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# Review of the Bus Fares Index: Final report and response



The DfT bus fares index is compiled from information provided by around 80 of the largest bus operators in England and Wales, and contributes to the Retail Prices Index (RPI), Consumer Prices Index (CPI) and National Accounts.

The index also informs the monitoring of trends in fares for ministerial briefing and monitoring the impacts of bus policy, and is published annually as part of the DfT bus statistics, in table BUS0405: <http://assets.dft.gov.uk/statistics/tables/bus0405.xls>

The methodology used to compile the bus fares index was last reviewed around 10 years ago, and in preparation for the forthcoming assessment of bus statistics by the UK Statistics Authority the Department commissioned a review of the index which was carried out by the Office for National Statistics' Methodology Advisory Service between May and September 2011.

**Section A** of this document contains the final review report, including recommendations for improving the index. The key recommendations include:

- attempting to improve the timeliness of the data collection for the RPI and CPI
- revising previously published figures to adjust for a number of issues; and
- changing from the existing panel survey approach to a random sample selection of operators (with implications for how the index is calculated).

In general, DfT accepts these recommendations. A brief summary of the DfT response to each of the 14 recommendations is given in **Section B**.

Further information about the review and the DfT response can be obtained by emailing [bus.statistics@dft.gsi.gov.uk](mailto:bus.statistics@dft.gsi.gov.uk) or by telephone on (020) 7944 3094.

## Acknowledgements

DfT is grateful to Jim O'Donoghue for his report and helpful advice to the DfT team responsible for producing the index, and to the Office for National Statistics for providing support for the project through the Quality Improvement Fund (QIF).

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# A Review of the bus fares index: final report

## 1 Introduction

1. The UK Statistics Authority is due to assess the Department for Transport's (DfT) Bus and Local Transport Statistics (which covers the Bus Fares Index) in January 2012.
2. This review is intended to help DfT to prepare for the assessment, in particular in relation to Principle 4 (Sound methods and assured quality) of the Code of Practice for Official Statistics. The main objectives are:
  - To describe what the index is currently measuring;
  - To review the existing methodology from data collection through to dissemination;
  - To assess the suitability of the index for its main users;
  - To make recommendations to improve the quality of the index.
3. The review has been funded by the Quality Improvement Fund, and has been conducted by Jim O'Donoghue of the Office for National Statistics' (ONS) Methodology Advisory Service.

## 2 Background

4. The main focus of this review is the DfT's bus fares index. Around 80 bus operators across Great Britain are surveyed quarterly, and from this an index of monthly changes in local bus fares is produced for five different areas of the country: London, English metropolitan, English non-metropolitan, Scotland and Wales. Annual results are published electronically on DfT's website:  
<http://assets.dft.gov.uk/statistics/tables/bus0405.xls>
5. The bus fares index was last reviewed about 10 years ago. Since then the bus market has had many changes, such as the national concession which ensured all disabled passengers and passengers of 60 and over were able to use buses for free. Numerous other potential issues have been identified with the index; these include:
  - what the index actually measures –the complexity of some ticket types (such as multi-modal and multi-journey tickets) make this less straight forward than would be initially the case.
  - The quality of the data supplied by bus operators.
  - How the index deals with non response.
  - How best to deal with late response, given that the retail prices index (RPI – one of the index main uses) is never revised.
  - Whether the fares index should also be expanded to calculate an average bus fare, as requested by some users.

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### **3 The current data collection and methodology**

6. This section of the report describes how the current bus fares index is compiled and disseminated. It uses information obtained by interviewing DfT staff, and from DfT documents and publications. This section also comments on the actual situation at the time of this review (mid-2011).

#### **3.1 What the index measures**

7. The index measures changes in the average fares paid by bus passengers, and so does not include reimbursement from local authorities for concessionary fares. Technically, it is an annually chained base-weighted (Laspeyre's) index. Weights should be updated annually but have been held constant since 2008. Prior to this, weights had been held constant from 2005 to 2007.

#### **3.2 The sample**

8. The sample is reviewed and updated once a year, using information from the latest annual Public Service Vehicle (PSV) survey data. The sample is chosen to include the largest operators (by passenger receipts and passenger journeys), such that it includes around 80% of activity by area. The choice of cut-off point and inclusion of smaller operators is made with reference to knowledge of these operators and the geographical coverage of the sample, especially in Scotland and Wales. The sample generally changes very little through this process, in terms of adding and removing operators, although changes may need to be made due to mergers etc. An operator may be included more than once for different areas, particularly if it operates in more than one type of area: eg metropolitan and non-metropolitan areas. It can also make it easier to provide fares information.

9. In 2011, there were 78 operators in the sample covering 87 areas of the country.

10. In practice, coverage by revenue ranges from 86 per cent in Wales to 94 per cent in the metropolitan areas, and membership of the panel has not been systematically reviewed for at least two years, if not longer. This means that a small number of the larger operators are not included.

11. The database where responses to the survey are stored identifies the current members of the panel but does not identify when operators joined or left the panel. As a consequence, all operators for which weights data are available are included in the calculation of the fares index, regardless of whether they are a member of the current panel. Those that are not members of the current panel (numbering 12 in 2010) are treated as having zero fares changes. This is likely to be biasing the index downwards.

#### **3.3 Data collection**

12. The survey is compulsory under the Statistics of Trade Act 1947. DfT ask for a single figure for each month, where months are defined by the consumer prices index (CPI) reporting periods, which fall on the first Tuesday of the month after the 12th. The figure requested is the

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percentage change in fares, defined as the change in the operator's total passenger receipts due to the fares change, assuming no changes in passenger journeys as a result of the fares changes. This will usually be nil, as operators do not change their fares every month.

13. Data are collected using an on-line facility. A copy of the questions can be found here:

<http://assets.dft.gov.uk/statistics/series/buses/fares-survey-questionnaire.pdf>

Each operator has its own logon id and password. The operators are asked to complete the on-line survey by e-mails that are sent out after the CPI reporting period in January, April, July and October. They are typically given three weeks to reply before being chased for non-response by e-mail and/or by telephone. Chasing can continue up to the date of transmission of the data to the ONS if necessary, as the index can be generated very quickly once the data is validated.

14. Operators can revise data but in practice there are few, if any, revisions.

### **3.4 Data editing and validation**

15. As the on-line forms get completed, data that are ambiguous, do not make sense, or do not follow the correct definition/format are checked with the contact. Relevant explanatory details are entered in the on-line form.

16. Validation includes examination of previous quarters' data, and checking for any unusually high or low changes or any odd patterns over time, or lack of changes, which can then also be confirmed or adjusted. In practice, resource constraints have limited the amount of validation that takes place, as can be seen by the growth in nil response in Table 2 (section 5.3).

### **3.5 Index calculation**

17. Data are downloaded into an MS Access database where index calculation takes place. The calculation is very simple. The monthly index is calculated as the weighted average of the proportional change in fares. Weights are taken from the PSV survey and are based on passenger receipts. Non-respondents are assumed to have experienced no change in fares, and are not separately distinguished from those reporting no change. This is likely to be biasing the index downwards, as fares usually increase annually. Furthermore, with the increase in nil-response, this downward bias is likely to have been increasing.

18. An examination of the weighting process found that due to a programming error London was receiving only five-sixths of the weight it should have been. Section 5.8 shows the combined impact of correcting for these effects.

19. Successive monthly indices are multiplied together to give continuous indices. The indices supplied to ONS for use as deflators in the National Accounts are based on 1995=100, while those supplied for use in the CPI and retail prices index (RPI) are based on January=100 for each year.

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### **3.6 Data publication and dissemination**

20. A quarterly index by area type used to be published in the ONS's Monthly Digest Of Statistics, but this publication is no longer produced. An annual index is published in the annual public transport statistics bulletin and Transport Statistics Great Britain. DfT collect data on behalf of the devolved administrations in Wales and Scotland.
21. Data are supplied quarterly to the ONS CPI/RPI team around the 18th of the month (February, May, August and November) for periods from 1995 up to the previous month. Similar data are sent to ONS quarterly for use as a deflator in the National Accounts.

## **4 Uses of the index**

22. The bus fares index has the following main uses:
- As a component of the main consumer inflation measures – the Consumer Prices Index (CPI) and Retail Prices Index (RPI);
  - As a deflator of household expenditure on buses in the National Accounts;
  - For briefing and general monitoring of inflationary trends in the bus industry.

### **4.1 Use in the CPI and RPI**

23. The RPI needs a bus fares index that relates to the level of fares prevailing on a middle Tuesday in the month (eg 15 February 2011). The index for the CPI should, in principle, cover all fares that have changed during the relevant calendar month, although ONS are content to use the same index in the CPI as for the RPI provided the timeliness of data supply can be improved.
24. The RPI is not revisable. The CPI can be revised in principle but in practice this only happens in the event of an error impacting on the all items CPI. The bus fares index is potentially revisable but, as noted in section 3.3, this rarely happens.
25. The index needs to be provided by the first Friday in the following month (eg 4 March 2011) in order to get into that month's Statistical Bulletin which is also published on a middle Tuesday (eg 22 March 2011). A monthly index is required; in the case of the CPI, this requirement is enshrined in an EU Regulation which has the force of law in the UK.
26. In practice, the full monthly index from January 1995 is supplied quarterly with a one-month lag (eg the bus fares index for the months of February to April 2011 was provided on 18 May 2011). The lag means that the consumer prices' team in the ONS has to produce their own estimates of the bus fares index. Deviations from DfT's actual index are dealt with by adjusting the bus fares index for the following month. ONS regard this situation as unsatisfactory, although ONS have not raised this as an issue with DfT in the past.

### **4.2 Use as a deflator in the National Accounts**

27. National Accounts need a quarterly index within 2 months of the quarter-end, based on 1995=100. The current data supply arrangements meet National Accounts requirements.

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### 4.3 Devolved administrations

28. The Scottish Executive and Welsh Government are content with the current arrangements for the collection and dissemination of bus fares indices for their respective countries. Both include the fares index in annual publications. The Scottish Executive commented that from a policy perspective the fares index is used to compare fares with inflation and with other parts of GB, both for developing policy and responding to enquiries from Ministers and Members of the Scottish Parliament.

### 4.4 Department for Transport (DfT)

29. The main uses made of the bus fares index in the DfT are:

- general briefing and speech writing for Ministers;
- responding to the Transport Select Committee, the Competition Commission (e.g. their recent inquiry into local bus services) and the like;
- assessing the impact of policy changes, such as the 20 per cent cut in bus operators' subsidy which comes into effect on 1 April 2012.

30. The current survey meets these requirements for data, although there is also interest in changes in fares at a local level and in gaining a better understanding of the factors impacting on the take-up and costs of different ticket types.

31. There is a developing interest in the use of multi-operator tickets, particularly detailed information by area on the number of journeys travelled using these tickets and their costs by comparison with local operators. The need for such information is being addressed by actions separate from this review.

32. More generally, the level of bus fares is needed as an input to the national bus model, which models the demand and supply for bus travel and is used to assess the impact of policy changes. Fares data (and profitability, i.e. revenue in relation to costs) are required for five area types: London, the metropolitan areas, urban, small towns and rural areas. This information can be hard to obtain because there is no official requirement to publicise fare levels or report them to local authorities.

## 5 Review of current methodology

### 5.1 Data collection

#### 5.1.1. Review of current data collection

33. A selection of operators, of differing sizes and from each area type, numbering 30 in total, were contacted by telephone and/or e-mail. They were asked to describe how they calculated the figures provided to DfT and the ease of calculation.

34. The vast majority reported that they were calculating the percentage change in fares as specified in the on-line instructions – i.e. as the effect of the change in fares on revenues,

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assuming no change in trip patterns. This is the equivalent of each operator calculating a Laspeyre's index for their own services.

35. One or two operators said that they were calculating the percentage change for only those fares that changed – i.e. fares that were left unchanged were not included in the overall average percentage change.
36. Few operators reported any difficulty in calculating the percentage fares change; for many it was required for their own purposes. The percentage change in the index was commonly known as the change in the gross yield. Use of this term may help new, future respondents to understand what figure is required, as could the provision of a worked example in a spreadsheet.
37. All operators contacted included changes in the cost of their own multi-trip tickets (eg one-day or weekly travelcards) in the figures they provided. However, almost all did not include changes in the cost of multi-operator tickets in the calculation. This is unlikely to have a significant bearing on the overall average percentage change in fares, as these multi-operator tickets generally make up only a small proportion of total fare revenues. However, sales of these tickets are growing rapidly – most report double digit percentage increases in annual sales – and there is DfT policy interest in their uptake.

***R1. DfT's on-line notes to be amended to say that:***

- a) it is only fares set by the operator that should be included in the calculation. This includes multi-trip tickets (e.g. weekly travelcard) but not multi-operator tickets.***
- b) all routes operating in the relevant area, including fares that have not changed, should be included in the calculation;***
- c) the required fares change is commonly known as the percentage change in the gross yield;***
- d) a worked example is available on-line of the desired calculation.***

38. The price of multi-operator tickets is negotiated and agreed by operators in the relevant area and, often, by local authorities or Passenger Transport Executives (PTEs). Separate companies are sometimes set up to manage the process. The growth in interest in, and use of, multi-operator tickets suggests that it may soon become important to include them in routine monitoring of the bus industry and, possibly, light rail/trams/metros (see section 7).

***R2. DfT to consider introducing regular monitoring of the usage and cost of multi-operator tickets, particularly in relation to bus travel.***

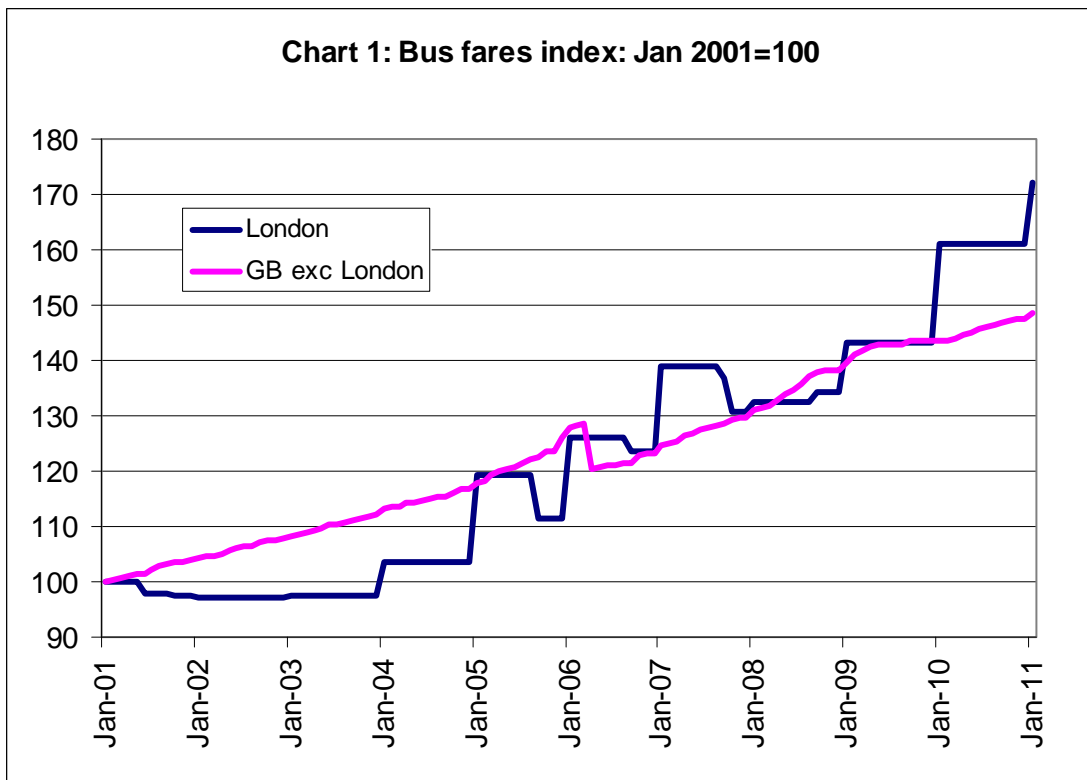
39. In implementing R2, DfT will obviously need to consider the most efficient and cost effective way of proceeding, taking into account the compliance burden. One possibility is to include the organisations responsible for multi-operator tickets in the list of operators from which the bus fares index's sample is drawn. This would require data on the revenue generated by these tickets that is attributable to bus travel so as to prevent its double-counting of revenue reported by operators.

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### 5.1.2 Concessionary fares

40. The last few years have seen the introduction of a national concessionary fares scheme for pensioners, who are now able to travel on buses for free. The national scheme was launched in April 2006; this entitled elderly travellers to free travel in their area of residence. On April 1st 2008 the local entitlement for free bus travel was extended to allow bus travel throughout England. Since April 2010, eligibility to free travel in England has been linked to the pension age. The latter increases by 6 months every calendar year, and will continue to do so for many years to come. See:  
<http://www2.dft.gov.uk/pgr/regional/buses/concessionary/informationlocalauthorities/staholderbulletins/number22.pdf>
41. In London, the elderly have been entitled to free bus travel since 1984. In Scotland and Wales the elderly are entitled to free travel from the age of 60.
42. Chart 1 clearly shows the impact of the national scheme; its introduction can be seen in the index for April 2006 which falls for almost all operators (see chart below). This is a result of travel that was previously charged for becoming free: operators report little difficulty in accounting for fares becoming free.
43. Dealing with prices becoming positive that were previously zero can be more difficult. This situation is happening currently with the gradual raising of the eligibility age. This is a fares increase because there is a gradually increasing segment of the population that is having to pay their bus fares.
44. Discussions with bus operators indicate that they are not reporting this rise as a fares increase. The likely reasons for this are that operators have no need to record the impact, as the revenues generated will be an indistinguishable part of total passenger receipts, and the effect is relatively small on a month-to-month basis.





45. It should be noted that incorporating fares that were previously zero requires a different approach to that currently used where the index is calculated as a weighted average of lower level fares indices. It is not possible to compute the latter directly for journeys that had previously been free if the base period fares (the denominator in the calculation) are zero.

46. This problem can be overcome in the case of the bus fares index by calculating, firstly, using National Travel Survey data, per year of age for affected pensioners the proportion of all pensioner bus journeys travelled that they make up. This is then used to work out the amount by which concessionary fare payments, as a percentage of all passenger revenues, would fall (and, implicitly, by how much passenger fares paid by the affected pensioners would increase) as a result of the gradually increasing eligibility age for pensions. The results are shown in Table 1.

**Table 1: Annual impact on bus fares index of increasing eligibility age for free travel (%)**

London	0.4%
Metropolitan Counties	0.7%
Rest Of England	0.8%
England	0.6%
Great Britain	0.5%

47. The factors in this table can be directly applied to the area level indices to give fares indices that take into account the impact of the rising eligibility age for free travel for pensioners.

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**R3. DfT to adjust the bus fares index to take account of the increasing eligibility age for pensioners' entitlement to free fares, and to make clear to operators that they are not required to do so.**

#### 5.1.3 The "basket of journeys" approach

48. Previous reviews have considered, and rejected, the possibility of compiling the bus fares index using a "basket" of journeys approach, similar to the basket of goods and services used for the CPI/RPI.
49. The CPI and RPI measure changes in average fares, across the complete spectrum of consumers' expenditure. It is clearly impractical to measure the change in price of every single item that is acquired. Instead, a selection of items are chosen (the "basket") whose change in prices are considered to be representative of a particular category of expenditure. For instance, the bread index is based on changes in the price of large white loaves - sliced and unsliced -, bread rolls, large wholemeal loaf and garlic bread. Small loaves are not specifically priced but are implicitly represented by the prices of large loaves.
50. In the case of the bus fares index, respondents to the survey are, in almost all cases, able to calculate a weighted change in fares for all journeys and ticket types they operate. There is, therefore, no need to price a basket of journeys. To do so would introduce random error, where little currently exists, and involve the commitment of additional resources by DfT and/or bus operators to monitor or report on the price of specific journeys. Additional information on the number of different types of journey would also be needed.
51. This review therefore makes no recommendations to change the basic approach currently used.

#### 5.2 Timing and frequency of data collection

52. The current data collection methods do not meet the requirements of the CPI and RPI in terms of either timeliness (data are needed by the first Friday in the month following the reporting period) or frequency (data are needed every month).

**R4. DfT to consider, in consultation with the ONS's prices team, how best to meet the latter's requirements for a timely, monthly bus fares index.**

53. One possible solution to meet the first of these requirements (timeliness) is for DfT to make some minor adjustments to the data collection timetable so that they contact respondents at the start of the calendar month. Respondents could then be asked to provide average fare changes for the period up to the next CPI/RPI collection day (which would typically be 2-3 weeks later), together with revisions to previous periods.
54. This approach should involve minimal additional staff resources but may require modifications to the on-line software. It also assumes that the percentage change in fares will be known for at least 2-3 weeks in advance, which should be the case.

55. All respondents are currently contacted quarterly. Analysis of frequency counts, for each operator in the current sample, of the months in which fares changes greater than or equal to 0.5 per cent took place, for the period January 2005 to January 2011 suggests that operators tend to alter fares once or twice annually, and that most individual operators have one particular month in which fare changes tend to be more common. Overall, the busiest months for fares changes, accounting for around one-third of the total, are January and April. However, there are a significant number of fares changes in all months, except perhaps December. This would tend to support the case for data collection to move to a monthly frequency.

56. It might be possible to reduce the staff resources involved with a monthly data collection by splitting the sample into three sub-samples depending on which month in the quarter the operator usually changes their fares. Each sub-sample could then be surveyed quarterly, as at present. This would spread DfT resources more evenly over the quarter. However, it should be noted that ONS would need all respondents to be surveyed in January, as that is the link month for chaining together successive annual indices.

### 5.3 Response chasing

57. Response can be monitored using the download functionality that sits alongside the on-line data entry facility. In 2010, this shows responses in at least one quarter of the year from all bar 4 operators. However, there is a question mark over the quality of data submitted by many of these respondents. They have the option of ticking a box if there have been no fare changes during the course of the quarter. It appears that this box is, in some cases, being ticked even though there may have been changes in fares. Evidence for this can be seen in Table 2, which shows the number of respondents reporting no change in fares (the table excludes the four non-respondents). It can be seen that nil responses have increased significantly, particularly during 2009 and 2010. This coincides with the introduction of the on-line data collection facility.

**Table 2: Respondents reporting no change in fares**

	Number of areas in the sample in 2011	Number of areas with no reported change in fares				
		2006	2007	2008	2009	2010
London	1	0	0	0	0	0
Metropolitan areas	16	1	1	1	6	2
Non-metropolitan areas	50	1	5	7	16	23
Scotland	10	5	3	1	1	5
Wales	10	1	0	2	3	6
Great Britain	87	8	9	11	26	36

58. Further research into the nil returns was conducted by searching the internet to see if there were reports of fares changes for the 13 operators who had not reported any changes in either 2009 or 2010. Ten were found to have changed fares during this period, and nothing was

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found for the other three operators. A similar analysis was done for the other 23 operators who had nil returns in 2010. This showed ten with reports of fare changes during this period; two had reports of fare freezes; and nothing was found for the other eleven operators.

***R5. Additional resources should be found for response chasing, including nil responses. E-mails to respondents should stress the compulsory nature of the survey.***

59. One possible approach might be to chase operators who reported fares changes in the same month in the previous year, and those who report no fare changes during the course of a calendar year. Internet searches for reports of fares changes could also be made, but this may not be too productive as operators are under no obligation to publicise fares changes.

#### **5.4 Sample selection and weights**

60. The use of a panel comprising the largest operators implicitly assumes that respondents to the survey are representative of the population as a whole, including the smallest operators. However, there is no way of knowing whether this is the case or not and membership of the panel has not been systematically reviewed for at least two years. It therefore seems an appropriate time to refresh the sample, and introduce probability sampling.

***R6. Sample of operators to be selected using a statistically random approach, and updated periodically.***

61. The suggested way to meet this recommendation is to introduce stratified random sampling. Strata would be the current area breakdown (London, metropolitan areas, non-metropolitan areas, Scotland and Wales). Separate samples would be drawn for each stratum, with operators being selected with probability proportional to revenues. This will generate two sub-strata within each area: large operators that are selected with certainty, and small operators. The proportion of revenue attributable to large operators varies considerably by stratum, accounting for around 90 per cent of total revenues in metropolitan areas but only 15 per cent in non-metropolitan areas.

62. Consideration would need to be given to minimising the response burden on the very smallest operators (eg those with annual revenue of less than £1m; there are around five such operators in samples drawn as suggested). Options include:

- Restricting the sampling frame so that it excludes the smallest operators, eg as determined by the number of discs, vehicle kms or turnover;
- Defining the smallest operators as separate strata, from which samples are drawn annually.

63. The stratum sample sizes depend on the degree of precision required for the area indices, when set against that required for Great Britain as a whole. It is also depends on what is assumed about stratum variances and the overall sample size. Sample sizes under three different scenarios are shown in Table 3 below. Points to note:

- Standard deviations have been calculated for the overall percentage change during the course of the year and averaged over the last four years. The reliability of these estimates is open to question, particularly in the smaller areas, given the levels of nil-response and that the sample is non-random. In practice, assuming that all stratum standard deviations

are equal yields results that are little different from those shown in the table;

- It has been assumed that the overall sample size is the same as currently; ie the overall compliance burden on business is unchanged;
- The calculation of sampling errors (%se) is based on the standard deviations derived from the existing sample and assumes random sampling;
- The optimally allocated sample has been chosen so as to be proportional to the standard deviation, S, within each stratum, h, so that  $n_h / N_h = kSh$ ;

64. The sample will need to be updated periodically, say every three years. Annual updating is not necessary because the rate of change of the operators is relatively low. It also reduces the resources involved in recruiting new operators to the sample. Although the sample does not need to be updated annually, the stratum (area) weights should be.

**R7. Stratum weights should be updated annually at the start of the year using results from the most recently completed PSV survey.**

**Table 3: Sample sizes under different scenarios**

	Standard deviation	Current sample		Equal precision		Optimal allocation	
		n	% se	n	% se	n	% se
London		1		1		1	
Metropolitan	3.5%	16	0.21%	11	0.52%	16	0.23%
Non-metropolitan	3.2%	50	0.42%	40	0.48%	42	0.46%
Scotland	3.9%	10	0.85%	17	0.50%	19	0.47%
Wales	3.7%	10	0.88%	18	0.50%	9	0.94%
Great Britain		87	0.18%	87	0.20%	87	0.17%

65. Documentation of the current methods indicates that weights change in April, despite the index that is calculated for the CPI/RPI being based on January. Updating weights in April may result in changes to the index because of changes in journey patterns, rather than fares changes. In practice, this has not been an issue in recent years because the weights have not been updated.

66. It should also be noted that if fares change on two or more occasions during the course of a year, the second and subsequent changes will not strictly be base weighted as required for the CPI/RPI. This is because the point of comparison from which changes in revenues are measured will relate to the pattern of consumption during the course of the year, rather than that prevailing before the first fares change. In practice, this is unlikely to have a significant impact on the overall index, as most companies just have a single general revision of fares during a year.

## 5.5 Index calculation

67. The use of probability proportional to size (PPS) sampling would have implications for the calculation of the index. Within each stratum, operators would be split into two categories:

- Those with revenues greater than the sampling interval; these are selected with certainty,

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and their weights are proportional to their revenues; these are the large companies;

- A sample of small companies that represent small companies as a whole. Each has the same weight which is calculated as the overall revenue of all small companies divided by the number of small companies sampled.

68. Algebraically, the calculation of the monthly index is as follows:

$$I_t = \left( \sum_{l=1,m} r_l * I_{l,t} + \sum_{s=1,n} \frac{r^T - \sum_{l=1,m} r_l}{n} * I_{s,t} \right) * \frac{1}{r^T}$$

where  $I_t$  is the index in month  $t$ ;  $r$  is passenger revenue; and  $l$  represents the large companies,  $s$  the small companies, and  $T$ , the overall total.

***R8 To adopt this index calculation method if it is decided to use PPS sampling.***

## 5.6 Data validation and imputation

69. The approach to validation described in section 3.4 seems reasonable, and there are no changes proposed.

70. More vigorous response-chasing should help reduce the need for imputation of missing values (including nil responses). Nonetheless, it is likely that there will still be some non or nil-response. There are various options for dealing with this, including:

- excluding the non-respondents from the calculation of the stratum indices; this is equivalent to assuming that their average fare change is the same as that for respondents in the same stratum (including those that reported no change in fares);
- if the non-respondent usually changes fares in the month in question, impute its fare change from those respondents that changed fares in the same month;
- estimating the missing value from what happened in the same month in the previous year for the non-respondent.

***R9. Estimates (implicit or explicit) should be imputed for missing values.***

## 5.7 Metadata

71. There is a lack of centrally available metadata relating to the sample of operators and data supplied by operators, some of which is essential in order to calculate the fares index accurately. In particular, the following are missing:

- Start date and end dates showing when an operator joined and left the sample;
- Non-response marker;
- The period to which the expenditure weights relate;
- The years for which each set of weights are used;
- Method of imputation (required by R8)

***R10 Metadata to be found and stored centrally.***

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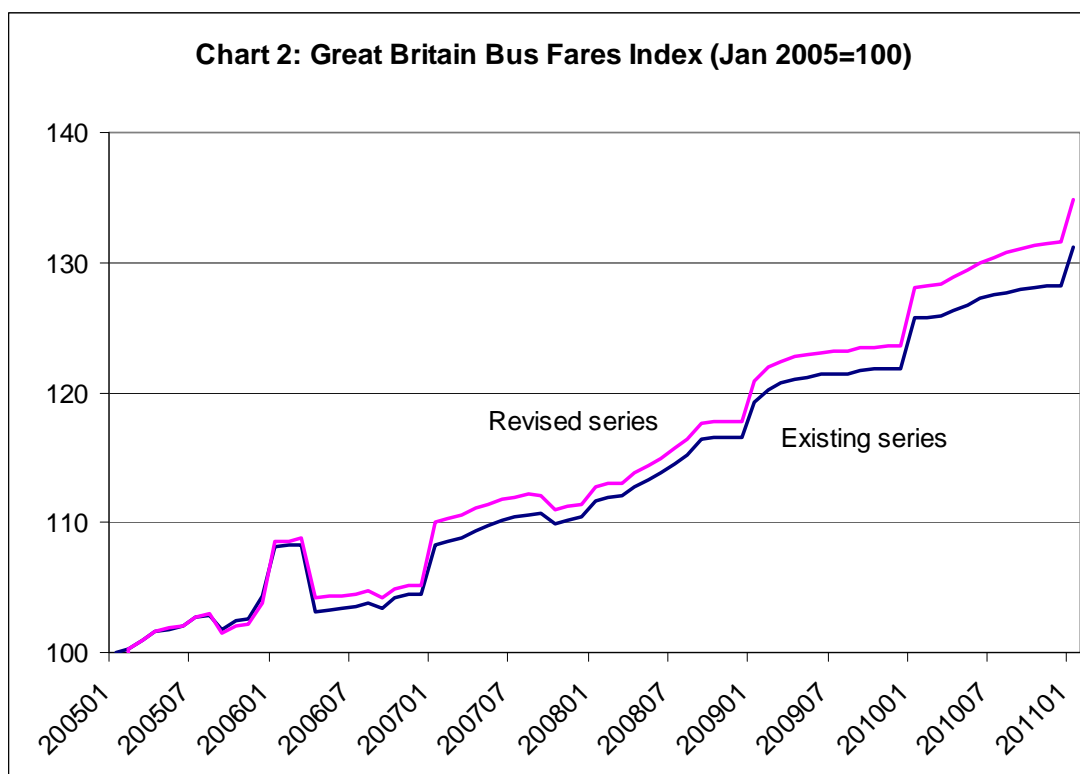
## 5.8 Revised estimates of the fares index

72. Previous sections have identified the following potential problems with the current computation of the bus fares index:
- Non-responses being counted as zero fare changes;
  - Operators that are not part of the panel being included in the calculation with zero fare changes;
  - A large increase in nil responses, particularly in 2009 and 2010; internet searches reveal fare increases for at least half of these operators;
  - A programming error leading to under-weighting of London;
  - Weights not being updated annually;
  - The raising of the eligibility age for free bus travel not being taken into account.
73. Table 4 and Chart 2 show the effect of correcting all the points identified above. The comparison is with the current index. In order to calculate a revised series, the following approach was taken. For 2009 and 2010:
- Operators for which internet searches showed a change in fares were excluded from the calculation: this is equivalent to assuming that their fares changed in line with the overall area average ;
  - Operators for which internet searches showed a freeze in fares were included in the calculation with zero fare changes throughout the two years;
  - Operators where no reports were found on the internet were also included in the calculation with zero fare changes;
  - Concessionary fares were included from April 2010, adding a monthly accumulating 0.04 per cent to the index.
74. For 2005 to 2008, all operators that were members of the panel during those years were included in the calculation, regardless of whether they reported no fare changes during the year.
75. The revisions during 2005 to 2008, are largely due to the inclusion of London with its correct weight. The London effect is particularly obvious in 2006 when its index was higher than the overall index for Great Britain, especially in January 2007. It is also obvious in 2007 when the opposite was true. The effect of annual updating of weights is minimal.
76. The London effect also exists in 2009 and 2010, but an additional effect comes from the exclusion of companies that are no longer part of the panel and those that are known to have changed their fares during the year.

**Table 4: Revisions to GB bus fares index: % change since start of the year**

	2005	2006	2007	2008	2009	2010
Jan	0	0	0	0	0	0
Feb	0	0	0	0	0.1	0.1
Mar	0	0.1	-0.1	0	0.1	0.1
Apr	0	0.6	-0.1	0.1	0.1	0.2
May	0	0.6	-0.1	0.1	0.1	0.2
Jun	0	0.6	-0.2	0	0.1	0.2
Jul	0	0.5	-0.2	0.1	0.1	0.3
Aug	0	0.5	-0.2	0.1	0.1	0.3
Sep	-0.3	0.4	-0.4	0.1	0.1	0.3
Oct	-0.4	0.3	-0.6	0.1	0.1	0.4
Nov	-0.4	0.3	-0.7	0.2	0.1	0.4
Dec	-0.5	0.3	-0.7	0.2	0.2	0.4
Jan <sup>1</sup>	0.4	1.3	-0.7	0.4	0.5	0.6

<sup>1</sup> January of the following year



**R11. DfT to publish revised estimates of the bus fares index which corrects the problems found with the current index.**

77. Revised quarterly figures by area of the country are shown in Annex C along with the size of the revisions.

## 5.9 Dissemination

78. It seems slightly odd for the quarterly bus fares index by area to be published in the ONS's



Monthly Digest of Statistics but not by DfT, particularly when DfT already produce a quarterly statistical report on buses. It is not clear whether this relates to concerns about the quality of the quarterly figures, particularly when analysed by area, or whether it is a historical accident.

**R12. DfT to consider most appropriate forum for publication of the quarterly bus fares index.**

## 6 Average fares

79. As noted in section 4.4, there is some interest in data on average bus fares paid by passengers. The current data collection for the bus fares index cannot meet this need, as it is concerned with measuring price changes only, and not fare levels.

80. However, DfT do collect and publish annual information on passenger journeys, including and excluding concessionary travel, and passenger revenue. From this, it is possible to derive annual average journey costs, as shown in Table 5 below.

**Table 5: Average passenger receipts<sup>1</sup> per journey<sup>2</sup> (pence)**

	2007/08	2008/09	2009/10
London	58.6	57.7	62.0
Non-metropolitan	108.9	111.1	129.0
Metropolitan	97.2	96.0	101.8
Wales	117.7	118.0	137.3
Scotland	95.1	102.3	102.0
<b>Great Britain</b>	<b>84.0</b>	<b>84.4</b>	<b>91.5</b>
England	82.0	81.7	89.4

<sup>1</sup> All passenger receipts including passenger payments for concessionary journeys

<sup>2</sup> Excludes concessionary journeys

81. The table excludes journeys made using concessionary tickets and shows considerable variation by area of the country. This may be related, at least in part, to differences in the average distance travelled.

82. At first sight, the results in this table might appear to be low, particularly for London where a single fare using an Oyster card is over £1. However, the average fare is lowered by the use of period and multi-modal tickets.

83. It should be noted that the results for all areas except London and Wales are slight over-estimates because they includes revenues generated by passengers travelling on concessionary tickets who pay a reduced tariff. In 2009/10 (the first year that this information was collected), the proportion of total revenue represented by these payments was a little over three per cent.

**R13. To consider the usefulness of the analysis in Table 5 and whether/how to disseminate to potential users.**

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## 7 Light rail/tram/metro fares

84. Consultations with the ONS revealed a desire on their part to improve the light rail fares index which they calculate for the RPI and CPI. Their index covers travel on all light rail, trams and metros including the Docklands Light Railway, Tyne and Wear metro, Strathclyde metro, Croydon tramlink, and Manchester and Sheffield trams. Fare changes on London Underground are measured separately.
85. ONS currently use a basket of journeys approach (see section 5.1.3) to measure changes in fares on light rail networks, with prices being collected from the internet by ONS staff. In 2011, ten different journeys from a selection of networks are priced. The main disadvantage of this approach is the limited range of fares for which prices are collected.
86. An alternative approach might be to ask a sample of metro operators, and issuers of multi-modal tickets, to provide information on the revenue generated by their operations together with changes in average fares, assuming no change in patronage (ie the same question as used for the bus fares survey). Discussions with operators for this review indicate that this information should be readily available. If similar information is collected for bus travel from coordinators of multi-operator tickets (see R2), it is likely to be more efficient (including minimising the compliance burden) and cost-effective to approach the respondent with one request for the desired data.

***R14. To consider options for improving the light rail fares index in consultation with ONS consumer prices team.***

87. It should be noted that ONS produce their own indices for coach travel and taxi fares.

## 8 Conclusions

88. Consultations with respondents to the bus fares survey indicate that the information they are asked to supply is understood and relatively easy to provide. Indeed, many operators calculate the change in the gross yield, as it is commonly referred to, for their own purposes. None reported any difficulties in dealing with concessionary fares, particularly the introduction of free travel for pensioners. Very few reported the impact of changes in the cost of multi-operator tickets in the data they provide. This latter omission is unlikely to be having a significant impact on the bus fares index, but it is a growing market and the usage of these tickets should be monitored.
89. The current sample of operators provides good coverage in terms of passenger receipts but the composition of the panel has not been systematically reviewed for at least two years, and it is not necessarily a representative sample.
90. One of the key uses for the fares index is the CPI/RPI. Consultations with the ONS's consumer prices team showed that the timeliness and frequency of the index does not meet their needs. Other users were broadly happy with the current index.
91. A series of recommendations are made to update the sample of respondents, data collection

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methods, validation, index calculation, metadata and dissemination. Principal among these are the introduction of a new sample, selected using probability sampling methods, and ideas for improving the timeliness and frequency of data collection.

92. A number of problem areas with the current index have been identified, and revised series calculated.
93. The options for calculating average journey fares are limited. One possibility is presented.
94. A need to improve the light rail/tram/metro fares index has been identified. There may be synergies in combining this with the collection of bus fares data, particularly in relation to multi-operator tickets.

## B DfT response to recommendations

The review report in section A above presents 14 recommendations. These are summarised below, with details of the DfT response.

Currently, the fares survey collects data on a quarterly basis, starting in January, April, July and October. The next (as at 20 October 2011) survey will therefore be issued in January 2012. This presents the first opportunity to make changes to the data collection.

Recommendation		DfT Response
R1	Amend online notes, including adding a worked example	We agree with this recommendation and will implement it as soon as possible, for the January 2012 data collection.
R2	Consider regular monitoring of usage and cost of multi-operator tickets	We agree that such monitoring would be worthwhile, but feel that this is best done outside the scope of the current fares survey. We intend to consult with local authorities in areas with multi-operator schemes to make a better assessment of the proportion of journeys covered by them. We will revisit this recommendation in light of any feedback received.
R3	Adjust fares index to account for increasing pensioners eligibility	We agree that the proposed adjustment is sensible and will implement from January 2012.
R4	Consider with ONS how best to meet their requirements for a timely, monthly bus fares index.	DfT have discussed the review report with the RPI/CPI branch head at ONS. As a result, it was agreed that the benefits of moving to a monthly data collection would not justify the increase in resource and response burden on operators, but that attempting to remove the current one month lag in the production would be worthwhile. This would mean that figures could be provided in a timely way every third month. DfT will aim to bring forward each quarterly data collection slightly to achieve this (as suggested in the review report).
R5	Additional resources should be found for response chasing	We agree and aim to ensure that 1-2 days of staff time are found for response chasing for each fares survey.
R6	Sample of operators to be selected using a statistically random approach	We agree that moving to a sample selected using a statistically random approach would be an improvement on the current approach, and will aim to adopt this from the January 2012 survey subject to development of a suitable method and any practical considerations (e.g. likely response rates for smaller operators).
R7	Stratum weights should be updated annually at the start of the year using results from the most	We agree and will implement this from January 2012.

	recently completed PSV survey	
<b>R8</b>	Adopt revised index calculation method (if decide to use PPS sampling)	Assuming a random sampling approach is adopted, then the change to the calculation method will be made at the same point. ONS have indicated that they would welcome such a change which would bring the fares index more closely into line with other aspects of the RPI.
<b>R9</b>	Estimates should be imputed for missing values	We agree, and proposed to adopt an implicit imputation approach where operators who do not provide a response over a 12 month period are excluded from the calculation of the index.
<b>R10</b>	Metadata to be stored centrally	This will be implemented as soon as possible.
<b>R11</b>	Publish revised estimates of the bus fares index which correct the problems found with the current index	A revised fares index has been published (on 20 October) reflecting the issues identified in the report.
<b>R12</b>	Consider the most appropriate forum for publication of quarterly fares index	It is intended that in future, the quarterly fares index will be published alongside current quarterly estimates of bus patronage (in March, June, October and December, around two and a half months after the end of the relevant quarter).
<b>R13</b>	Consider usefulness of figures related to average receipts per journey	We already publish the data which allows these figures to be produced, so there does not appear to be a strong case for a further published table.
<b>R14</b>	Consider options for improving the light rail fares index in consultation with the ONS consumer prices team	Following discussions with ONS, they are content to continue with the current approach (which represents a very small contribution to the overall RPI/CPI).