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# *Cost of Service Inquiry for Community Pharmacy*

Report by PwC

June 2011

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<sup>1</sup> PwC was commissioned by the Department of Health (DH). The independent research and analysis to estimate costs was, subject to the terms of the contract agreed between PwC and DH, undertaken on behalf of DH who brought the Pharmaceutical Services Negotiating Committee (PSNC) into the engagement. Both DH's and PSNC's insights to the subject matter have been taken into account by PwC in forming their views as set out in this report.

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# 1. Executive Summary

In October 2009, PricewaterhouseCoopers ('PwC') was commissioned by the Department of Health (DH) to undertake independent research and analysis to estimate the costs, currently and within a 5-year timeframe, incurred by pharmacies in England in providing the community pharmacy services defined under the national NHS community pharmacy contractual framework. DH involved the Pharmaceutical Services Negotiating Committee (PSNC) throughout PwC's work and both DH's and PSNC's insights to the subject matter have been taken into account by PwC in forming their views as set out in this report.

The project was overseen by a Steering Group providing pharmacy policy and practice, analytical, statistical and finance expertise. The Group comprised representatives from DH and PSNC as well as external experts including representatives from HM Treasury, NHS Employers and Professors of Statistics, Business and Economics.

The results of this Cost of Service Inquiry (COSI) are intended to inform negotiations between the DH and PSNC regarding the appropriate level of funding required to provide NHS pharmaceutical services to patients.

The focus of this report is on the current cost of community pharmacy at the time the work was carried out. Based on the approach and assumptions set out in this report, PwC calculate the average allocated NHS costs per pharmacy branch (including fair return, a portion of head office and common costs and also the cost of enhanced services) to be £243,364 using Allocation method 1 and £245,407 using Allocation method 2 (for the year ending March 2010). Average allocated NHS costs per fee item dispensed are calculated as £3.03 using Allocation method 1 and £3.06 using Allocation method 2 (for the year ending March 2010). Figure 2 and Figure 3 show how these results vary across different types of pharmacy.

In carrying out a COSI of this nature, there are a range of methodologies that may be applied. There are also a number of areas in which it is necessary to make certain assumptions for the purposes of analysis. In the course of this work, the project team has considered a wide range of methodologies and assumptions and the impact that these alternative approaches have on the final results obtained. The numbers presented in this report are based on our expert view of the most appropriate approaches and assumptions to adopt. This view has been informed by discussions with the DH/PSNC project team, but does not necessarily reflect the views of either party. Further details of the alternative approaches considered are provided in the Appendices to this report.

PwC undertook a survey of pharmacies in England to collect data on the costs they currently incur in delivering NHS pharmacy services. Stratified random sampling was used to select a representative sample of community pharmacies in England. The stratification variables selected were pharmacy type, prescription item<sup>2</sup> volumes and medicines use review (MUR) volumes.

The target for the survey fieldwork was to complete interviews with 500 pharmacy branches. To reduce some of the uncertainty relating to response rates, the sampling was carried out in two waves. The total sample selected and invited to participate in the survey was 1432 branches, representing just over 13% of the population of English community pharmacy branches in 2009.

Ahead of deploying a nationwide survey of community pharmacies and their costs, a pilot survey of a small number of community pharmacies and head offices was undertaken to inform the fieldwork approach and development of the survey questionnaires. This took the form of a number of site visits by PwC staff.

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<sup>2</sup> For the purposes of analysis, prescription item volumes have been calculated based on the total prescription item fees paid by NHSBSA to each branch. For this reason, in this report "prescription items" are sometimes referred to as "fee items".

Fieldwork was carried out by our International Survey Unit. The PwC fieldwork team contacted sample members by telephone to request participation in the survey. Questionnaires were sent in the form of Word questionnaires to the majority of Independent and Smaller Multiple respondents and a data request in Excel form to the Large Multiple & Supermarket entities<sup>3</sup>. The survey asked respondents to provide details of costs and revenues – as well as other branch information. In addition, the survey requested that respondents also provide copies of their financial accounts for each branch in the sample, plus a set of accounts for the entity head office, where appropriate. These accounts were used as a cross-check on the information provided in the survey. Our fieldwork team kept in regular contact with survey recipients to encourage completion and respond to any queries from respondents. The main fieldwork spanned the period late January 2010 to 27th April 2010. Following this, as part of our data auditing processes, we recontacted a number of pharmacy entities during the data analysis phase to clarify certain aspects of their cost data<sup>4</sup>.

Overall, the final response rate to the survey was 40%<sup>5</sup>. This is within the range of what would be expected for a study of this type and the fieldwork methodology used. The final results and analysis are based on data from 573 branches. The sample has been weighted to ensure representativeness in terms of the full pharmacy sampling frame.

A number of data validation checks were carried out prior to starting the analysis. In some cases where key pieces of data were missing from survey responses, we were able to fill in the missing information using the financial accounts provided. Cost information has been imputed when the data was not provided in the survey, it was not possible to fill in this data from the hard copy accounts and the missing costs were such that it would not be appropriate to assume a £0 value. However, given that imputation was only carried out for a subset of pharmacies for a small set of variables, the impact on overall results is negligible<sup>6</sup>.

The figure below provides an overview of the approach used to calculate a value for the cost of providing NHS pharmaceutical services. This cost is calculated as:

$$\text{Total NHS Cost} = \text{Operating Costs} + \text{Fair Return on Investment}$$

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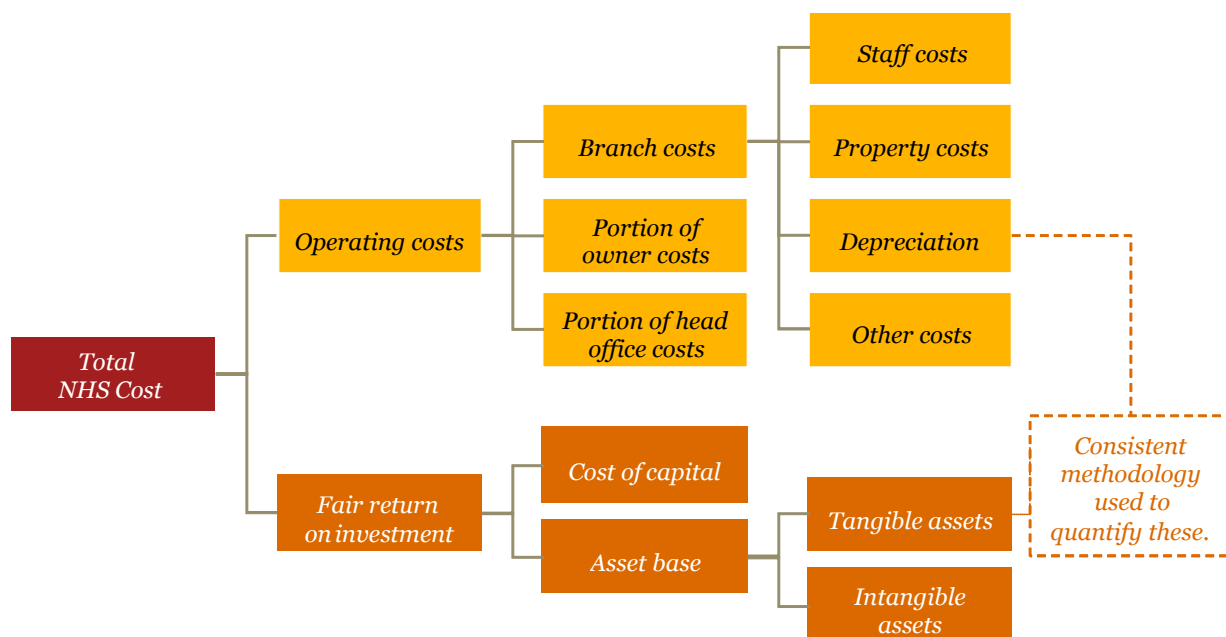
<sup>3</sup> For the purposes of the study, Large Multiples & Supermarkets were defined as the 10 largest pharmacy entities in England (this included supermarket pharmacies). Of the remaining entities, Independents were defined as those with 1 – 5 branches and Smaller Multiples as those with 6 or more branches.

<sup>4</sup> For example, PwC recontacted a number of Large Multiple entities to check data relating to head office cost allocations and a number of supermarket entities to check some gaps in divisional head office cost data.

<sup>5</sup> The response rate of 40% is calculated as 573 completed interviews divided by the drawn sample of 1432 branches.

<sup>6</sup> Overall imputation increased the average allocated NHS cost per branch by 0.33%.

**Figure 1: Framework for calculating the cost of providing NHS pharmaceutical services**



Once data on overall costs of pharmacies had been collected via the survey, it was necessary to identify the proportion of these costs that are attributable to NHS part of the business. In carrying out this analysis, it was necessary to make certain judgments about what allocation methodology was most appropriate for each type of cost.

The operating costs of a pharmacy are made up of staff costs, property costs, depreciation and other costs, plus a portion of head office and owner costs. Each type of cost is allocated between the categories NHS, non-NHS and Common using a combination of LRIC (Long Run Incremental Cost) and FAC (Fully Allocated Cost) methodologies. Costs for head office divisions and owner costs have either been allocated to individual branches using a revenue-based split or a uniform split based on number of branches. Common costs have then been allocated based on an equi-proportional mark-up (EPMU) approach. This approach allocates the Common costs to NHS and non-NHS in the same proportion that costs have been directly allocated to these categories.

In the cost analysis presented in this report, we show results using two alternative approaches to allocating costs between NHS and non-NHS. These two approaches are defined as follows:

- Allocation method 1:
  - Staff costs are allocated using a FAC approach based on the splits of staff time (between NHS, non-NHS and Common) reported in the survey for each type of staff.
  - Property costs are allocated using a FAC approach based on the split of revenue between NHS and non-NHS activities.
  - Depreciation costs are allocated using a LRIC approach based on the estimated value of NHS, non-NHS and Common branch assets
  - Other costs are allocated based on a LRIC or FAC approach depending on the cost type – and informed by how other branch costs are allocated, e.g. staff training costs are allocated in the same proportions as staff costs and utilities are allocated in the same proportions as property costs.
- Allocation method 2:
  - Staff costs are allocated using a LRIC approach based on categorisation of each staff type as NHS, non-NHS or Common.
  - Property, Depreciation and Other Costs are allocated in the same way as for Allocation method 1.

To remain a viable commercial enterprise, in addition to operating costs, investors in pharmacy businesses also need to earn a fair rate of return to reward them for the risks they have taken in investing in their business. We have sought to estimate the fair return for the NHS component of a pharmacy business. We note that for many pharmacy businesses, NHS represents the major part of their business, however one reason why our analysis distinguishes between different pharmacy types is to recognise the fact that the extent to which this is the case varies by pharmacy type.

The approach taken in this report to estimating this fair return is based on the Weighted Average Cost of Capital (WACC). The WACC is the minimum rate of return an investor would achieve in a competitive market. WACC is most readily applied to calculating fair return for investors in large companies, since its application generally involves the use of stock market information. It has strong theoretical underpinnings and many regulators and competition authorities have used the WACC framework in their analyses; there is therefore strong precedent for its use. WACC is arguably not so well suited for calculating fair return for investors in smaller companies, such as Independents and Smaller Multiple pharmacy businesses. However, there is no standard framework that is commonly used for estimating a fair rate of return for investors in such smaller businesses. We recommend that a pragmatic, and defensible, approach is to use the standard WACC framework for the small pharmacy companies as for the Large Multiples & Supermarkets, with appropriate application of a Small Companies Premium. Such premia have been adopted by UK regulators in setting prices (for example, by OFWAT<sup>7</sup>).

Under the WACC approach, the Fair Rate of Return is calculated as:

$$\text{Fair Rate of Return} = \text{WACC} \times (\text{Tangible Assets} + \text{Intangible Assets}),$$

The survey asked pharmacists to provide details of the costs incurred in their most recent annual accounting period. This means that the cost data collected correspond to a number of different annual periods<sup>8</sup>. For the purposes of analysis, all costs and values provided in the survey have been inflated to a common time period (April 2009 – March 2010). We have not however made any adjustments to account for any changes in the number of prescription items or other services provided by the pharmacy since the period covered by their most recent accounts.

When presenting analysis results and average costs, the weighted mean average of the whole sample has been used. We have not excluded any branches based on an assessment of their levels of efficiency (in terms of the costs incurred relative to the service offered). We note that average NHS costs shown in this document include the cost of any enhanced services.

For the purposes of reporting cost analysis results for the sample, 5 pharmacy type groupings are used as follows: Independents (1-5 branches), Smaller Multiples (6+ branches), Non-retail-driven Large Multiples (branches from the 6 largest entities which focus on NHS services – as defined by the entities themselves), Retail-driven Large Multiples (branches from the 6 largest entities which focus on retail services – as defined by the entities themselves) and Supermarkets (in-store pharmacies)<sup>9</sup>. We have found these distinctions helpful when considering the characteristics of different types of pharmacy and the implications for costs.

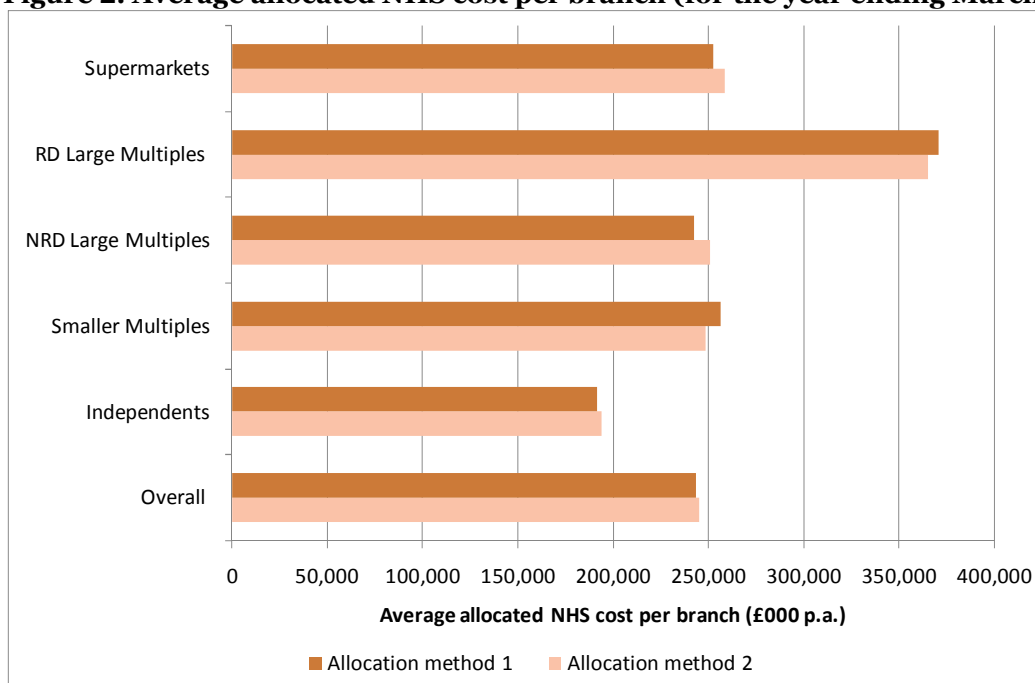
<sup>7</sup> As described in the Ofwat report “Future water and sewerage charges 2010-15:Final determinations”(2009).

<sup>8</sup> Cost data for 50% of the sample was provided for a 12-month period closing less than 6 month before the date of the survey (April 2010). Less than 8% of branches provided data for a 12-month period closing before the end of 2008. The average closing month of accounts for which cost data was provided was August 2009.

<sup>9</sup> We have not reported results separately for any online pharmacies picked up in the sample. Exclusively online pharmacies are a very small proportion of the population and their business model and costs are likely to be quite different to those of the majority of pharmacy businesses. The project team agreed that the COSI would not explicitly focus on online pharmacies.

Overall, average allocated NHS costs per branch (including fair return, a portion of head office and common costs and also the cost of enhanced services) are calculated as £243,364 using Allocation method 1 and £245,407 using Allocation method 2. Figure 2 below shows the average allocated NHS cost per branch split by pharmacy type.

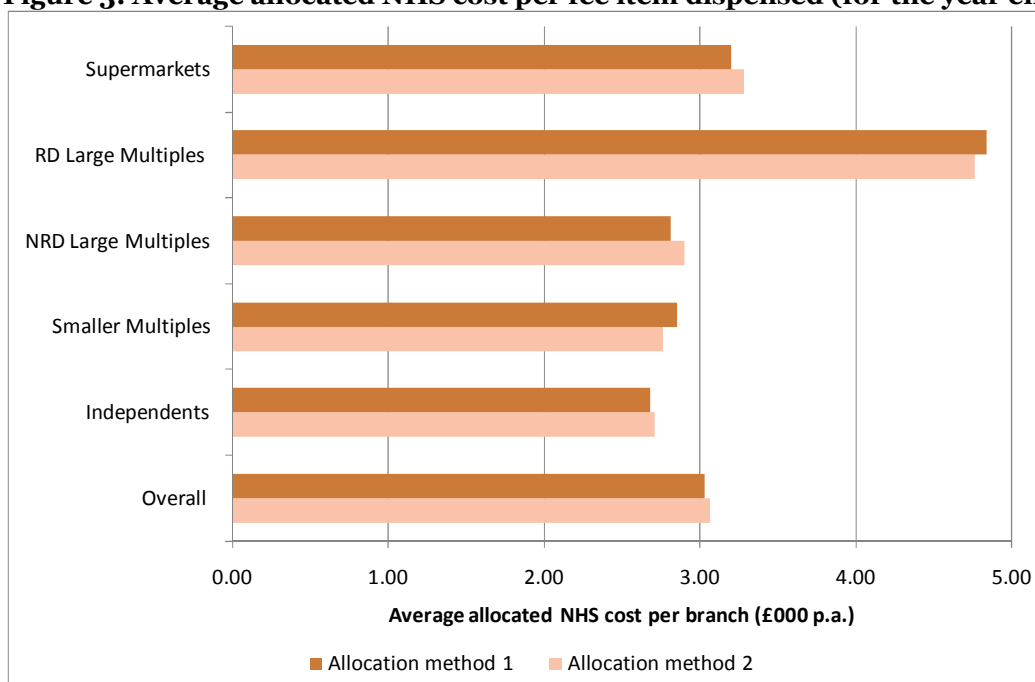
**Figure 2: Average allocated NHS cost per branch (for the year ending March 2010)**



*Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC*

An average cost per item dispensed can be calculated by dividing the allocated NHS cost per branch by the volume of prescription items dispensed per branch. Overall, average allocated NHS costs per fee item dispensed are calculated as £3.03 using Allocation method 1 and £3.06 using Allocation method 2. Figure 3 below shows this average allocated NHS cost per fee item dispensed split by pharmacy type.

**Figure 3: Average allocated NHS cost per fee item dispensed (for the year ending March 2010)**





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*Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC*

This report identifies and quantifies the various NHS costs involved in delivering community pharmacy services. The question as to the extent to which the NHS should pay for the different categories of cost is outside the scope of PwC's work and may be a matter for further negotiation.

## **2. Introduction**

### **2.1. Background to the 2010 Cost of Service Inquiry**

The Community Pharmacy Contractual Framework (CPCF) introduced in April 2005 provided the basis for improving the quality and range of services provided through community pharmacies. One of the features of the framework is greater transparency and accountability in setting the basis upon which pharmacy contractors should be paid and provision for regular review. Under the contractual framework, pharmacy contractors are expected to provide a wider range of services than just dispensing. Services are divided into three categories: essential, advanced and enhanced. Due to their expertise in medicines, pharmacies are making an important and increasing contribution to expanding access to clinical services in the NHS, supporting people to get the most from their medicines, improving health and well-being, and reducing health inequalities.

Funding for the CPCF in 2005 was underpinned by a joint Department of Health (DH)/Pharmaceutical Services Negotiating Committee (PSNC) cost of service inquiry, undertaken in 2003, which assessed the cost of providing the existing baseline essential services. In 2009 the Department of Health took the decision that a new cost of service inquiry should be undertaken to identify the current costs and also to estimate the likely future cost of providing NHS pharmaceutical services. This updated Cost of Service Inquiry (COSI) is important for realising the DH's vision as laid out in the White Paper, "Equity and Excellence: Liberating the NHS" (2010).

In October 2009, PricewaterhouseCoopers ('PwC') was commissioned by the Department of Health (DH) to undertake independent research and analysis to estimate the costs, currently and within a 5-year timeframe, incurred by pharmacies in England in providing the community pharmacy services defined under the national NHS community pharmacy contractual framework. DH involved the PSNC throughout PwC's work and both DH's and PSNC's insights to the subject matter have been taken into account by PwC in forming their views as set out in this report.

### **2.2. Project Governance**

The project was overseen by a Steering Group providing pharmacy policy and practice, analytical, statistical and finance expertise. The Group comprised representatives from DH and the PSNC as well as external experts including representatives from HM Treasury, NHS Employers and Professors of Statistics, Business and Economics.

The daily running of the project was undertaken by a Project Team comprising DH and PSNC representatives and PwC staff.

### **2.3. Objectives of this study**

The results of this COSI are intended to inform negotiations between the DH and PSNC regarding the appropriate level of funding required to provide NHS community pharmacy services to patients.

This report has been prepared to present the final results of this COSI.

In carrying out a COSI of this nature, there are a range of methodologies that may be applied. There are also a number of areas in which it is necessary to make certain assumptions for the purposes of analysis. In the course of this work, the project team has considered a wide range of methodologies and assumptions and the impact that these alternative approaches have on the final results obtained. The numbers presented in this report are based on PwC's expert view of the most appropriate approaches and assumptions to adopt. This view has been informed by discussions with the DH/PSNC project team, but does not necessarily reflect the views of either party. Details of the methodology used and the assumptions made are provided in this report. In addition to the main report, further detail and information on the approaches used and the alternative approaches considered are provided in a number of technical Appendices to this report.

We note that as part of the provision of NHS pharmaceutical services, contractors procure medicines for supply to NHS patients. These procurement costs are captured by the COSI. However, given the scope of the project, this work has not looked at aspects of procurement income or funding delivery.

## 3. Cost survey

### 3.1. Sampling methodology

#### 3.1.1. Defining the sampling frame

PwC undertook a survey of pharmacies in England to collect data on the costs they currently incur in delivering NHS pharmacy services.

The population list used as the basis for drawing the sample for the survey fieldwork was generated by merging NHSBSA monthly payment reports for the most recent 12 months available at the time of sampling (September 2008 - August 2009).<sup>10</sup>

We sought to exclude from the population any branches that had opened or closed within the last year and therefore would not have a full year of financial accounts available. We also excluded from the sample pharmacies that have standard Local Pharmaceutical Services (LPS) contracts and Specialist Food companies<sup>11</sup> as it was expected that such pharmacies would have atypical costs. From the population of 10,633 branches (as at August 2009) we excluded:

- 405 branches with 3 or more consecutive months of zero basic dispensing fee payments in the period September 2008 to August 2009;
- 41 branches with standard LPS contracts<sup>12</sup>; and
- 3 Specialist Foods branches.

There was a degree of overlap among these excluded branches. Taken together, the exclusions represent 4.1% (436) of the total population of 10,633 branches. Branches excluded from the sampling frame were not uniformly distributed throughout the population; over 80% of excluded branches were low volume branches from smaller entities.

The survey sampling frame was the remaining 10,197 branches (= 10,633 – 436). Further detail on the sampling frame is provided in Appendix G.

#### 3.1.2. Sampling methodology

Stratified random sampling was used to select a representative sample of community pharmacies in England.

Using stratified random sampling ensures that all key sub-groups of interest are represented in the sample, while still providing a statistical basis for the calculation of confidence intervals around population parameters (since all members of the population have a known non-zero probability of being selected).

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<sup>10</sup> The Prescription Pricing Services (PPS), part of the NHS Business Services Authority (NHSBSA), supplied this data on 3rd December 2009.

<sup>11</sup> The NHSBSA identified 3 specific pharmacy contractors that specialised in the supply of a limited number of products (i.e. sip feeds and total parenteral nutrition (TPN)) to customers across the country rather than to a local community. The products and the majority of prescriptions dispensed by these contractors, and therefore the remuneration and reimbursement of these contractors, are atypical. For this reason it was agreed these contractors should be excluded from the sampling frame.

<sup>12</sup> This does not include pharmacy branches with essential small pharmacy local pharmaceutical services (ESPLPS) contracts.

The variables (and strata for each variable), which we used as the basis for stratification of the main fieldwork sample, were drawn from NHSBSA data and are as shown in Table 1.

**Table 1: Stratification criteria used for survey sample**

Variable	Strata definitions	Rationale for using these strata
Pharmacy ownership structure: Large multiple, Smaller multiple, Independent	Large Multiples & Supermarkets: Boots, Lloyds, Rowlands, Co-op, Day Lewis, Sainsburys, Morrisons, Asda, Tesco and Superdrug. Smaller multiples: Entities with more than 5 branches but not a Large Multiple or Supermarket. Independents: Entities with 5 branches or less.	Different pharmacy types have different cost structures Expected response rates would vary by pharmacy type and wanted to select the sample sizes to reflect this (e.g. 90% for Large Multiples & Supermarkets and 50% for independents). Expected different response rates because of the fact that: <ul style="list-style-type: none"> <li>• multiples are more likely than independent pharmacies to have electronic data systems that make it relatively straightforward to collate cost information for particular branches.</li> <li>• multiples are more likely than independent pharmacies to have a member of staff available to collate the information requested by the survey, whereas at independent pharmacies the owner pharmacist would be responding to the survey alongside their daily workload involved in running the branch.</li> </ul>
Volume of items dispensed per month: Low, Medium, High	Low: 0-20th percentile Medium: 20th-60th percentile High: > 60th percentile	Expected pharmacy costs to vary by size of business Stratifying ensured we picked up a spread Looked at average monthly item volumes for the most recent 12 month period available at the time of sampling – i.e. Sept 08 – Aug 09.
Volume of MURs <sup>13</sup> carried out per month: None, Lower, Higher	None: No MURs Lower: 0 to median of non-zero monthly MUR volume, Higher: More than the median of non-zero monthly MUR volumes	Expected pharmacy costs to vary by the quality and number of advanced and enhanced services being offered – MUR volumes was used as a proxy for this quality of service provision and the number of advanced and enhanced services being offered. Stratifying ensured we picked up a spread in terms of MUR activity. Looked at average monthly MUR volumes for the most recent 12 month period available at the time of sampling – i.e. Sept 08 – Aug 09.

*Source: PwC assumptions discussed with DH/PSNC*

The stratification as described leads to a total of 27 strata (3 pharmacy types x 3 item categories x 3 MUR categories).

The allocation of the sample between different strata was designed to ensure sufficient sample sizes in strata of particular interest so that it is possible to carry out sub-group analysis while still being able to make accurate inferences about the population as a whole. On this basis, a “power allocation”<sup>14</sup> approach to stratification was

<sup>13</sup> Medicines Use Review (MUR)

<sup>14</sup> Power allocation involves allocating sample to each strata based on the ratio of the square root of a stratum’s population size divided by the sum of the square root of population size across all strata. This results in an allocation of sample across strata between that which would be achieved using strictly proportional allocation and uniform allocation.

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used, such that proportionately more pharmacies are sampled in strata that are relatively under-represented in the population.

Geographic region and urban rural location were also considered as bases for stratification. However, it was decided that pharmacy type, item volumes and MUR volume were likely to be better indicators of cost variations. In addition, we expected to obtain good geographic coverage without specifically stratifying the sample based on this.

The target for the study fieldwork was to obtain completed interviews with 500 pharmacy branches. The sampling was carried out in two waves to reduce some of the uncertainty relating to response rates.

In the first wave of sample (carried out in January 2010) different response rates were anticipated for each of the three main pharmacy types as follows: 50% for Independents, 70% for Smaller Multiples and 90% for Large Multiples & Supermarkets. This led to an initial sample of 759 branches. These branches were invited to participate in the survey.

The rationale for expecting different response rates for different pharmacy types is discussed in Table 1. We note that although different response rates were assumed for the purposes of drawing the sample, the analysis weightings are calculated to ensure that all pharmacy types are appropriately represented in the results shown in this report.

The 759 branches drawn in the initial sample were randomly selected based on the stratified sampling described in the previous section and the sample was allocated among strata based on a power allocation approach<sup>15</sup>. The sample sizes are shown in Table 2.

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<sup>15</sup> Table 1 in Appendix G shows the total sampling frame sizes per strata.

**Table 2: Sample sizes drawn in Wave 1 – number of branches in each stratum**

		MURs			
		Zero MURs	Lower volumes of MURs (< median of non-zero MUR volume)	Higher volumes of MURs (> median of non-zero MUR volume)	Total
Items	<b>Independents</b>				
	Low volume (<20th percentile)	36	31	28	<b>95</b>
	Medium volume (20th - 60th percentile)	42	48	46	<b>136</b>
	High volume (>60th percentile)	41	47	47	<b>135</b>
	<b>Total</b>	<b>119</b>	<b>126</b>	<b>121</b>	<b>366</b>
		MURs			
		Zero MURs	Lower volumes of MURs (< median of non-zero MUR volume)	Higher volumes of MURs (> median of non-zero MUR volume)	Total
Items	<b>Smaller Multiples</b>				
	Low volume (<20th percentile)	9	15	16	<b>40</b>
	Medium volume (20th - 60th percentile)	13	25	20	<b>58</b>
	High volume (>60th percentile)	11	22	21	<b>54</b>
	<b>Total</b>	<b>33</b>	<b>62</b>	<b>57</b>	<b>152</b>
		MURs			
		Zero MURs	Lower volumes of MURs (< median of non-zero MUR volume)	Higher volumes of MURs (> median of non-zero MUR volume)	Total
Items	<b>Large Multiples &amp; Supermarkets</b>				
	Low volume (<20th percentile)	11	27	26	<b>64</b>
	Medium volume (20th - 60th percentile)	13	37	39	<b>89</b>
	High volume (>60th percentile)	13	37	38	<b>88</b>
	<b>Total</b>	<b>37</b>	<b>101</b>	<b>103</b>	<b>241</b>

In the second wave of sampling (carried out on 2nd March 2010) a further 121 Smaller Multiple branches and a further 552 Independent branches were selected – a total available sample of 1432 branches. The details of the full sample are shown in Table 3 below. This additional wave of sampling was carried out as a result of revised response rate estimates by our fieldwork team based on actual response rates observed in the early stages of fieldwork. We did not select additional Large Multiple & Supermarket branches because the expected response rate for this group remained unchanged.

**Table 3: Total sample sizes (Wave 1 + Wave 2) – number of branches in each stratum**

		MURs			
		Zero MURs	Lower volumes of MURs (< median of non-zero MUR volume)	Higher volumes of MURs (> median of non-zero MUR volume)	Total
Items	<b>Independents</b>				
	Low volume (<20th percentile)	90	78	71	<b>239</b>
	Medium volume (20th - 60th percentile)	105	120	119	<b>344</b>
	High volume (>60th percentile)	103	119	113	<b>335</b>
	<b>Total</b>	<b>298</b>	<b>317</b>	<b>303</b>	<b>918</b>
		MURs			
		Zero MURs	Lower volumes of MURs (< median of non-zero MUR volume)	Higher volumes of MURs (> median of non-zero MUR volume)	Total
Items	<b>Smaller Multiples</b>				
	Low volume (<20th percentile)	16	26	28	<b>70</b>
	Medium volume (20th - 60th percentile)	22	44	37	<b>103</b>
	High volume (>60th percentile)	19	40	41	<b>100</b>
	<b>Total</b>	<b>57</b>	<b>110</b>	<b>106</b>	<b>273</b>
		MURs			
		Zero MURs	Lower volumes of MURs (< median of non-zero MUR volume)	Higher volumes of MURs (> median of non-zero MUR volume)	Total
Items	<b>Large Multiples &amp; Supermarkets</b>				
	Low volume (<20th percentile)	11	27	26	<b>64</b>
	Medium volume (20th - 60th percentile)	13	37	39	<b>89</b>
	High volume (>60th percentile)	13	37	38	<b>88</b>
	<b>Total</b>	<b>37</b>	<b>101</b>	<b>103</b>	<b>241</b>

## 3.2. Fieldwork

### 3.2.1. Pilot study

Ahead of deploying a nationwide survey of community pharmacies and their costs, a pilot survey of a small number of community pharmacies and head offices was undertaken. This took the form of a number of site visits by PwC staff. Pilot branches were selected to ensure a spread in terms of type of pharmacy, region and urban/rural location. In total the pilot survey involved PwC staff visiting 13 pharmacy branches and 5 pharmacy head offices. Each visit lasted approximately 2 hours.

The purposes of the pilot visits were to:

- Gain a qualitative understanding of the nature of the pharmacy business;
- Understand the different staff roles and who would be best placed to respond to our survey;
- Present potential survey questions and obtain feedback on the wording of questions and how straightforward they were to answer;
- Gain an understanding of accounting practices and obtain examples of their accounts. Understand how easily different types of information might be to provide;
- Gain an understanding of the different categories of cost involved in running a pharmacy business, including centralised costs of any sort, such as a head office;
- Discuss whether, in the pharmacist's view, the proposed questions would provide a fair reflection of their costs and whether there were things we were missing; and
- Discuss how we could improve the survey methodology or tools to make it more straightforward or attractive for pharmacists to respond.

Following the pilot visits, our fieldwork team also tested the proposed fieldwork approach by contacting a small sample of branches.

The survey questionnaire and methodology were significantly refined as a result of the pilot visits. In particular it was agreed that pharmacy owners would prefer to source the information required and fill in a postal



questionnaire in their own time rather than providing all the information required in a single lengthy telephone interview. The view was taken that allowing pharmacists the time to look up the information requests would increase the accuracy and completeness of the survey responses.

Further detail of the pilot study, and the pilot questionnaire used, is included in Appendix F.

### 3.2.2. *Main fieldwork*

Fieldwork was carried out by PwC's International Survey Unit.

Before fieldwork began, jointly-branded letters from DH and PSNC were sent to head offices of all entities with one or more branches selected in the survey sample. The purpose of this letter was to inform pharmacies of the planned research and encourage their participation. For those entities with no head office, or where contact details for the head office were not known, the DH/PSNC letter was sent directly to the sampled branches.

The PwC fieldwork team contacted the letter recipients by telephone to request participation in the survey. During this initial phonecall, a number of screening questions were asked to ensure that all branches sampled met the required criteria. The screener questionnaire is provided in Appendix E. Where possible, PwC asked the head office representative to coordinate the response from the sampled branches. However, where this was not possible, PwC then contacted the sampled branches individually.

Following the initial phonecall, PwC sent out survey questionnaires for each branch to the appropriate individual. Four separate survey questionnaires were used in the fieldwork as summarised in Table 4. The full questionnaires are provided in Appendices A to D.

**Table 4: List of survey questionnaires**

<b>Questionnaire</b>	<b>Comments</b>
Branch Questionnaire	Requested information on branch specific costs and activities. For large multiples and supermarkets, a visit and data request was made rather than paper/electronic surveys being sent.
Head office –employee-level costs	Requested information on head office costs in a way that related to employees and not departments. This was primarily developed with smaller multiples in mind.
Head office –department-level costs	Requested information on head office costs by cost centre or department. This was primarily developed with larger multiples and supermarkets in mind.
Owner Questionnaire	Requested information on owner costs to ensure that all staff-related costs were considered. This was only used for independents and smaller multiples, not for large multiples and supermarkets.

Hardcopy questionnaires were sent to the majority of Independent and Smaller Multiple respondents and a data request in electronic Excel form to the Large Multiple & Supermarket entities. The survey asked respondents to provide details of costs and revenues – as well as other branch information. In addition the survey requested that respondents also provided copies of their financial accounts for each branch in the sample, plus a set of accounts for the entity head office, where appropriate. These accounts were used as a cross-check on the information provided in the survey.

Respondents were encouraged to return their completed questionnaires and accounts within a 2 week period. During the time that the respondents worked on their questionnaires, the PwC fieldwork team was in regular contact to check on progress and encourage timely completion.

In reality, the majority of entities required longer than 2 weeks to return their completed responses. The main fieldwork spanned the period late January 2010 to 27th April 2010. Following this, as part of our data auditing

processes, PwC recontacted a number of pharmacy entities during the data analysis phase to clarify certain aspects of their cost data<sup>16</sup>.

Further details of the fieldwork methodology are provided in Appendix H.

### 3.3. Response rates

The order in which individual branches were contacted and followed up was determined by the random order assigned at the time the sample was selected. Each of the 27 strata were effectively managed as a separate sampling exercise, although where more than one branch in an entity had been selected as part of the sample, we aimed to approach the head office just once to request participation of all branches picked up in the sample, even if some of the entity's branches fell into several different strata or featured much lower in the randomly ordered list than others.

During the fieldwork phase, responses and non-responses were monitored using the following variables:

- Strata (based on pharmacy type, item category and MUR category);
- Region;
- Urban/Rural location;
- Item and MUR volume;
- Index of Multiple Deprivation and Health index (as indicators of levels of social deprivation); and
- NHSBSA payments made in most recent year for which data was available (September 2008 to August 2009).

Efforts were made during fieldwork to address any possible non-response bias, in particular in terms of strata and geographic locations.

Overall, the final response rate to the survey was 40%. Response rates are within the range of what would be expected for a study of this type and the fieldwork methodology used.

The final results and analysis presented in this report are based on data from 573 branches. Response rates and achieved sample sizes are summarised in Table 5 below.

**Table 5: Survey response rates – based on branches by pharmacy type**

	Sampling frame (p)	Sample drawn (n)	Responses received and used in analysis (r)	Response rate (r/n)
Independent	3890	918	261	28%
Smaller multiple	997	273	88	32%
Large Multiple & Supermarket	5310	241	224	93%
Overall	10197	1432	573	40%

*Source: PwC survey of pharmacy contractors*

### 3.4. Weighting

The sample has been weighted to ensure representativeness in terms of the full pharmacy sampling frame. The weights calculated for each member of the sample have three components:

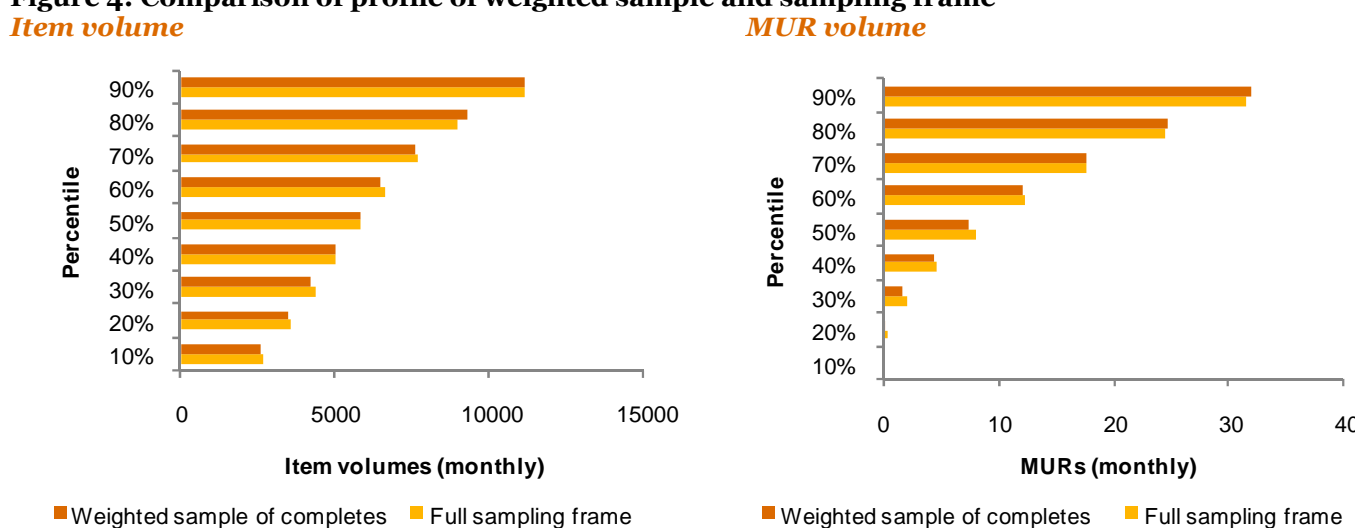
<sup>16</sup> For example, PwC recontacted a number of Large Multiple entities to check data relating to head office cost allocations and a number of supermarket entities to check some gaps in divisional head office cost data.

- Component 1 is calculated as the sampling frame size divided by the sample size and is required since power allocation was used to determine sample numbers rather than proportional allocation.
- Component 2 is calculated as the sample size divided by the number of responses and is required since response rates were different in each stratum.
- Component 3 is an additional weighting adjustment calculated to adjust for non-response bias<sup>17</sup>. It is calculated separately for each pharmacy type using regression techniques to ensure that:
  - The sum of the item volumes for the weighted sample exactly matches the sum of the item volumes for the sampling frame.
  - The sum of the MUR volumes for the weighted sample exactly matches the sum of the MUR volumes for the sampling frame.
  - The proportion of London branches in the weighted sample exactly matches the proportion in the sampling frame.

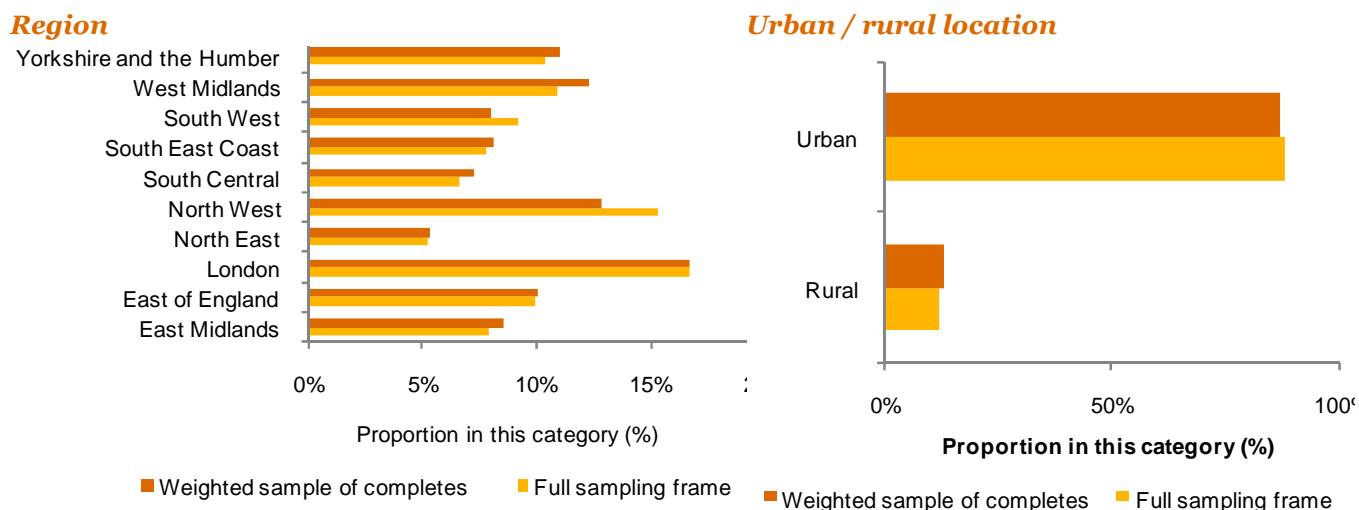
The first two weighting components ensure that the number of complete interviews in each stratum is scaled up to the size of the sampling frame in that stratum. The third weighting component is an additional adjustment to deal with non-response bias. The criteria chosen for the non-response bias weights were the result of extensive discussion and consideration of a range of pharmacy characteristics also including geographic region, urban/rural location and levels of social deprivation in the vicinity of the pharmacy branches. The view of the project team was that item volumes, MUR volumes and location in London were the three factors that were most likely to affect the costs incurred by pharmacies and were therefore the most important factors to ensure the sample was representative in terms of.

The non-response bias weights were calculated separately for each of the three main pharmacy types. The charts below however show that overall the final weighted sample of 573 branches is comparable to the profile of the full sampling frame.

**Figure 4: Comparison of profile of weighted sample and sampling frame**



<sup>17</sup> Decisions regarding the appropriate weighting adjustments to make for non-response bias were made following a comparison of the sample profile and the sampling frame profile. The project team concluded that using weighting to adjust the sample profile for the three variables mentioned in the text to bring them into line with the profile of the sampling frame would help ensure that any cost analysis conducted would be representative of the full sampling frame.



Source: PwC survey of pharmacy contractors and NHSBSA data

Further details of the weighting calculations are provided in Appendix G. The sampling and weighting methodology was developed by PwC in close discussion with the DH/PSNC team and advice from the team’s statistical advisor.

Throughout the analysis presented in this report and accompanying Appendices, the numbers of branches in each pharmacy type are assumed to be as shown in the table below.

**Table 6: Number of branches assumed for the population sampling frame (based on NHSBSA data)**

	Independent	SM	NRD LM	RD LM	Super-market	Overall
Number of branches <sup>18</sup>	3,424	1,398	3,598	1,225	552	10,197

### 3.5. Scaling up to the full population

The sampling frame for the survey comprised 10,197 branches. This sampling frame was based on a population of 10,633 branches contained in the NHSBSA payment report for the most recent month for which data was available at the start of the project (August 2009). As already explained, from this population of 10,633 branches, a number of branches were excluded from sampling frame (405 branches who had £0 payments recorded from NHSBSA for 3 or more consecutive months in the period September 08 – August 09, 41 branches with standard LPS contracts and 3 Specialist Food companies<sup>19</sup>). There was some overlap between these 3 categories of branches. In total, the number of excluded branches was 436 (representing 4.1% of the original population).

<sup>18</sup> We note that the number of branches of each pharmacy type in the sampling frame is equal to the sum of the weights of the sample members of this type.

<sup>19</sup> The NHSBSA identified 3 specific pharmacy contractors that specialised in the supply of a limited number of products (i.e. sip feeds and total parenteral nutrition (TPN)) to customers across the country rather than to a local community. The products and the majority of prescriptions dispensed by these contractors, and therefore the remuneration and reimbursement of these contractors, are therefore atypical. For this reason it was agreed these contractors should be excluded from the sampling frame. NHSBSA also identified 41 pharmacy branches with LPS contracts. This number does not include pharmacies with ESPLPS contracts.

Therefore, to estimate the total NHS cost for the whole population – rather than just the sampling frame – an adjustment is needed to take account of the costs of the branches in the population that were excluded from the sampling frame.

The survey did not gather cost information on the branches excluded from the sampling frame, therefore any adjustment calculated will be a rough estimate only.

We suggest that three possible approaches to calculating this adjustment are:

1. Adjustment based on the number of branches in the sampling frame compared to the population.
2. Adjustment based on the volume of script items in the sampling frame compared to the population.
3. Regression adjustment based on volume of script items, MURs and pharmacy type (as defined for the sampling frame and population) and using estimated NHS costs (based on the survey) as the dependent variable.

Our preferred method for calculating this adjustment is method 3, the regression adjustment, because this makes fullest use of the cost information available. The adjustments have been calculated individually for each of the 3 pharmacy types. Because the majority of branches excluded from the sampling frame were independent branches, the adjustments calculated for this pharmacy type (to get from the sampling frame to the population) is larger than for the other 2 pharmacy types.

Table 7 below shows the adjustments calculated using these three methods.

**Table 7: Adjustments to get from sampling frame to full population**

	<b>Method 1: Number of branches</b>	<b>Method 2: Volume of fee items</b>	<b>Method 3: Regression</b>
Independent	108.3%	102.1%	104.48%
Smaller Multiple	103.6%	101.1%	101.43%
Large Multiple	101.5%	100.3%	100.68%
Overall	104.3%	101.0%	101.78%

*Source: NHSBSA data and PwC assumptions discussed with DH/PSNC*

## **3.6. Data cleaning and validation**

### **3.6.1. Validation checks**

A number of data validation checks were carried out prior to starting the analysis as follows:

- Double entry of responses to key questions, such as those relating to costs reported in accounts, to identify any data entry errors in these fields (for Independents and Smaller Multiples whose survey responses were largely submitted in hard copy).
- Spot checks of the remaining responses to identify any further data entry errors.
- Total checks to ensure that responses that were expected to sum to other fields did so, particularly checking that percentages summed to 100%.
- Magnitude checks to identify records where reported costs were outliers from the remainder of the data. These data points were not removed purely on the basis of their outlier status, but these checks helped identify data points that could have been errors (i.e. typos).
- Querying of individual responses by recontacting particular pharmacy entities. This was particularly useful when dealing with abnormally small or large costs and when trying to identify the constituent costs that made up “Other Cost” responses.

These data validation checks allowed PwC to identify both data entry errors and those surveys with “abnormal” responses.

### 3.6.2. Dealing with missing data – using the accounts

In some cases where key pieces of data were missing from survey responses, PwC was able to fill in the missing information using the financial accounts provided. Accounts were reviewed for 223 Independent branches and a number of the Small Multiples<sup>20</sup>. The number of pharmacies with key data missing from both the survey and the accounts was very small. The table below provides some further details.

**Table 8: Volume of missing data supplied by financial accounts**

Survey data fields we were able to fill using account information	Number of pharmacies with data missing in the survey	Number of pharmacies we were able to fill in data from the accounts
Total revenue	13	12
Cost of goods sold	18	17
Staff costs	6	5
Depreciation costs	32	16
Property costs	3	3

Source: PwC survey of pharmacy contractors

### 3.6.3. Dealing with missing data – imputation

Cost information has been imputed where:

- the data were not provided in the survey;
- it was not possible to fill in this data from the hard copy accounts; and
- the missing costs were such that it would not be appropriate to assume a £0 value.

Two different methods of imputation have been used as follows:

- A nearest neighbour donor based approach has been used for all missing key cost lines (where it would not be appropriate to assume a £0 value).
  - In this methodology the same “donor” is used for each missing data point of a particular “recipient” pharmacy. Donors are selected from the same pharmacy type as the recipient. Within a given pharmacy type a donor is selected that is ‘similar’ to each recipient pharmacy. The characteristics used to determine this similarity were NHS revenue, retail revenue and number of fee items.
  - This methodology ensures that the relationships between variables in the data are preserved by virtue of selecting all data for a particular recipient from the same donor pharmacy.
- A mean based approach has been used to impute missing responses to employee level questions (such as hours worked and split of time between NHS and non-NHS activities) which are used to calculate the appropriate allocation of staff costs.
  - This method leads to a final dataset with less variation than if a donor based method was used. However this was considered acceptable because the number of pieces of missing data was small and the resulting data are used to create just one percentage split of staff costs per pharmacy branch. In

<sup>20</sup> It was not possible to cross-check survey responses against accounts for the Large Multiple sample because the Large Multiple accounts didn’t break costs down for individual branches.

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addition, it was not obvious how a “nearest neighbour donor” should be identified for this type of employee level data.

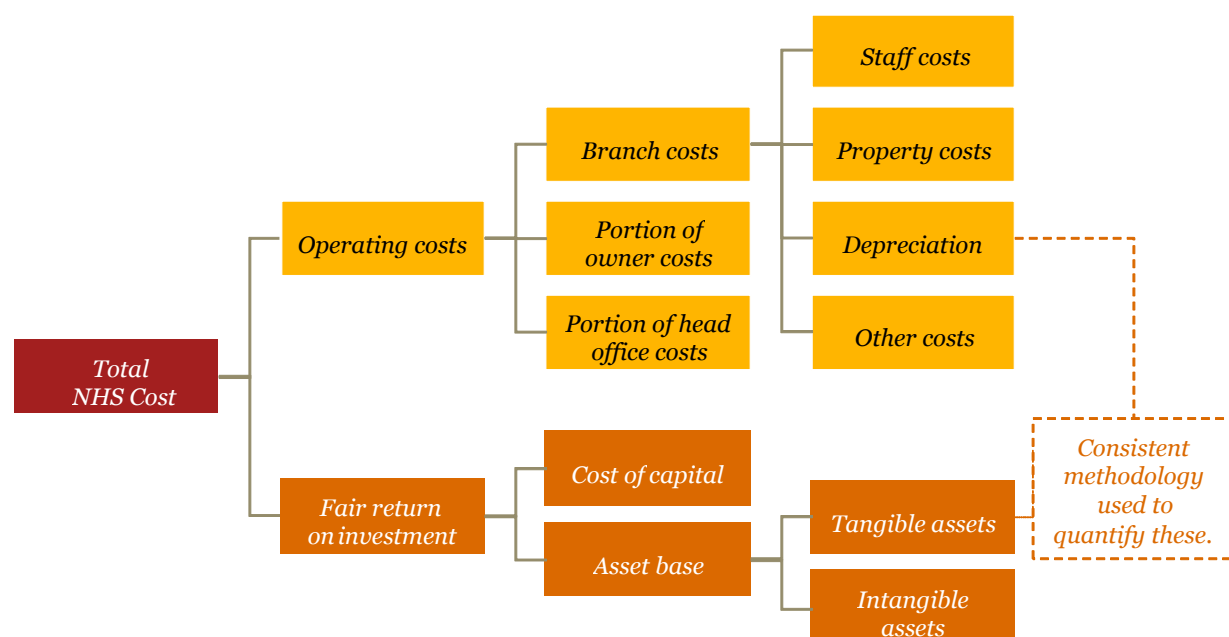
For cost information that was previously missing and is now imputed we would expect costs to increase. For data used in cost allocation we would expect that the imputation would not change the results as long as the allocations that were missing were missing randomly. Full details on the imputation methodology are provided in Appendix J. In this we show that the amount of cost and allocation information we were required to impute is not substantial. Overall imputation increased the average allocated NHS cost per branch by 0.33%.

# 4. Framework for calculating and allocating costs

## 4.1. Overview

The figure below provides an overview of the approach used to calculate a value for the cost of providing NHS pharmaceutical services. This cost is calculated as Operating Costs plus a Fair Return on Investment.

**Figure 5: Framework for calculating the cost of providing NHS pharmaceutical services**



## 4.2. Cost allocation

The operating costs of a pharmacy are made up of staff costs, property costs, depreciation and other costs, plus a portion of head office costs. Each type of cost is allocated between the categories NHS, non-NHS and Common (ie. those costs that common to both NHS and non-NHS activities).

A summary of the cost allocation methodology used is provided in this section. Further details of the allocation methodologies are provided in Appendix K.

### 4.2.1. Allocating costs

Two main approaches to allocating costs were considered in developing the methodology for the allocation of pharmacy costs between NHS, non-NHS and Common:

- LRIC: a long-run incremental cost approach, which is based on the concept of avoidable costs.
  - Under a LRIC approach, NHS costs are those costs that would be avoided in the long-run if the business stopped offering NHS community pharmacy services and non-NHS costs are those costs that would be avoided in the long-run if the business stopped offering retail services. Common costs are those costs that are not avoided in either scenario and are therefore common to both parts of the business.
  - LRIC allocation has a strong base in economic theory and is used by regulators and competition authorities.



- LRIC requires a complex thought exercise to identify costs on the basis of hypothetical counterfactual situations where different activities are assumed not to exist. It was not possible to collect detailed information on appropriate LRIC allocations during the costs survey<sup>21</sup> so for the purposes of this COSI analysis LRIC allocations are based on PwC's judgment, informed by the survey data and discussions with the DH/PSNC project team.
- FAC: a fully-allocated cost approach, which involves allocating cost in proportion to drivers such as stated percent of time spent on different roles, split of floor-space etc.
  - FAC has the advantage that the allocation can be based on the branch-specific data collected during the costs survey.

#### **4.2.2. Allocating branch costs**

In the cost analysis presented in this report, we show results using two slightly different approaches to allocating costs between NHS and non-NHS. These two approaches are defined as follows:

- Allocation method 1:
  - Staff costs are allocated using a FAC approach based on the splits of staff time (between NHS, non-NHS and Common) reported in the survey for each type of staff.
  - Property costs are allocated using a FAC approach based on the split of revenue between NHS and non-NHS activities.
  - Depreciation costs are allocated using a LRIC approach based on the estimated value of NHS, non-NHS and Common branch assets
  - Other costs are allocated based on a LRIC or FAC approach depending on the cost type – and informed by how other branch costs are allocated, e.g. staff training costs are allocated in the same proportions as staff costs and utilities are allocated in the same proportions as property costs.
- Allocation method 2:
  - Staff costs are allocated using a LRIC approach based on categorisation of each staff type as NHS, non-NHS or Common.
  - Property, Depreciation and Other Costs are allocated in the same way as for Allocation method 1

We note that the key difference between these two allocation methods is the treatment of staff costs. This difference leads to a slight difference in the proportion of overall costs originally allocated to NHS and non-NHS. This in turn has an affect on the proportion of Common costs allocated back to NHS and non-NHS when presenting results for property, depreciation and other costs.

#### **4.2.3. Allocating head office costs**

Head office costs have been split between NHS, non-NHS and common categories based on divisional cost splits provided in the head office survey.

Costs for certain head office divisions have been allocated to individual branches using a revenue-based split, with the remainder using a uniform split based on the number of branches.

#### **4.2.4. Allocating common costs**

Common costs have been allocated based on an equi-proportional mark-up (EPMU) approach. This approach allocates the common costs to NHS and non-NHS in the same proportion that costs have been directly allocated

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<sup>21</sup> As a result of the pilot survey, PwC concluded that because questions involving LRIC allocations entail quite a difficult thought process, they work best when you guide respondents through them face to face and we couldn't be confident we would get reliable answers to these questions via a postal survey.

to these categories, as shown in the example below. For example, if a particular branch had NHS assets of £70K, Non-NHS assets of £30K and Common assets of £10K, then £7K of the Common assets would be allocated to NHS and £3K would be allocated to non-NHS.

**Figure 6: Equi-proportional mark-up (EPMU) approach**



### 4.3. The “Reasonably Efficient Pharmacy”

There was discussion over the course of the project regarding how “reasonably efficient” may be defined and what levels of efficiency are reasonable in the case of community pharmacy businesses. While it is generally acknowledged that genuinely inefficient and unreasonably efficient pharmacies should not be included in the estimate of average costs, it is also important that the costs of dealing with normal business risks are included.

The NHS costs estimated for the survey sample cover a wide range. However at least some of this variation is due to the fact that the pharmacies in the sample differ in terms of their characteristics and the volumes of different services they offer. In Appendix S we show the results of some econometric analysis on the survey results that seeks to identify the most and least efficient members of the sample. This analysis investigates the extent to which the observed cost variations may be attributed to differences in known pharmacy characteristic variables. The variations in cost that are not explained by this analysis may be due to differences in efficiency between pharmacy branches. However, other reasons for unexplained costs may also include non-standard one-off costs incurred by pharmacies in a particular year and costs attributable to pharmacy characteristics for which data was not collected by our survey - in addition to normal variation in costs which would be expected in any survey of this sort. We conclude that, based on the data currently available, such analysis is unable to provide definitive proof regarding levels of efficiency and the extent to which this is a level of efficiency that is “reasonable”.

For the reasons explained above, when presenting cost analysis, no members of the final sample have been removed due to their assumed level of efficiency. When presenting average costs in this report, we use the weighted mean average of the whole sample. We acknowledge that, to the extent that the sample includes branches whose costs reflect inefficiencies, or indeed over-efficiencies, this will have an effect on the cost estimates calculated.

It is observable that there are some marked differences in costs between some pharmacy types. In Appendix Q we show the impact of some of these more extreme differences on the calculation of average NHS cost per branch and cost per fee item.

### 4.4. Fair rate of return

In addition to operating costs, the cost of providing NHS pharmaceutical services also includes a fair return on investment. The project team held a series of meetings at which the appropriate rate of return for investors in community pharmacies was discussed.

To remain a viable commercial enterprise, investors in pharmacy businesses need to earn a fair rate of return to recognise the risks they have taken in investing in their business. We have sought to estimate the fair return for the NHS component of a pharmacy business. The approach taken to estimating this fair return is based on the Weighted Average Cost of Capital (WACC). The WACC is the minimum rate of return an investor would achieve in a competitive market. WACC is most readily applied to calculating fair return for investors in large companies, since its application generally involves the use of stock market information. It has strong theoretical underpinnings and many regulators, and competition authorities have used the WACC framework in their analyses; there is therefore strong precedent for its use. WACC is arguably not so well suited for calculating fair return for investors in smaller companies, such as Independents and Smaller Multiple pharmacy businesses. However, there is no standard framework that is commonly used for estimating a fair rate of return for investors in such smaller businesses. We recommend that a pragmatic, and defensible, approach is to use the standard WACC framework for the small pharmacy companies as for the Large Multiples & Supermarkets, with appropriate application of a Small Companies Premium. Such premia have been adopted by UK regulators in setting prices (for example, by OFWAT<sup>22</sup>).

Under the WACC approach, the Fair Rate of Return is calculated as:

$$\text{Fair Rate of Return} = \text{WACC} \times (\text{Tangible Assets} + \text{Intangible Assets})$$

where the WACC is a weighted average of the cost of debt and the cost of equity for pharmacy businesses.

The calculation of the Fair Rate of Return is described in Section 6, and full details of the fair return methodology are provided in Appendices M - P.

#### 4.5. Other analysis assumptions and caveats

A number of analysis assumptions are noted below:

- All average NHS costs shown in this pack include the cost of any enhanced services.
  - Insufficient data are available from the survey and from the NHSBSA to robustly estimate the costs associated with delivering enhanced services.
- We note that cost data shown do not include distribution costs but do include items such as pharmacy collection and delivery. We have excluded head office distribution costs from our base case calculations on the assumption that these are the costs of delivering drug supplies to the pharmacy branches (and therefore may overlap with wholesaler services for smaller pharmacies). The magnitude of these distribution costs is provided in section 5.5. We have however included all branch costs relating to delivery staff and driver costs in our analysis on the assumption that these costs primarily relate to collecting prescriptions from local surgeries and delivering them to the pharmacy and to delivering prescriptions to patients. We have also included in the branch cost calculations any "other" costs recorded that were described as relating to delivery or distribution<sup>23</sup>.
- The survey asked pharmacists to provide details of the costs incurred in their most recent annual accounting period<sup>24</sup>. This means that the cost data collected correspond to a number of different annual

<sup>22</sup> As described in the Ofwat report "Future water and sewerage charges 2010-15: Final determinations" (2009).

<sup>23</sup> The amounts of these costs overall are "Branch delivery/driver staff" : £6,451 per branch (total); £6,245 (allocated to NHS), "Other branch costs described as "delivery" or "distribution"": £782 (total); £703 (allocated NHS). The questionnaire did not require respondents to provide definitions of what types of activity come under the headings delivery/distribution.

<sup>24</sup> Cost data for 50% of the sample was provided for a 12-month period closing less than 6 months before the date of the survey (April 2010). Less than 8% of branches provided data for a 12-month period closing before the end of 2008. The average closing month of accounts for which cost data was provided was August 2009.

periods. For the purposes of calculating average costs, all costs and values have been inflated to the period April 2009 to March 2010. The inflation measures used to uprate data from the period of accounts reported in the survey for each cost category are as follows:

- Staff costs – Average weekly earnings index (AEI);
- Property costs – Retail price index (RPI);
- Other costs and tangible asset values – Consumer price index with the effect of indirect taxation removed (CPIY).

Further details of the inflation methodology used are provided in Appendix L.

- Prescription item volumes have not been inflated. NHSBSA fee item volumes for the year corresponding to the cost data provided in the survey<sup>25</sup> are used in any fee item analysis shown. Similarly we have not applied any inflation to other measures of service activity such as volumes of other services provided, nor adjusted for additional regulatory burden or efficiency since the survey. There is a degree of inconsistency in using inflated costs together with such uninflated activity measures. However we suggest that, at least for the purposes of econometric analysis (as presented in Appendix R), this is a pragmatic approach given that we have no information on how different activity measures may have changed over time.

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<sup>25</sup> Survey respondents were asked to provide cost data for the 12-month period corresponding to their most recent set of financial accounts.

# 5. Operating Costs

## 5.1. Staff costs

In the survey, cost information was gathered for nine categories of staff as follows:

- Pharmacists;
- Branch managers;
- Pre-registration students;
- Technicians;
- Counter assistants;
- Delivery and distribution staff;
- Accountants;
- Cleaners; and
- Other staff.

Staff costs are the largest element of cost incurred by pharmacy businesses. We have calculated the impact on overall results of using two alternative methods for allocating staff costs between NHS, non-NHS and common categories: Allocation Method 1 and Allocation Method 2. Allocation method 1 uses an FAC approach and allocation method 2 uses a LRIC approach, as described in section 4.2.2 above.

Allocation Method 1 (the FAC approach) uses the data collected by the branch survey on the proportion of time spent on NHS, retail and common activities by each type of staff. The proportions of cost allocated to the NHS for each job type under this methodology are shown in Table 9. The calculations in this table include an element of the common costs allocated to NHS. Table 9 also shows the overall proportion of staff costs allocated to each job type.

**Table 9: Proportions of staff costs allocated to the NHS under Allocation Method 1 (i.e. using FAC methodology for staff costs)**

	Proportion of overall staff costs	Indp	SM	NRD LM	RD LM	Spmkt	Overall
Pharmacists	36%	91%	95%	87%	96%	87%	<b>91%</b>
Branch managers	13%	89%	91%	88%	38%	85%	<b>79%</b>
Pre-registration students <sup>26</sup>	1%	87%	94%	82%	24%	72%	<b>83%</b>
Technicians	35%	89%	95%	92%	96%	95%	<b>93%</b>
Counter assistants	6%	25%	53%	21%	9%	22%	<b>20%</b>
Delivery and distribution staff	6%	93%	98%	97%	98%	N/A	<b>97%</b>

<sup>26</sup> The proportion of pre-reg student time allocated to NHS in retail driven large multiples is lower than might be expected. This proportion is based on the survey response from a single RDLM branch. This result does not have a significant impact on overall analysis results as overall pre-reg students only account for staff costs of £205 per branch on average.

Accountants	1%	79%	70%	N/A	20%	77%	<b>71%</b>
Cleaners	<1%	71%	66%	64%	N/A	77%	<b>71%</b>
Other <sup>27</sup>	2%	63%	83%	92%	5%	N/A	<b>13%</b>
<b>Total</b>	<b>100%</b>	<b>74%</b>	<b>87%</b>	<b>77%</b>	<b>49%</b>	<b>70%</b>	<b>69%</b>

Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

Under Allocation Method 1, the shares of cost allocated to NHS for pharmacists and technicians, which together account for more than 70% of staff costs overall, are similar across pharmacy types.

The proportions of costs allocated to NHS for many of the other job types are much lower for retail driven large multiples than for other pharmacy types. This suggests that the staff carrying out roles in the retail driven large multiples do considerably different proportions of NHS work to those in other pharmacy types.

The NHS allocation for counter assistants in smaller multiples is much higher than for other pharmacy types. This difference is largely driven by one particular pharmacy entity and we suggest this is due to differences in the role of a counter assistant within this entity compared to other smaller multiples<sup>28</sup>.

Under Allocation Method 2 (the LRIC approach) to allocating staff costs, we make assumptions regarding which cost category (NHS, retail or common) best describes each staff type and have allocated the total costs for the staff type to this category. The categorisations used are shown in Table 10 together with the proportion of costs allocated to NHS on average across all pharmacies by staff type. The calculations in this table include an element of the common costs allocated to NHS.

**Table 10: Proportions of staff costs allocated to the NHS under a LRIC methodology (Method 2)**

	Category	Overall allocated to NHS
Pharmacists	NHS	100%
Branch managers	NHS for all except RD LMs Common for RD LMs	90%
Pre-registration students	NHS	100%
Technicians	NHS	100%
Counter assistants	Retail	0%
Delivery and distribution staff	NHS	100%
Accountants	Common	74%

<sup>27</sup> Our analysis has shown that retail driven large multiples have far more staff categorised as Other than other pharmacy types (even when volume effects have been taken into account). On average retail driven large multiples have over six Other staff full time equivalents per branch while other pharmacy types have less than one. This suggests that these members of staff are more likely to be associated with the retail side of the business.

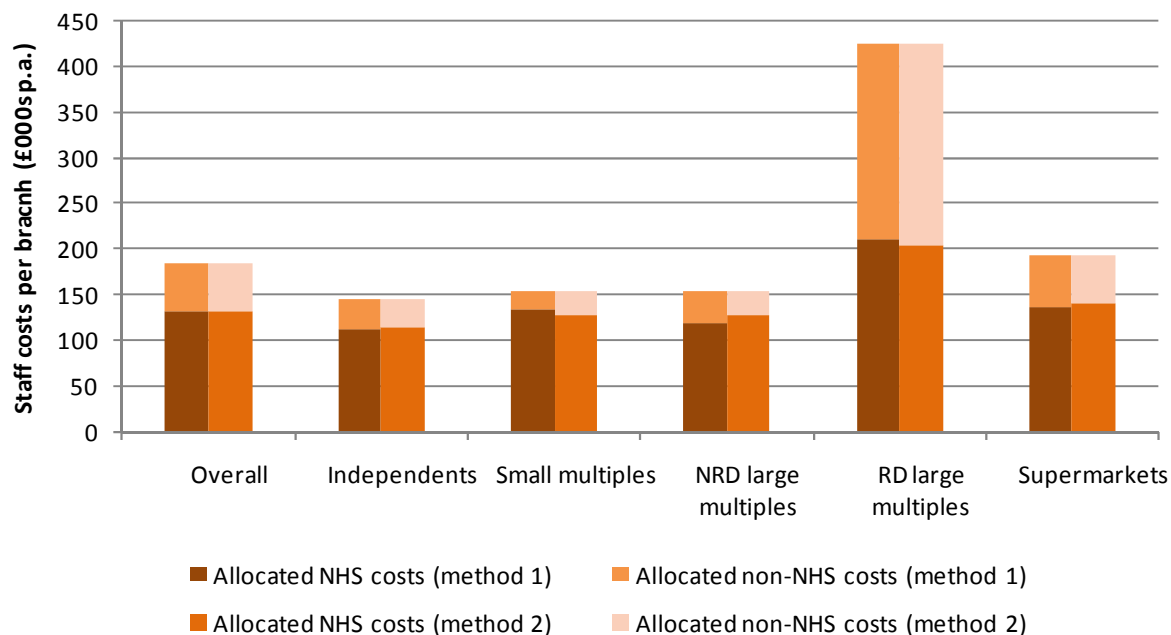
<sup>28</sup> We note that if the proportion of counter assistant time allocated to NHS was 20% for Smaller Multiples (i.e. in line with the average proportion for the overall sample) rather than 52%, then total Small Multiple NHS costs would reduce by £8,443 or 3.3%.

Cleaners	Common	82%
Other	Common for all except RD LMs Retail for RD LMs	10%
<b>Total</b>		<b>70%</b>

Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

Figure 7 below shows how total staff cost varies by pharmacy type. Total staff cost includes a portion of owner costs. Owner costs were collected by the survey and were broken down into salary, rent paid to the owner, rent paid to the owner’s partner, dividends and other owner costs. We note that some of these owner costs, particularly a portion of those marked as dividends, may actually be a return on the pharmacist’s investments (and therefore counted in the fair return calculations as well). However, as we do not have a basis for identifying where this may be the case, we suggest that all owner costs should be included to avoid underestimating the total staff costs particularly in the case of independent pharmacies<sup>29</sup>. Owner costs are allocated to individual branches using a similar method to head office costs and allocated between NHS and non-NHS using an FAC methodology.

**Figure 7: Total staff costs (including owner costs) and allocation between NHS and non-NHS (under Allocation Methods 1 and 2)**



Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

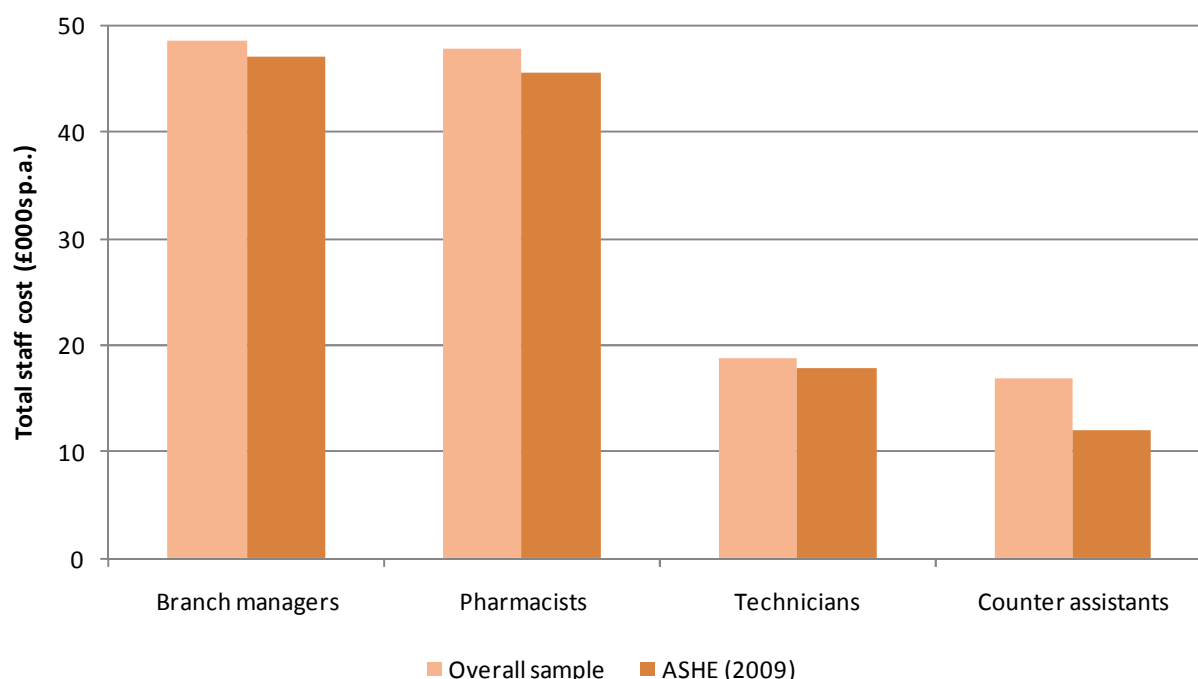
We note that Independents report lower staff costs than other pharmacy types. There may be a number of reasons for this, but it is possible that there may have been some under-reporting of costs in the survey by Independent pharmacies.

<sup>29</sup> Independent owners reported dividends of £17,637 per branch and SM<20 owners reported dividends of £7,840 per branch. SM>20 did not report any dividends and Large Multiples & Supermarkets were not asked to fill out the Owner survey questionnaire. Dividends may include pharmacist salary and compensation for entrepreneurial activity, as well as a return on capital invested in the business.

To help validate the total staff costs we have compared the implied total staff costs per branch from the survey with the Office for National Statistics (ONS) labour force survey data. This comparison is shown in Figure 8 below. The ONS data used is from the 2009 Annual Survey of Household Earnings (ASHE) and the pharmacist, branch manager and technician salaries refer specifically to the pharmacy sector. The counter assistant salaries have been compared with general retail assistant salaries. This ASHE survey collects annual gross pay so we have uplifted these values by 25%. This is a rough adjustment made to account for pensions, holiday allowance and other benefits to give a fair comparison with total staff costs<sup>30</sup>.

We observe that the survey staff costs per full-time equivalent (FTE) appear consistent with the ONS data. We note that the retail assistants in the ASHE survey are not specific to the pharmacy sector, which may explain the difference between costs for the counter assistant category shown in the chart.

**Figure 8: Comparison of total annual staff costs per FTE from the survey with ASHE data**



*Source: PwC survey of pharmacy contractors and ASHE data*

Table 11 shows the amount of total staff costs allocated to the NHS under the two cost Allocation Methods based on the proportions shown in Table 9 and Table 10 above. This data is also shown graphically in Figure 7. For the purpose of these calculations, common costs have been allocated between NHS and non-NHS based on an EPMU approach. These allocated NHS staff costs are fairly similar for 4 of the 5 pharmacy types (ranging between £112,969 and £134,998 per branch under Allocation Method 1 and between £114,803 and £141,015 under Allocation Method 2). Retail Driven Large Multiples have much higher allocated NHS staff costs than the other pharmacy types (£209,825 under Allocation Method 1 and £204,402 under Allocation Method 2).

**Table 11: Allocated NHS staff costs per branch (including owner costs and a portion of common staff costs)**

<sup>30</sup> On average, the disaggregate staff costs reported by survey respondents were 24% less than the total staff cost figure provided. This reflects the fact that, based on the survey data, on average bonuses and other employer-paid staff costs add approximately 25% to the wage bill.



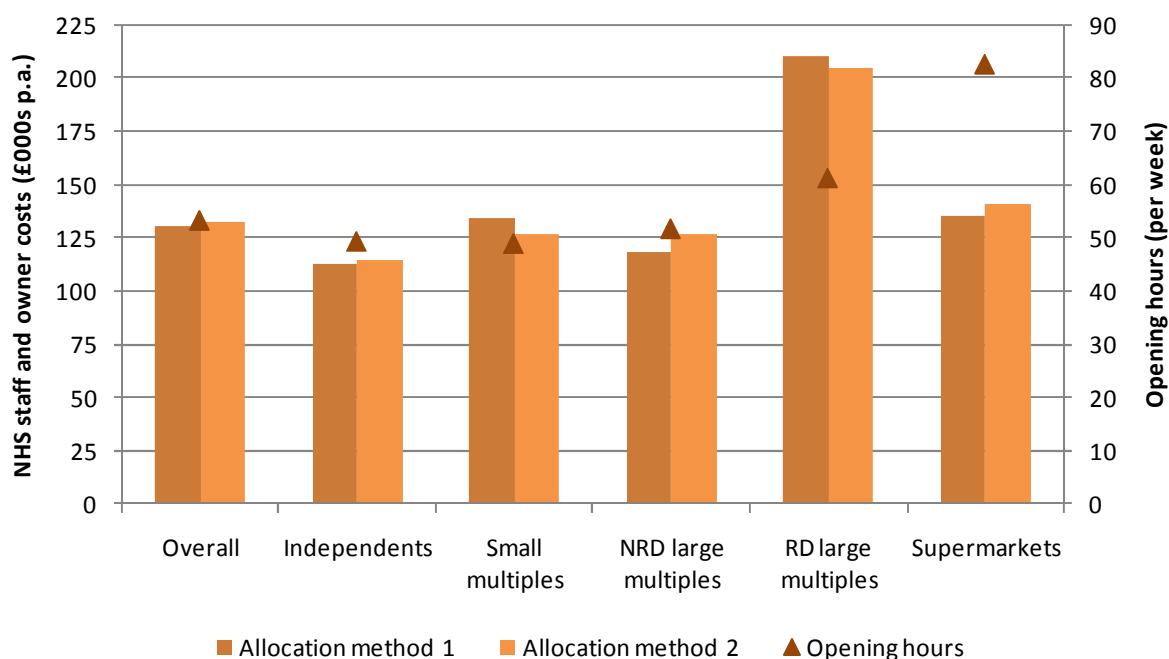
	Allocation method	Indp	SM	NRD LM	RD LM	Spmkt	Overall
Total NHS staff costs <sup>31</sup>	1	112,969	133,818	118,598	209,825	134,998	130,640
	2	114,803	126,429	126,317	204,402	141,015	132,641

Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

We have carried out a number of analyses to further understand the staff costs allocated to the NHS and how this varies by pharmacy type.

Firstly we have carried out a comparison of staff costs and opening hours as shown in Figure 9 below. This demonstrates that opening hours and staff costs are similar for three out five of the pharmacy types. The independent, small multiple and NRD large multiple branches average between £43 and £52 of NHS costs per hour (using Allocation Method 1). For example, a cost of £43 per hour may be explained as one pharmacist (costing approximately £20 per hour), one dispenser and one technician (each costing approximately £9 per hour), giving a total of £48 per hour. Assuming that NHS activity makes up approximately 90% of these total costs gives £43 per hour. The implied NHS staff cost per hour is significantly higher for RD large multiples and significantly lower for supermarkets than for the independent, small multiple and NRD large multiple branches.

Figure 9: Comparison of NHS staff costs and opening hours



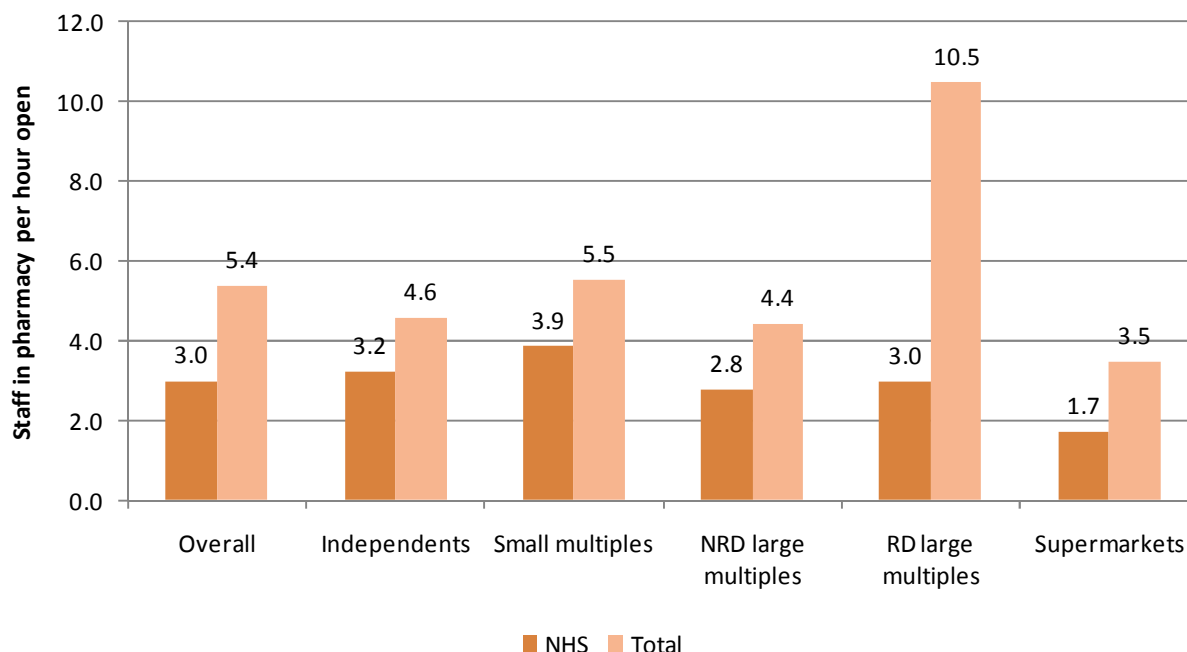
Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

We have considered the average number of staff employed by branches within each pharmacy type. We have divided this by the number of hours the pharmacy branch is open to make a more direct comparison between pharmacy types. This analysis is shown in Figure 10. As shown, the average number of NHS employees in the

<sup>31</sup> For Independents and Smaller Multiples (SM), total NHS staff costs include a portion of owner costs as well as branch staff costs. For Independents, 44% of the total NHS staff costs are based on a portion of the reported owner costs being allocated to the individual branch. For SM, 5.5% of the total NHS staff costs are a portion of reported owner costs.

store at any time varies across pharmacy type between 1.7 (for supermarkets) and 3.9 (for smaller multiples) employees per hour that the pharmacy is open.

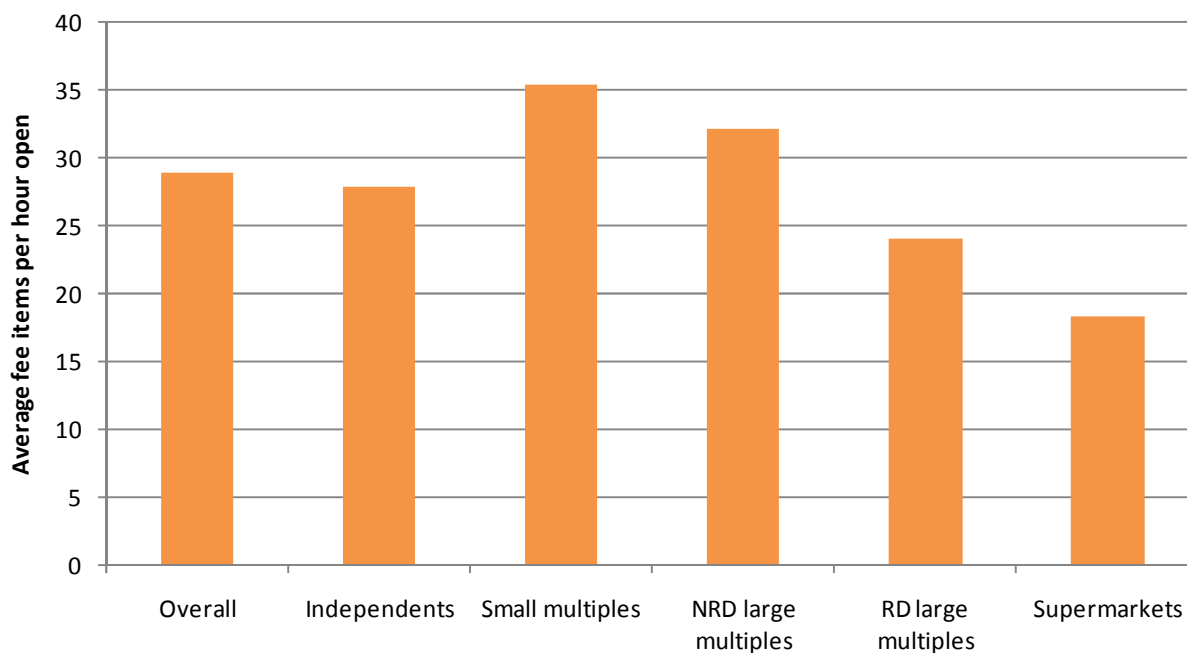
**Figure 10: Number of staff per hour that the pharmacy is open**



*Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC*

Figure 11 shows the number of prescription items dispensed per hour that the pharmacy is open. Differences in volume of items dispensed may help to explain some of the variation in number of NHS employees across pharmacy type shown in Figure 10. Small multiples employ the highest number of NHS staff per hour that the pharmacy is open – but they also dispense the highest volume of items per hour. Similarly, supermarkets employ the lowest number of NHS staff per hour – but also dispense the lowest volume of items per hour.

**Figure 11: Fee items dispensed for each hour the branch is open**



Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

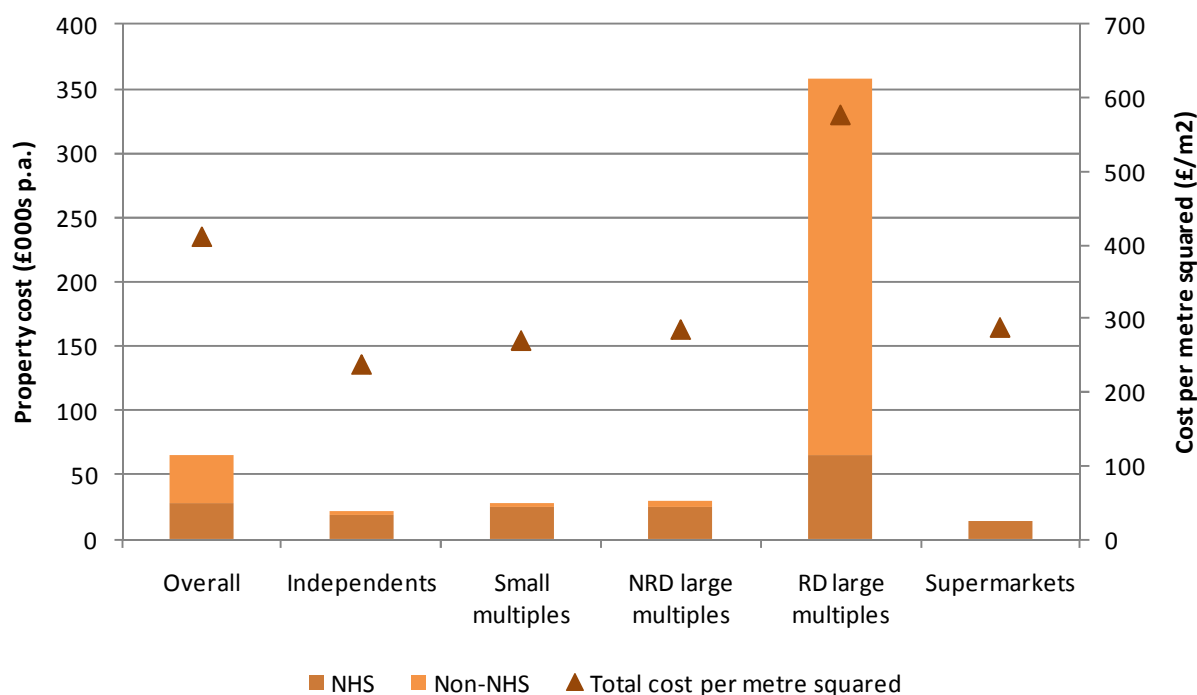
## 5.2. Property costs

Property costs primarily consist of actual or estimated rents but also include utilities and business rates.

Property costs have been split into NHS and non-NHS on the basis of the revenue split reported for the branch. An exception to this is supermarket pharmacy rent, 100% of which is allocated to NHS. Property costs have been allocated based on revenue rather than floor area partly because it is more straightforward to accurately estimate the proportion of a branch’s revenues that are NHS and non-NHS than the proportion of branch floor area. In addition we have also considered the fact that for many independent and smaller multiple branches, the size of their property is influenced more by the standard size of properties in a given geographical area and the property that is available to rent at any given point in time – rather than a detailed assessment of the exact floor space required to offer NHS services. We have allocated 100% of supermarket rent to NHS because the supermarket rents provided in the survey responses were estimated by the supermarket head offices to be the rent associated with the pharmacy business only. Figure 12 shows total property cost by pharmacy type and the proportion of this that is allocated to NHS under allocation method 1<sup>32</sup>. It also shows the total property cost per square metre.

We note that costs per metre squared are similar for all pharmacy types except retail driven large multiples (£577 per m<sup>2</sup> for retail driven large multiples and £238 to £288 per m<sup>2</sup> for all other pharmacy types). Retail driven large multiples have far higher total and NHS property costs. Their higher costs may be due in part to the higher cost location of their properties i.e. retail driven large multiple branches are often located in prime retail locations such as shopping centres and high streets.

**Figure 12: Property cost allocation (between NHS and non-NHS) and total property cost per square metre**



Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

<sup>32</sup> As defined in section 4.2.2 of this report.

### 5.3. Depreciation

Total depreciation cost has been based on the depreciation reported in the survey, i.e. from the most recent set of accounts at the time of the survey. It is noted, however, that accounting depreciation is based on historical purchase prices. For this reason an uplift is applied to inflate the depreciation costs to the analysis period. This uplift has been calculated as inflation over a period equivalent to half the weighted average asset life of all the assets within each branch (a period of just under 4 years across the sample as a whole) and has been applied over and above any adjustment made to inflate from the accounting period to 2009/10 prices). The average uplift calculated is 12.4%<sup>33</sup>.

The survey did not collect data to directly inform how accounting depreciation should be allocated between NHS and non-NHS. The allocation of depreciation costs has been carried out using a consideration of the refit/replacement estimates provided in the survey for existing branch assets and how these branch assets might reasonably be allocated to NHS and non-NHS activities. Average refit estimates from the survey are shown in the table below.

**Table 12: Average refit costs per branch**

	Independents	Small multiples	Large Multiples & Supermarkets	Overall
Implied shop refit estimate (including dispensary, counter area and retail shelving)	£59,581	£62,952	£57,542	£58,968
Consultation room refit estimates	£6,237	£6,107	£7,656	£6,967
IT refit estimates	£11,792	£11,673	£22,678	£17,514
Other refit estimates (including motor vehicles and capped other assets)	£13,375	£17,502	£64,585	£40,937
Total refit estimates	£90,984	£98,235	£152,461	£124,386

*Source: PwC survey of pharmacy contractors*

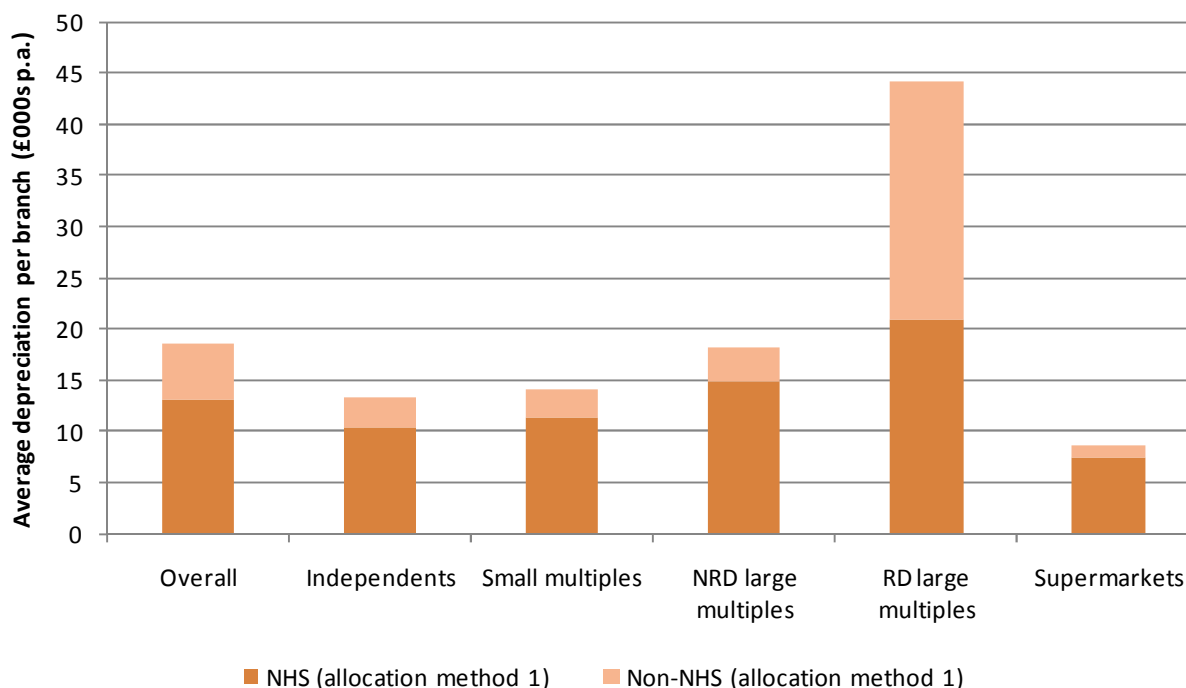
We note that refit estimates provided for “other branch assets” have been capped at £150,000 per branch to ensure unusually high costs are not allocated NHS. The cap is mostly applied to retail driven large multiples. Despite this, the average refit estimates are by far the highest for this pharmacy type. This is due to the high “Other IT” and “Other” asset refit estimates provided by these branches.

The refit estimates provided, combined with assumptions about average asset lives, have been used to calculate an estimate of economic depreciation for each asset type. The asset life assumptions have been made such that the economic depreciation across all branches reconciles with the uplifted accounting depreciation. Each asset for which economic depreciation has been calculated is then categorised as either NHS, non-NHS or Common based on a LRIC methodology and these allocation proportions are used to allocate depreciation costs. Full details of how depreciation has been calculated and allocated between NHS and non-NHS are provided in Appendix K.

<sup>33</sup> The uplift factor is calculated as the average CPIY inflation over a period equivalent to half of the weighted average asset life of the assets within each individual branch. On average, half the weighted average asset life is 3.85 years and, on average, the CPIY figure used is approximately 3.1%. A rough estimate of the uplift can therefore be calculated as  $-1 + (1 + 3.1\%)^{3.85} = 12.4\%$  - although we note that in reality this calculation is carried out on a per branch basis, not at an aggregate level.

Figure 13 shows the proportion of depreciation allocated to NHS by pharmacy type. Overall NHS depreciation cost is estimated at £13,198 per branch (under allocation method 1<sup>34</sup>) which is 71% of total depreciation.

**Figure 13: Depreciation cost allocation (under allocation method 1)**



Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

## 5.4. Other costs

The survey asked respondents to provide details of any Other costs not already covered in responses to the survey questions. Where possible, these costs have been categorised and a breakdown is provided in the table below. On average, branches reported Other costs of £20,909.

**Table 13: Other branch costs**

	Indp	SM	NRD LM	RD LM	Spmkt	Total Other Costs (£)	Total Other Costs (%)
Repairs	£3,465	£4,526	£5,926	£18,211	£2,536	£6,200	30%
Professional fees	£5,257	£1,158	£349	£267	£1,066	£2,137	10%
Professional subscriptions	£1,858	£939	£1,287	£1,639	£551	£1,433	7%
Delivery	£736	£2,787	£404	£0	£0	£772	4%
Marketing and advertising	£1,050	£448	£244	£445	£1,044	£610	3%
Interest payments	£1,055	£813	£275	£0	£0	£563	3%

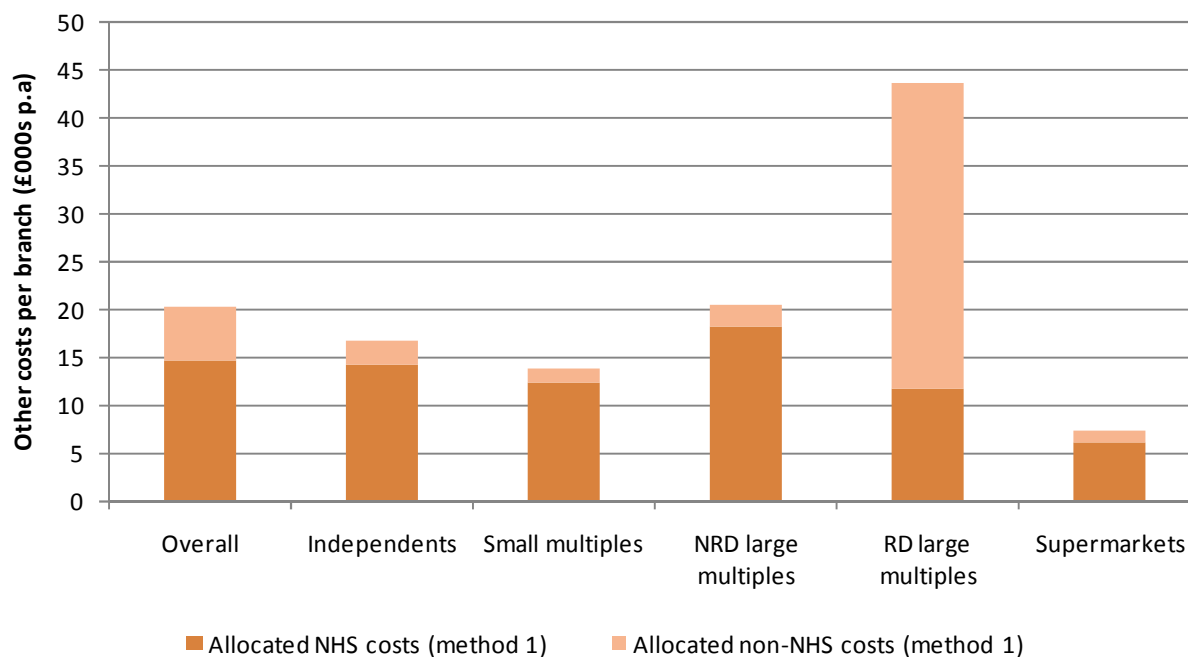
<sup>34</sup> As defined in section 4.2.2 of this report.

	Indp	SM	NRD LM	RD LM	Spmkt	Total Other Costs (£)	Total Other Costs (%)
Staff training	£773	£545	£230	£369	£493	£486	2%
Insurance	£691	£708	£242	£0	£0	£414	2%
Postage, printing and stationary	£503	£479	£409	£0	£0	£379	2%
Cleaning	£117	£244	£537	£0	£193	£273	1%
Information technology	£445	£496	£0	£0	£0	£217	1%
Mixed financials	£164	£675	£0	£0	£0	£148	1%
Bank charges	£245	£200	£0	£0	£0	£110	1%
Other	£1,408	£480	£10,873	£22,616	£1,381	£7,167	34%
<b>Total other branch costs</b>	<b>£17,767</b>	<b>£14,498</b>	<b>£20,776</b>	<b>£43,547</b>	<b>£7,265</b>	<b>£20,909</b>	<b>100%</b>

Source: PwC survey of pharmacy contractors

Consideration has been given to how each category of cost should be allocated between NHS and non-NHS. Further details of these allocations are provided in Appendix K. Figure 14 below shows the magnitude of the total other costs reported by pharmacy type and the proportions of Other costs allocated to the NHS and non-NHS under Allocation Method 1<sup>35</sup>. Overall, Other costs allocated to NHS are £14,607 per branch.

**Figure 14: Allocation of Other Costs between NHS and non-NHS (under Allocation Method 1)**



Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

<sup>35</sup> As defined in section 4.2.2 of this report.

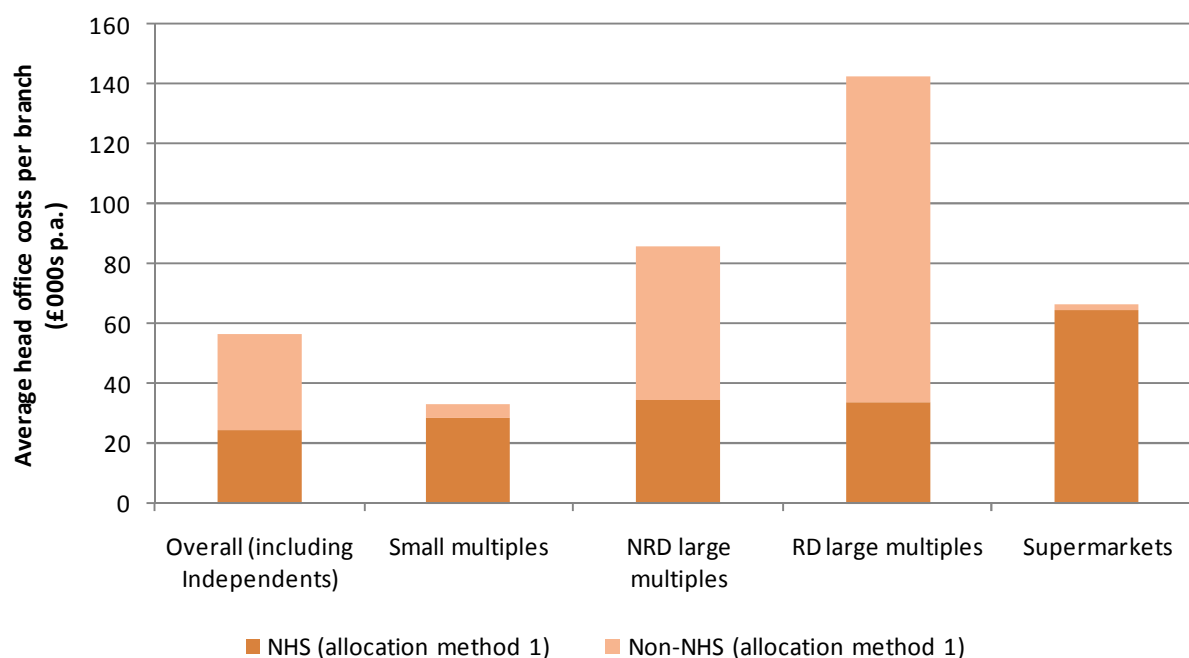
## 5.5. Head office costs

In the survey head office costs are reported by division. To estimate the cost of NHS pharmacy, these costs must be allocated back to individual branches. We have done this by looking at the categories of head office costs and deciding which are likely to vary according to branch activity, in particular size of revenues. Where higher revenues are likely to increase specific divisions of head office costs, we have allocated these head office costs to branches on the basis of branch share of revenue, i.e. the payroll processing and buying/wholesale divisions. Where divisional costs are likely to be independent of branch size, we have allocated head office costs to branches on a uniform basis so that each branch with an entity receives the same head office division cost, i.e. the professional services and finance divisions. Based on this categorisation, the head office costs are allocated to each branch accordingly. By division, the costs are then allocated to NHS, non-NHS and common categories based on proportions reported in the survey. Average allocated head office costs are shown in Figure 15 below.

We note that the large difference between Small Multiples and NRD Large Multiples head office costs is driven by one particular entity.

Independent head office costs are very low. These figures include certain centralised costs, but do not include any staff costs, as these have been categorised as owner costs for Independents (and combined with branch staff costs for the purpose of analysis). On average, head offices costs for independents are less than £2,600 per branch. It is possible that there may have been some under-reporting of centralised costs by Independent pharmacies. Due to their small scale, independent head office costs are *not shown in the graph below*. They are, however, included in the calculation of the height of the overall bar which is why the overall NHS cost is shown to be lower than the other NHS costs by pharmacy type shown in Figure 15.

**Figure 15: Allocation of Head office costs between NHS and non-NHS per branch (under Allocation Method 1)**



Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

As discussed in section 4.5, for the purposes of the calculations in this report, head office distribution costs are excluded. Table 14 shows the size of these head office distribution costs per branch by pharmacy type.

**Table 14: Excluded head office distribution costs (£ per branch)**

	Overall	Independents	Small multiples (less than 20 branches)	Small multiples (more than 20 branches)	Non-retail driven large multiples	Retail driven large multiples	Supermarkets
Total HO distribution costs	4,626	0	571	16,729	3,298	17,986	0
HO Distribution costs that would be allocated to NHS <sup>36</sup>	2,371	0	450	13,519	3,033	2,074	0

*Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC*

<sup>36</sup> These HO distribution costs are not included in the analysis calculations, however the table shows the value of the HO distribution costs that would be allocated to NHS had they not been excluded.



## 6. Fair Rate of Return

### 6.1. Overview

The fair return represents the return that a company should earn on invested capital in order to provide sufficient returns to the investors who are financing the business.

Our approach to assessing the level of “fair return” for the NHS component of a pharmacy business is as follows:

- **Tangible assets:** We have used survey data, together with a number of assumptions, to calculate a value for the NHS tangible assets for the branches in the sample. This broadly includes working capital, fixtures and fittings, IT assets and stock;
- **Intangible assets:** We have used a Greenfield modelling approach to estimate the value of intangible assets held by a pharmacy branch as a proportion of their revenue. A Greenfield modelling approach is a top-down approach based on a hypothetical comparison of the value of an established pharmacy against the value of a new start-up pharmacy. The difference in net present value reflects the intangible investment incurred when building up the new business
- **Fair return on assets:** We have calculated a fair rate of return using a standard WACC methodology. The WACC gives the minimum rate of return an investor would expect to achieve in a competitive market and uses economic theory to estimate the cost of debt and the cost of equity for pharmacy businesses. The cost of equity has been calculated using a standard Capital Asset Pricing Model (CAPM). We discuss the assumptions involved in using this approach in the course of this chapter.

For the purpose of reporting fair return figures, we have divided the Smaller Multiple branches into two sub-groups: SM<20 (belonging to entities with 6 – 20 branches) and SM>20 (belonging to entities with more than 20 branches but which are not one of the 10 Large Multiple & Supermarket entities).

### 6.2. Tangible assets

NHS tangible asset value is calculated as the sum of:

- NHS dispensing stock
- NHS working capital
- Physical NHS assets (including a portion of head office NHS assets)
- A portion of physical common assets (including a portion of head office common assets).

To enable us to allocate an appropriate portion of the value of common branch assets to the NHS, it is also necessary for us to estimate the value of non-NHS branch assets. We have used a similar methodology to do this as used for NHS assets – except that we are not able to estimate a value for non-NHS working capital<sup>37</sup>.

#### 6.2.1. Dispensing stock

In the survey, branches provided the value of their “most recent stock valuation” (and the date this took place) for: Dispensing stock (including NHS stock), OTC medicines and other stock (including toiletries, baby goods, electrical and sundries). We understand that pharmacy stock is typically valued based on an estimate of the

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<sup>37</sup> The result of not being able to estimate a value for non-NHS working capital is that the calculated value for non-NHS tangible value will be a slight under-estimate. This means that the proportion of common tangible asset value allocated to NHS under an EPMU approach will be slightly higher than it would otherwise be.

price paid by the pharmacy to the wholesaler<sup>38</sup>. Stock values provided have been inflated from the stock valuation date to September 2009 using CPIY<sup>39</sup>. This date is the mid-point of the year ending March 2010 and as such, the value of stock on this date may be seen to be an average stock value for the 12-month period which is being used as the base period for the purposes of analysis. We use the dispensing stock value to add into the value for NHS tangible assets.

### **6.2.2. NHS working capital**

We have calculated an estimate of NHS working capital as a percentage of the cost to pharmacies of purchasing drugs.

Each month a contractor receives an advance based on an estimate of 80% of the value of prescriptions sent to NHSBSA one month earlier. The advance payment means that contractors get paid some money before all prescriptions have been processed and priced<sup>40</sup>. Assuming all prescriptions are bought and dispensed in the middle of the month, this means that contractors receive:

- 80% of payment 1.5 months after dispensing the medicines; and
- 20% of payments 2.5 months after dispensing the medicines

We understand that pharmacies generally pay wholesalers at the end of the month after the medicines have been bought, so contractors pay:

- 100% of the cost of medicines 1.5 months after dispensing the medicines.

This suggests that, on average, working capital is worth 0.2 of one month's worth of drug costs due to the one month lag between pharmacists paying their wholesaler and receiving the final 20% of their reimbursement from NHSBSA<sup>41</sup>.

The starting point for calculating the cost of drugs to pharmacies is the reimbursement paid by NHSBSA to cover the cost of drugs. Pharmacies are able to negotiate discounts with their wholesaler on NHS related drugs and the reimbursement paid to pharmacists by the NHSBSA includes application of the discount deduction scale. However, the reimbursement amount is more than the amount actually paid by pharmacists, since the funding is designed to provide a target drugs margin of £500m. We suggest that this drugs margin should be subtracted from the NHSBSA reimbursement amount to obtain an estimate of the actual amount pharmacies pay to purchase their drugs, and thus a basis for calculating working capital. For the purpose of these calculations, we assume that the target £500m drugs margin is allocated between branches in the sampling frame in proportion to prescription item volumes<sup>42</sup>. We calculate an annual average value for cost of drugs to pharmacies of £626,444 across all pharmacy types. This is 92.8% of the average value of NHSBSA reimbursement value of £674,747.

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<sup>38</sup> In reality pharmacies purchase their drugs from a range suppliers and each may achieve different discounts. This means that the stock valuation figures reported by pharmacies may or may not reflect the actual price paid for the drugs.

<sup>39</sup> CPIY is an index based on the Consumer Price Index (CPI) that is designed to measure movements in 'core' prices, excluding price changes which are directly due to changes in indirect taxation.

<sup>40</sup> The 80% advance is calculated using the total items sent to the NHSBSA and the average cost of drugs for the previous month. Pharmacies also receive 80% of their fees and an inflationary allowance.

<sup>41</sup> These assumptions are based on information provided by, and discussions with, DH/PSNC.

<sup>42</sup> Appendix M shows the impact on the working capital estimate and overall tangible asset value of assuming an actual drugs margin of £0, £750m or £1000m.

### 6.2.3. Physical assets

#### Branch assets

Survey respondents were asked to estimate the cost of replacing branch assets with brand new equivalents. The Table below shows how these asset categories have been allocated between NHS, non-NHS and common.

**Table 15: Allocation of branch tangible assets between NHS, non-NHS and common**

<b>Branch Asset</b>	<b>Categorisation</b>
Dispensary	NHS
Consultation Room	NHS
Counter Area	Common
Retail Shelving	Non-NHS
IT equipment – NHS-related equipment	NHS
IT equipment – non-NHS-related equipment	Non-NHS
IT equipment – other IT equipment	Common
Motor Vehicles <sup>43</sup>	NHS
All Other Assets <sup>44</sup>	Common

*Source: PwC assumptions discussed with DH/PSNC*

The current value of an asset is calculated as 50% of the refit cost. That is, it is assumed that on average assets are halfway through their economic life.

The “All Other Assets” category was described in the survey questionnaire as “all other assets in this branch including: fixtures and fittings in shop front area (excluding retail shelving) storage areas, offices, WC etc.” Respondents were not required to specify exactly what was included in this All Other Assets category. In addition to the specific examples provided in the survey text, it is possible that asset values reported here may also include capital payments made to set up the pharmacy business, for instance premium payments to developers and payments for leasehold improvements made prior to the business first starting trading.

#### Head office assets

Survey respondents also provided information on the refit costs for the following Head Office assets. The assumptions regarding allocation to NHS, non-NHS and Common are shown in Table 16 below.

**Table 16: Allocation of head office assets between NHS, non-NHS and common costs**

<b>Head Office</b>	<b>Categorisation</b>
IT equipment / software – NHS-related equipment	NHS
IT equipment / software – Non-NHS-related equipment	Non-NHS
IT equipment / software – other IT equipment	Common

<sup>43</sup> Survey respondents were not asked to identify the purpose for which any motor vehicle assets owned by a branch were used. In discussion with DH/PSNC, PwC has made the assumption that the majority of branch motor vehicle assets will be used for NHS business, for example the collection of prescriptions from local surgeries and delivery of these to the branch and also the delivery of prescriptions to patients.

<sup>44</sup> We note that the refit estimates provided for “Other Assets” have been capped at a value of £150,000. This is because certain retail driven large multiple branches provided extremely large “Other Asset” refit estimates that were skewing the mean average results. It has been suggested that these very large refit estimates may include values for assets already captured elsewhere in the operating costs. The Annex to Appendix M shows the impact of this cap on the overall value calculated for tangible assets.

Motor vehicles <sup>45</sup>	Common
Head office fixtures and fittings	Common
Other	Common

Source: PwC assumptions discussed with DH/PSNC

We have calculated the value of these head office assets in the same way as described for branch assets. A portion of head office asset value is then allocated to each branch. The approach to head office asset value allocation adopted in this analysis is as follows:

- Allocate Head Office assets to NHS, non-NHS and Common based on allocations set out in the table above.
- Allocate Head Office assets to individual branches using a uniform proportion based on the number of branches in the group (ie. if the Head Office assets relate to an entity with 100 branches, 1% of the head office asset value will be allocated to each branch from the entity contained in the survey sample).
- Adjust Large Multiple & Supermarket Head Office asset values to ensure that the total Head Office asset value for Large Multiples & Supermarkets based on the weighted sample of branches is equal to the actual total Head Office asset value for the full population of Large Multiple & Supermarket entities. The calculated adjustment is 13.7%<sup>46</sup> which is the difference between the population and sample totals for the Head Office asset values divided by the sample total for the Head Office asset values.

#### 6.2.4. Portion of Common assets

Common assets (both branch-specific and those allocated from the Head Office) are allocated to NHS based on the ratio of NHS to non-NHS asset value – i.e. using an EMPU approach.

The methodology for allocating head office assets and common assets is consistent with the methodology used in the cost analysis for allocating head office costs and common costs.

#### 6.2.5. Results

Table 17 below shows how the NHS tangible asset value is built up using the elements described in this paper. The overall calculated average value of tangible assets per branch is £118,362.

**Table 17: Average total NHS tangible assets attributable to branch**

	Independ- ent	SM<20	SM>20	NRD LM	RD LM	Super- market	Overall
Dispensing stock	£33,841	£39,239	£50,790	£55,065	£49,426	£69,502	£46,748
NHS working capital	£9,023	£10,312	£13,502	£11,283	£10,633	£11,160	£10,548

<sup>45</sup> Survey respondents were not asked to identify the purpose for which any motor vehicle assets owned by a head office were used. In discussion with DH/PSNC, PwC has made the assumption that the head office motor vehicle assets may be used for both the NHS and non-NHS sides of the business, and are therefore classified as Common assets.

<sup>46</sup> It has not been possible to calculate an equivalent adjustment for Smaller Multiples as the sampling methodology was not designed to collect data from all Smaller Multiple entities in the population. We note that this 13.7% adjustment to large multiple head office assets is equivalent to the 5.3% adjustment applied to large multiple head office costs (as described in Appendix K). The adjustments differ because one is based on asset values and the other on costs. Also the methods used to allocate head office assets and costs to branch NHS are not exactly the same.

Physical NHS branch assets	£23,958	£21,454	£25,351	£23,459	£29,290	£21,158	£24,222
Head Office NHS IT <sup>47</sup>	£62	£198	£702	£14	£7	£90	£97
Sum of NHS asset values	£66,884	£71,204	£90,345	£89,821	£89,356	£101,911	£81,616
Portion of physical Common branch assets	£7,680	£7,642	£13,386	£24,635	£22,096	£3,490	£15,598
Portion of physical Common Head Office assets	£86	£2,571	£3,858	£45,969	£37,031	£0	£21,149
Sum of common asset values	£7,766	£10,214	£17,244	£70,604	£59,127	£3,490	£36,747
<b>Total NHS tangible assets</b>	<b>£74,650</b>	<b>£81,417</b>	<b>£107,589</b>	<b>£160,425</b>	<b>£148,483</b>	<b>£105,400</b>	<b>£118,362</b>

Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

We note that the asset values calculated based on the branch refit estimates are comparable with the depreciation costs calculated as set out in section 5.3. Depreciation reflects the return of the investment made in assets. Fair return on tangible assets reflects the return on this investment.

### 6.3. Intangible assets

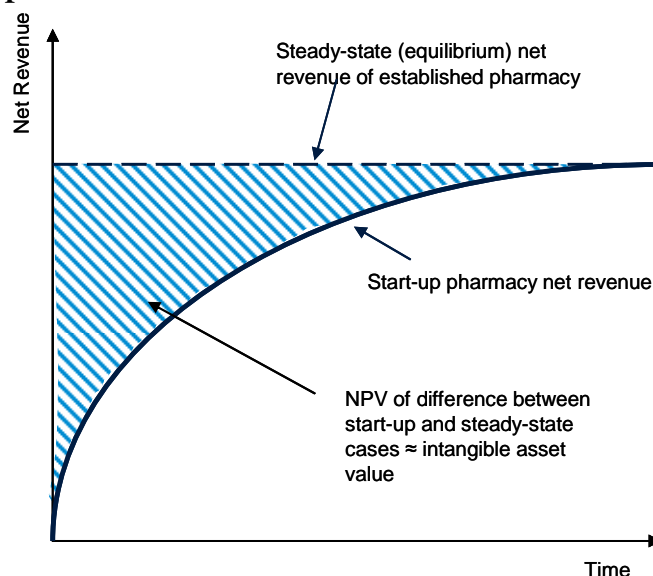
In addition to earning a fair return on the tangible assets invested in a business, an investor requires a fair return on the intangible assets associated with the business. Intangible assets include the effort and negative profits involved in the early years of setting up a business to reach the point where it is possible for the business to generate a steady stream of revenues.

The issue of how best to quantify intangible assets is the subject of some debate. Further details of the assumptions involved in estimating intangible assets are provided in Appendix N. For the purposes of estimating a value for the intangible assets of a pharmacy, we have chosen to use a method called a Greenfield approach. We have chosen to use this method because it is transparent about the assumptions being made and is based on direct assessment of the current pharmacy market in England. This approach to valuing intangible assets is based on building simple models of two types of pharmacies: a steady-state pharmacy and a start-up pharmacy. The difference in value between the two types of pharmacy represents the premium an investor might be willing to pay to invest in an established pharmacy compared with a start-up pharmacy. Assuming that the scope of business and tangible assets remain constant, this premium can be seen as a measure of the intangible asset value for the steady-state pharmacy, i.e.

$$\text{Intangible asset value of steady-state pharmacy} = \text{NPV of steady-state pharmacy} - \text{NPV of start-up pharmacy}$$

This is illustrated in Figure 16 below.

<sup>47</sup> We note that NRD LM and RD LM survey responses classified the majority of head office assets, including IT, as Common. This is why the figures for Head Office NHS IT for these two pharmacy type are small compared to the other pharmacy types.

**Figure 16: Greenfield approach illustration**

This intangible asset value can then be scaled to individual pharmacy branches by expressing in terms of some measure of the size of the branch. We have chosen to express the value of intangible assets as a percentage of the steady-state NHS turnover of each branch.

A simple Excel model was built to carry out this Greenfield assessment. The model and its inputs are summarised below. Where possible, we have used the COSI survey data to inform the inputs for the Greenfield model<sup>48</sup>:

- We use a single model with inputs based on the average data across all pharmacy types.
- Cash flows are modelled on a 25-year time horizon (plus terminal value)<sup>49</sup>
- All revenues and costs in the model are expressed in real terms.
- The steady-state total NHS revenue (Fees and NIC) is assumed to be equivalent to the average NHS revenue based on the survey data. From this NHSBSA reimbursement data has been used to derive an average value for NHS revenues minus the cost that pharmacists pay for the drugs they dispense (i.e. NHS revenue (Fees only)). This calculation includes an assumption that the NHSBSA reimbursements paid to pharmacists includes a target drugs margin of £500m.
- The steady-state total NHS cost for a pharmacy is assumed to be equivalent to the average NHS cost based on the survey data.

<sup>48</sup> By using the survey sample to provide inputs to the Greenfield calculation, we are assuming that the branches in the sample have reached a steady state in terms of revenues. We believe this to be a reasonable working assumption although in reality a small number of the branches in the sample are likely to have been in start-up phase at the time of the survey. According to NHSBSA data, only 13 of the pharmacies in the survey sample have opened since January 2005.

<sup>49</sup> To ensure that the terminal values in the Greenfield model are calculated correctly, we use a Greenfield modelling period of 25 years to ensure that, even when assumptions imply that the business makes considerable losses in the earlier years, they have begun paying tax and reached steady state by the end of the modelling period.

- For the start-up pharmacy, it is assumed that revenue converges to the steady-state level of revenue over a number of years. Historic NHSBSA data for the pharmacy population for the period September 2005 – March 2010 was analysed to inform the revenue convergence profile used in the Greenfield model. Since exact payments and tariff amounts have changed since January 2005, for the purposes of analysis, we focused on how the number of prescription items dispensed evolves over time, rather than payments themselves. Table 17 below shows the revenue growth profile calculated for the Greenfield start-up pharmacy.

**Table 18: Assumed turnover profile for start-up pharmacy**

	Years from launch					
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Turnover (as a percentage of steady-state turnover)	48%	69%	79%	85%	92%	100%

*Source: NHSBSA data, PwC analysis and assumptions discussed with DH/PSNC*

- For the start-up pharmacy, it is assumed that costs converge to the steady-state level of costs over the same period of time as the revenues.
  - In terms of a lower bound, we suggest that over the start-up period it would not be expected that the costs of a start-up pharmacy would be less than the costs of a steady-state pharmacy processing the same volume of prescription items. We used the survey data to quantify a relationship between NHS revenues (excluding NIC) and NHS costs to enable us to estimate the costs of a steady-state pharmacy with a given prescription item volume. The results are shown in Table 19 below.
  - In terms of an upper bound, we suggest that over the start-up period we would not expect the costs of a start-up pharmacy to exceed the costs of a steady-state pharmacy over the same period. We test the impact on the results of assuming steady-state costs from the beginning of the start-up period. The results are shown in Table 19 below.
- We assume that there is no significant additional capital expenditure or investment in working capital required in either the steady-state or start-up pharmacy scenario.
- The Greenfield model does not include any estimate of the costs of setting up the start-up business
- As for the WACC calculations, a tax rate of 28% is assumed for pharmacies belonging to multiples and 21% for independent pharmacies. This is equivalent to an overall average tax rate of 25.6%. It is assumed that tax is paid on profits but tax is not paid if profits are negative. It is assumed that losses are rolled forward indefinitely such that tax is only paid if the total profits since Year 0 are positive.
- To calculate the NPV of the business, an annual discount rate is used. We required a discount rate that reflects the cost of capital to an investor of investing in a pharmacy business. We use the post-tax real WACC of 9.2% (calculated using a real risk-free rate based on an inflation assumption of 2.5%).
- It is assumed that the business will continue operating into perpetuity so a terminal value is included in the calculation. For the terminal growth rate (the rate at which profits are assumed to grow beyond the modelling period) we use a long-term view of real GDP growth of 2.25%<sup>50</sup>.
- We calculate the difference in NPV between the start-up and established pharmacy business and express this difference as a percentage of NHS turnover. This is the estimate of NHS intangible assets.

As shown in Table 19 below, the Greenfield model gives a result of 25.7% when using the upper bound assumption for costs for the start-up business and a result of 12.3% when using the lower bound assumption for costs for the start-up business. In the absence of data on how the costs of start-up pharmacies actually evolve, we suggest that a pragmatic approach is to use a percentage between these two values. We have used a value of

<sup>50</sup> The value of 2.25% is PwC's view - but is also broadly in line with Treasury assumptions.

20% in our base case calculations<sup>51</sup> i.e. NHS intangible assets are calculated as 20% of total NHS revenues for each branch<sup>52</sup>.

**Table 19: Greenfield model percentages**

	<b>% of total NHS revenues</b>
Result using lower bound cost assumption (based on regression)	12.3%
Result using upper bound cost assumption (based on constant costs assumption)	25.7%
<b>Recommended “mid-point” percentage</b>	<b>20%</b>

*Source: PwC analysis, 2010*

Based on current assumptions, the calculated average value of intangible assets per branch is £169,585. The table below shows how this value breaks down by pharmacy type. A number of alternative approaches and assumptions were considered for the calculation of the value of intangible assets. These are described in further detail in Appendix N.

**Table 20: Intangible assets**

	<b>Indep- endent</b>	<b>SM&lt;20</b>	<b>SM&gt;20</b>	<b>NRD LM</b>	<b>RD LM</b>	<b>Super- market</b>	<b>Overall</b>
Total NHS Revenues	£722,420	£827,833	£1,086,992	£910,222	£863,214	£874,715	£847,924
% from Greenfield Model	20%	20%	20%	20%	20%	20%	20%
Implied Intangible Assets	£144,484	£165,567	£217,398	£182,044	£172,643	£174,943	£169,585

*Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC*

## 6.4. Cost of Capital

For pharmacies to remain viable commercial enterprises, investors in pharmacy businesses need to earn a fair rate of return to reward them for the risks they have taken in investing in their business. We have sought to estimate the fair return for the NHS component of a pharmacy business. The approach we have taken to estimating this fair return is through the use of the Weighted Average Cost of Capital (WACC). In section 6.5, this cost of capital is then applied to the sum of the NHS tangible asset base and NHS intangible asset base as calculated in sections 6.2 and 6.3 to calculate a value for fair rate of return.

As discussed in section 4.4, the WACC is the minimum rate of return an investor would achieve in a competitive market. WACC is most readily applied to calculating fair return for investors in large companies, since its application generally involves the use of stock market information. It has strong theoretical underpinnings and many regulators and competition authorities have used the WACC framework in their analyses; there is

<sup>51</sup> We note that the exact mid-point of the upper bound and lower bound percentages mentioned is closer to 19%, however we suggest that given the assumption-driven nature of the Greenfield approach, it is more appropriate to round this value to 20%.

<sup>52</sup> In addition to the Greenfield approach, a market capitalisation analysis was also carried out. Although this analysis suggests a value of 38% rather than 20%, we suggest that the market capitalisation analysis overestimates the value of intangibles since it is based on a comparator set of retail companies. We suggest that the Greenfield model is a better basis for estimating a value for intangible assets since it is specifically tailored to community pharmacy businesses.



therefore strong precedent for its use. WACC is arguably not so well suited for calculating fair return for investors in smaller companies, such as Independents and Smaller Multiple pharmacy businesses<sup>53</sup>. However, there is no standard framework that is commonly used for estimating a fair rate of return for investors in such smaller businesses. We recommend that a pragmatic, and defensible, approach is to use the standard WACC framework for all pharmacy types, with appropriate application of a Small Companies Premium. Such premia have been adopted by UK regulators in setting prices (for example, by OFWAT<sup>54</sup>). Further discussion on the cost of capital assumptions and calculations is provided in Appendix O.

Under the WACC framework, the cost of capital requires the calculation of three components:

- The cost of equity: the rate of return equity investors would expect on an investment of this sort;
- The cost of debt: the interest rate debt providers would charge for providing debt to such an investment; and
- The debt-equity ratio: the relative proportions of debt and equity used to finance the investment.

The Weighted Average Cost of Capital (WACC) weights the costs of equity and cost of debt using the proportion of total investment funding accounted for by each. The WACC is the measure of the minimum expected return providers of both forms of capital require in order to be incentivised to invest capital in a business. The WACC therefore represents the minimum rate of return a company should expect to achieve from its overall activities to satisfy its various capital providers.

The Weighted Average Cost of Capital (WACC) is calculated as:

$$\text{WACC} = \frac{D}{D + E} k_D (1 - T) + \frac{E}{D + E} k_E$$

Where:

- D is the value of debt in the capital structure;
- E is the value of equity in the capital structure;
- $k_D$  is the pre-tax cost of debt;
- $k_E$  is the post-tax cost of equity; and
- T is the corporate tax rate.

The standard framework for calculating the cost of equity is the Capital Asset Pricing Model (CAPM). This framework assumes that equity investors require their investment to yield at least the return available on risk-free instruments (e.g. UK government bonds). Added to this risk-free rate of return, equity investors expect a premium for the risk involved in an equity investment.

This premium is defined as the general equity market risk premium (EMRP) multiplied by the beta. EMRP is the additional average return compared to the average risk-free return needed to compensate an average investor for investing in equities of average risk. The beta is a measure of the riskiness of a particular equity investment relative to the average equity investment. In particular, it is a measure of the degree of systematic risk for a particular investment.

A key aspect of the CAPM framework is that it distinguishes between specific risks and systematic risks, as follows:

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<sup>53</sup> In particular, the standard WACC framework only compensates investors for systematic risk, not for specific risk. We are aware that many small pharmacy business owners are not typically well diversified and will therefore be exposed to specific risks as well as systematic risks.

<sup>54</sup> As described in the Ofwat report “Future water and sewerage charges 2010-15: Final determinations” (2009).

- Specific risks are those risks which are specific to a company or project, and can be “diversified away” by holding a portfolio of investments. That is, by holding a diversified portfolio of equity investments, an equity investor is not exposed to such risks since those investments which perform badly due to specific risk factors can be expected to be offset by investments which perform well for specific risk reasons and vice versa. Since equity investors need not be exposed to specific risks they do not affect required returns, and hence are not captured in the standard cost of equity, but should be reflected in the calculation of the expected cash flows from the project.
- Systematic risk refers to risk factors which affect all equity investments simultaneously in the same direction to a greater or lesser extent, and hence cannot be diversified away. Movements in economy wide factors such as changes in the GDP growth rate, interest rates, savings rates and inflation contribute to systematic risk. These risks are captured in the cost of equity and hence WACC. Standard equity betas are a measure of this risk (i.e. the systematic risk associated with a particular equity investment, relative to the average risk of investing in the equity market). If a particular investment is of average risk, beta = 1; beta is greater than 1 for a more than average risky investment and less than 1 for a less risky investment. The higher the beta, the higher is the exposure to systematic risk, and hence the higher is the cost of equity.

The CAPM framework only compensates investors for systematic risks rather than specific risks. We recognise that investors in smaller pharmacy businesses are not typically fully diversified with respect to their investments in these businesses, and are therefore exposed to specific as well as systematic risk. However, we suggest that this is a matter of personal choice and that investors who choose not to diversify may perceive non-financial benefits related to owning and running their own business. In addition, the specific risks encountered by pharmacies will be partially reflected in the wide range of operating costs incurred by pharmacies in the 12-month period captured in the survey responses.

Although we acknowledge that the WACC and CAPM frameworks may not be ideal for small pharmacy businesses, we note that the application of a larger Small Company Premium for these small pharmacy types does allow them a higher return. Such premia have been adopted by UK regulators in setting prices (for example, by OFWAT<sup>55</sup>). Under the CAPM, the cost of equity is expressed as:

$$k_E = r_F + (\beta_E \times \text{EMRP}) + \text{SCP},$$

where  $r_F$  is the risk-free rate;

$\beta_E$  is the equity beta;

EMRP is the equity market risk premium; and

SCP is the small company premium

Annex 3 to Appendix O provides details of an alternative approach to calculating the cost of equity that was discussed by the project team in the course of this work. The key difference in this approach is the use of a total beta rather than a standard equity beta for the smaller pharmacy entities. Total beta is a measure of the total risk a business is exposed to, not just the systematic risk.

The cost of debt is the return required by providers of debt to a company. This is equal to the margin (premium) lenders require above the risk-free rate, added to the risk-free rate. This debt margin reflects the perceived risk of default by the borrower. Since interest on debt reduces taxable profit, there is a valuable tax shield associated with debt finance. This reduces the effective cost of debt. To reflect this in the formula, the sum of the risk-free rate and debt margin is multiplied by (1- the corporate tax rate). The cost of debt can be expressed as:

<sup>55</sup> As described in the Ofwat report “Future water and sewerage charges 2010-15: Final determinations” (2009).

$$k_D = r_F + m_D,$$

where  $r_F$  is the risk-free rate;

and  $m_D$  is the debt margin.

#### 6.4.1. Comparator companies

The application of the CAPM requires the identification of listed businesses which are comparable to the business or businesses being analysed. It is important that the comparators are similar businesses so that the factors that drive beta and gearing (e.g. cyclical nature of demand, and cost structure including the proportion of fixed costs) are comparable to the target business. No such listed companies exist in the UK so it was necessary to look for comparators in Europe and North America. We have identified listed companies with an industrial classification that includes drug retail and pharmacies. The companies identified offer a combination of both pharmacy and retail services. It was not possible to identify businesses offering only pharmacy services.

We acknowledge that the comparators identified are not perfect. However we believe that they provide a good representation of the level of risk inherent in the community pharmacy business. The list of comparators was discussed with the project team and Steering Group and further detail on the selection of comparators is provided in Appendix O.

The table below presents equity betas, debt/equity (D/E) ratios and asset betas for each comparator. The equity betas (estimated by regressing historic returns of the equity against the returns of the overall market) are based on 5 years of monthly data for the period March 2005 – March 2010. The D/E ratios are the 5-year average debt-equity ratios of the 5 selected comparator companies<sup>56</sup>. The asset betas are derived by dividing the equity beta by (1 + D/E). We use median averages in our analysis.

**Table 21: Comparator data**

	Geographic locations	Equity beta	Standard error	R2	5-year D/E ratio	Asset beta
CVS Caremark Corporation	US & Canada	0.82	0.16	0.28	0.19	0.69
Galenica Ltd.	European Developed Markets	0.99	0.23	0.23	0.26	0.79
Shoppers Drug Mart Corp.	US & Canada	0.62	0.13	0.16	0.12	0.55
The Jean Coutu Group (PJC) Inc.	US & Canada	0.64	0.23	0.06	0.19	0.54
Walgreen Co.	US & Canada	0.84	0.18	0.24	0.03	0.82
Mean		0.78			0.16	0.68
Median		0.82			0.19	0.69

<sup>56</sup> This is an average of the annual average D/E ratios calculated for the period 31 March 2005 - 31 March 2010. For each year, the D/E ratio is calculated as Total Debt divided by Market Capitalisation.

*Note: Equity betas are adjusted 5-year monthly betas to Q1 2010.*

*Source: PwC analysis, Capital IQ*

### 6.4.2. Debt/Equity ratio

The D/E ratio is assumed to be 19% for Large Multiples & Supermarkets and SM>20 (based on the analysis of comparator companies) and 0% for SM<20 and Independents (because the debt these smaller pharmacy businesses hold is backed by personal guarantees and thus has equity-like characteristics). A D/E ratio of 19% is equivalent to a gearing ratio of 16% (D/(D+E)).

### 6.4.3. Risk-free rate

Under the CAPM approach, the risk-free rate should be the return on an asset that has returns that are uncorrelated with movements in the market portfolio. In practice, such an asset does not exist and thus the true risk-free rate is not observable. In practice, the redemption yields on “safe”, liquid, financial instruments, which are considered to have negligible default risk, are generally used as approximations of the risk-free rate.

Our analysis suggests that 20-year UK government bond yields have been less distorted by current market conditions than shorter-term bonds. As at the end of Q1 2010, the yield on a 20-year UK nominal government bond was approximately 4.5%. Ordinarily, we would obtain a real risk-free rate by looking at the expected yields on index-linked Government bonds. However, in this instance we recommend calculating a real risk-free rate by converting the nominal risk-free rate using an inflation assumption and the Fisher relationship. The Fisher relationship is defined as:

$$(1 + R_{\text{nom}}) = (1 + R_{\text{real}})(1 + i)$$

where:  $R_{\text{nom}}$  = nominal rate

$R_{\text{real}}$  = real rate

$i$  = rate of inflation

To convert the nominal risk-free rate into a real risk-free rate, we use an inflation assumption of 2.5%. This is a forward-looking long-term view of inflation which is appropriate since we are using it to convert a nominal risk-free rate based on expected future yields for 20 year UK bonds.

The implied real risk-free rate as at March 2010 is 2.0% (converting the nominal risk-free rate of 4.5% using the inflation assumption of 2.5% and the Fisher Relationship).

### 6.4.4. Equity beta

The equity beta can be estimated by regressing historic returns of the equity against the returns of the overall market. The stronger the correlation, and the greater the amplitude of any movement in returns, the higher the systematic risk associated with an investment. The equity beta of a company is affected by:

- Cyclicity of revenues (due to the economy)
- Cyclicity of costs (the ability of the company to tailor its costs according to market conditions). This in turn is driven by:
  - Operational gearing – i.e. the level of fixed costs.
  - Debt gearing – i.e. the level of debt funding.

These factors are not independent of each other as companies make decisions on their cost structure, particularly their debt gearing, based on the nature of their revenues. This interdependence leads to clustering of equity betas around 1.0 – i.e. if a business has low cyclicity of revenues and low fixed costs (which would imply a lower asset beta) it is likely to choose to take on more debt (which implies a higher equity beta).

The companies selected as comparators (shown in Table 21) are involved in other businesses apart from pure pharmacy, primarily retail, and as a result their betas represent the risk of the blended business. We have given qualitative consideration to how the equity beta might differ if the comparators were a set of pure pharmacy

companies in England. We conclude that, compared to a retail business, a pure pharmacy business might be expected to have lower revenue cyclicality (which would imply a lower asset beta) but higher operational gearing (which would imply a higher asset beta). Since the debt gearing decision of a company is dependent on the assessment of the risk involved, the debt gearing would be expected to mean that the equity beta of both retail and pure pharmacy businesses would tend towards 1.0. Based on this qualitative assessment, we conclude that there is no good reason to make an adjustment to the equity beta from that observed for the set of retail pharmacy comparator companies. The median equity beta observed for the set of comparator companies is 0.82.

We have also looked at the equity betas used in recent regulatory decisions and have considered how the equity beta for a pure pharmacy company might compare with these. Regulated businesses may be viewed as relevant comparators for a pure pharmacy business. In particular, they have very stable demand cyclically which may be considered analogous to pharmacies. We conclude that the cyclical risk of pharmacies is arguably higher than that of regulated businesses and that on this basis we might expect an equity beta for pure pharmacy to be at least as high as the beta for a regulated business. However, regulated businesses typically have high levels of fixed costs and on this basis we might expect an equity beta for pure pharmacy to be lower than the beta for a regulated business. As for the comparison with retail companies, we would expect any differences in debt gearing between regulated businesses and pure pharmacy businesses to have a normalising effect on the equity betas – i.e. they will both tend towards 1.0.

The median value of the equity betas used in recent regulatory decision is 1.0. We suggest this may be viewed as an upper bound for a pharmacy equity beta. We suggest that a lower bound for the pharmacy equity beta may be obtained by re-levering the median asset beta used in regulatory decisions using the pharmacy comparator gearing ratio<sup>57</sup> of 0.19) to give an equity beta value of 0.7. We suggest that 0.7 may be seen as a lower bound for the equity beta of a pharmacy as, if a pharmacy business did in reality have as low an asset beta as a regulated business, we would ordinarily expect to see higher levels of debt gearing than those observed.

In summary, an equity beta point estimate of 0.82 is used for the purposes of base case analysis. This is the median average of betas from the set of retail pharmacy comparator companies. Values of 1.0 and 0.7 have also been tested based on a comparison with regulated businesses. Details of this sensitivity analysis are provided in Appendix O. In addition, Annex 3 to Appendix O provides details of an alternative approach to calculating the Cost of Capital. The key difference in this approach is the use of a total beta rather than a standard equity beta for the smaller pharmacy entities.

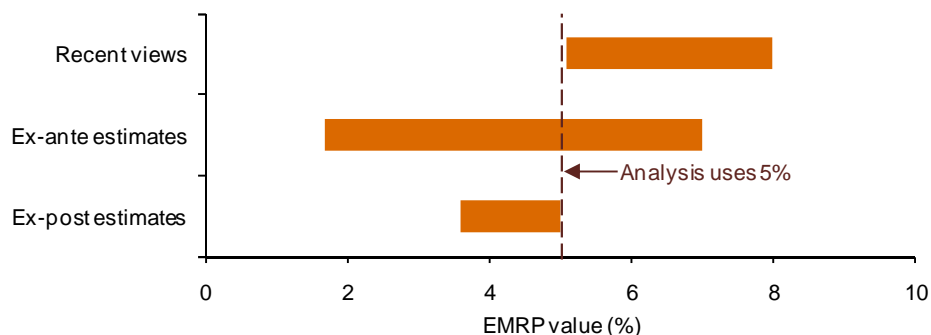
#### **6.4.5. EMRP**

The EMRP is the additional expected return that an investor demands for the additional risk faced when investing in equities of average risk, compared to a risk-free investment. Our estimate of the EMRP is based on a survey of both ex post and ex ante studies of the EMRP.

The chart below shows the range of EMRP values resulting from each of the types of data sources used.

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<sup>57</sup> The median asset beta used in the regulatory decisions reviewed was equal to 0.57 and the pharmacy comparator gearing ratio is 0.19 (as shown in Table 21). 0.57 multiplied by 1 + 0.19 is equal to 0.68, or 0.7 to one decimal place.

**Figure 17: EMRP ranges**

Source: PwC analysis

We consider that in the context of assessing the level of fair return on pharmacy assets it is most appropriate to use a long-term estimate of the EMRP. We use an EMRP of 5.0% for the purposes of the WACC calculation. This is a mid-point of the values obtained from the review of evidence.

#### 6.4.6. Small Company Premium

We recommend that a Small Company Premium (SCP) is added to the standard CAPM formula. By applying a larger SCP for the smallest companies, we allow them a higher return. This SCP approach follows on from the findings of Fama and French<sup>58</sup>, who suggested that the CAPM may be mis-specified with respect to size – and empirical findings based on analysis of US data that show that investors in smaller companies consistently demand excess returns over CAPM.

To identify a range of potential SCPs, we have referred to:

- Ibbotson (2009): provides analysis of long-term US equity returns in excess of CAPM data, by size of company (measured in terms of market capitalisation).
- Duff & Phelps (2010): provides long-term historical equity risk premiums based on the New York Stock Exchange (NYSE), by size of company (using eight alternate measures of company "size", including market capitalisation, and 25 size-ranked portfolios )

Selecting an SCP from existing sources of data such as these has a sound economic basis and is accepted practice in the regulated world and standard practice in the valuation world. We acknowledge however that there may be other methods for estimating an appropriate level of Small Company Premium to apply in this particular case. We note that the Ibbotson and Duff&Phelps SCP figures are based on analysis of US companies. It may be that equivalent analysis of UK companies would yield different SCP values, but no such analysis exists to our knowledge.

To select the appropriate level of size premia to use in calculations, we must determine the range of pharmacy company sizes for the pharmacy types in question. For listed companies, we can use market capitalisation. For companies which are not listed, we have used an approach based on standard valuation techniques and have calculated a rough estimate of market capitalisation using multiples of profit measures. The formula used to calculate this estimate of market cap (Equity Value) is:

$$\text{Equity Value} = \text{Enterprise Value (EV)} - \text{Net Debt}$$

<sup>58</sup> Fama E.F. and French K.R (1993)

Where:

$$\text{Enterprise Value} = \text{EBITDA} \times (\text{EV/EBITDA multiple})$$

For the purpose of this analysis we use the median EV/EBITDA multiple from the set of comparator companies. The values for market capitalisation obtained using this method are rough estimates only. However, we would expect the average calculated for the pharmacy types to be reasonably close to the true average. In addition we note that the size bands used in the Ibbotson and Duff&Phelps analysis are quite broad.

Based on an analysis of the median size of the companies in the sample of each pharmacy type, we recommend a Small Company Premium (SCP) of 6.33% for Independents and Smaller Multiples (i.e. SM<20 and SM>20) and 1.13% for Large Multiples & Supermarkets<sup>59</sup>. Further details of this analysis are provided in Appendix O.

#### **6.4.7. Debt margin**

We have calculated a figure for debt margin using a three-month average of the margins for a spread of UK companies with a BBB credit rating. Over a 10 year timeframe we found the margin to be 2.7% and over a 15 year timeframe we found the margin to be 2.3%. The average of these two values is 2.5%. We have used a figure of 2.5% for debt margin in the WACC calculation.

#### **6.4.8. Corporate tax rate**

For the larger multiples WACC calculation we use the Main Rate of UK corporation tax of 28%. This tax rate applies to companies with annual profits in excess of £1.5m. The large UK multiples such as Alliance Boots and Lloyds comfortably have profits in excess of this level, and so in our view will Smaller Multiples.

For the Independents WACC calculation we use the Small Profits Rate of UK corporation tax of 21%. This level of tax applies to companies with annual profits not exceeding £300k.

#### **6.4.9. Tax benefit adjustment**

In the scenario where the debt of Independents and SM<20 is assumed to be zero (as described in 6.4.2), there is an implied tax benefit on the debt interest actually paid. This tax benefit must be subtracted from the final values calculated for fair return. The required adjustment is calculated as interest paid multiplied by the corporate tax rate<sup>60</sup>. To carry out this calculation it is necessary to estimate the average debt levels and interest paid of these smaller pharmacy businesses. We have estimated debt per branch by reviewing the accounts of the SM<20 in the sample and have assumed equivalent levels of debt for the Independent group.

For SM<20, the tax benefit adjustment (real, pre-tax) is calculated as:

$$\text{debt per branch (£)} \times \text{cost of debt (\%)} \times \text{tax rate (\%)} = £90,400 \times 7\% \times 28\% = £1,812$$

For Independents, the tax benefit adjustment (real, pre-tax) is calculated as:

$$\text{debt per branch (£)} \times \text{cost of debt (\%)} \times \text{tax rate (\%)} = £90,400 \times 7\% \times 21\% = £1,359$$

<sup>59</sup> The median market cap value calculated for the Large Multiples & Supermarkets group is \$8,417 million. This corresponds to an SCP of 0.74% based on Ibbotson and 1.52% based on Duff % Phelps. The median market cap value calculated for the Smaller Multiples with more than 20 branches group is \$35.0 million. This corresponds to the smallest SCP category calculated for both data sources which is 6.28% based on Ibbotson and 6.37% based on Duff & Phelps. For the purposes of our analysis we have taken the mid-point of the Ibbotson and Duff & Phelps SCP values.

<sup>60</sup> This adjustment is based on an estimated interest payment only – rather than a capital plus interest payment.

The tax benefit adjustment is subtracted from the fair return value after multiplying the asset base by the WACC.

#### 6.4.10. Results

For each pharmacy type, the calculated real WACC is based on the latest data available as at March 2010 and is our best estimate of what the WACC should be going forward. We use a real WACC (rather than a nominal WACC) to avoid double-counting of inflation when multiplying by the nominal asset base. Based on current base case assumptions, the calculated average pre-tax real WACC is 12.3%.

**Table 22: Cost of Capital**

	<b>Indep- endents</b>	<b>Small multiples (&lt;20 branches)</b>	<b>Small multiples (&gt;20 branches)</b>	<b>Non- retail driven large multiples</b>	<b>Retail driven large multiples</b>	<b>Super- markets</b>	<b>Overall</b>
WACC (pre-tax real)	15.7%	17.2%	15.2%	9.1%	9.1%	9.1%	12.3%

Source: PwC analysis and assumptions discussed with DH/PSNC

#### 6.4.11. Sensitivity to WACC assumptions

We have calculated the fair rate of return based on the WACC assumptions outlined in this paper. This is PwC's recommended approach; however we acknowledge that there are some challenges in applying this framework to the NHS pharmacy sector. In particular, we note that:

- There is a broad mix of large and small businesses in the sector. Typically WACC is most commonly applied to larger businesses.
- We are dealing with a sector comprising 3000+ separate businesses so detailed analysis of the factors affecting individual businesses is not possible.
- The available comparator data on which to base WACC assumptions is not perfect.

As described in this chapter, we have taken steps to address these issues. This has involved some reliance on proxy data and other assumptions in order to derive the WACC, however we note that estimating an appropriate WACC is not a precise science and it is always necessary to use a degree of judgment.

During the course of the COSI, there has been particular discussion with the project team on two issues:

- The extent to which regulated companies may be better comparators for pharmacy than the set of retail pharmacy companies listed in Table 21.
- The extent to which it is appropriate to use a standard equity beta for estimating the cost of equity – since the standard equity beta only compensates investors for systematic risk, not specific risk and many investors in pharmacy, particular smaller pharmacy businesses, are unlikely to be well diversified so are exposed to specific risk as well as to systematic risk.

Annexes 2 and 3 to Appendix O provide sensitivity analysis to show the impact of on the overall results of basing calculations on alternative assumptions.

### 6.5. Fair Rate of Return

- The Fair Rate of Return is calculated as:

$$WACC \times (\text{Tangible Assets} + \text{Intangible Assets}) - \text{tax benefit adjustment}$$

- A real WACC is used to avoid double-counting of inflation when multiplying by the nominal asset base.



- Pre-tax fair return is initially calculated by multiplying the nominal asset base by the real WACC.
- The tax benefit adjustment calculated for Independents and SM<20 is then subtracted from the initial fair return figures to give an adjusted figure for the year ending March 2010.
- When calculating fair return for future years, the asset base should be inflated but the WACC and tax benefit assumptions should be kept constant.
- Overall, the calculated average pre-tax fair return per branch (for the year ending March 2010) is £33,189.

The details of how this number is built up are provided in the table below.

**Table 23: Calculated Fair Return on Investment**

	<b>Indep- endent</b>	<b>SM&lt;20</b>	<b>SM&gt;20</b>	<b>NRD LM</b>	<b>RD LM</b>	<b>Super- market</b>	<b>Overall</b>
Total NHS Revenues	£722,420	£827,833	£1,086,992	£910,222	£863,214	£874,715	£847,924
% from Greenfield Model	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Intangible Assets	£144,484	£165,567	£217,398	£182,044	£172,643	£174,943	£169,585
Tangible Assets	£74,650	£81,417	£107,589	£160,425	£148,483	£105,400	£118,362
Total Assets	£219,134	£246,984	£324,988	£342,469	£321,126	£280,343	£287,947
Real WACC	15.7%	17.2%	15.2%	9.1%	9.1%	9.1%	12.3%
Fair Return	£34,344	£42,472	£49,272	£31,138	£29,197	£25,489	£33,744
Tax Benefit Adjustment	-£1,329	-£1,772	£0	£0	£0	£0	-£555
<b>Adjusted Fair Return</b>	<b>£33,015</b>	<b>£40,700</b>	<b>£49,272</b>	<b>£31,138</b>	<b>£29,197</b>	<b>£25,489</b>	<b>£33,189</b>
Fair return (tangible) <sup>61</sup>	£11,247	£13,417	£16,312	£14,586	£13,500	£9,583	£13,642
Fair return (intangible)	£21,768	£27,283	£32,960	£16,552	£15,697	£15,906	£19,546

*Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC*

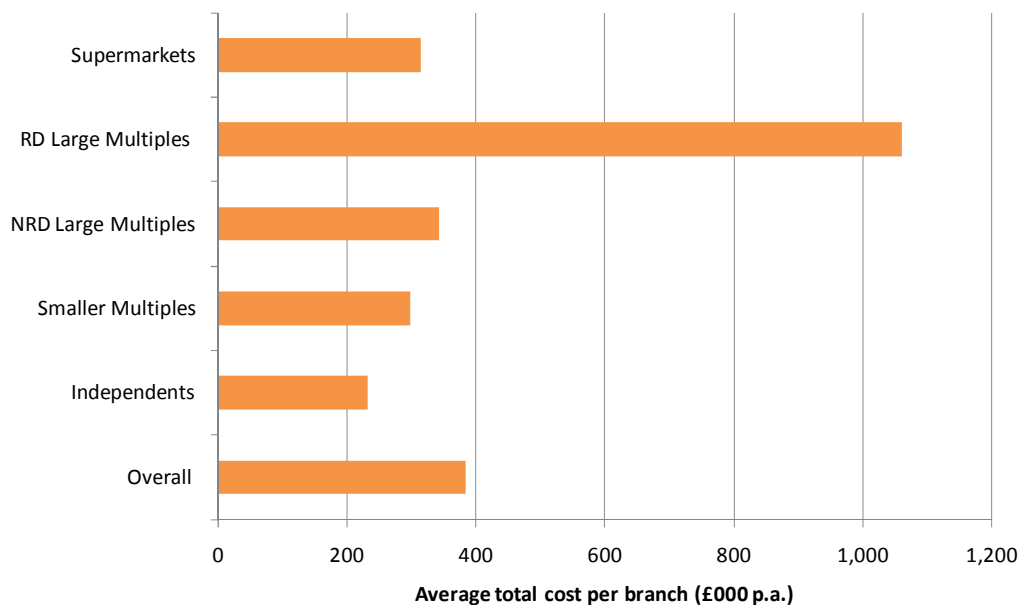
<sup>61</sup> The tangible and intangible elements of fair return are calculated based on the ratio of tangible asset value to to intangible asset value.

## 7. Overall results

### 7.1. Average total (NHS and non-NHS) cost per branch

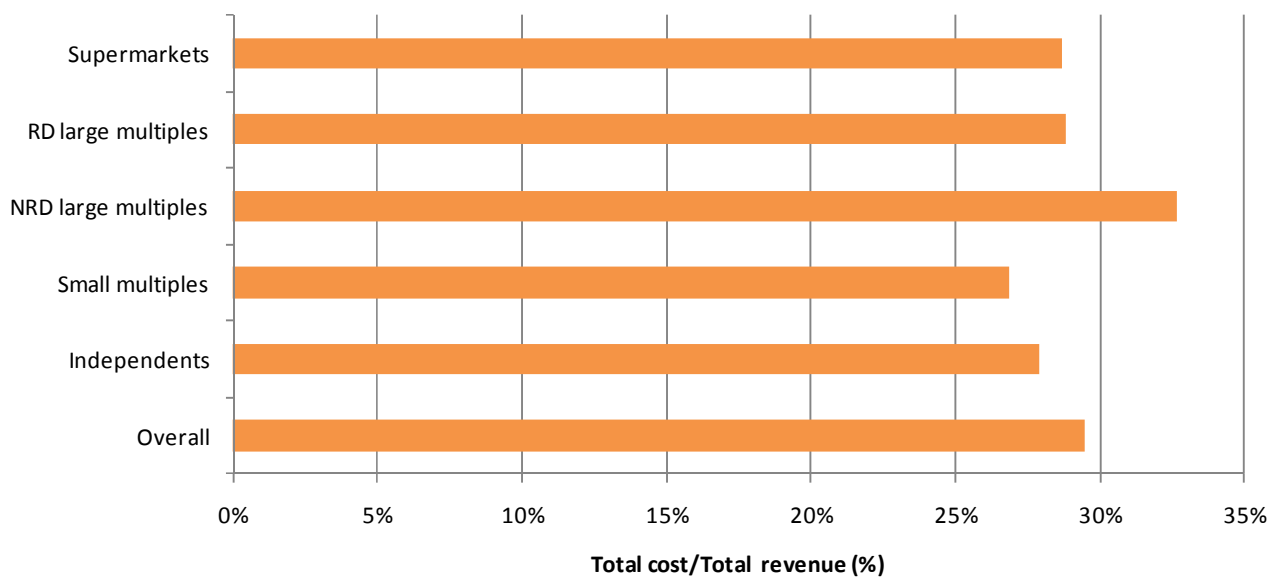
The chart below shows total calculated cost per branch including NHS and retail operating costs and tangible and intangible elements of NHS fair return but excluding the cost of goods sold. All results shown are for the year ending March 2010.

**Figure 18: Average total (NHS and non-NHS) cost per branch**



*Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC*

We note that total pharmacy costs vary greatly between the pharmacy types. This is, however, largely in proportion to total revenue as shown in Figure 19 below. Total cost is a very low proportion of total revenue in this graph due to the fact that cost of goods sold has not been included in the cost calculations – but is included in the revenue figures.

**Figure 19: Total cost divided by total revenue**

Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

## 7.2. Average NHS cost per branch

The total average NHS cost per branch, split by cost type, is shown in Table 24. NHS costs include:

- NHS costs reported at the branch, owner and head office including the cost of enhanced services (it has not been possible to separate out these service costs).
- An allocation of common costs from the branch, owner and head office questionnaire.
- NHS fair return including tangible and intangible elements

**Table 24: Costs allocated to the NHS including fair return (per branch)**

<b>£ per annum per branch</b>	<b>Allocation method</b>	<b>Indp</b>	<b>SM</b>	<b>NRD LM</b>	<b>RD LM</b>	<b>Spmkt</b>	<b>Overall</b>
Branch staff	1	62,879	126,693	118,598	209,825	134,998	112,845
	2	64,667	119,333	126,317	204,402	141,015	114,835
Owner	1	50,090	7,125	Nil	Nil	Nil	17,795
	2	50,136	7,096	Nil	Nil	Nil	17,806
Non-staff branch	1	43,187	49,019	58,774	97,927	27,661	55,221
	2	43,224	48,847	59,019	97,621	27,706	55,262
Head office	1	2,480	28,199	34,140	34,060	64,200	24,314
	2	2,551	28,031	34,140	34,060	64,200	24,315
Tangible fair return	1 and 2	11,229	15,012	14,586	13,500	9,583	13,116
Intangible fair return	1 and 2	21,786	30,423	16,552	15,697	15,906	20,073

<b>Total</b>	<b>1</b>	<b>191,650</b>	<b>256,471</b>	<b>242,650</b>	<b>371,010</b>	<b>252,348</b>	<b>243,364</b>
	<b>2</b>	<b>193,593</b>	<b>248,742</b>	<b>250,614</b>	<b>365,280</b>	<b>258,410</b>	<b>245,407</b>

Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

We have calculated confidence intervals around the calculated average NHS costs per branch, overall and also split by pharmacy type. The table below shows 95% confidence intervals. This means that, based on our sample analysis, we are 95% “confident” that the true population average lies in this range<sup>62</sup>.

**Table 25: 95% confidence intervals around mean NHS cost per branch (£)**

Allocation Method	£	Indp	SM	LM	Overall
<b>1</b>	Mean	191,650	256,471	272,892	243,364
	Lower bound of 95% confidence interval	180,875	239,958	258,379	234,773
	Upper bound of 95% confidence interval	202,426	272,983	287,405	251,954
<b>2</b>	Mean	193,593	248,742	277,541	245,407
	Lower bound of 95% confidence interval	182,882	232,563	264,228	237,412
	Upper bound of 95% confidence interval	204,304	264,291	290,854	253,401

The average cost allocated to NHS varies by pharmacy type. Some of this variation can be explained by the prescription item volume differences across pharmacy types. Allocated NHS cost estimates per fee item are as shown in Table 26. With this volume effect removed, NHS costs look similar for four of the five pharmacy types<sup>63</sup>. In the chart below, ‘cost’ is the cost allocated to the NHS (NHS costs and an allocation of common costs), including an element of fair return and the cost of enhanced services and ‘fee items’ is the yearly volume of prescription items based on the most recent available NHSBSA data.

**Table 26: Average allocated NHS cost per fee item (including fair return)**

	Indp	SM	NRD LM	RD LM	Spmkt	Overall
Allocation method 1 cost per branch (£ p.a. per branch)	191,650	256,471	242,650	371,010	252,348	243,364

<sup>62</sup> We are able to calculate confidence intervals around these results because of the stratified random sampling methodology used to select the sample of branches. We have not calculated individual confidence intervals for the three different types of large multiple branches (i.e. RDLM, NRDLN and Supermarket) because our sampling was not carried out based on these categorisations.

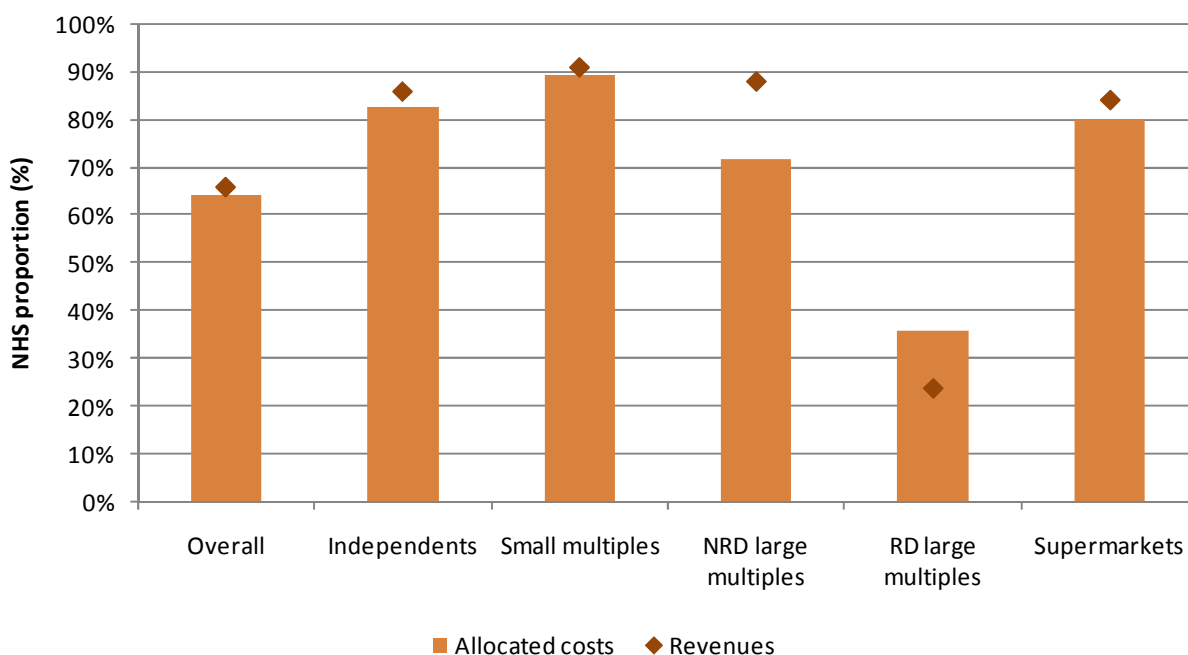
<sup>63</sup> It is important to note that this is not the same as the incremental cost per additional fee item as estimated by the econometric analysis set out in Appendix R as it includes both the fixed and variable elements of NHS costs, which in turn include the cost of provision of MURs and enhanced services.

Allocation method 2 cost per branch (£ p.a. per branch)	193,593	248,742	250,614	365,280	258,410	245,407
Fee items per branch (# p.a. per branch) <sup>64</sup>	71,507	90,066	86,413	76,680	78,756	80,325
<b>Allocation method 1 cost per fee item (£ per fee item)</b>	<b>2.68</b>	<b>2.85</b>	<b>2.81</b>	<b>4.84</b>	<b>3.20</b>	<b>3.03</b>
<b>Allocation method 2 cost per fee item (£ per fee item)</b>	<b>2.71</b>	<b>2.76</b>	<b>2.90</b>	<b>4.76</b>	<b>3.28</b>	<b>3.06</b>

Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

For the purposes of comparison we have also compared the overall proportion of costs allocated to the NHS and the overall proportion of revenue attributable to NHS (as reported in the survey). The results are shown in Figure 20.

Figure 20: NHS share of costs and revenues



Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC

Although generally fairly similar, we note that the NHS revenue and cost shares for RD and NRD are very different. This is due to the way that one entity allocated its head office costs between NHS and non-NHS.

<sup>64</sup> While the costs per branch have been inflated using the methodology discussed in 4.5 above, the fee items per branch represent the actual number processed between April 2009 and March 2010 by the weighted sample.

### 7.3. Common costs

For certain branches, the total costs allocated to the common category are quite substantial. The largest common costs are:

- Head office (or owner costs for Independents);
- Staff; and
- Depreciation.

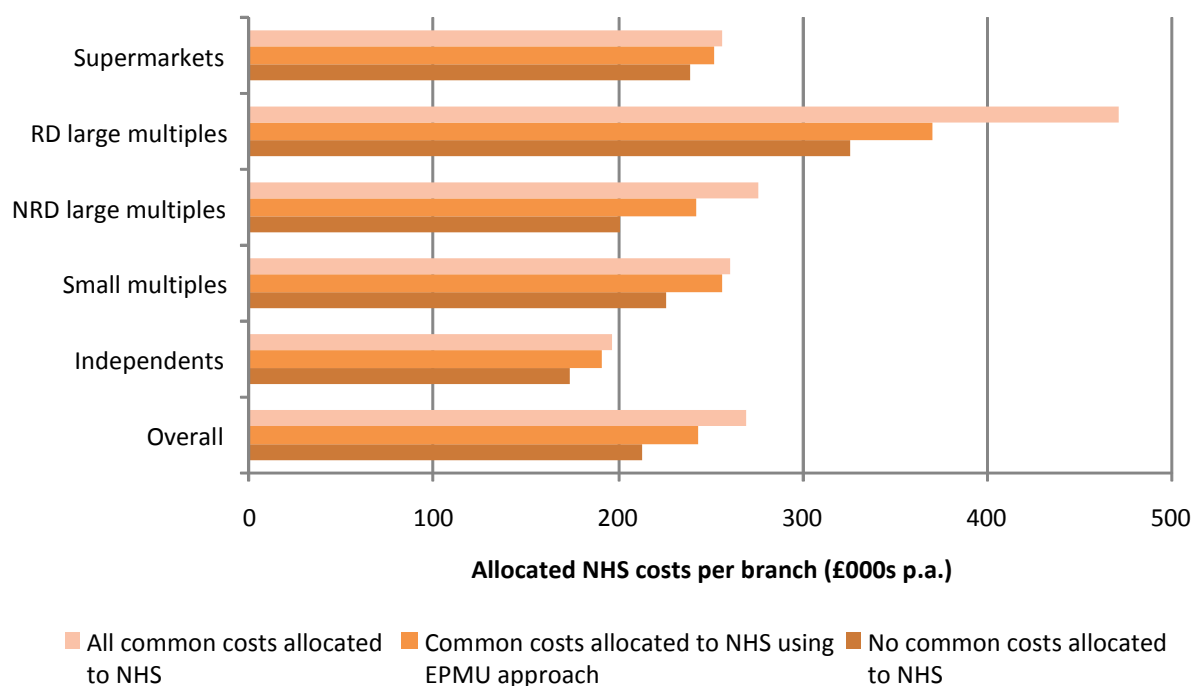
For the purposes of the calculations shown in this report, we have allocated common costs between NHS and non-NHS using the EPMU (equi-proportional markup) method. Allocating common costs in this way is often a pragmatic approach but arguably becomes less reliable as the proportion of costs in the common category increases. In such cases an alternative cost allocation may be more appropriate.

In Figure 21 below we show the impact on overall results of:

- Using an EPMU allocation of common costs (values shown next to bars);
- Allocating 0% of common costs to NHS; and
- Allocating 100% of common costs to NHS.

Allocating all common costs to the NHS leads to an overall per branch cost of £269,731 compared with £212,559 when no common costs are allocated.

**Figure 21: Allocation of common costs**



*Source: PwC survey of pharmacy contractors and assumptions discussed with DH/PSNC*

As noted in this chapter, independents and retail driven large multiples show some marked differences in the magnitude of costs they incur relative to other pharmacy types (particularly when common costs are allocated using EPMU). Therefore, in Appendix O, we carry out sensitivity analysis to show the impact on results of excluding these pharmacy types from the calculation of overall averages.

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This report identifies and quantifies the various NHS costs involved in delivering community pharmacy services. The question as to the extent to which the NHS should pay for the different categories of cost is outside the scope of PwC's work and may be a matter for further negotiation.

# Appendices

<b>Appendix</b>	<b>Title</b>
A	Branch questionnaire
B	Owner questionnaire
C	Head office (without cost centres) questionnaire
D	Head office (with cost centres) questionnaire
E	Screeener questionnaire
F	Pilot questionnaire and details of pilot visits
G	Sampling and Weighting
H	Fieldwork process
I	Data validation checks
J	Imputation approach
K	Cost allocation methodology
L	Inflation methodology
M	Fair return – Tangible assets
N	Fair return – Intangible assets
O	Fair return – Cost of Capital
P	Fair return - Overview
Q	Cost Sensitivity Analysis
R	Results of Econometric Analysis
S	Econometric Efficiency Analysis



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Footnote 1: PwC was commissioned by the Department of Health (DH). The independent research and analysis to estimate costs was, subject to the terms of the contract agreed between PwC and DH, undertaken on behalf of DH who brought the Pharmaceutical Services Negotiating Committee (PSNC) into the engagement. Both DH's and PSNC's insights to the subject matter have been taken into account by PwC in forming their views as set out in this report.

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