Composition

97 It has been suggested, at least with respect to the provision of health services, that organisations serving less populous rural areas tend to require a more flexible and independent staff, and that this results in the need for a generally higher-grade and more costly workforce[68]. As staffing costs are a significant component of overall costs, it has thus been argued that resource allocation mechanisms should take account of *necessary* differences in the cost of providing *appropriately* skilled workforces in different areas. The first part of this argument seems to apply to policing. Leaving aside the very small and anomalous City of London force (which, at 32.4%, has a very high proportion of staff graded Inspector and above – probably as a direct consequence of being so small), the proportion of higher-grade officers varies from 18.9% to 27.1% (in the Metropolitan and Nottinghamshire Police Forces respectively). In general terms, the proportion of higher-grade officers reflects rurality; with 1 in 4 offices being higher grade in the 10 most rural forces compared to only 1 in 5 in the 10 least rural forces[69].

98 This notwithstanding, it does not appear to translate into a *per capita* staffing resource difference. Police Outcome Activity (POA) FTE and cost data for 2014/15 shows that, in terms of both officers and overall staff (i.e. Police Officers, Police Community Support Officers and 'Other Staff'), per employee costs are slightly lower (by circa 2%) in the 10 most rural forces compared to the 10 most urban forces: and very much lower (by circa 10%) if the Metropolitan and City of London forces, with their London allowances, are included[70]. Rural forces may have a greater proportion of higher-grade officers, but this must be being offset by staff being on generally lower bands within each grade. Whilst it could be argued that this reflects the greater financial pressure being experienced by rural forces (the *per capita* funding for the 10 most rural forces is £172.28, compared to £193.96 for the least rural, rising

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[68] Asthana, S., Gibson, A., Moon, G., Brigham, P. (2003) 'Allocating resources for health and social care: the significance of rurality', *Health and Social Care in the Community*, 11(6):486-93.

[69] Data on workforce statistics from Home Office, Police workforce, England and Wales: 31 March 2015 (July 2015). See https://www.gov.uk/government/statistics/police-workforce-england-and-wales-31-march-2015. The proportion of population in each force area living in rural LSOAs derived from the RUC11 2011 Census classification of LSOAs available via NOMIS (https://www.nomisweb.co.uk/). (For further information see https://www.gov.uk/government/statistics/2011-census-rural-analysis-a-guide-to-nomis).

[70] For all staff, the average per employee costs are £43,357 in the 10 most rural forces, and £44,094 in the 10 least rural forces, rising to £49,169 if the two London forces are included. The equivalent figures for police officers are £51,472 and £52,497, rising to £55,888 if London is included. (https://www.justiceinspectorates.gov.uk/hmic/media/value-for-money-profile-2014-poa-data.ods.

to £228.39 if the two London forces are included), the fact of the matter is that there is no compelling evidence that rurality incurs additional costs by requiring forces to recruit and maintain a more flexible and skilled workforce. We do not consider this issue to require further investigation.

Fixed Costs and Economies of Scale

99 In theory, an allocative process which makes no allowance for inescapable 'fixed costs' which are independent of the size of an organisation will disadvantage smaller forces. It is also arguable whether economies of scale can be achieved across many aspects of policing and that, if this is not taken into account smaller forces will be further disadvantaged. This is not about rurality *per se* but, with the notable exception of the City of London (which serves a residential population of just 8,072 people and daily transient population of 319,200), most of the smaller forces (in terms of population and officer/staff numbers) serve rural areas. Thus only two of the 15 most rural police forces serve more than a million people (Devon & Cornwall and West Mercia) whilst, excepting the ever anomalous City of London, only one of the least rural forces serve less than a million people (Cleveland). In terms of officer numbers, even ignoring the Metropolitan Police Service (with nearly 32,000 officers), the 15 most urban forces have, on average, 3,275 officers compared to just 1,400 in the 15 most rural forces. Rural forces, being predominately smaller, are thus far less likely to be able to benefit from economies of scale.

100 Without access to detailed financial data, we have been unable to undertake any serious analysis of the additional costs that may be associated with force size. There is, however, some evidence that smaller (and predominately rural) forces are facing such additional costs (either because of fixed cost effects or due to economies of scale) and that further investigation is warranted. Thus, excluding the City of London and the Metropolitan Police Service, the 10 smallest forces spend (Gross Revenue Expenditure[71]) very nearly the same in *per capita* terms (£198.95) and the 10 largest forces (£195.96), and also very nearly the same in per officer (£52,616 and £52,425 respectively) and per 'all staff' terms (£44,253 and £43,531 respectively). But the percent expenditure committed to 'other costs' (i.e. non-staff costs) in the 10 smallest forces is, at 22.1%, some 7.1% higher than the 20.7% committed in the 10 largest forces. This is precisely what one would expect if all forces had to cover an initial fixed cost quanta and/or economies of scale were being achieved by the larger forces, and very similar figures are returned if the two London forces are included; namely 22.7% committed to non-staff costs in the 10 smallest forces compared to 20.3% in the 10 largest forces – which equates to a 12% premium for the smaller forces. As equates to £32.1 million across the 10 smallest forces, or the equivalent of over 600 officers (a 5% increase), this represents a substantial additional cost for those forces.

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[71] Cost data taken from Police Objective Analysis – Expenditure & Earned Income (GRE, Earned Income and NRE) and staffing data taken from Police Objective Analysis – Staffing (Officers, Staff & PCSO FTEs). Both available in the value-for-money-profile-2014-poa-data.ods spreadsheet (https://www.justiceinspectorates.gov.uk/hmic/media/value-for-money-profile-2014-poa-data.ods)

101 This analysis is provisional, and other explanations of this differential in the relative size of 'non-staff' costs, but it strongly suggests that this is an issue which deserves further investigation. Once again the issue is that factors over which forces have no control but which incur additional costs (so-called 'legitimate' factors) should be incorporated in any equitable formula funding mechanism. We thus strongly recommend that the Home Office (a) investigate whether there are identifiable fixed costs that apply to all forces and, if so, introduce an initial fixed funding quanta to be awarded to all forces *prior* to the application of population and needs-based formulae, and (b) investigate whether larger forces are able to exploit economies of scale unavailable to smaller forces and, if so, introduce a suitable mechanism to dampen the effect and thereby ensure a genuinely equitable distribution of available resources.

4 Assessment of Police Funding Formulae

4.1 Introduction

102 In its 2011 review of formula funding of local public services, the National Audit Office (NAO) proposed that Government departments should ensure that funding models are designed to support clear objectives (that is, promote payer's intentions), that there should be transparency about the basis of funding, and that formulae can be monitored and reviewed to understand the extent to which objectives are fulfilled and value for money achieved[72]. Additional criteria that have been proposed include the need for formulae to have a strong underlying logic, to be technically robust and to be resistant to manipulation by providers and budget holders[73].

103 This set of key principles provides a useful benchmark against which to assess the quality of funding formulae. There are many lessons to be drawn from the proposed reform of police funding, not least the need for the formula-making machinery of government departments to ensure due process.

4.2 Background to the proposed reform

104 In 2015/16, the Police Grant allocated by central government accounted for 62% of gross revenue expenditure by the 39 police forces in England (a proportion of this is based on funding previously paid through the Revenue Support Grant (RSG) to Local Authorities). A further 6% is provided through special and specific grants (such as the Counter Terrorism Police Grant and additional funding for the two London police forces) and 7% by 'other income', whereby police forces make charges for performing non-statutory functions, such as policing sports events[74]. The remaining 24% of expenditure is paid from council tax, a local tax on domestic properties. Arrangements are similar for the four police forces in Wales. Here however, 37% of gross revenue comes from council tax.

105 This complex set of arrangements means that the efficacy of the funding system rests not only on the Police Allocation Formula but on the formula that determines the RSG and the approach to collecting council tax. It is not within the scope of this report to provide a detailed critique of either system, suffice to say that, although local government finance has experienced significant changes including the introduction of the Business Rates Retention Scheme in 2013 and substantial cuts in funding, the RSG is rooted in historic funding patterns

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[72] NAO (2011). *Formula funding of local public services*. Report by the Comptroller and Auditor General HC 1090 Session 2010–2012. London: The Stationery Office.

[73] Rice, N. and Smith, P. (1999). *Approaches to capitation and risk adjustment in health care: an international survey.* University of York, Centre for Health Economics; Segal, L. and Chen, Y. (2001). *Priority setting for health: a critique of alternative models*. Health Economics Unit, Centre for Program Evaluation, Monash University; Smith, P.C. (2006). *Formula funding of public services*. London: Routledge

[74] Johnston, N. and Politowski, B. (2016). *Police Funding. Briefing Paper Number* 7279. London: House of Commons Library.

determined by the much criticised Four Block Formula[75]; while the council tax system has been described as regressive, outdated and widely discredited[76].

4.3   Proposed Reform of the Police Funding Formula

106 The Home Office's proposals for reform of police funding arrangements in England and Wales were launched on the 21st July 2015 for a period of public consultation that closed on the 15th September. The intention was to implement this new model from 2016/17, subject to securing broad support for the approach[77].

107 The document lists three options for a future funding model. It is doubtful that many would disagree with the dismissal of the possibility of maintaining existing arrangements. The Home Office also rejected the option of upgrading the PAF, first because there is currently no suitable alternative data on policing demands (a legitimate observation but one that could have been acted upon) and second because "workload estimates created by complex models such as the PAF are highly sensitive and small changes in data can lead to big changes in funding allocations"[78]. This is a shame in our opinion as an upgraded workload model would likely examine the factors (demographic, socio-economic) associated with national average activity groupings. Moreover, there is no reason to assume that these variables would be any less stable than those identified in the Consultation document (particularly as the use of different Acorn measures results in quite sizeable differences in funding allocations). Finally, insofar as the PAF was designed to reflect the workloads of police forces, its underlying logic was rather more robust than that of the proposed reform.

108 The Home Office's preferred option was to offer a much more simplified model for allocating funding. This, is was argued, should be based on an understanding of the *drivers* of crime and police demand, namely alcohol, drugs, 'character', opportunity, effectiveness of the Criminal Justice System and profit. Insofar as this suggests a shift towards theorising the approach to formula funding (i.e. introducing an underlying logic), it can be welcomed as an attempt to move towards a more normative approach to police funding (that is, from *what is* to *what ought to be*). It should be noted, however, that the proposed drivers are of crime. No attempt was made to theorise about possible drivers of non-crime demands on policing.

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[75] Gibson, A. and Asthana, S. (2012). A Tangled Web: Complexity and Inequality in the English Local Government Finance Settlement, *Local Government Studies*, 38(3): 301-19; Gibson, A. and Asthana, S. (2011). Resource allocation for English local government: a critique of the four block model. *Journal of the Royal Statistical Society, Series A*. 174(3): 1-18

[76] Leishman, C., Bramley, G., Stephens, M., Watkins, D. and Young, G. (2014). *After the council tax: impacts of property tax reform on people, places and house prices*. York: Joseph Rowntree Foundation.

[77] Home Office (2015). *Consultation on reform of police funding arrangements in England and Wales*. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/447083/2015_07_20_Police_funding_consultatio n_doc.pdf

[78] Home Office (2015). *Consultation on reform of police funding arrangements in England and Wales*. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/447083/2015_07_20_Police_funding_consultatio n_doc.pdf, p.18

109 Moreover, rather than modelling the factors that might be independently associated with drivers of crime, the Home Office directly analysed *recorded crime* counts. It reduced need for policing to five variables: population, Band D equivalent properties, households with no adults employed and dependent children, hard pressed population (an Acorn classification) and bars per hectare. No exemplifications were given on the impact of funding changes on forces. Nor, despite an acknowledgement of non-crime demands, was any attempt made to model the factors associated with, for example, public safety and welfare.

110 Unsurprisingly, the vast majority of the responses to the consultation were negative. The Home Office responded to these and, in October 2015, offered a revised sets of proposals (removing the Council Tax base indicator, accounting for overall volume of bars as well as bar density and adding an Area Cost Adjustment). The Office of the Devon and Cornwall Police and Crime Commissioner raised questions about the 'Urban Adversity' weighting, going on to that forces, such as South Yorkshire and West Midlands stood to lose £28 million, while the Metropolitan Police gained £181 million, depending on which Acorn measure was used. The fact that a change to the deprivation indicator that is used in the model can result in such a redistribution of resources quite rightly raised alarm bells.

111 Soon after the Home Office was made aware of its calculation error, the Minister for Policing announced that the Government was postponing the implementation of the reformed funding arrangements until 2017-18. In December 2015, the Home Affairs Committee published its Inquiry into the Reform of the Police Formula, which lambasted the Home Office for its misguided approach, deplorable calculation errors and a process that had ended in chaos.

112 It is important to remember, however, that the proposals were rejected, not on the basis of key principles, but due to a technical mistake. Updating the formula to account for such data errors is unlikely to address the more fundamental deficiencies of the proposed reform.

4.3.1 Technical robustness

113 Our assessment of the funding formula would suggest that there has not been suitable rigorous examination of the statistical and categorical data used. As noted above, the distribution of funding is sensitive to the Acorn definition that is used (i.e. 'hard pressed families' or 'urban adversity'). The latter category excludes groups that are in the 'financially striving' category such as students, low income pensioners and terraces occupied by many Asian families, even though evidence suggests that these groups are likely to be at increased risk of victimisation and/or in need for reassurance. It also focuses on terraced housing (other than that occupied by many Asian families), while excluding low income groups occupying e.g. semi-rural, right-to-buy or post-war estates. The segmentation of these groups is strongly focused on their internet use and shopping preferences. It is not at all apparent why these categories should be treated as plausible indicators of demand for policing.

114 Greater care to understand the meaning of and variation in the data is necessary, and to use appropriate methodology. The use of Cronbach's alpha statistic, for example, does not guarantee construct validity. More problematically, the correlation coefficients found between model indicators, crime and non-crime are based on analyses of *count* data rather than rates per capita. Here, the varying size of police forces confounds observed relationships. In other words, the high correlation between the number of 'households with dependent children but no adults in employment' and 'Total MAPPA offenders' is simply because you will tend to have large number of both in areas with large populations and small numbers of both in areas with small populations. It says very little more than this.

115 In summary, the proposed reform involved the deployment of ill-understood statistical methods. The use of count as opposed to rate data has resulted in statistic artefact. More generally, without theoretical justification for the choice, exclusion and weighting of variables, the indiscriminate (and, in this case, inappropriate) use of Principal Component Analysis (PCA) has the same 'witch's cauldron' effect as the indiscriminate use of regression analysis. Further comments have been made in Section 1 of this report.

4.3.2 Promoting policy objectives

116 As a flawed statistical analysis of some factors that are associated with police recorded crime, it is difficult to see how the reformed formula promotes policy objectives. It is based on an essentially reactive definition of policing and presents no incentives for proactive demand, for example around public protection work and problem-solving/demand reduction. Nor does it address significant issues of latent demand such as child sexual exploitation, domestic abuse and sexual offences[79].

117 If funding is to respond to the changing nature of policing, including the challenges presented by new types of criminal activity and reflect the longer term benefits of investing resources 'upstream' in prevention rather than on a reactive crisis-driven system, then resources will need to be distributed according to underlying need rather than historic activity and its costs – which have become distorted and inefficient. There is no indication that the Home Office accepts this critique or has plans to explore alternative approaches to formula funding. As a result, the scope for ensuring that funding arrangements shift from 'what is' to 'what ought to be' seems limited.

4.4   Conclusion

118 The Home Office is not alone in failing to more widely communicate how it decides to deploy its share of public expenditure. Many funding formulae have become so statistically complex (some would say incomprehensible to all but specialists) that it is extremely difficult to subject them to proper scrutiny. In the case of police funding, the Home Affairs Committee's inquiry played an important role in highlighting failings of process in the proposed reform of the

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[79] Hales, G. (2015). *Home office police funding consultation: An opaque sticking plaster?* London: The Police Foundation

formula. However, few have engaged with the underlying logic and statistical basis of the proposals. Thus, there is no guarantee that a revised or new formula will be any better.

119 The Four Block Model (4BM), another statistically opaque formula that was used to distribute local government funding, offers salutary lessons in this respect. While objections had been made to the 4BM on the basis of complexity, lack of transparency and unaccountable political interference, it was not until the technical shortcomings of this arbitrary and inequitable model were exposed that it became completely untenable.

120 The public, local police forces, PCCs and Parliament deserve better. The Home Affairs Committee's recommendation that an independent panel be appointed to assist the Home Office in formulating revised proposals would a sensible start. There are precedents for this in the Settlement Working Group, reconstituted in 2016 as the Needs & Distribution Technical Working Group (NDTWG), which is looking at the principles to inform the distribution of local government funding; and the Advisory Committee for Resource Allocation (ACRA) and its Technical Advisory Group (TAG) which oversee the formulae used to allocate NHS resources.

121 ACRA and TAG comprise NHS England analysts, NHS managers, public health experts and senior academics. Thus, their membership is wider than that of the NDTWG. ACRA documents and research reports are published on the NHS England website, as are the technical guide to allocation formulae and accompanying spreadsheets of data and weightings. The Committee works to clear objectives (promoting equal opportunity of access to health care for equal needs and addressing avoidable health inequalities). Thus, while the approach to NHS funding it not without its critics, it is open to expert scrutiny.

122 The two advisory groups for the governance and development of NHS formula funding were first established in the 1990s[80]. Until recently, the deliberation of these committees was confidential (as remains the case with TAG). The growing transparency of NHS funding is to be welcomed but it may reflect the confidence of what is undoubtedly a highly expert team of in-house analysts. Few other departments, including the Home Office, have this level of knowledge and experience. If they are to develop robust systems for formula funding, there is a strong case for inviting cross-department engagement, external oversight and investment in internal expertise.

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[80] Bevan, G. (2009). The search for a proportionate care law by formula funding in the English NHS. *Financial Accountability & Management* 25(4): 391–410

NRCN

National Rural Crime Network

Championing greater understanding of rural crime and taking action to make the countryside safer

FACT Crime costs rural communities up to £800 million a year

Source: The true cost of crime in rural areas, NRCN, 2015

FACT Fear of crime affects four out of ten rural people – twice as many as the national average

Source: The true cost of crime in rural areas, NRCN, 2015

FACT Two out of three rural people think local police fail to deal with the problems that matter to them – twice as many as the national average

Source: The true cost of crime in rural areas, NRCN, 2015

FACT Rural theft costs more than £44 million and is increasing

Source: NFU Mutual Crime Survey, 2014

The NRCN is working to:

- make the voice of rural communities heard
- help secure fair funding for rural forces
- provide the public, police and partners with examples of best practice
- influence Government policy

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