

A Review of GP Earnings and Expenses

Final Report

November 2017

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Executive summary

The Scottish Government, in collaboration with the Scottish General Practice Committee (SGPC), commissioned Deloitte to collect quantitative and qualitative information with the aim of gaining a better understanding of the variation in general practice earnings and expenses.

In particular, the key objectives of this study are to:

- Assess the scale of net income and expenses variability across general practices and the extent to which there are systematic differences between different practice types;
- Understand the impact of different factors such as scale and remoteness on unit costs;
- Undertake selected discussions with the sector to collect their views about the existing funding allocation model and potential ways to improve it; and
- Set out alternative scenarios to amend the existing funding allocation model, drawing on data analysis and sector engagement. These scenarios are preliminary and would require significant work to reach a preferred way forward; this is not part of the scope of this study.

The quantitative analysis is primarily based on financial and operational data collected from a sample of Scottish general practices. The qualitative analysis is based on engagement with a number of sector experts¹ and the Research Advisory Group (RAG)². The main findings gathered are summarised below together with the limitations of the study.

Engagement with the sector

- **SAF.** A number of stakeholders felt that the current formula could be improved to better reflect differences in workload and costs across practices, based on anecdotal evidence suggesting large differences in earnings across practices.
- **Limitations of the SAF.** Sector experts identified three key areas where the SAF could be improved: scale, rurality/remoteness and deprivation. However, there was little agreement around the relative importance of these factors.

Data analysis

The data analysis presented in this study is the most detailed analysis to date on earnings and expenses in Scottish primary care; however, they should be interpreted as directional due to the limitations associated with the sample representativeness and size, and challenges related to the historical funding allocations.

- **Sample representativeness.** The data analysis is based on a sample of Scottish general practices, which is relatively representative of the population in terms of location and deprivation. However, the sample over-represents large practices and under-represents small practices.³ Due to this, the results of the analysis may over or underestimate the cost and net income variability, and the impact of scale and remoteness on costs.
- **Sample size.** The sample contains 15 practices located in remote areas. Given the relatively small sample of remote practices, the estimated differences in costs and net income between remote and other practices may be subject to estimation error. Furthermore, the impact of

¹ The sector experts were selected from the RAG and comprised GPs (12), individuals from Health Boards (5), the Scottish Government (5) and academia (2).

² Group of sector professionals from the Scottish Government, Health Boards and BMA overseeing the project.

³ An information request was sent to 600 practices selected so that they are representative of the population. Out of these 600 practices, 109 practices provided all information requested. The response rate was not uniform; large practices had higher response rate compared to small practices.

scale for very small practices is challenging to identify as there are only a few very small practices in the sample. It is recommended that further analysis, based on additional targeted data collection, is undertaken to understand the impact of scale on very small practices.

- **Historical allocations.** Differences in net income and costs between general practices may reflect differences in the levels of efficiency, which may be affected by the historical funding allocations; general practices that may have been relatively under-funded have greater pressure to operate efficiently compared to practices that may have been relatively over-funded. Conversely, under-funded practices may be less efficient due to potential lower historical levels of investment.

The data analysis helps to better understand the:

- Composition of general practice costs (staff costs, premises, other expenses);
- Average cost of primary care provision;
- Scale of variation in costs across general practices;
- Factors that impact general practice costs;
- Average partner GP net income; and
- Scale of net income variability and the extent to which there are systematic differences in net income across different types of practices.

The key findings gained from the data analysis are summarised below.

- **Costs composition.** Analysis based on data from a sample of general practices' financial accounts suggests that staff costs are the largest component of general practice costs, accounting for 70% of total costs (partner GP compensation is reflected in practice net income and is not included in practice costs). The second largest component of total costs is premises costs, which accounts for 16% of total costs.
- **Average costs.** The average costs per registered patient, excluding partner GP compensation, in the sample of practices analysed is £76 per year. Partner GP compensation is not recorded under practice expenses but is included in general practice net income. If net income is included in practice costs, as a proxy for partner GP compensation, then the average cost per registered patient in the sample of practices analysed is £145 per year.
- **Costs variability.** There is considerable variation in total costs and total costs per patient across general practices analysed; average costs per patient typically ranges between £49 and £110 per year.
- **Factors that impact costs.** Scale and practice location have a statistically significant impact on general practice costs: smaller practices tend to exhibit higher costs per patient than larger practices, and remote practices have higher costs per patient than practices located in urban or accessible areas.
- **Average net income per partner GP.** The average annual net income (NHS and non-NHS) per whole time equivalent partner GP is £98,700, (see section 3 for details around the calculation of whole time equivalent partner GP net income).⁴
- **Net income variability.** There is considerable variation in average net income per partner GP between practices. Some of the evidence also indicates that there are systematic differences in net income between different practice types. In particular, remote practices have lower net income per partner GP than urban or accessible practices, and larger practices have higher net income per GP than smaller practices. Also, the lower the number of partner GPs per registered patient and the lower the number of partner GPs relative to the number of medical staff in a practice, the higher the net income per partner GP.

⁴ The ratio of non-NHS to NHS income cannot be calculated based on the data available.

Funding allocation model

On the basis of sector engagement and data analysis, two core funding allocation model scenarios were identified by stakeholders.

- 1. Scenario 1: Improved version of SAF.** An improved version of the existing model, where the workload and unit cost components are estimated on the basis of the 2016 review and recommendations of this study.
- 2. Scenario 2: Separate funding models for different types of costs.** Some stakeholders suggested a model whereby different types of practice expenses are funded through different funding mechanisms. For example, it was suggested that partner GP compensation (and potentially salaried GP expenses) and practice expenses are separated and funded through different allocation models and/or are directly reimbursed. The motivation for this model, according to sector experts, is to deal with increasing expenses, standardise the number of GPs and other medical staff per registered patient, and provide greater income security.

Scenario 1 is based on the existing framework, but suggests improvements to the SAF, whereas scenario 2 constitutes a significant change in the funding allocation framework.

Conclusion

It is recommended that additional work is undertaken, as follows:

- Given the limitations associated with the data used in this study, additional data and analysis would be required. In particular, it is recommended to collect and incorporate additional data in order to:
 1. Make the sample more representative of the population; and
 2. Increase the number of small and remote practices in the sample.
- Scenario 2 represents preliminary ideas and not a fully developed funding model. If scenario 2 is further pursued, it will need to be developed and tested.

The findings of this report have been reviewed by the RAG and should be seen in light of limited data availability.

1 Introduction

1.1 Background: Funding of general practices in Scotland⁵

In 2015/16 there were 984 practices in Scotland which received £753.9 million funding from NHS Scotland. The majority of the funding was allocated to 17J practices⁶ which accounted for 81% of all practices. 17C and 2C practices accounted for 13% and 6% of all practices respectively in 2015/16.⁷

Since 2004, when the existing contract was introduced, the allocation of primary care funds to practices has accounted for differences in a number of factors.

- **Workload.** Practices that have more patients registered and/or have patients with high relative healthcare need to receive more funding.
- **Excess unit costs.** Different practices may have different costs due to external factors, for instance, location. The formula aims to compensate practices for unavoidably “excess” costs.
- **Services provided.** Practices’ funding depends on the type of non-core or enhanced services they provide.⁸
- **Quality of Outcomes Framework (QOF; 17J only).** Up until 2015/16, 17J practices received a performance-based payment based on QOF.⁹
- **Premises costs.** Practices are reimbursed for their premises expenses on the basis of an estimation of the rental value of the property.
- **Other factors.** Such as GP experience (seniority payment) and correction factor payments.¹⁰

The payments associated with workload and excess unit costs are covered by the Global Sum, the largest component of the payment to general practices, which accounted for c.62% of the total funding in 2015/16. The other major payment to general practices is related to enhanced services, which accounted for c.14% of total funding in 2015/16.

The Global Sum is allocated to practices on the basis of the Scottish Allocation Formula (SAF) and accounts for both workload and excess unit costs. These factors were estimated for the 2004 contract using patient and general practice data on consultation numbers, list size, demographic composition and income.

The Global Sum is allocated to general practices on the basis of historical QOF and a weighted capitation using data and statistical techniques, whereas other payments are based on either actual costs, enhanced services payment or lump sums.

⁵ This section is primarily drawn from: Information Services Division - NHS Scotland (2016). NHS Scotland Payments to General Practice: Financial Year 2015/16; available at: <http://www.isdscotland.org/Health-Topics/General-Practice/Publications/2016-11-01/2016-11-01-ScotlandGPPayments2015-16-Report.pdf>.

⁶ Also called General Medical Services (GMS) practices.

⁷ 17J practices have contracts that are nationally negotiated with some local flexibility for GPs to “opt out” of certain services or “opt in” to the provision of other services. 17C practices (formerly known as Personal Medical Services or PMS) have locally negotiated agreements which can be flexible in accordance with local circumstances. 2C are practices that are typically run by Health Boards.

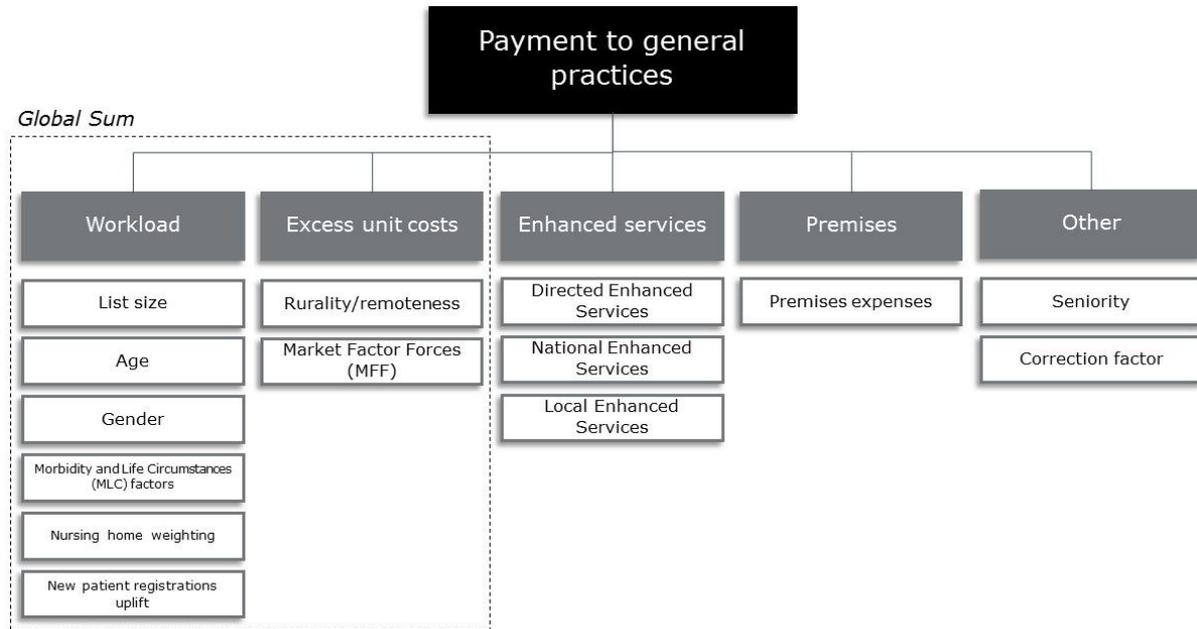
⁸ Apart from the core services which all practices are required to provide, there are services for which practices have the flexibility to opt-in or opt-out.

⁹ The QOF measured a general practice’s achievement against a set of indicators designed to promote good practice (Information Services Division – NHS Scotland (2016). Quality and Outcomes Framework Prevalence, achievement, payment and exceptions data for Scotland, 2015/2016). QOF budget has now been moved to Global Sum.

¹⁰ Some practices receive a Minimum Practice Income Guarantee (MPIG) payment used to top up their income and match their basic income levels to their income levels before the 2004 contract was introduced. The payments made under MPIG are called correction factor payments.

The main payments made to general practices are summarised in Figure 1 (QOF payments were made until 2015/16 are not included in the figure).

Figure 1: Payments to general practices in Scotland



1.2 Recent developments

In 2016, the Scottish Government undertook a review of the SAF, particularly focused on the methodology underpinning the estimation of the workload and excess unit costs (2016 review)¹¹ and made recommendations about the workload and unit costs components.

- **Workload dimension of the SAF.** The review proposed a more comprehensive approach to estimate differences in healthcare need across practices.¹² The review also applied the recommended approach and provided revised estimates of relative need.
- **Excess unit costs dimension of the SAF.** The review of the excess unit cost methodology identified a number of limitations and proposed an alternative approach. Due to the lack of available data, a revised estimation of the excess unit costs was not feasible.

1.3 Objectives of this study

In this context, the Scottish Government, in collaboration with the SGPC, commissioned Deloitte to collect quantitative and qualitative information with the aim to gain a better understanding of the variation in general practice earnings and expenses.

In particular, the objectives of this study are to:

- Gain a better understanding of the differences in general practice net income and expenses;
- Assess the scale of net income variability across general practices and the extent to which there are systematic differences in net income between different practice types;
- Understand the impact of different factors such as scale and remoteness on expenses;
- Undertake selected discussions with the sector to collect views about the existing funding allocation model and potential ways to improve it; and

¹¹ Deloitte (2016). Scottish Allocation Formula: GMS workload model; and Deloitte (2016). Scottish Allocation Formula – General Medical Services: Unit cost formula review.

¹² In 2004, the impact of age and gender was modelled separately from the impact of deprivation and other Morbidity and Life Circumstances factors (MLC) whereas in the 2016 review the impact of all these factors was modelled within the same framework. The methodology proposed in the 2016 review provides, in principle, more accurate estimates of relative need.

- On the basis of the data analysis and sector engagement, set out alternative scenarios around possible changes to the existing funding allocation model.

The work carried out as part of this study was overseen by the Research Advisory Group (RAG), a group of sector professionals from the Scottish Government, Health Boards and BMA, which provided advice on different aspects of the study.

1.4 Limitations of this study

The analysis presented in this study should be interpreted considering the scope and limitations set out below.

- **Scope.** The objectives of this study focus on different aspects of the relative allocation of funds across general practices, as opposed to the total quantum of funds, which is outside the scope of this study. Also, the study does not look at workforce requirements to deliver primary care services.
- **Sample representativeness limitation.** The data analysis presented is based on a sample of Scottish general practices, which is relatively representative of the population in terms of location and deprivation. However, the sample over-represents large practices and under-represents small practices (see Appendix B). Due to this, the results of the analysis may over or underestimate the cost and net income variability, and the impact of scale and remoteness on costs.
- **Sample size limitation.** The sample contains 15 practices located in remote areas (14% of all practices in the sample; see Appendix A for further details on the sample composition). Given the relatively small sample of remote practices, the estimated differences in costs and net income between remote and other practices may be subject to estimation error.
- **Historical allocations.** Differences in net income and costs between general practices may reflect differences in the levels of efficiency, which may have been affected by the historical funding allocations; general practices that may have been relatively under-funded have greater pressure to operate efficiently compared to practices that may have been relatively over-funded. Conversely, under-funded practices may be less efficient due to potential lower historical levels of investment.
- **Scenarios.** The scenarios presented in this study have been determined by discussions with sector stakeholders and are still under development. As such, a cost-benefit analysis would need to be undertaken at a later stage when the scenarios are better defined.

Due to these limitations, the results of the analysis should be viewed as directional. The scenarios will need to be developed and tested should they be pursued further.

The remainder of this study is organised as follows:

- **Section 2** describes the over-arching methodology used in this study;
- **Section 3** summarises the results of the data analysis, which is based on summary statistics and regression analysis;
- **Section 4** summarises the key insights gained from the sector engagement;
- **Section 5** sets out alternative funding allocation model scenarios;
- **Appendix A** provides a detailed summary of the data used;
- **Appendix B** sets out the results of the sample representativeness analysis;
- **Appendix C** provides summary statistics of the data collected;
- **Appendix D** describes the regression model structure; and
- **Appendix E** sets out detailed results of the regression analysis.

2 Methodology

This study consists of three overarching steps:

- Step 1 uses data analysis to understand the variation in practices' costs, net income and staff composition;
- Step 2 involves engagement with a number of sector experts to gather the sector's views around the existing allocation formula and potential ways to improve it; and
- Step 3 synthesises the insights collected from the data analysis and engagement with the sector, and sets out alternative funding allocation model scenarios.

This overarching methodology is illustrated in Figure 2 and further discussed in the remainder of this section.

Figure 2: Over-arching methodology



2.1 Step 1: Data analysis

The data analysis is primarily based on financial and other data collected directly from a sample of Scottish general practices. In particular, 600 practices were contacted and asked to provide their 2015/16 financial accounts together with other information, requested in the form of a questionnaire. Out of these 600 practices, 109 practices provided their financial accounts and a completed questionnaire. The data provided by these 109 practices formed the core part of the quantitative information used in this study. Further details about the information request, the data collected and representativeness of the sample are provided in Appendix A and B.

The data analysis is based on two types of analysis.

- **Summary statistics.** These include the mean and other statistics that describe the distribution of the variables of interest (costs, net income and staff composition).
- **Regression model.** The regression model is designed to quantify the impact of a variable of interest such as scale on expenses whilst controlling for the effect of other factors, such as remoteness. The regression model is a multivariate approach and, in principle, provides more accurate estimates of the underlying relationships compared to summary statistics. The structure of the regression model is set out in Appendix D.

The regression analysis aims to better understand the impact of scale, location and deprivation on costs. The motivation for this analysis is discussed below.

- **Scale: Due to economies of scale, larger practices have lower costs per patient compared to smaller practices.** The existing allocation formula does not explicitly recognise that unit costs may vary between practices due to (unavoidable) differences in list sizes; however, small practices are implicitly compensated through the correction factor. The motivation for testing this hypothesis is that if there are significant economies of scale in the provision of primary care services, then the funding allocation formula could be potentially improved by taking differences in scale into account.
- **Location: Remote practices have higher costs per patient than other practices.** The existing funding allocation formula makes a rurality and remoteness adjustment according to which rural and remote practices receive more funds than urban practices. As considered in the 2016 review of the SAF, the approach used to estimate the rurality/remoteness adjustment is subject to a number of limitations.¹³ The objective is to assess, within a more robust framework, the degree to which rurality/remoteness impose additional costs on general practices.
- **Deprivation: Practices in deprived areas have higher costs per patient than practices located in affluent areas.** Practices in deprived areas may have higher costs due to higher workload associated with the registered population's relative need. This hypothesis was tested in the 2016 review of the SAF and it was found that, after controlling for age, gender and other factors, patients in deprived areas have higher need. Furthermore, practices in deprived areas may have higher costs due to staff recruitment and retention challenges, i.e. it is possible that practices in deprived areas find it more difficult to recruit and retain staff and as a result have higher staff costs. This is tested in this study.

2.2 Step 2: Sector engagement

As part of the sector engagement, telephone interviews with 24 sector experts were conducted between February and June 2017. The sector experts were selected from the RAG and comprised GPs (12), individuals from Health Boards (5), the Scottish Government (5) and academia (2).

The objective of the engagement with the sector was to: (1) understand the sector's views around the existing allocation formula (limitations and possible ways to improve it); (2) collect insights around the current challenges in primary care and (3) gather ideas about possible scenarios for alternative funding allocation models. Discussions with the sector experts were carried out to inform the work undertaken in this study and any changes to the funding allocation model would require significant additional engagement with the sector.

2.3 Step 3: Synthesis

This final step brings together the insights from Steps 1 and 2, developing a set of preliminary scenarios for future funding allocation models.

¹³ The most important limitations was that the estimation of the rurality/remoteness adjustment was based on practices' pre-2004 income and not practices' costs. See Deloitte (2016). Scottish Allocation Formula – General Medical Services: Unit cost formula review.

3 Data analysis: findings

The two main variables analysed were the general practice costs per patient and average net income per Whole Time Equivalent (WTE) partner GP.

- **Costs per patient.** Costs per patient are computed using both total and staff costs¹⁴, and both unweighted and weighted list size: the unweighted list size is the number of patients registered with a practice; and the weighted is the list size weighted by patient age, gender, deprivation and other socio-economic factors. The weighted list size is a measure of case-mix adjusted list size. The weighted list size is employed to control for differences in practices' demographics and workload, and to capture the excess costs associated with scale, location and deprivation. The weighted list size was obtained from the 2016 workload model (see Appendix A for further details on how this variable was constructed).
- **Average net income per WTE partner GP.** Average net income per WTE partner GP is defined as total practice net income, obtained from practices' 2015/16 financial accounts, divided by the number of WTE partner GPs. The latter is calculated as the total number of hours worked by partner GPs, obtained from the questionnaire, divided by 40, i.e. one WTE is expected to work 40 hours per week. This assumption was informed by the RAG.

This section is organised in the following order:

- Section 3.1 provides a number of summary statistics on costs, net income and staff composition for the general practices in the sample; and
- Section 3.2 investigates the relationship between costs and scale, location and deprivation.

The key results of the data analysis are summarised below.

- **Costs composition.** Staff costs are the largest component of general practice costs, accounting for 70% of total costs. The second largest component of total costs is premises costs, which accounts for 16% of total costs.
- **Costs variability.** There is considerable variation in average costs in the sample of general practices analysed, typically ranging between £49 (bottom decile) and £110 (top decile) per registered patient.
- **Net income variability.** There is considerable variation in average net income per WTE partner GP between practices, typically ranging between £60,000 (bottom decile) and £130,000 (top decile). There is also some evidence that indicates that there are systematic differences in net income between different practice types. In particular, it is found that remote practices have lower net income per partner GP than urban or accessible practices, and that larger practices have higher net income per GP than smaller practices.
- **Impact of scale on costs.** Economies of scale in the provision of primary care services in Scotland is found; smaller practices tend to exhibit higher costs (both total and staff costs) per patient than larger practices.
- **Impact of location on costs.** It is found that remote practices have significantly higher costs (both total and staff costs) per patient than practices located in urban or accessible areas. This is the case even after controlling for the impact of scale and other factors on costs.
- **Impact of deprivation on costs.** Once the impact of scale, workload associated with patient case-mix (including deprivation) and location is controlled for, no differences in costs per patient between practices located in areas with different levels of deprivation is identified.

¹⁴ General practice costs reported in financial accounts do not capture the partner GP compensation which is reflected on the general practice net income. The analysis is primarily focused on costs excluding partner GP compensation.

These results should be interpreted with care due to the limitations associated with the sample representativeness and sample size, as set out in Section 1.

3.1 Exploratory data analysis

This section sets out summary statistics of general practice costs, net income and staff composition.

3.1.1 General practice costs

This section provides summary statistics on general practice costs for the general practices in the sample.

- **Costs composition (Figure 3).** Staff costs are the largest component of general practice costs, accounting for 70% of total costs (partner GP compensation is reflected in practice net income and is not included in practice costs). The second largest component of total costs is premises costs, which accounts for 16% of total costs.
- **Staff and premises costs (Figure 4).** On average, staff costs are around £380,000 per year and premises costs are around £83,000 per year.
- **Costs variability (Table 1, Figure 5 and Figure 6).** There is considerable variation in total costs and total costs per patient. With regards to the latter, there are practices that have costs per patient greater than £200. These are practices that provide significant dispensing services. Variation in costs may be partly explained by the workforce composition (see regression analysis in the next section): partner GP compensation is not included in staff costs, it is part of net income. As such the higher the partner GP to medical staff ratio, the lower the costs reported in general practices' financial accounts, all other things being equal.
- **Costs variability in remote practices (Figure 7 and Figure 8).** The variability in total costs per patient is larger in remote practices compared to practices located in urban or accessible areas.

Figure 3: Cost composition

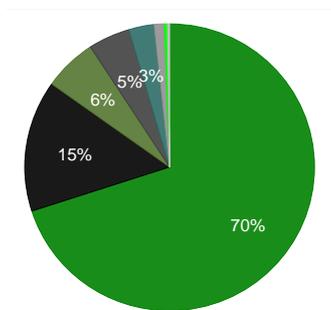
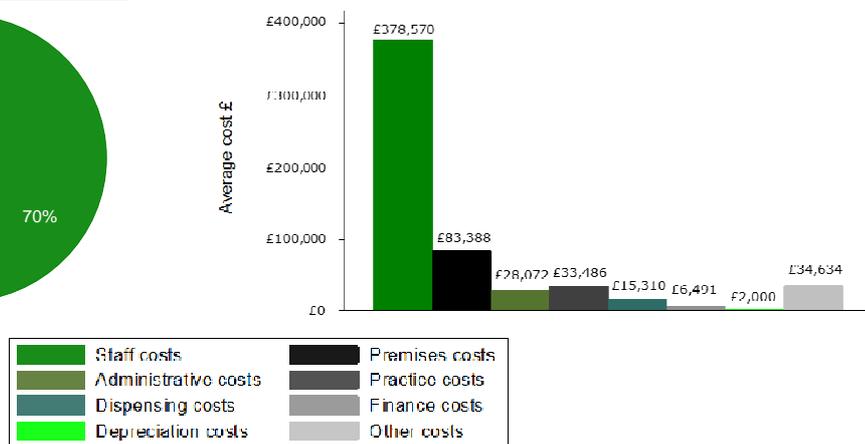


Figure 4: Average total cost by type



Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland

Table 1: Distribution of general practice costs

	Mean	Standard deviation	P10	P25	P50 (median)	P75	P90
Total costs (excluding dispensing)	£0.53m	£0.29m	£0.21m	£0.32m	£0.47m	£0.68m	£0.86m
Cost (excluding dispensing) per patient	£76.5	£36.7	£48.9	£55.7	£66.8	£82.2	£109

Notes: Average practice costs per patient is computed by dividing total practice costs by the list size; Dispensing costs include the costs of drug purchases, but not staff and other costs associated with the provision of dispensing services; Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

Figure 5: Variation in total costs

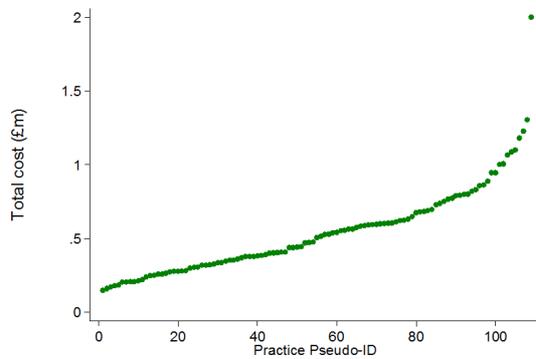
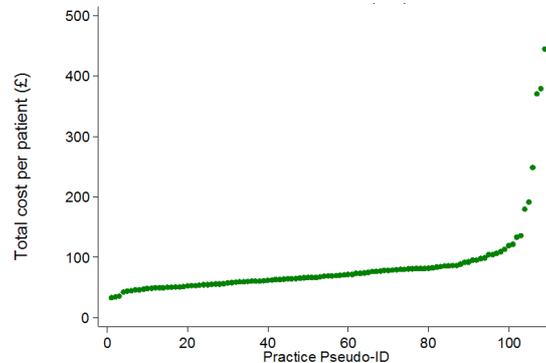


Figure 6: Variation in total costs per patient



Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland

Figure 7: Cost per patient by area type

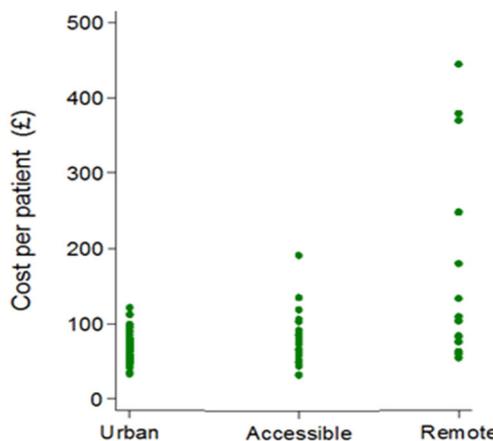
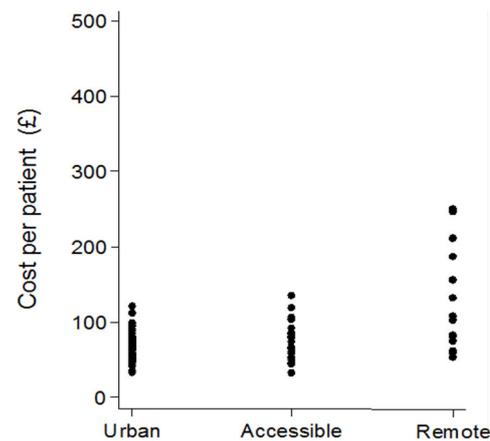


Figure 8: Cost per patient (excluding dispensing) by area type¹⁵



Notes: The area classification is based on the 8-fold Scottish Government Urban Rural Classification; Urban: Large Urban and Other Urban areas (rural/urban classifications 1,2); Accessible: Accessible Small Towns and Accessible Rural (rural/urban classifications 3,6); Remote: Remote Small Towns, Very Remote Small Towns, Remote Rural, Very Remote Rural (rural/urban classifications 4,5,7,8); Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

¹⁵ While the costs of dispensing drugs is removed, it isn't possible to remove the proportion of staff costs that directly relate to dispensing, which will affect average non-dispensing staff costs.

3.1.2 Partner GP net income

Table 2 provides a set of summary statistics on practice average net income of WTE partner GPs within the sample. At the mean practice, average annual net income per partner GP is £99,000¹⁶, however, there is significant variability across general practices.¹⁷ The difference between the 25th (p25) and 75th (p75) percentile of the net income distribution of the practices within the sample is £32,000 and the difference between the 10th (p10) and 90th (p90) percentile is around £64,000.¹⁸ There are practices whose partner GPs on average earn less than £60,000 and over £130,000; however, these values may be the result of measurement error.¹⁹

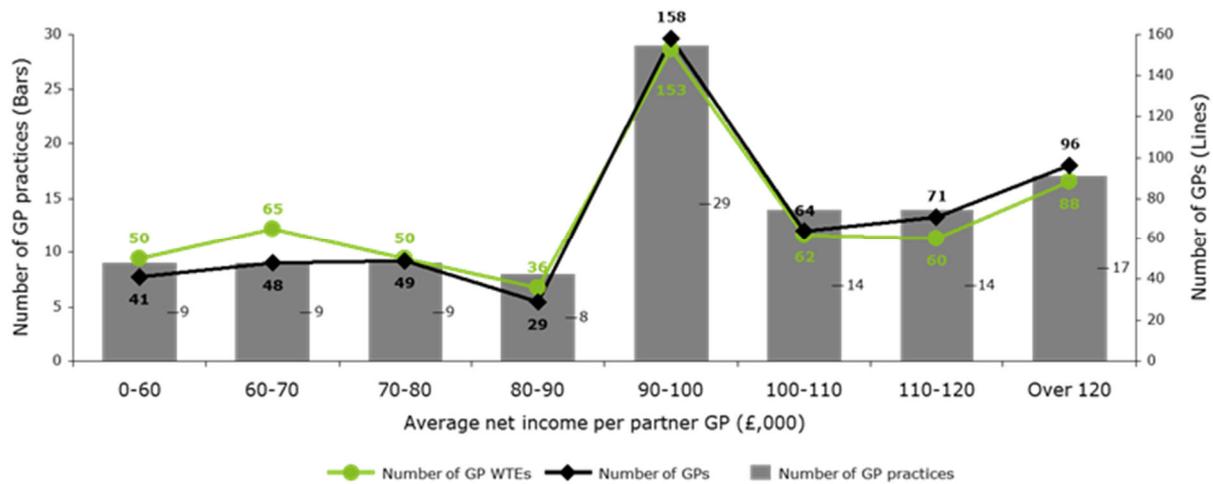
Table 2: Distribution of practice average net income of partner GPs (WTE) (£, 000s)

Mean	Standard deviation	p10	p25	p50 (median)	p75	p90
£99	£29	£63	£80	£98	£112	£128

Notes: Net income per partner GP is expressed in terms of Whole Time Equivalent; p10, p25, p75 and p90 indicate the 10th, 25th, 75th and 90th percentile, respectively; p50 is the 50th percentile or median; Source: Deloitte analysis based on Practices' Financial Accounts and Questionnaire.

Figure 9 shows the distribution of practice average net income per partner GP and highlights the wide variation in the net income observed in the sample of practices analysed.

Figure 9: Distribution of practice average net income of partner GPs (WTE) (£, 000s)



Notes: Net income per partner GP is expressed in terms of Whole Time Equivalent; Source: Deloitte analysis based on Practices' Financial Accounts and Questionnaire.

¹⁶ This value is broadly consistent with the £90,400 average net income reported by NHS Digital for Scottish GMS partner GPs in 2014/15. The difference between the value reported by NHS Digital and the value reported in this study could be explained by differences in the methodology. For example, NHS Digital uses headcount as opposed to WTEs.

¹⁷ The average net income per partner GP reported is based on the assumption that a WTE partner GP works 40 hours per week. If instead a 37.5 hours per week is assumed, the average net income per partner GP is c. £92,600.

¹⁸ A percentile is a measure used in statistics indicating the value below which a given percentage of observations in a group of observations fall. For example, the 10th percentile is the value below which 10% of the observations are found. The 75th percentile is the value below which 75% of the observations are found. If a partner GP has net income in the 90th percentile, that means that he or she earns more than 90% of the partners in the sample.

¹⁹ General practices were asked to provide the number of hours worked by partner GPs in a typical week. This information was used together with the net income information obtained from practices' financial accounts to compute the net income per WTE partner GP. It is recognised that the "number of hours worked in a typical week" is an approximation of the average number of hours actually worked by GPs and, in some cases, it may be subject to non-negligible errors. Furthermore, net income at the extremes of the distribution may have been affected by non-recurrent income and expenses.

The net income variability observed in the sample is broadly consistent with anecdotal evidence and the sector's views that there is great variability in practice earnings (see Section 4). This variability could be explained by three factors.

- **Distortions introduced by the funding allocation formula.** The allocation formula and income received by NHS Scotland may not reflect expenditure incurred..
- **Differences in efficiency.** General practices may operate at different levels of efficiency.
- **Differences in quality.** Quality of service associated with consultation and waiting times may also vary across practices.

These explanations are generally consistent with the sector's views (see Section 4). Several sector experts interviewed, including GPs, considered that variation in net income across practices could be explained not only by distortions associated with the allocation formula, but also differences in efficiency and quality of service. With regards to the latter, it was suggested that greater standardisation in the workforce models could be achieved.

The figures below set out the average net income per partner GP by area type, deprivation and list size (additional analysis is presented in Appendix C).

- **Area type (Figure 10).** There is some evidence indicating that partner GPs in urban practices earn more than partner GPs in remote practices.²⁰ The difference in the mean net income is around 11% (£101,000 in urban practices versus £93,000 in remote practices); however, there is no difference in the median income between urban and remote practices. The difference in net income between urban and accessible practices depends on whether the mean or median is used, but it is relatively small. The results should be interpreted with care given the low number of remote practices within the sample. Furthermore, statistical testing suggests no significant differences in the mean of average net income per partner GP (WTE) between area types (the results of the statistical tests could have also been affected by the small number of remote practices).
- **Deprivation (Figure 11).** No correlation between average net income and deprivation is found. Average net income per partner GP appears to be around £98,000 across all deprivation quintiles.^{21,22}
- **List size (Figure 12).** There is some evidence to suggest that larger practices have higher net income per partner GP than smaller practices. However, the relationship is relatively weak; the correlation between net income and list size is c.21%.

²⁰ The area classification is based on the 8-fold Scottish Government Urban Rural Classification; Urban: Large Urban and Other Urban areas (rural/urban classifications 1, 2); Accessible: Accessible Small Towns and Accessible Rural (rural/urban classifications 3, 6); Remote: Remote Small Towns, Very Remote Small Towns, Remote Rural, Very Remote Rural (rural/urban classifications 4, 5, 7, 8).

²¹ The deprivation quintiles are based on the Morbidity and Life-time Circumstances (MLC) estimates from the 2016 workload model (see Appendix A). The quintiles effectively divide practices into five groups of equal size (each group contains 20% of all practices in the sample); Quintile 1 is the most deprived and Quintile 5 is the least deprived.

²² Statistical testing suggests no statistically significant differences in average net income by deprivation quintiles.

Figure 10: Average net income of a WTE partner GP by area type

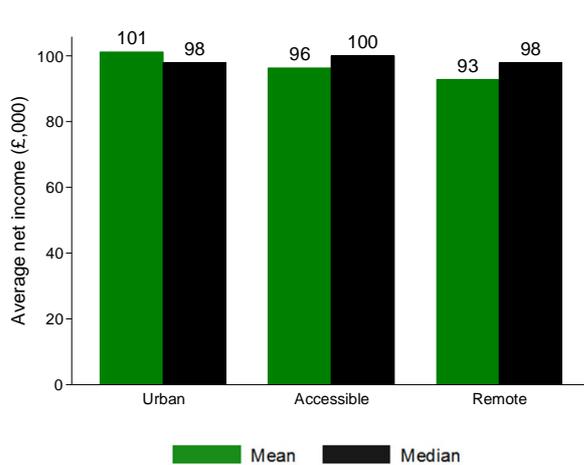
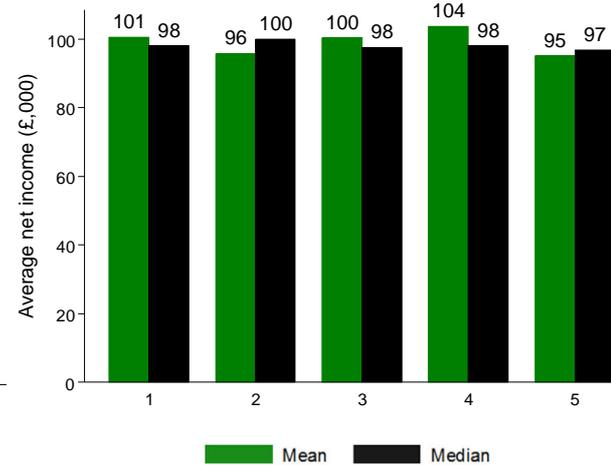
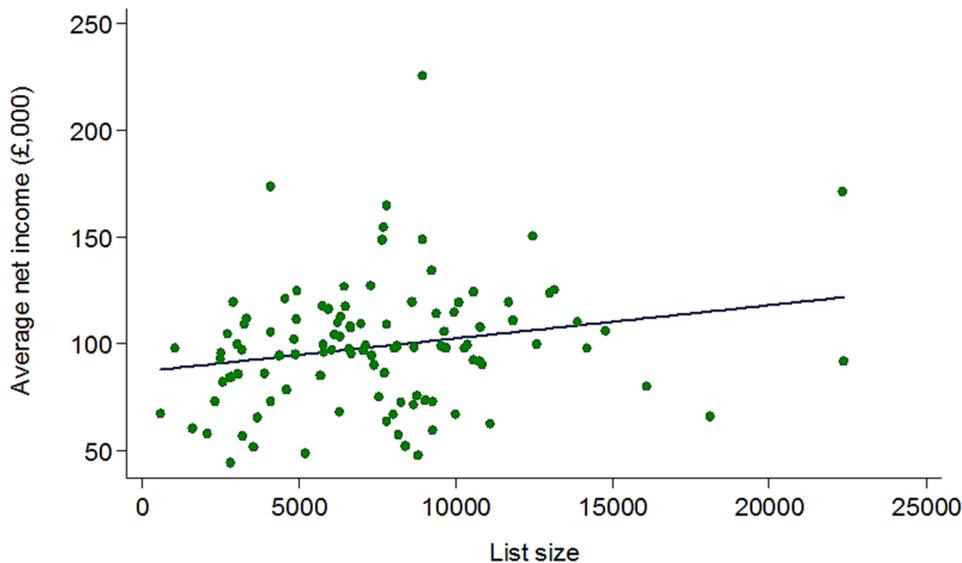


Figure 11: Average net income of a WTE partner GP by deprivation quantile



Notes: Net income per partner GP is expressed in terms of WTE; The area classification is based on the 8-fold Scottish Government Urban Rural Classification; Urban: Large Urban and Other Urban areas (rural/urban classifications 1,2); Accessible: Accessible Small Towns and Accessible Rural (rural/urban classifications 3,6); Remote: Remote Small Towns, Very Remote Small Towns, Remote Rural, Very Remote Rural (rural/urban classifications 4,5,7,8); The deprivation quantiles are based on the Morbidity and Life-time Circumstances (MLC) estimates from the 2016 workload model (see Appendix A); The quantiles effectively divide practices into five groups of equal size (each group contains 20% of all practices in the sample); Quantile 1 is the most deprived and Quantile 5 is the least deprived; Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

Figure 12: Average net income per partner GP (WTE) (£, 000s) and unweighted list size



Notes: Net income per partner GP is expressed in terms of WTE. Unweighted list size is the number of patients registered with a practice. Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

Also, there is some evidence to suggest that the lower the number of partner GPs per registered patient and the lower the number of partner GPs relative to the number of medical staff in a practice, the higher the net income per partner GP (see Appendix C).

Overall, the evidence presented in this section suggests that there is considerable variation in average net income per partner GP between practices within the sample. There is some indication that there are systematic differences between urban and rural practices, and large and small practices. Distortions associated with the allocation formula could possibly drive the observed variability in net incomes; however, there might be other factors that have contributed to net income disparities.

3.1.3 Variation in staff composition

This section provides summary statistics on general practice medical staff composition for the practices in the sample.

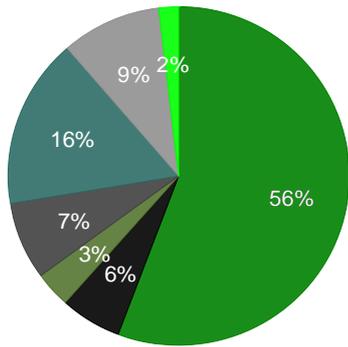
- **Number of GPs (Table 3).** Most of the practices are run by partner GPs with no support from salaried GPs, albeit there are some practices that have a large number of salaried GPs.
- **Clinical staff (Table 3).** The average number of clinical staff (salaried GPs, nurses and other health workers) per partner GP is 0.86 WTE.
- **Medical staff composition (Figure 13).** Partner GPs account for around 56% of all medical workforce (WTE); the second largest type of workforce is treatment room nurses, accounting for 16% of all medical workforce (WTE).
- **Average number of medical staff (Figure 14).** On average, there are 5.2 partner GPs (WTE) and 0.54 salaried GPs (WTE) per practice.
- **Medical staff salaries (Figure 15).** Average annual WTE salaries for salaried GPs within the sample is around £70,000; advanced nurses and treatment nurses are paid around £42,000, and £39,000 per year (WTE). These estimates should be interpreted carefully as they are based on a small sample of staff (see Figure 16).
- **GP contact minutes (Figure 17 and Figure 18).** GPs tend to spend more time per patient in remote areas, relative to urban and accessible areas based on the 2015/16 data. Average GP contact minutes per patient display little variability by deprivation. The only exception is from practices in the second most deprived quintile where GPs appear to spend more time with patients.

Table 3: Variation in staff composition

	Number of Partner GPs (WTEs) per practice	Number of Salaried GPs (WTEs) per practice	Ratio of practice clinical staff to Partner per practice
Mean	5.2	0.5	0.86
Standard deviation	2.9	1.1	0.56
P10	2.1	0	0.38
P25	3.1	0	0.52
P50	4.5	0	0.73
P75	6.6	0.8	1.1
P90	8.6	1.6	1.5

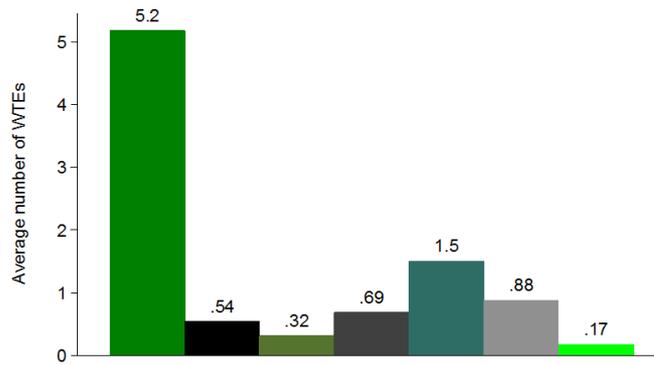
Notes: p10, p25, p75 and p90 indicate the 10th, 25th, 75th and 90th percentile, respectively; p50 is the 50th percentile or median; Source: Deloitte analysis based on Practices' Financial Accounts and Questionnaire.

Figure 13: Average share of medical WTEs by type



■ Partner GPs
■ Other GPs
■ Treatment Room Nurses
■ Other Nurses, HSW and Phlebotomists

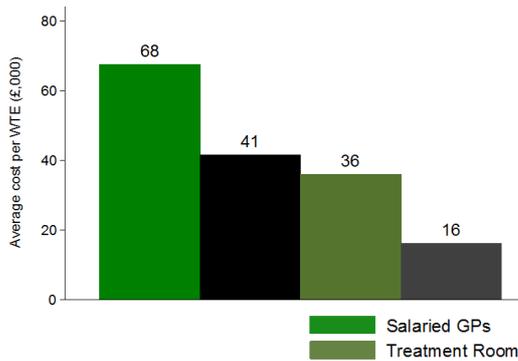
Figure 14: Average number of medical WTEs by type



■ Salaried GPs
■ Assistants

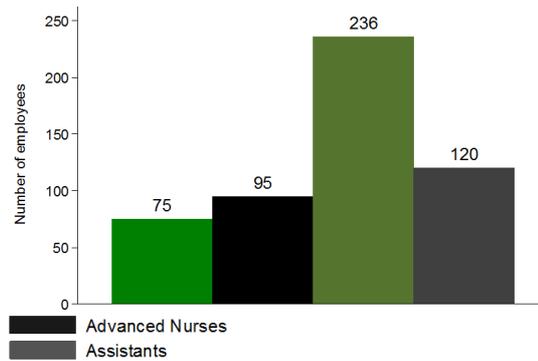
Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland

Figure 15: Average cost per medical WTE by type



■ Salaried GPs
■ Treatment Room Nurses

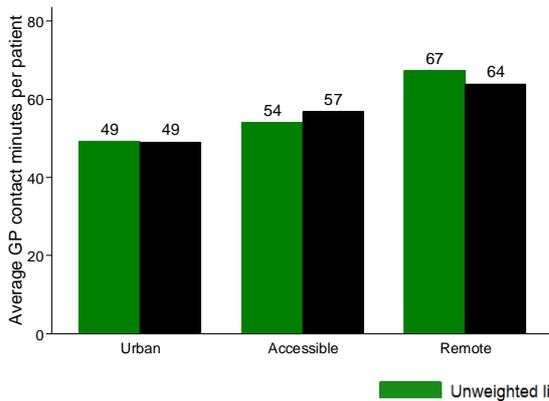
Figure 16: Medical headcount observed in the sample



■ Advanced Nurses
■ Assistants

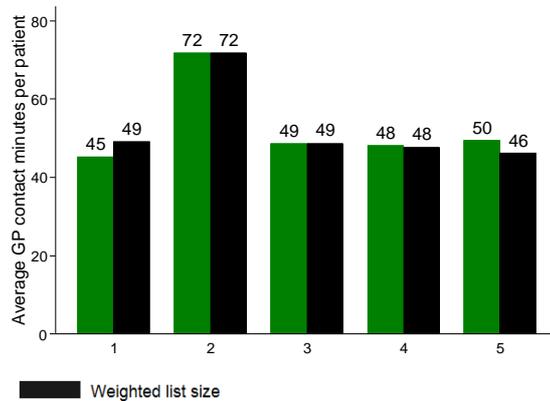
Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland

Figure 17: Average GP contact minutes per patient by area type



■ Unweighted list size
■ Weighted list size

Figure 18: Average GP contact minutes per patient by deprivation quintile



Notes: The area classification is based on the 8-fold Scottish Government Urban Rural Classification; Urban: Large Urban and Other Urban areas (rural/urban classifications 1,2); Accessible: Accessible Small Towns and Accessible Rural (rural/urban classifications 3,6); Remote: Remote Small Towns, Very Remote Small Towns, Remote Rural, Very Remote Rural (rural/urban classifications 4,5,7,8); The deprivation quintiles are based on the Morbidity and Life-time Circumstances (MLC) estimates from the 2016 workload model (see Appendix A); The quintiles effectively divide practices into five groups of equal size (each group contains 20% of all practices in the sample); Quintile 1 is the most deprived and Quintile 5 is the least deprived; Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

3.2 Impact of scale, location and deprivation on costs

3.2.1 Impact of scale on costs

Figure 19 and Figure 20 investigate the relationship between average costs per patient and unweighted list size.²³

Figure 19: Average total costs (excluding dispensing) per patient and unweighted list size

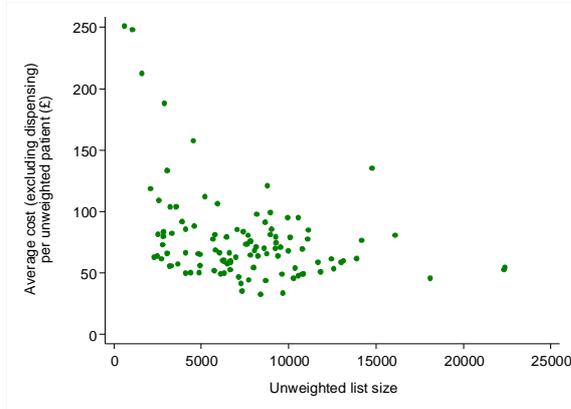
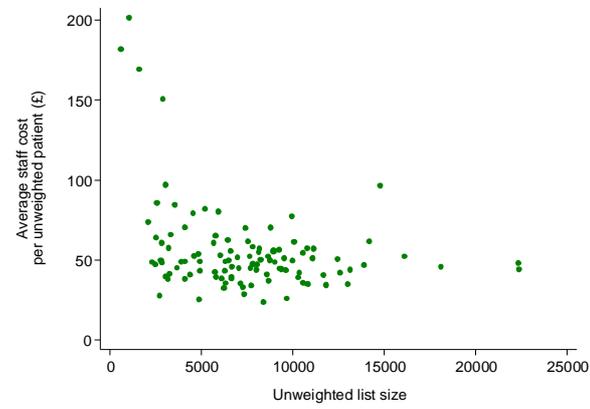


Figure 20: Average staff costs per patient and unweighted list size



Notes: Average practice costs per patient is computed by dividing total (or staff) practice costs by the list size; Dispensing costs include the costs of drug purchases, but not staff and other costs associated with the provision of dispensing services; Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

- These plots provide some evidence indicating that provision of primary care services in Scotland is subject to economies of scale: larger practices appear to have lower costs per patient than smaller practices. This finding is consistent with sector's views that there are economies of scale in the provision of primary care services.
- The relationship is relatively weak as indicated by the wide dispersion of the data points (correlation between costs per patient and list size is around -34%). This also indicates that there might be other factors that drive differences in practices' average costs.
- The results are not sensitive to the measure of costs (total versus staff costs) and measure of list size (weighted versus unweighted list size).

The results of this analysis are consistent with the results of the regression analysis which suggest statistically significant scale effects, even after controlling for the effect of other factors. In particular, it is found that a 10% increase in weighted list size, leads, on average, to a 1.7% decrease in total costs per patient or a 1.1% decrease in staff costs per patient.²⁴

Figure 21 and Table 4 show the distribution of the list size of all general practices in Scotland, indicating significant variation in scale. Together with the estimates discussed above, this would suggest considerable changes in the funding of practices if scale is incorporated in the SAF. It is recommended that the following considerations are taken into account.

- **Unavoidable small scale.** Assess the degree to which small scale is unavoidable. This is a practice used by NHS England²⁵, which makes a scale adjustment in its funding allocation formula for acute providers, considering the availability of alternative providers within a region.²⁶
- **Very small practices.** The impact of scale on very small practices is challenging to identify as there are only a few very small practices in the sample. It is recommended that additional

²³ The relationship appears to be log-linear which is the functional form used in the regression analysis.

²⁴ See Appendix E; Models 1 and 2 respectively.

²⁵ ACRA(2015)36. Costs of unavoidable smallness due to remoteness.

²⁶ This was primarily assessed by looking at patient travel times to alternative providers.

analysis, with targeted data collection, would be required to understand the impact of scale on very small practices.

Figure 21: List size by practice (All Scottish practices)

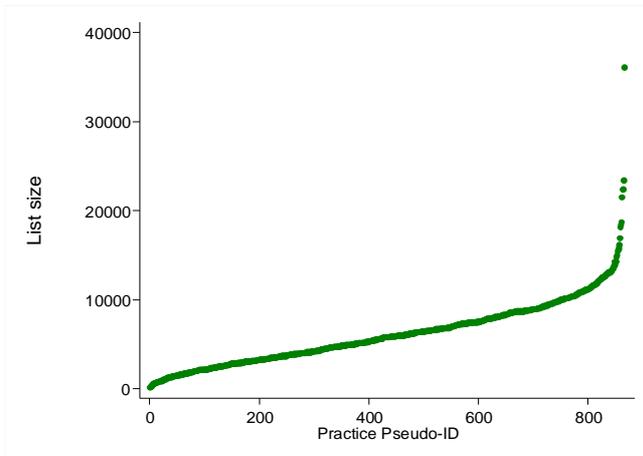


Table 4: List size distribution (All Scottish practices)

List Size	
Mean	6,047
Minimum	124
p10	2,044
p25	3,334
p50	5,697
p75	8,198
p90	10,418
Maximum	36,028

Note: p10, p25, p75 and p90 indicate the 10th, 25th, 75th and 90th percentile, respectively; p50 is the 50th percentile or median; Source: Deloitte analysis on ISD Scotland data

3.2.2 Impact of location on costs

Figure 22 and Figure 23 investigate the relationship between average costs per patient and practice location.

Figure 22: Average practice costs per patient by area type

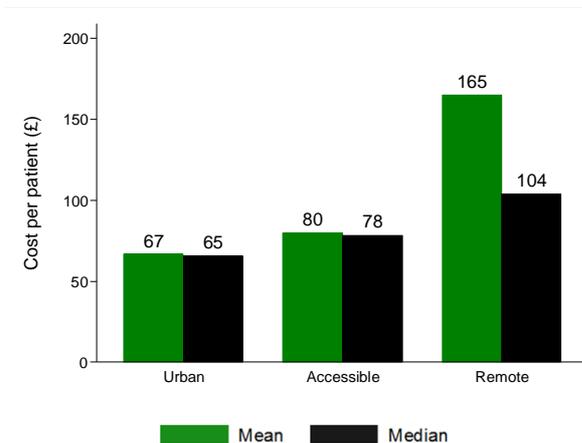
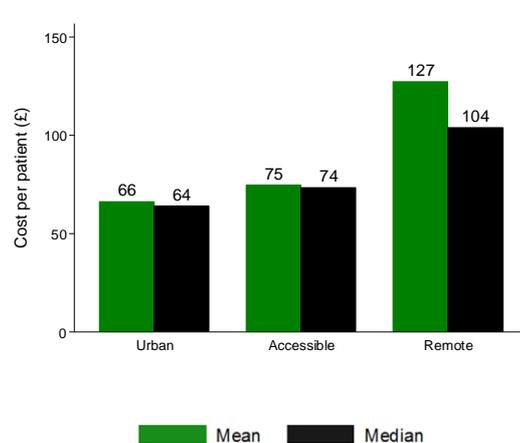


Figure 23: Average practice costs (excluding dispensing) per patient by area type



Notes: The area classification is based on the 8-fold Scottish Government Urban Rural Classification; Urban: Large Urban and Other Urban areas (rural/urban classifications 1,2); Accessible: Accessible Small Towns and Accessible Rural (rural/urban classifications 3,6); Remote: Remote Small Towns, Very Remote Small Towns, Remote Rural, Very Remote Rural (rural/urban classifications 4,5,7,8); Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

- These plots indicate that there are considerable differences in average costs per patient between practices located in remote areas and practices located in urban or accessible areas. Average total costs per patient in remote areas are £165 whereas average total costs in urban and accessible areas are £67 and £80, respectively.²⁷

²⁷ Average funding per patient is also higher in remote areas compared to urban and accessible areas (see Figure 52 in the Appendix).

- The difference in average costs between area types is considerably lower when dispensing costs are excluded.²⁸ Average total costs per patient in remote areas are £127 whereas average total costs in urban and accessible areas are £66 and £75, respectively. This reflects the fact that dispensing practices are primarily located in remote areas.
- The difference in average costs is also lower when the median, instead of the mean, is considered.²⁹
- Statistical testing suggests that the difference in the mean of average costs (both with and without dispensing costs) between different area types is statistically significant.

These results are consistent with the results of the regression analysis, which suggest that practices in remote areas have c.22% higher total costs per patient and c.23% higher staff costs per patient compared to those located in urban areas³⁰. However, the size of the impact varies considerably, based on stability tests conducted (see Appendix E). This could be related to the small sample size for remote practices, discussed in Section 1. Finally, no statistically significant differences are identified in average costs per patient between practices in urban and accessible areas.

3.2.3 Impact of deprivation on costs

Figure 24 and Figure 25 investigate the relationship between deprivation and average total costs per patient and average staff costs per patient, respectively.

Figure 24: Average total costs (excluding dispensing) per patient by deprivation

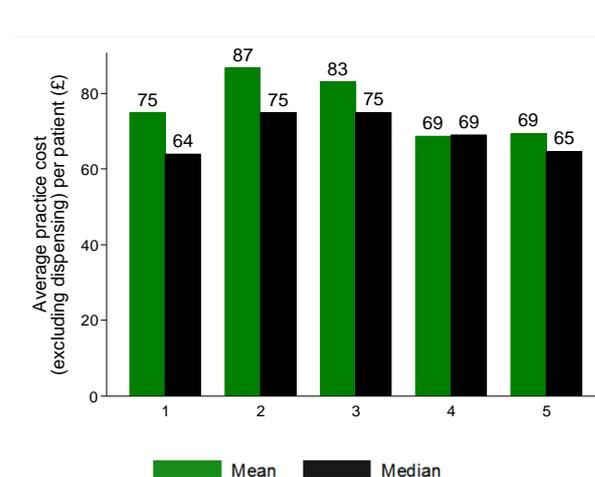
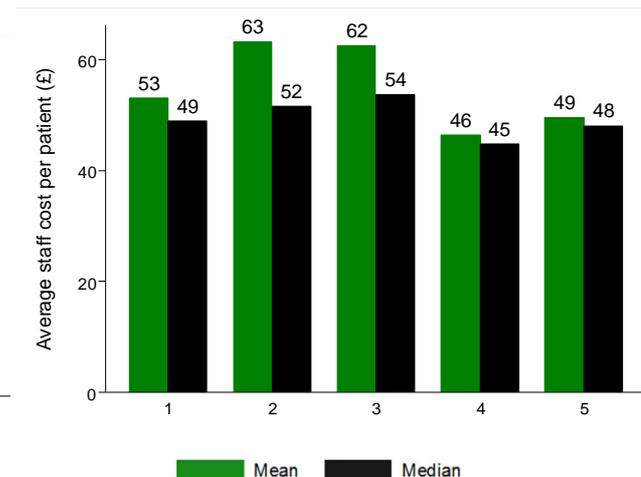


Figure 25: Average staff costs per patient by deprivation



Notes: The deprivation quantiles are based on the Morbidity and Life-time Circumstances (MLC) estimates from the 2016 workload model (see Appendix A) and is based on patient deprivation levels as opposed to the deprivation of the data-zone where the practice is located at; The quantiles effectively divide practices into five groups of equal size (each group contains 20% of all practices in the sample); Quantile 1 is the most deprived and Quantile 5 is the least deprived; Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

- These plots indicate that average costs vary considerably by deprivation. Practices located in the most affluent parts of the country have lower costs than other practices; however, the relationship does not appear to be linear. Practices in the second deprivation quantile have the highest average costs, followed by practices in the third and first quantile.³¹

²⁸ While the costs of dispensing drugs is removed, it isn't possible to remove the proportion of staff costs that directly relate to dispensing, which will affect average non-dispensing staff costs.

²⁹ The mean and the median are two different types of averages. The mean is the more conventional measure, computed by adding up all the data values and then dividing by the number of values. The median is the middle value of a set of numbers that have been ordered from smallest to largest. Although the mean is more commonly used, it can be affected by atypical observations or outliers. The median is less sensitive to outliers.

³⁰ See Appendix E; Models 1 and 2 respectively.

³¹ Statistical testing carried out to assess the statistical difference in the average costs suggested that average costs are not statistically different between different deprivation quantiles.

- The pattern of the variation in average costs per patient across deprivation quintiles is similar between total costs (excluding dispensing) and staff costs.
- The differences in average costs between deprivation quintiles is smaller when the median, instead of the mean, is used to compare average costs.

The regression results suggest that once the impact of scale, rurality and other factors is controlled for, there is no difference in average costs per patient between practices located in different areas of deprivation. The regression results provide, in principle, more accurate estimates than the summary statistics and as such more weight should be placed on these results.

3.2.4 Regression analysis summary

Table 5 provides a summary of the regression model results discussed in the previous sections. The structure of the model is described in Appendix D. Detailed results together with the sensitivity analysis carried out to assess the robustness of the regression output are set out in Appendix E.

Table 5: Regression model results

Variable type	Variable	Impact on Total costs	Impact on Staff costs	Comments
Scale	Weighted list size	Negative (statistically significant)	Negative (statistically significant)	<ul style="list-style-type: none"> • A 10% increase in weighted list size leads to a 1.7% decrease in total costs per patient. • The impact of scale on staff costs is smaller: a 10% increase in weighted list size leads to a 0.9% decrease in staff costs per patient.
Location	Remote	Positive (statistically significant)	Positive (statistically significant)	On average, practices in remote areas have c.19% higher total costs per patient and c.23% higher staff costs per patient compared to those located in urban areas.
Location	Accessible	No identified impact	No identified impact	No statistically significant difference in costs per patient are identified between accessible and urban practices once other factors are controlled for.
Deprivation	MLC Deprivation quintiles	No identified impact	No identified impact	No statistically significant results

Source: Deloitte analysis based on Practices’ Financial Accounts, Questionnaire and ISD Scotland.

4 Engagement with sector experts: key insights

This section summarises the insights gained from engagement with sector experts and is organised across three main areas of discussion:

- Limitations of the SAF and possible ways to improve it;
- Main challenges facing primary care in Scotland; and
- Alternative funding allocation models.

4.1 Scottish Allocation Formula

- **SAF.** A number of stakeholders suggested that the current formula could be improved to better reflect differences in workload and costs across practices. According to sector experts, this is evident from the large difference in earnings across practices (based on anecdotal evidence).
- **Limitations of the SAF.** According to sector experts, there are three key areas where the SAF could be significantly improved: rurality/remoteness, deprivation and scale. However, there was no agreement around the relative importance of these factors.
- **Rurality/remoteness.** The rural GPs interviewed suggested that rural practices have higher workload per patient due to lack of alternative settings of care³² and higher costs per patient due to operating at small scale and travelling costs.³³ Other sector experts interviewed indicated that, apart from higher unit costs due to small scale, there is no clear evidence to suggest that rural and remote practices have materially higher workload or costs than other practices.
- **Deprivation.** Similar to rurality/remoteness, there was no agreement between the sector experts interviewed on the impact of deprivation on workload and costs. Some of the sector experts suggested that the SAF underestimates the impact of deprivation on workload whereas others suggested that patients in affluent areas expect more time from their GPs, which leads to higher workload. Also, practices in less deprived areas have a higher proportion of elderly patients who have higher need.^{34,35}
- **Scale.** There was generally a consensus around the impact of scale on costs. Several sector experts suggested that small practices have higher costs per patient than larger practices. Some experts also suggested that small practices make greater use of locums to cover sick and annual leave which leads to higher than average staff costs.³⁶
- **Incentives.** Some sector experts suggested that the current formula does not provide the right incentives to recruit the appropriate number of staff required to serve the population; partner GPs could avoid recruiting staff with the aim to increase profits.

³² First contact for traffic accidents and other urgent care.

³³ It was also suggested that rural practices find it challenging to recruit staff due to their geographical location and factors associated with lack of amenities, e.g. schools, childcare, location attractiveness and often high cost of living. Also, the level and breadth of staff skill requirements are greater in rural and remote areas than in other areas. In addition, rural GPs suggested they have less opportunities to top-up their income by providing non-NHS services, e.g. serving private clients or providing occupational services. It was also suggested that additional income associated with dispensing generates cash flows but not significant profits.

³⁴ One sector expert suggested that deprivation may increase workload only for older patients (e.g. a 35 year old patient from a deprived area has, on average, similar need to a 35 year old patient from an affluent area).

³⁵ It was recognised by several individuals interviewed that quantifying the impact of deprivation on workload is challenging due to unmet need. One sector expert suggested that an additional adjustment is required, outside the formula, to deal with this challenge.

³⁶ One sector expert suggested that the correction factor associated with the Minimum Practice Income Guarantees, negotiated in the transition to the 2004 contract, might have led to long-term inequalities in practice funding as some practices were more successful in negotiating their MPIG levels than others.

4.2 Challenges

The majority of the sector experts interviewed suggested that there are two key challenges facing primary care in Scotland:

- Financial sustainability of general practices; and
- Recruitment of salaried and partner GPs.

Improvements or changes in the existing funding allocation model was one of the proposed mitigations to these challenges. Other proposals and mitigations are not discussed here as they are outside the scope of this study.

4.3 Alternative funding allocation models

The alternative funding allocation models proposed by the sector experts interviewed can be categorised in four groups.

- 1. Improved version of the existing SAF.** Some stakeholders interviewed suggested that the current independent contractor model could work well with an improved formula (and potentially other contract changes) that allocates funds to practices in a fairer way than the existing SAF.
- 2. Separate allocation models for remote and other practices.** Some individuals suggested two separate contracts for (1) remote practices and (2) urban and accessible practices. The motivation is that remote practices are quite different from other practices and a single funding allocation model cannot fit both types of practices.
- 3. Separate funding models for different types of costs.** Some stakeholders suggested a model whereby different types of costs are funded by different funding mechanisms. This is the second core model which is further discussed in the next section.
- 4. 2C or salaried GP model.** Some sector experts suggested a model whereby practices are run more directly by Health Boards, similar to the 2C contract. This would still require an allocation formula that takes into account differences in workload and costs across practices. The main difference, from an allocation point of view, is that funds would be allocated to Health Boards instead of general practices.

The discussion in the next section focuses on two of these four models: improved version of the existing SAF and a model that uses different funding mechanisms for different types of costs.

A model that builds upon separate allocation formulas for remote practices and urban/accessible practices is not discussed, as differences between remote and other practices could be taken into account within a single model. The analysis presented in this study suggests that remote practices have higher costs than urban practices, but these differences could be sufficiently modelled and taken into account in a single formula. In other words, the analysis did not identify any cluster of practices that are very different from other practices. However, it is recognised that:

- There might be practices that are very idiosyncratic (very small or serve a specific type of population) and alternative funding arrangements may be required (these need to be tested further, with more targeted data collection); and
- The funding determined by an allocation formula might be too low for some remote practices to be financially viable, and therefore additional funding arrangements may be required.

Finally, the 2C / salaried GP model is not considered as it would constitute a significant change in the primary care contract and would require a full evaluation of costs and benefits as well as significant engagement with GPs. This is not within the scope of this study.

5 Synthesis: funding allocation model scenarios

This section combines the insights gathered from the data analysis and sector engagement setting out some scenarios around alternative funding allocation models.

- Section 5.1 discusses the type of factors a fair allocation formula should consider on the basis of the evidence of the data analysis and engagement with the sector.
- Section 5.2 presents the first core funding allocation scenario based on the current SAF.
- Section 5.3 presents the second core funding allocation scenario.

5.1 Funding allocation considerations

Table 6 summarises the key factors previous research and this study have identified as important in determining general practice workload and unit costs. These factors are broadly consistent with the sector's views gathered in the stakeholder engagement undertaken as part of this study.

Table 6: Funding allocation considerations

Factors		Comment
Workload	List size	The higher the number of registered patients, the higher the workload
	Age	Number of consultations (workload) vary significantly by patient age and gender (see the 2016 review of the SAF - workload model)
	Gender	
	Deprivation	Number of consultations also depend on the level of deprivation; the 2016 review found that patients in the most deprived areas have higher utilisation of primary care services than patients in the least deprived areas (even after controlling for age, gender and other factors)
	Other MLC	Apart from deprivation, there are other factors that reflect MLC factors that drive utilisation of services and workload. For instance, the 2016 review of the SAF found that workload is positively related to two variables: limiting long-term illness ratio and a measure of long-term sick and unemployed people (see the 2016 review of the SAF - workload model)
Unit costs	Scale	This study finds that there are considerable economies of scale in the provision of primary care in Scotland; however, this does not mean that all practices that have, for instance, less than average scale should be compensated. Any compensation should consider the degree to which small scale is unavoidable
	Rurality/remoteness	This study finds that remote practices have higher costs per registered patient than other practices. The higher costs may be associated with the complexity of services provided (due to lack of alternative settings of care), travelling times, greater use of locums to provide leave cover, and staff recruitment and retention challenges

Factors		Comment
	Recruitment and retention	There might be differences in average staff costs due to recruitment and retention challenges in deprived and remote areas. With regards to deprived areas, this study is unable to identify statistically significant differences in costs. With regards to remote practices, the higher unit costs for remote practices identified in this study may be due to recruitment and retention challenges

Notes: MLC: Morbidity and Life Circumstances.

5.2 Scenario 1

The existing SAF, in principle, takes account of these factors, with the exception of scale (see Figure 1). However, the methodology that underpins the SAF estimation is subject to important limitations.³⁷

- As discussed in the 2016 review of the SAF³⁸, the estimation of the impact of age and gender on workload in the existing SAF is carried out in isolation of the estimation of the impact of deprivation and other MLC factors on workload, which could lead to considerable over- or under-estimation of workload.
- The existing SAF makes a rurality/remoteness adjustment, but the methodology that underpins the estimation is subject to important limitations. The most significant limitation is that the estimation of the rurality/remoteness adjustment is based on practices' income and not practices' costs.³⁹
- The existing SAF makes an adjustment for differences in wages across regions (Market Forces Factor) using economy-wide data; this adjustment might be inappropriate as it might not reflect differences in wages in primary care.

The first scenario considered here is an improved version of the existing SAF and three are alternative options.

- Update the workload component of the SAF on the basis of the 2016 SAF review.**
- Update the excess unit cost component of the SAF on the basis of the evidence provided in this study and additional analysis.** Given the data limitations discussed in Section 3, it is recommended that additional data are collected and incorporated in the analysis in order to develop a robust estimation of the excess unit costs. Furthermore, additional analysis related to very small practices may be required.
- Update both the workload and excess unit cost components of the SAF.** This combines options (a) and (b).

5.3 Scenario 2

Scenario 2 is based on a model that requires some type of cost separation and uses separate funding mechanisms for different types of costs. The motivation for this model, according to sector experts, is to deal with increasing expenses, standardise the number of GPs and other medical staff per registered patient, and provide greater income security.

Some alternative options proposed by sector experts under this scenario are illustrated in Figure 26.

³⁷ As discussed in the 2016 review of the SAF, the estimation of the impact of age and gender on workload is carried out in isolation of the estimation of the impact of deprivation and other MLC factors on workload, which could lead to considerable over- or under-estimation of workload. The methodology proposed in the 2106 review deals with this limitation.

³⁸ See Deloitte (2016). Scottish Allocation Formula – General Medical Services: Workload.

³⁹ See Deloitte (2016). Scottish Allocation Formula – General Medical Services: Unit cost formula review.

Figure 26: Alternative funding allocation models

	Formula-based	Direct reimbursement
No cost separation	Baseline	
Cost separation	Option A	Option B

- **Baseline.** This indicates the current allocation model where partner GP compensation and practice expenses are implicitly compensated through the SAF.
- **Option A.** Option A indicates a model whereby partner GP compensation (and potentially salaried GP expenses) is separated from practice expenses and separate allocation formulas, one for the partner GP compensation and one for practice expenses, are used to allocate funds.
- **Option B.** Option B is similar to option A but instead of using an allocation formula, it directly reimburses practices for the partner GP time and practice expenses.

Combination of options A and B. An alternative option would be a combination of options A and B whereby partner GP compensation is determined through an allocation formula and practice expenses are directly reimbursed.

These options represent preliminary ideas and are not fully developed funding models. Should these be pursued further, they would need to be developed and tested, taking into account, among other things, the following considerations:

- **Transparency.** Is the funding allocation model transparent in the sense it is clear how the payments are calculated and why different types of practices receive different amount of funding?
- **Complexity.** How complex is it to compute differences in workload and unit costs across practices required to develop a fair funding allocation model? Are the data required to develop a funding allocation model available?
- **Flexibility and incentives.** Does the funding allocation model allow practices to choose the service delivery model that better fits the local population, and does it provide the incentives for practices to innovate and operate efficiently?
- **Standardisation.** Does the funding allocation model facilitate the standardisation of service provision?

Furthermore, any model changes would require significant discussions and potential negotiation with many parties; this is beyond the scope of this study.

6 Appendix A: Data

The core part of the data used in the data analysis was provided directly from general practices. In particular, an information request was sent to a sample of 600 practices asking them to provide their financial accounts and other information requested in the form of a questionnaire. This section provides a summary of the data collected from general practices as well as other sources.

6.1 Data Summary

The dataset used in analysis was collected from four different sources:

- Practices' Financial Accounts;
- Questionnaire;
- ISD Scotland; and
- Scottish Government.

The data analysis presented in this study is based on a sample of 109 practices, determined by the practices that responded to the information request. The information request was initially sent to 150 practices, however, due low response rate (c.10%), an additional 450 practices were contacted. Out of the 600 practices contacted in total, 137 practices responded to the information request (c.23% response rate). 113 practices agreed to provide their financial accounts and 128 practices completed the questionnaire. Overall, 109 practices provided both pieces of information required for the analysis.

The consolidated dataset contains information on earnings, expenses, hours worked, list size and list composition. Table 7 summarises the variables and data sources used in the analysis.

Table 7: Data used in the analysis

Variable Type	Variables	Description	Source
Net income	Total practice net income	Total income minus total expenses	Financial accounts
	Partner GPs' shares of total net income	Share of practices' net income of each partner GP	Financial accounts
Costs	Total practice costs	Total practice expenses including staff, premises and administrative costs	Financial accounts
	Staff costs	Expenses related to wages (by staff), salaries, locums, training and staff wellbeing	Financial accounts and questionnaire
	Premises costs	Expenses related to rent, insurance, maintenance, repairs, cleaning and utilities	Financial accounts
	Administrative costs	Expenses related to stationery, accountancy, legal and professional fees, telephone and printing	Financial accounts
	Practice costs	Expenses related to instruments, consumables, levies and subscriptions	Financial accounts
	Finance costs	Expenses related to interest payments and other bank charges	Financial accounts
	Depreciation	Expenses related to depreciation of equipment and fixtures	Financial accounts
	Other costs	Expenses not included in any of the above categories	Financial accounts

Variable Type	Variables	Description	Source
Income	Total practice income	Total income split by global sum, enhanced services, dispensing, and other income streams	Financial Accounts and ISD Scotland
Headcount	Workforce headcount	Headcount split by workforce type: partner GPs, salaried GPs, other GPs, advanced nurses, treatment room nurses, assistants, and other nurses and phlebotomists	Questionnaire
Hours worked	Number of hours worked in a typical week	Practices were asked to state for each individual member of workforce the number of hours spent in a typical week	Questionnaire
	Number of sessions on an average week	Practices were asked to state the number of sessions provided on an average week by partner and salaried GPs	Questionnaire
	Average duration of a session (hours)	Number of hours that constitute a standard GP session	Questionnaire
Contract type	17J vs. 17C	Indicator variable identifying whether a practice is 17J or 17C	ISD Scotland
	Dispensing	Indicator variable identifying whether a practice is provides dispensing services	ISD Scotland
List size	Unweighted list size	Number of people registered with a practice	ISD Scotland
	Weighted list size	Number of people registered with a practice, adjusted for age, gender, deprivation. ⁴⁰	Scottish Government
Deprivation	Deprivation and MLC index	Index capturing differences in deprivation and MLC	Scottish Government
Area type	Practice location	Indicator variable based on practice's location calculated on the basis of the 8-fold Scottish Government Urban Rural Classification; Urban: Large Urban and Other Urban areas (rural/urban classifications 1,2); Accessible: Accessible Small Towns and Accessible Rural (rural/urban classifications 3,6); Remote: Remote Small Towns, Very Remote Small Towns, Remote Rural, Very Remote Rural (rural/urban classifications 4,5,7,8)	ISD Scotland
Network	Federation	Indicator variable identifying whether a practice is part of a general practice federation or network	Questionnaire
	Number of sites	Number of sites the practice operates from	Questionnaire

⁴⁰ This variable was based on the 2016 SAF review and reflect the model fitted values of the workload model (all practice dummy variables were set to 0).

6.2 Sample composition

Table 8 summarises the composition of the practises in the sample. The majority of the practices in the sample tend to be urban, 17J practices, non-dispensing, and have a single branch.

Table 8: Sample composition

Variable type	Variable	Number of practices in the sample	Share of practices in the sample
Location	Urban	71	65%
	Accessible	23	21%
	Remote	15	14%
Deprivation	Quintile 1 (most deprived)	21	20%
	Quintile 2	22	20%
	Quintile 3	22	20%
	Quintile 4	22	20%
	Quintile 5 (least deprived)	22	20%
Dispensing	Dispensing	8	7%
	Non-Dispensing	101	93%
Contract type	17C	9	8%
	17J	100	92%
Network	Not a part of a federation	104	95%
	Part of a federation	5	5%
Number of sites / branches	1 site	87	80%
	2 sites	20	18%
	3 sites	2	2%

Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaires and ISD Scotland.

7 Appendix B: Sample representativeness

7.1 Sample selection

The sample of 600 practices where the information request was sent was selected using a balanced sampling approach. The balanced sampling approach balances the selected sample on a set of variables so that the sample means for these variables mirror the population means as closely as possible. The motivation was to select a sample that is as representative of the population as possible.

The balance sampling approach was based on the following procedure:

1. Define a set of variables to balance the sample on;
2. Define a loss function to measure distance from the target values for chosen variables;
3. Draw 10,000 random samples of 600 practices;
4. Compute the loss function for each of the 10,000 samples; and
5. Select the sample which minimises the loss function.

The set of variables to balance the sample on were:

- Number of GPs;
- List size;
- Global Sum Income;
- Total Enhanced Services Income;
- Share of patients living in 15% most deprived data-zones;
- Number of Care Home patients;
- Contract type;
- Dispensing; and
- Rurality.

7.2 Sample representativeness

Although the sample was selected so that it is representative of the population, the practices that responded to the information request are not representative of the general practices in Scotland.

This is shown in Figure 27 and Figure 28 which compare the average list size and number of GPs across all general practices in Scotland and average list size and number of GPs in the 109 practices within the sample. The average size of the practices in the population is around 25% higher than the average size of the practices in the sample (the difference is statistically significant), which means that the sample under-represents small practices.

Figure 29 and Figure 30 assess the representativeness of the sample in terms of location and deprivation and suggest that the sample is relatively representative of the population in terms of these variables (differences between the sample and population shares are statistically insignificant).

Finally, Table 9 provides additional statistics on the distribution of a number of variables for the practices in the population and the sample.

Figure 27: Average list size

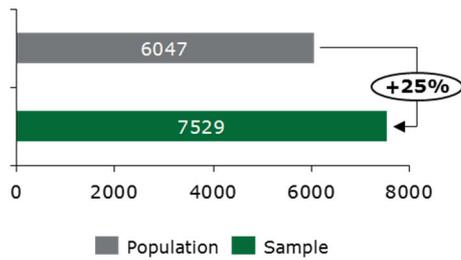


Figure 28: Average number of GPs

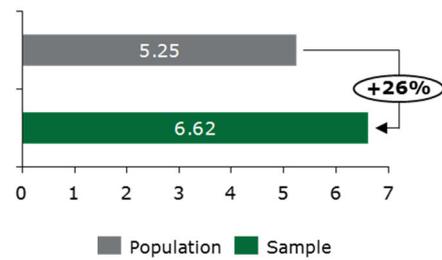


Figure 29: Percentage of practices by area type

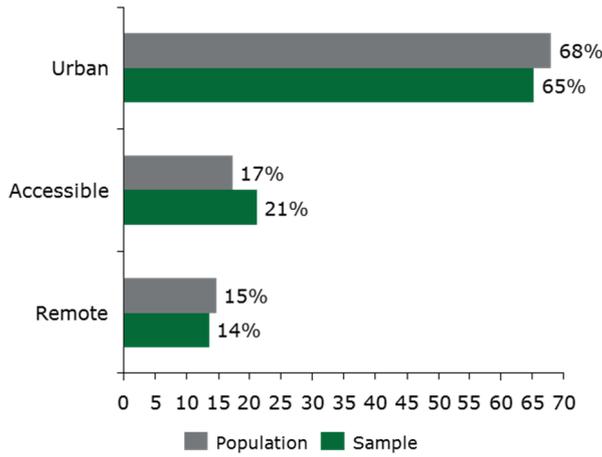


Figure 30: Percentage of patients by deprivation

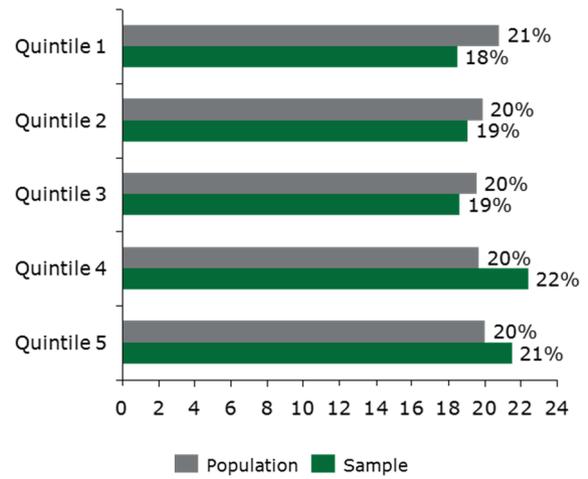


Table 9: Comparison of the distribution moments between population and the sample

	Statistic	Number of GPs	List size	Rurality	Share in 15% most deprived
Population	Mean	5.25	6,047	2.75	17%
	Standard deviation	3.17	3,595	2.2	20%
	Minimum	1	124	1	0%
	P25	3	3,334	1	0%
	P50	5	5,697	2	8%
	P75	7	8,198	3	28%
	Maximum	22	36,028	8	82%
Sample	Mean	6.62	7,529	2.8	14%
	Standard deviation	3.7	3,986	2.08	18%
	Minimum	1	590	1	0%
	P25	4	4,583	1	0%
	P50	6	7,317	2	6%
	P75	8	9,524	3	22%
	Maximum	22	22,370	8	81%

Notes: p10, p25, p75 and p90 indicate the 10th, 25th, 75th and 90th percentile, respectively; p50 is the 50th percentile or median; The area classification is based on the 8-fold Scottish Government Urban Rural Classification; Urban: Large Urban and Other Urban areas (rural/urban classifications 1,2); Accessible: Accessible Small Towns and Accessible Rural (rural/urban classifications 3,6); Remote: Remote Small Towns, Very Remote Small Towns, Remote Rural, Very Remote Rural (rural/urban classifications 4,5,7,8); Deprivation measure is from GP Workforce and practice list sizes 2006-2016 (December 2016, based on September 2016 data), Table 7; Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

8 Appendix C: Additional summary statistics

This section provides additional summary statistics on costs and net income based on the 109 general practices in the sample.

8.1 Summary statistics: net income

This section investigates the correlation between net income and a number of other variables. The main insights from this analysis are that net income is negatively correlated with the number of partner GPs (the lower the number of WTE GPs the higher the net income per WTE partner GP) and positively correlated with medical staff hours per partner GP. No correlation is identified between net income and costs, salaried GP hours per partner GP, and enhanced services.

Figure 31: Average net income per partner GP WTE and cost per patient

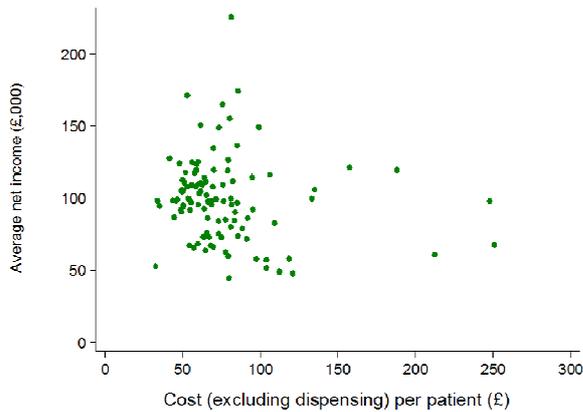


Figure 32: Average net income per partner GP WTE and number of partner GP WTEs per 1,000 patients

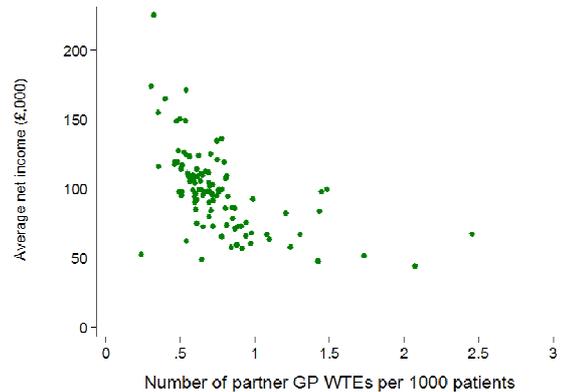


Figure 33: Average net income per partner GP WTE and ratio of partner to salaried GPs

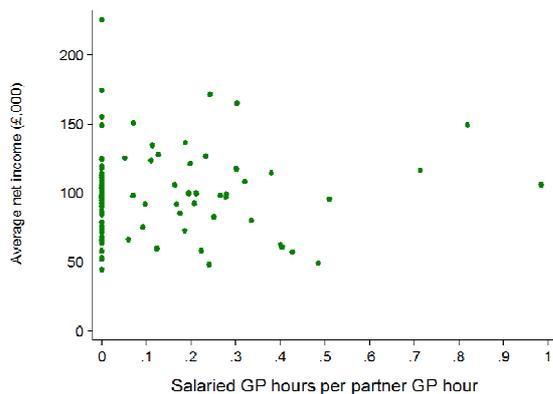


Figure 34: Average net income per partner GP WTE and ratio of medical staff to partner GPs

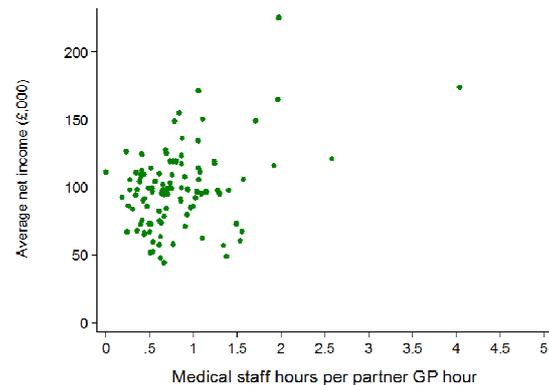


Figure 35: Average net income per partner GP WTE and enhanced services' income share

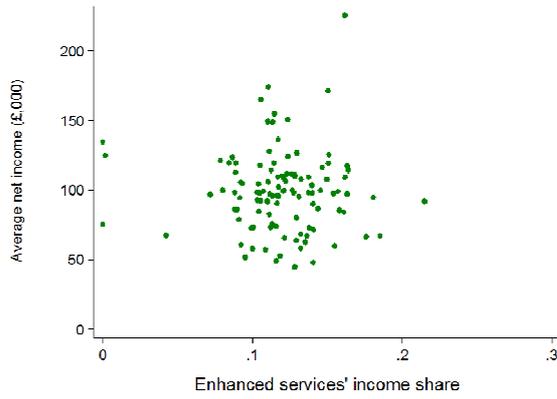


Figure 36: Average net income per partner GP WTE and local enhanced services' income share

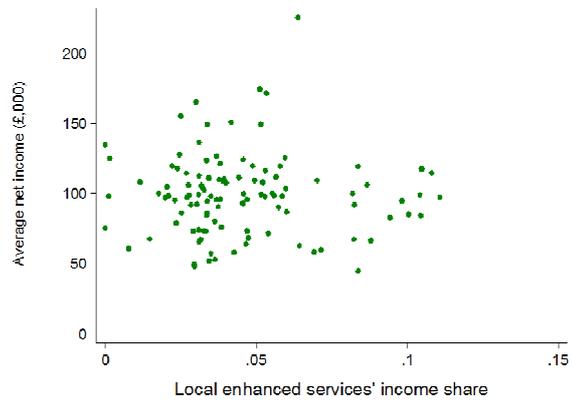


Figure 37: Average net income per partner GP WTE and cost (excluding dispensing) per patient

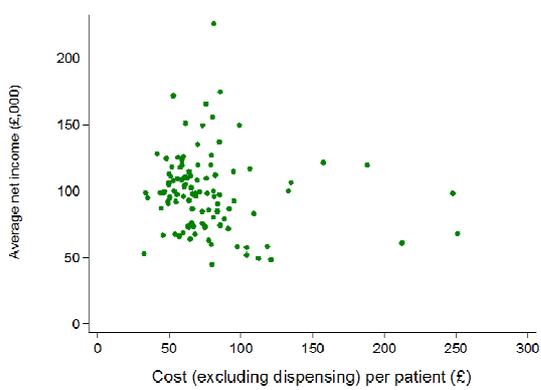


Figure 38: Average net income per partner GP WTE and MPIG payment per partner GP

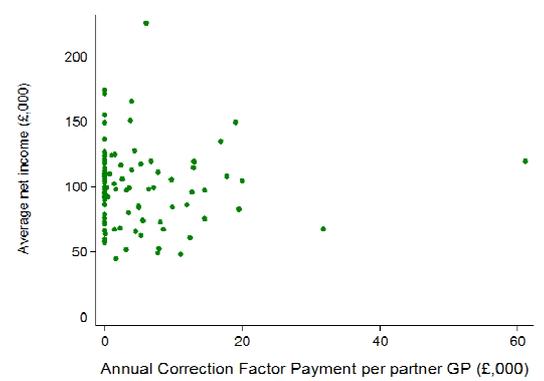


Figure 39: Average net income per partner GP WTE and total premises costs

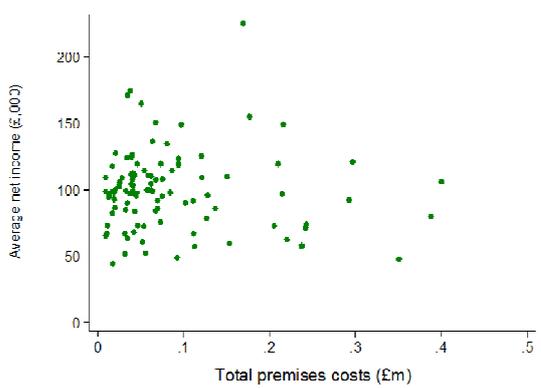


Figure 40: Average net income per partner GP WTE and total premises costs per patient

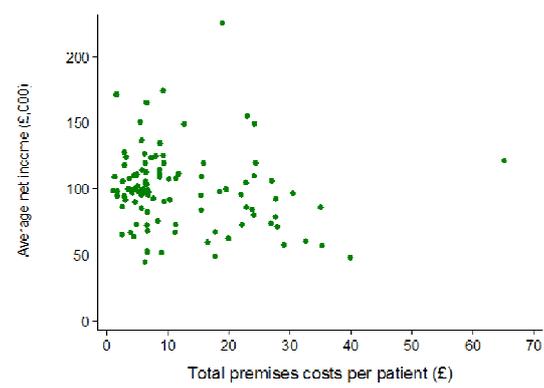


Figure 41: Average net income per partner GP WTE and total dispensing costs

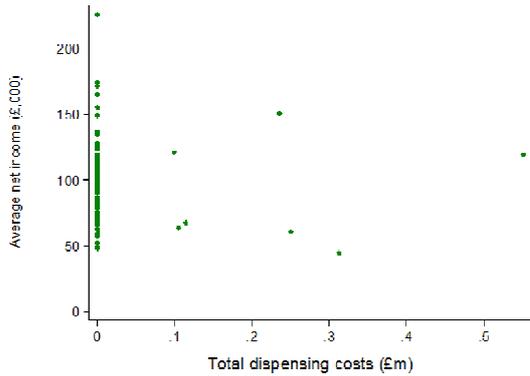
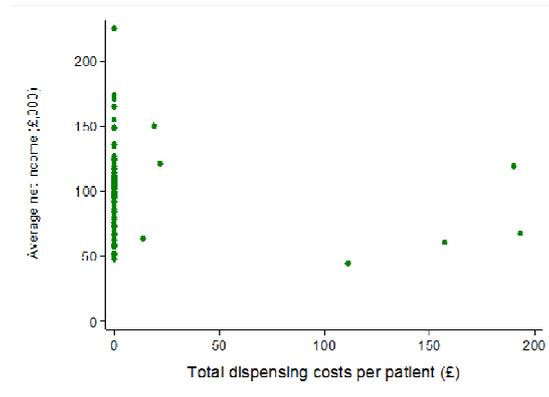


Figure 42: Average net income per partner GP WTE and total dispensing costs per patient



Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland

8.2 Summary statistics: other variables

This section provides plots for other variables and relationships of potential interest which are not considered further in this study.

Figure 43: Average cost per patient and enhanced services' income share

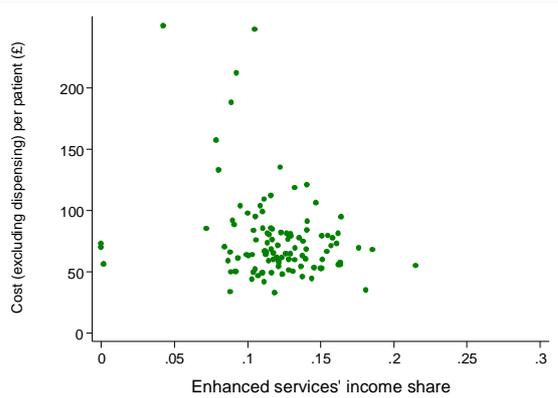


Figure 44: Enhanced services' income share by area type

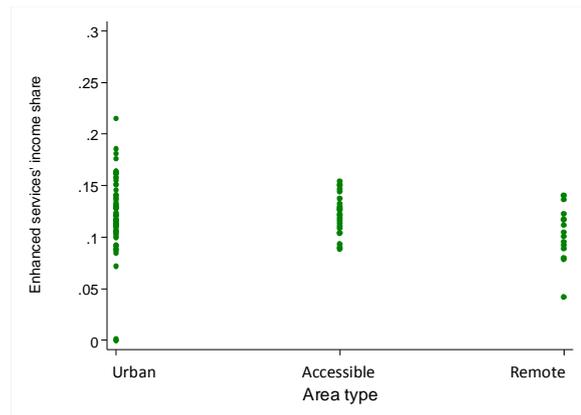


Figure 45: Total NHS income to total expenditure ratio

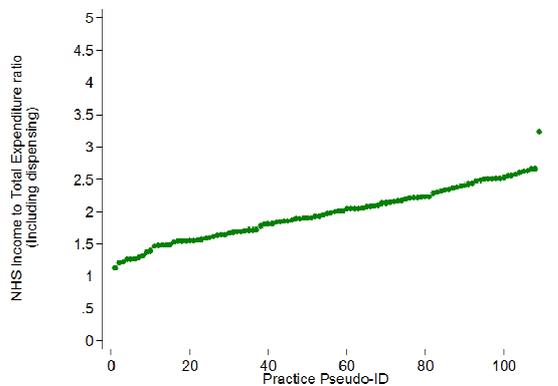


Figure 46: Total enhanced services income and total NHS income

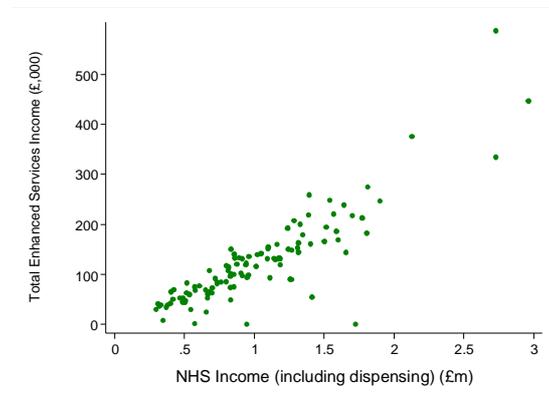


Figure 47: List size by area type

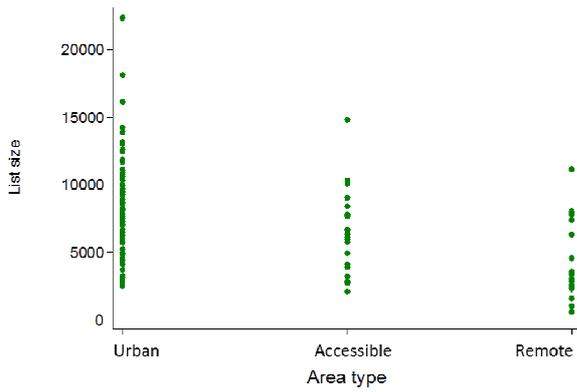


Figure 48: NHS funding per patient by area type

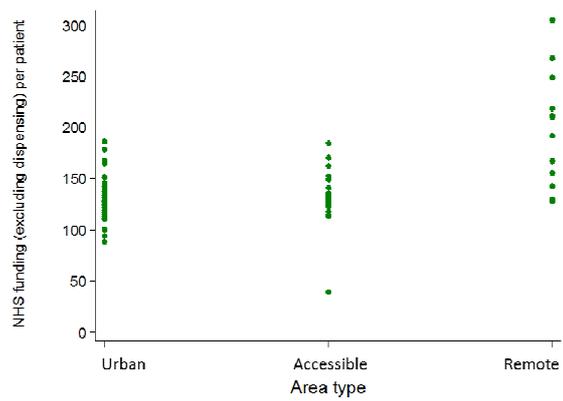


Figure 49: Total NHS income (excluding dispensing) by area type

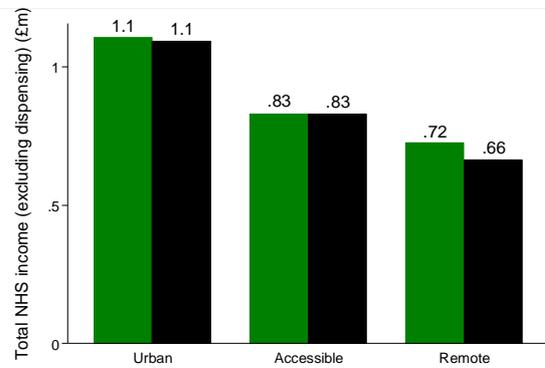


Figure 50: Total NHS income (excluding dispensing) per patient by area type

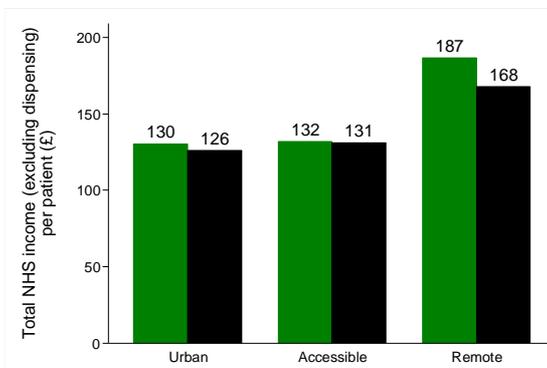


Figure 51: Total NHS income (excluding dispensing) by deprivation quintile

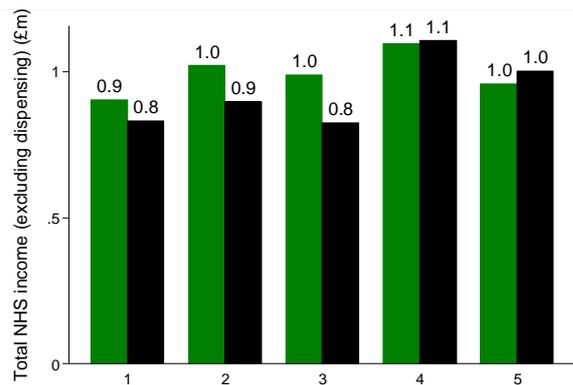


Figure 52: Total NHS income (excluding dispensing) per patient by deprivation quintile

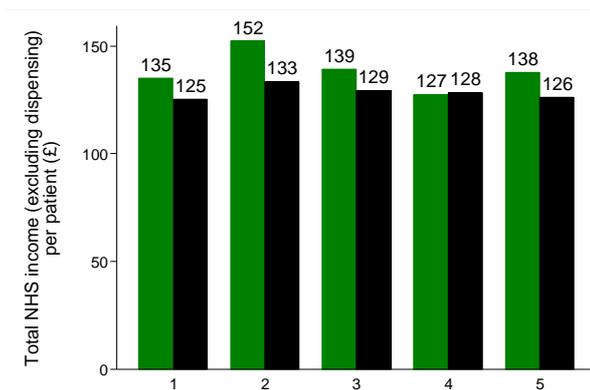


Figure 53: WTE to headcount ratio

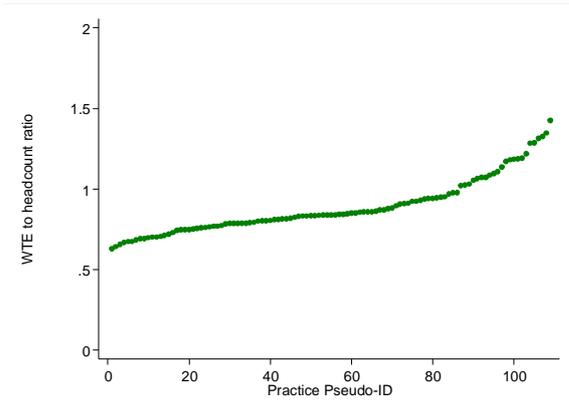


Figure 54: WTE to headcount ratio. Partner GPs only

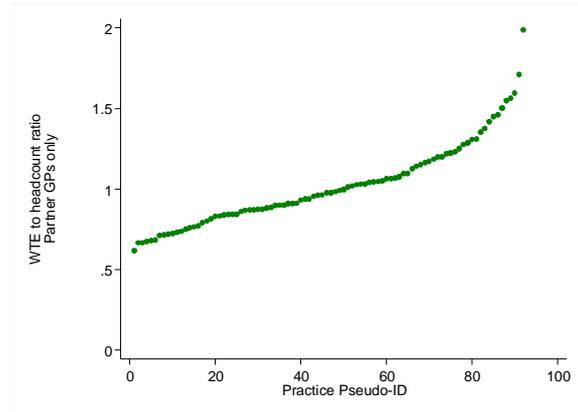


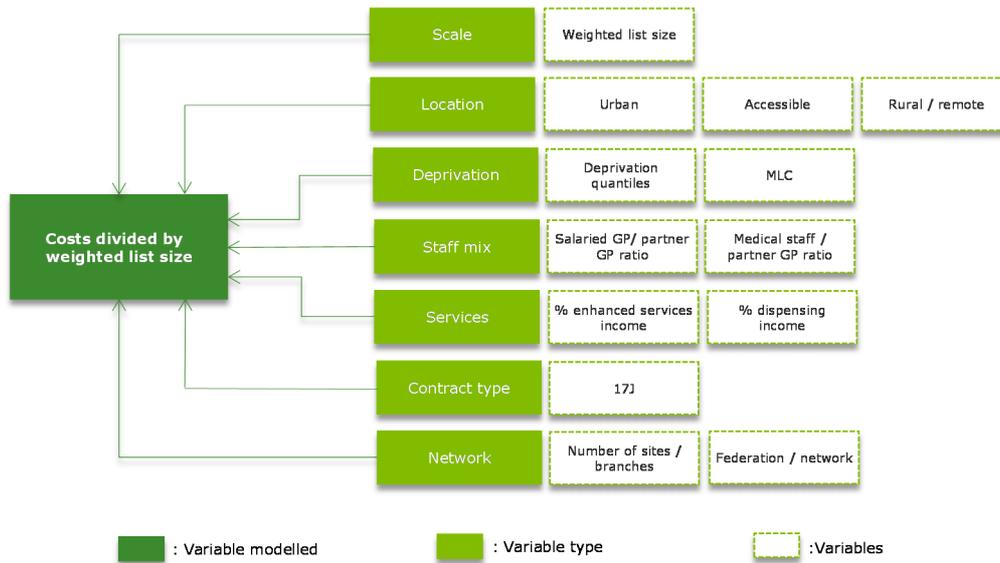
Figure 55: Average weekly working hours by partner GPs

p5	p25	p50	p75	p95
9.8	31.6	37.5	43	60

Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland

9 Appendix D: Regression model specification

The general model used in the regression analysis is set out below.



Two alternative models are estimated based on two different measures of costs: total costs (excluding dispensing costs⁴¹) divided by weighted list size and staff costs divided by weighted list size. These variables are measures of average costs per registered patient, and are modelled as a function of seven types of variables.

- **Scale.** Weighted list size aims to capture the impact of scale on costs. If there are economies of scale, the impact of weighted list size would be negative and statistically significant.
- **Location.** The impact of location on costs is quantified through indicator variables that identify the location of the practice, i.e. urban, accessible or remote. If the remote indicator variable is positive and statistically significant it would indicate that remote practices have higher costs.
- **Deprivation.** Deprivation is included in the model to test the hypothesis that practices that are located in deprived areas find it more difficult to recruit and/or have higher staff costs.
- **Staff mix.** Staff costs reported in practices' financial accounts depend on the staff mix, in particular, salaried to partner GP ratio as the partner GP compensation is not included in staff costs. The staff mix variables are included to control for differences in practices' staff mix.
- **Services.** Costs per patient depend on the type of services provided. Practices that provide a lot of enhanced and dispensing services are expected to have, on average, higher costs than practices that offer only core services, keeping all other things constant. The percentage of enhanced and dispensing income relative to total NHS income variables aims to control for this.
- **Contract type.** An indicator variable that identifies whether a practice is 17C or 17J is included in the model to allow the possibility that costs differ between these two types of practices.
- **Network.** Costs per patient may vary depending on the number of sites/branches and whether a practice is part of a federation. In order to control for these factors, two variables indicating the number of branches and whether a practice is part of a federation are included in the model.

⁴¹ Dispensing costs include the costs of drugs purchases, but not staff and other costs associated with the provision of dispensing services.

10 Appendix E: Regression output

This section provides detailed regression results, including:

- Model coefficients for the baseline models discussed in the main section;
- Model coefficients for a number of alternative models (sensitivity analysis); and
- Model diagnostics.

This Appendix has been drafted for readers with knowledge of statistics and/or regression analysis.

10.1 Baseline models

Table 10 overleaf sets out the coefficients of the total costs model (Model 1) and staff costs model (Model 2) discussed in the main body of this study.

The main variables of interest are scale, location and deprivation; all other variables are included as controls. For instance, the staff mix variables are included in order to control for differences in costs associated with the way workforce compensation is recorded; partner GP compensation is part of net income whereas staff compensation is recorded as costs. The coefficient of the ratio of salaried GPs' hours to partner GP hours in Model 1 is 0.84 suggesting that the difference in costs between a practice that has one salaried GP and five partner GPs and a practice that has two salaried GPs and five partner GPs is around £90,000 (the difference between the two practices is one salaried GP). This reflects the additional costs associated with employing a salaried GP, which go above the average salary for salaried GPs.⁴²

The contract type and federation variables should be interpreted with care due to sample size issues; there are only nine 17C and five federation practices in the sample.

10.2 Sensitivity analysis

A number of alternative models were estimated to test the sensitivity of the results to alternative model assumptions.

- **Scale.** Alternative models were estimated to assess whether the impact of weighted list size on costs is non-linear (Model 7 and Model 13). Furthermore, the sensitivity of the results to the measure of list size (unweighted instead of weighted) was investigated (Model 4 and Model 10).
- **Scale and location.** The models were re-estimated by excluding remote practices from the estimation sample with the aim to assess whether the identified impact of scale on costs is driven by remote practices (Model 8 and Model 14).⁴³
- **Deprivation.** Alternative measures of deprivation were tested, e.g. ISD's share of population living in the 15% most deprived areas (Model 6 and Model 12) and ISD deprivation quintiles based on the median person (Model 5 and Model 11).
- **Model specification.** Alternative versions of the model were estimated with insignificant variables being dropped.

⁴² The calculation is based on the following formula: Difference in cost = (difference in salaried to partner GP ratio) x (coefficient) x (average practice cost); the difference in salaried to partner GP ratio is 0.2; the average practice cost is £563,000 and reflects the sample average.

⁴³ Additionally, models were estimated by excluding small practices, defined as those with less than 3,000 patients. The magnitude and significance of the scale coefficient was unaffected by the exclusion of small practices.

The results of the sensitivity analysis suggest that the main conclusions discussed in the main section are not sensitive to the model assumptions.

Table 10: Baseline model coefficients

	Variable	Model 1 Logarithm of total costs (excluding dispensing costs) per weighted patient	Model 2 Logarithm of staff costs per weighted patient
Scale	Logarithm of list size	-0.169***	-0.119***
Location	Urban	Baseline	Baseline
	Accessible	0.012	-0.005
	Remote	0.223***	0.230***
Deprivation	Quintile 1	-0.023	-0.057
	Quintile 2	0.031	0.055
	Quintile 3	0.009	0.016
	Quintile 4	0.110	0.020
	Quintile 5	Baseline	Baseline
Staff mix	Ratio of salaried GPs' hours to Partner GP hours	0.843***	0.760***
	Ratio of other medical staff hours to Partner GP hours	0.120***	0.134***
Services	Enhanced services as a share of total non-dispensing NHS income	-0.250	0.613
	Dispensing as a share of total non-dispensing NHS income	0.400***	0.552***
Contract type	17J practice	Baseline	Baseline
	17C practice	-0.071	-0.157*
Network	Number of sites	0.080	0.050
	Not a part of federation	Baseline	Baseline
	Part of federation of practices	0.148	0.185
Constant	Constant	3.289***	2.407***

Statistical significance⁴⁴: * $p < 10\%$; ** $p < 5\%$; *** $p < 1\%$

Green shading indicates key variables; grey shading indicates control variables.

Notes: The area classification is based on the 8-fold Scottish Government Urban Rural Classification; Urban: Large Urban and Other Urban areas (rural/urban classifications 1,2); Accessible: Accessible Small Towns and Accessible Rural (rural/urban classifications 3,6); Remote: Remote Small Towns, Very Remote Small Towns, Remote Rural, Very Remote Rural (rural/urban classifications 4,5,7,8); The deprivation quantiles are based on the Morbidity and Life-time Circumstances (MLC) estimates from the 2016 workload model (see Appendix A); The quantiles effectively divide practices into five groups of equal size (each group contains 20% of all practices in the sample); Quantile 1 is the most deprived and Quantile 5 is the least deprived; Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

⁴⁴ Statistical significance levels of 1%, 5% and 10% are typically seen as conventional thresholds for concluding whether the tested hypothesis can be rejected or not. For example, p-value of less than 0.10 suggests the tested hypothesis can be rejected with at least 90% confidence.

Table 11: Sensitivity analysis for Total Cost model

	Model 1	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Scale							
Logarithm of weighted list size	-0.169***	-0.151***	-	-0.156***	-0.150***	-1.077	-0.157***
Logarithm of unweighted list size	-	-	-0.180***	-	-	-	-
Square of logarithm of list size	-	-	-	-	-	0.040	-
Location							
Urban	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
Accessible	0.012	Baseline	-0.037	0.014	0.012	0.018	0.044
Remote	0.223***	0.216***	0.263***	0.191***	0.209***	0.223***	-
Deprivation							
Quintile 1	-0.023	-	-0.139*	-0.014	-	-0.017	-0.013
Quintile 2	0.031	-	-0.034	0.044	-	0.023	0.017
Quintile 3	0.009	-	-0.081	0.102	-	0.008	0.022
Quintile 4	0.11	-	0.052	0.029	-	0.109	0.104
Quintile 5	Baseline	-	Baseline	Baseline	-	Baseline	Baseline
Population share living in 15% most deprived data-zones	-	-	-	-	-0.074	-	-
Staff mix							
Ratio of salaried GPs' hours to Partner GP hours	0.843***	0.819***	0.834***	0.776***	0.806***	0.839***	0.827***
Ratio of other medical staff hours to Partner GP hours	0.120***	0.133***	0.142***	0.126***	0.130***	0.116**	0.104***
Services							
Enhanced services as a share of total non-dispensing NHS income	-0.25	-	-0.169	-0.233	-0.259	-0.263	-0.100
Dispensing as a share of total non-dispensing NHS income	0.400***	0.393***	0.422***	0.382***	0.398***	0.357***	0.139
Contract type							
17J practice	Baseline	-	Baseline	Baseline	Baseline	Baseline	Baseline
17C practice	-0.071	-	-0.078	-0.084	-0.073	-0.071	-0.032
Number of sites	0.08	0.080*	0.088	0.078	0.065	0.076	0.061
Network							
Not a part of federation	Baseline	-	Baseline	Baseline	Baseline	Baseline	Baseline
Part of federation of practices	0.148	-	0.078	0.135	0.110	0.132	0.160
Constant							
Constant	3.289***	3.026***	5.625***	3.147***	3.128***	8.395	3.127***

Statistical significance: * p<10%; ** p<5%; *** p<1%; Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

Table 12 : Sensitivity analysis for Staff Cost model

	Model 2	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
Scale							
Logarithm of weighted list size	-0.119***	-0.087**	-	-0.115***	-0.113***	-0.927	-0.089*
Logarithm of unweighted list size	-	-	-0.119***	-	-	-	-
Square of logarithm of list size	-	-	-	-	-	0.036	-
Location							
Urban	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
Accessible	-0.005	Baseline	-0.052	-0.008	-0.007	0.001	0.021
Remote	0.230***	0.246***	0.277***	0.252***	0.252***	0.229***	-
Deprivation							
Quintile 1	-0.057	-	-0.181*	-0.035	-	-0.052	-0.020
Quintile 2	0.055	-	-0.014	0.002	-	0.047	0.042
Quintile 3	0.016	-	-0.081	0.005	-	0.014	0.019
Quintile 4	0.02	-	-0.046	0.014	-	0.019	0.016
Quintile 5	Baseline	-	Baseline	Baseline	-	Baseline	Baseline
Population share living in 15% most deprived data-zones	-	-	-	-	-0.037	-	-
Staff mix							
Ratio of salaried GPs' hours to Partner GP hours	0.760***	0.807***	0.747***	0.786***	0.782***	0.756***	0.760***
Ratio of other medical staff hours to Partner GP hours	0.134***	0.133***	0.159***	0.128***	0.128***	0.131***	0.135***
Services							
Enhanced services as a share of total non-dispensing NHS income	0.613	-	0.657	0.665	0.689	0.602	0.573
Dispensing as a share of total non-dispensing NHS income	0.552***	0.565***	0.586***	0.523***	0.524***	0.514***	0.291
Contract type							
17J practice	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
17C practice	-0.157*	-0.176**	-0.164*	-0.164*	-0.163**	-0.157*	-0.103
Network							
Number of sites	0.05	-	0.055	0.051	0.053	0.047	0.042
Not a part of federation	Baseline	-	Baseline	Baseline	Baseline	Baseline	Baseline
Part of federation of practices	0.185	-	0.108	0.123	0.124	0.171	0.181
Constant							
Constant	2.407***	2.206***	4.783***	2.378***	2.352***	6.950	2.025***

Statistical significance: * p<10%; ** p<5%; *** p<1%; Source: Deloitte analysis based on Practices' Financial Accounts; Questionnaire and ISD Scotland.

10.3 Diagnostic testing

This section sets out the following diagnostic tests for the baseline models:

- Test for heteroscedasticity;
- Test for misspecification of the functional form (RESET); and
- Test for normality of residuals.

The results are presented in Table 13 and suggest that the models pass all these diagnostic tests (if the p-value is less than 0.10 the hypothesis that the model errors are homoscedastic, normally distributed and that the model is well specified cannot be rejected at 10% level).

Table 13: Diagnostic testing

	Model 1	Model 2
Breusch-Pagan test for heteroscedasticity, p-value	0.8431	0.4274
Ramsey test for misspecification, p-value	0.4829	0.2686
Cameron-Trivedi test of skewness in residuals, p-value	0.4280	0.4865
Cameron-Trivedi test of kurtosis in residuals, p-value	0.9239	0.9511

Source: Deloitte analysis based on Practices' Financial Accounts, Questionnaire and ISD Scotland.

In addition to these tests, DFBETAs were conducted. DFBETAs is a test of coefficient stability or influence: it assesses how much a coefficient is changed by deleting one observation. The DFBETAs identified seven influential observations for the remoteness variable in the total costs model.⁴⁵ In the staff costs model, nine of influential observations were identified. The DFBETAs tests suggested that the remoteness coefficient varies between 0.19 and 0.26 in the total costs model (coefficient in the baseline model is 0.22). And between 0.21 and 0.26 in the staff costs model (coefficient in the baseline model is 0.23). These highlight the instability of the remoteness coefficient which could be due to the low number of remote practices in the sample.

⁴⁵ DFBETAs values greater than the absolute value of 2 divided by the square root of number of observations are considered as influential.



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