

FEATURE

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Issues in the measurement of low pay

SUMMARY

The UK uses two major surveys to produce low pay estimates; the official ASHE measure and supplementary LFS measure. The differences between these measures have been accepted as a consequence of the different survey methods and purposes.

This article describes three related investigations into these differences. The first shows how the timing of measurement is important and suggests evidence of non-compliance. The second examines the perceived inaccuracy of responses in household surveys and how this affects LFS low pay estimates. The third shows that the measure of hourly rate used can explain much of the difference between the estimates.

This work supports the current methods for generating low pay estimates and highlights the need for an awareness of these background issues when interpreting the estimates.

The National Minimum Wage (NMW) was introduced in the UK in 1999 by the Government as a direct response to the perceived growth in inequality in wages throughout the 1980s and 1990s. Subsequent analysis has led to many arguments about the impact of the NMW. These debates have largely relied upon official survey data produced by the Office for National Statistics (ONS). ONS produces National Statistics (aggregate statistics produced to a defined quality standard) on the number of low paid. These figures relate to those earning below the NMW, and are broken down by a variety of personal and employer characteristics.

The Low Pay Commission Reports (LPC, 2005 and 2007) give an idea of the range of work carried out on the NMW, mostly using this official data at aggregate and individual level. Changes in the ONS aggregates are seized upon as evidence that the NMW is or is not having an impact on jobs, wages, profits, and so on. Low pay figures are therefore highly visible statistics and small changes are often highlighted in the press.

The survey methodologies and collection practices are well-established, follow international best practice, and are produced with standard confidence intervals. Nevertheless, relatively little work has been carried out, either by ONS or by external researchers, on how robust some of these figures are when put under the spotlight that is possible by combining and contrasting the survey microdata at the most detailed level.

In studying changes over time, it is assumed that the NMW measures are affected by the same factors each year. It is also assumed that the period over which studies are carried out is not of major importance, that the wage itself is measured accurately and that errors in measurement lead to proportional impacts on statistics. Finally, it is often assumed that differences in official statistics are the result of irreconcilable differences in the data sources.

When working with most official statistics, these are reasonable assumptions. However, when dealing with low pay, these need to be treated more cautiously. Because the concept of low pay is an on-off measure, small deviations in methods or circumstances can lead to large changes in results. Given the policy importance of low pay, there is an important discussion to be had around the sensitivity of results.

This article describes how the official statistics on low pay are collected and published, and relates how the accuracy of low pay statistics is commonly perceived. This is then reviewed in light of several recent results (Griffith *et al.*, (2006), Ormerod and Ritchie (2006a), Ormerod and Ritchie (2006b)). These investigations compare the methodology for low pay estimates, look at the effect of rounding on employee responses to earnings questions and examine the effect of timing. Overall, the article supports the current methods for generating low pay estimates but suggests that the number of low paid can be a misleading construct without an awareness of these background issues.

Sources of low pay estimates

The Annual Survey of Hours and Earnings (ASHE) has been the main source of information on earnings in the UK since 2004 and comprises a 1 per cent sample of employees using information provided by employers. ASHE is used to generate the official estimates of the low paid, the percentage of jobs paid below the NMW; see Milton (2004) for a description of the ASHE estimate and its forerunners.

However, ASHE is not the only source for official low pay statistics. The household-based Labour Force Survey (LFS) also includes information on hours and earnings, as well as much more personal data. As ASHE has very limited information on the individual, LFS estimates are required to support the ASHE estimates where breakdowns by personal characteristics are required, for example, ethnicity. An improved methodology for the LFS was developed by ONS in 2005 to use improved information on second jobs (Ormerod (2006)).

Until 2004, ONS placed equal weight on the low pay estimates of LFS and the New Earnings Survey (NES), ASHE's predecessor. This was an acknowledgement that neither survey gave a definite answer on the number of low paid. ASHE was developed to remedy this uncertainty, and is considered to be the most reliable estimate; hence, the National Statistic for the number of low paid is simply the ASHE figure. However, the nature of low pay analysis is to try to understand which groups of individuals are more affected by the NMW.

The LFS is vital to this analysis because ASHE has very limited personal data. ASHE and LFS estimates are therefore examined together by the Low Pay Commission (LPC) and others to assess the impact of the NMW on earnings and other related subjects.

The main difference between the two estimates has always been attributed to the different sources of the information. ASHE is collected from the employer and as such the earnings information is thought to be more reliable as it is mainly provided with reference to company records. The LFS is provided by the individual and it is subject to recall error which is compounded when the information is provided by proxy response. These differences are described in detail in Ormerod (2006).

The ASHE survey takes place in April so there is a six-month gap between the uprating of the NMW and the official ONS measurement of the low paid. The LFS collects information on a quarterly basis. This has recently moved from seasonal to calendar quarters to comply with European requirements. ONS has developed a partial back series for calendar quarters so that the effect of this change can be investigated (Madouros (2006)). In examining the impact of the move from seasonal to calendar quarters, ONS produced low pay estimates for both seasonal and calendar quarters throughout the year. This gave the opportunity to investigate the change in the estimates of the low paid throughout the year and to look at the affect of the October uprating on the level of the low paid.

Figure 1 summarises the various measures of low pay produced by ONS.

The pattern is generally consistent across all methods with an increase in the percentage of jobs paid below the NMW since 2003. The overall changes in the numbers of people below the minimum wage are related to the size of the change in the NMW (Lam *et al*, (2006)).

Effect of methodology on low pay estimates

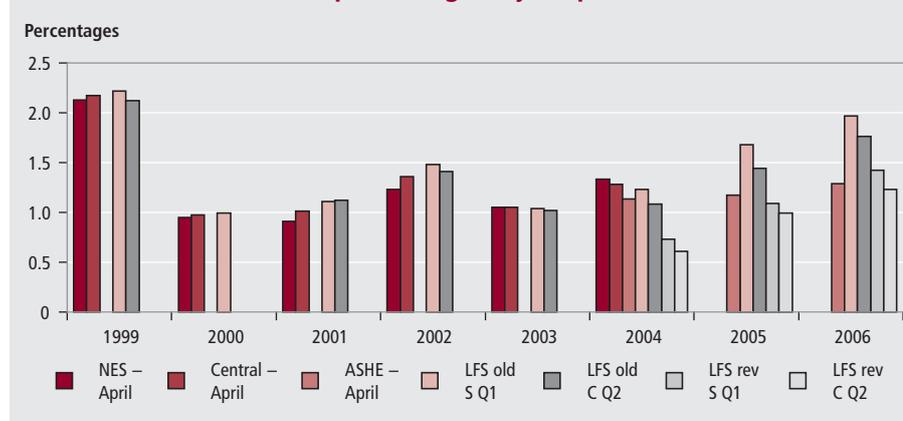
Which hourly rates are comparable?

Estimates of low pay are generated by comparing individuals' hourly earnings with the appropriate NMW rate. The National Statistics on low pay are therefore calculated from ASHE by comparing the NMW with the derived hourly rate: earnings for the period divided by hours worked. For employer surveys, the derived rate is believed to be the best measure of hourly pay because it is based on actual earnings and hours worked. The information provided by employers is extracted from pay records and therefore earnings and hours are likely to be more accurate than the same information provided from a household survey.

Basing estimates on the derived rate has the advantage of being able to include the desired components of pay as, for example, the LPC recommends that shift premium should be excluded. A stated rate is more likely to be based on basic pay only, but even then it is difficult to ensure that the respondent has included the desired components in the basic rate. Although validation against the derived rate can help, guidance is not clear in LFS and not explicit in ASHE.

For a household survey, a stated hourly rate is more likely to be an accurate measure for pay per hour than the derived hourly rate, as the derived rate is calculated by dividing weekly earnings by hours worked. Hourly rates are only applicable for certain types of jobs, while total earnings and hours are provided by most respondents. Individuals who provided stated rate information are generally low paid and, as estimates of the low paid focus on this part of the earnings distribution, this is not a big issue. For individuals providing both derived and hourly rate information in the LFS, it has been shown that the distribution of the derived rate is much wider than the stated rate and in some cases implausible. This is likely to be because respondents do not provide hours information that exactly matches the earnings information for the period and this results in an inaccuracy in

Figure 1
Annual estimates of the percentage of jobs paid below the NMW



Notes:

- NES NES estimates, applicable until 2003
- Central Central estimate derived using ASHE and LFS methodologies
- ASHE ASHE estimate, applicable from 2004
- LFS old LFS old methodology
- LFS rev LFS revised methodology, applicable from 2004 (see Ormerod (2005))
- S Q1 Seasonal quarter 1 (March, April, May)
- C Q2 Calendar quarter 2 (April, May, June)
- 2000 Calendar data set not available for LFS

the derived hourly rate. LFS estimates are therefore based on the hourly rate where this is provided. Where a respondent does not provide hourly rate information, this is imputed using a nearest neighbour model, where the derived rate has the most influence.

In summary then, the derived rate is thought to be the best measure of actual earnings and this is used in the ASHE estimate of low pay. For household surveys, the derived rate is thought to be inaccurate and the stated rate is therefore used in its place.

Comparable ASHE and LFS low pay estimates

There is therefore a basic difference between the methodologies used to create the ASHE and LFS low pay estimates; the ASHE estimate is based on the derived rate while the LFS estimate is based on the stated rate. Due to issues with the LFS derived rate, it is not possible to produce a credible LFS estimate on the ASHE basis (Ormerod (2005)). Since 2004, however, ASHE has also collected a stated rate of pay, for those workers who are paid an hourly rate. ONS

currently uses this hourly rate for the validation of the derived rate but it is not used in reporting. This investigation created low pay estimates from ASHE based on three additional hourly rate measures:

- stated hourly rate – this is simply the hourly rate stated by the respondent. As the stated rate is only applicable for certain individuals, only half the data set will have this variable
- basic-derived – this is a derived rate based on basic pay only. The derived rate used in the official methodology includes other and incentive payments. This derived rate is comparable to the stated rate, which is based on basic pay only, and
- combined – this is the stated rate if it is present; otherwise the derived rate is used. This is comparable to the LFS hourly rate measure used to estimate low pay. Since the derived rate is not an issue in ASHE, it is used alone and not imputed as for the LFS

Table 1
Annual estimates of the number of jobs paid below the NMW using various hourly pay measures

	16+			18+		
	Jobs below		Jobs below	Jobs below		Jobs below
	Jobs	NMW	NMW	Jobs	NMW	NMW
	(thousands)	(thousands)	(per cent)	(thousands)	(thousands)	(per cent)
2004						
ASHE derived	-	-	-	24,518	276	1.1
ASHE basic-derived	-	-	-	24,519	343	1.4
ASHE stated ¹	-	-	-	11,221	117	1.0
ASHE combined ¹	-	-	-	24,520	227	0.9
LFS ²	-	-	-	24,226	147	0.6
2005						
ASHE derived	25,246	308	1.2	24,753	289	1.2
ASHE basic-derived	25,246	376	1.5	24,753	355	1.4
ASHE stated ¹	10,982	136	1.2	10,579	129	1.2
ASHE combined ¹	25,247	256	1.0	24,752	239	1.0
LFS ²	25,124	250	1.0	24,527	244	1.0
2006						
ASHE derived	25,309	337	1.3	24,964	322	1.3
ASHE basic-derived	25,308	405	1.6	24,964	390	1.6
ASHE stated ¹	10,602	160	1.5	10,319	153	1.5
ASHE combined ¹	25,309	285	1.1	24,964	271	1.1
LFS ²	25,146	307	1.2	24,574	302	1.2

Notes:

- 1 Some basic validation carried out on stated rate where factor errors were obvious.
- 2 Revised LFS methodology devised in 2005 based on calendar quarters.
- Not applicable as 16–17 year rate not introduced.

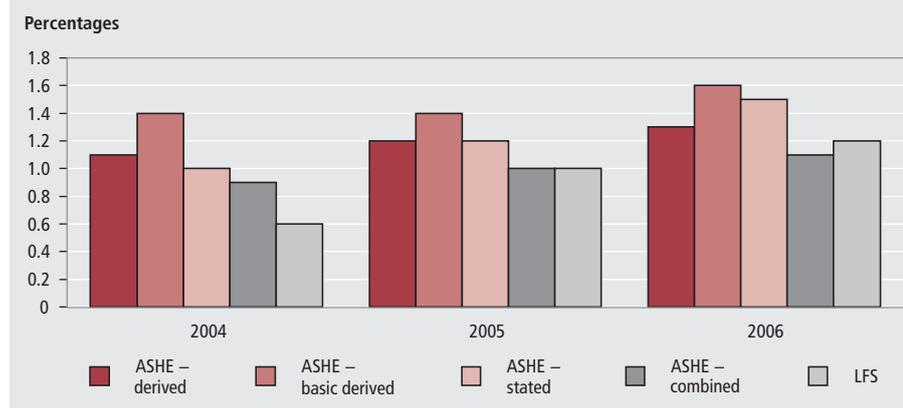
Table 1 shows these ASHE estimates for 2004 to 2006. The LFS estimates are included for comparison purposes. Figure 2 illustrates the pattern for individuals aged 18 and over.

Estimates based on the basic-derived hourly rate of pay are higher than the estimates based on the derived rate. The basic derived rate is by definition lower than the derived rate as it excludes other and incentive payments. This therefore results in a higher estimate of the low paid. Estimates based on the stated rate are lower than estimates based on the derived rate for two possible reasons. Employers may be reluctant to write down a stated rate that is below the NMW. There may also be some employers who believe they are paying above the NMW when this is not actually the case. The situation can arise where the employer calculates an hourly rate by dividing an annual salary by 52 (weeks) and then by 7 (days). However, there are 52.2 weeks in a year and the hourly rate actually paid is therefore less than intended.

The ASHE combined measure is closer to the LFS measure, even in 2004, when the stated rate was subject to a number of problems. In 2005 the difference is negligible.

This work supports the use of the derived rate of pay in the ASHE low pay estimates. The derived hourly rate is the most accurate measure of pay per hour. However, when the information on total hours and total earnings comes from household surveys, the derived rate is inaccurate. In this case

Figure 2
Estimates of the percentage of jobs paid below the NMW using various hourly pay measures for individuals aged 18 and over



the stated rate should be used. It is therefore necessary for ASHE and LFS low pay estimates to be based on different measures of hourly pay. ASHE estimates produced on the same basis as the LFS estimates are very similar. In summary, the estimates can be partially reconciled on the basis of the methodology used, partly driven by the nature of the source data.

Effect of source on low pay estimates

This section focuses on the second reason for the differences; the source of the information. ASHE estimates should be provided by employers from actual pay records (and follow-up checks confirm that this is overwhelmingly the case). LFS responses are recalled by the respondents, often without reference to documentation. In around 30 per cent of cases, the respondent is not available when the survey is carried out, and a 'proxy response' is provided by another member of the household.

The potential for recall error in the LFS poses a particular problem for low pay estimates, as it changes the distribution of observed earnings. Because low pay estimates are concerned with numbers below a limit, then a different distribution will lead to a biased estimate of the number of low paid, even if the estimate of the earnings distribution remains unbiased.

It is difficult to assess the true extent of this problem because, by its nature, there has been no corroborating information available on individual responses. However, the level of the NMW does provide an insight into the issue of recall error, and the possible direction of any bias.

Focus points and rounding

Lam *et al* (2006) showed that employers like to pay employees on wage rates at 'round' values, such as £4.50, £5.00 and to a lesser extent £5.75, £6.25. It is likely that household members paid at these wage rates would accurately recall rates, total wages and total hours. However, the actual wages paid in survey weeks often do not correspond to round values, and the concern here is that LFS respondents who do not refer to pay records carry out the rounding themselves: £4.95 being reported as £5.00, and so on. Total hours and earnings may also be rounded. The LFS shows a large number of employees being paid £5.00 per hour prior to 2006. Whether this a true figure or rounded is impossible to determine. However, this is also observed in ASHE with employers preferring to pay at round numbers.

The April 2006 NMW of £5.05 provides a natural experiment to test rounding by comparing stated and derived rates surrounding the £5.05 mark. Individuals rounding wages are likely to round down to £5.00; rounding wages up to £5.10 does not seem a likely alternative to using the actual wage. Observing large numbers of employees paid at £5.00 rather than £5.05 would imply significant rounding. This conclusion can be tested by comparing the ASHE records, which are compiled from documentation and are less likely to be subject to rounding error.

As well as rounding on the wage rate, household respondents may be rounding on total hours and earnings too. This is also likely to lead to more observations at £5.00 on the derived wage. This then leads to a further source of supporting information. If the derived and stated wage rates differ, the two can be investigated for evidence of rounding.

Two years were studied in comparison with 2006. In 2004, the NMW was set at £4.50. This is one of the 'focal points' where employers tended to fix wages; it also a relatively straightforward number to use in calculations. In contrast, in 2005, the NMW was £4.85, which does not have any obvious round numbers in the vicinity. Hence, if rounding by household surveys is a significant issue, then in the LFS:

- 2004 should show little rounding effect, with derived and stated rates similar and a peak of employees paid at the NMW
- 2005 should demonstrate no particular peak around the NMW, and a distribution of values around the NMW
- 2006 should demonstrate a peak at £5.00, below the NMW

Earnings around the NMW

Figure 3 shows the distribution of earnings around the NMW in ASHE and LFS for individuals aged 22 and over, using the stated and derived hourly rate measures. ASHE estimates of low pay are based on the derived hourly rate of pay and this is shown in part (a). Peaks at the NMW can be seen clearly for 2004 at £4.50, at £4.85 in 2005 and at £5.05 in 2006. Peaks in the derived rate are also clearly visible at other focus points in the distribution, £5.00, £5.50 and £6.00.

In 2005 the peak at £5.00 is particularly high, suggesting that, when the minimum wage is close to a round number, many employees chose to pay the next round number up. This is not the case in 2006, with the minimum wage at £5.05. Rounding to the next focus point at £5.50 may be

too much of an increase from the NMW and there is therefore a higher peak at the NMW in 2006 than observed in previous years. The change in the percentage of jobs below the NMW is also related to the size of the uprating (see Lam *et al* (2006)), but the position relative to a focus point also appears to be significant.

Employers are aware that they cannot round down and are unlikely to round up by a large amount. It therefore appears that the NMW, depending on its position relative to a focus point, can encourage some employers to take their earnings higher than the NMW if this is set close to a focal point. This could suggest that many employers could use £5.50 as their lowest wage following the uprate in October 2006 to £5.35.

This contrasts with the picture for the derived rate of pay from the LFS, in part (b). Here, peaks are clearly visible at the focus points but only small peaks appear at the minimum wage values. Respondents on the LFS may not match the hours and earnings for a period; this will give an inaccurate derived hourly rate. Equally, respondents may round their hours or earnings resulting in a 'rounded' derived rate. As employers respond to ASHE, they will be eager to provide accurate hours and earnings information as they do not want wages to appear to be below the NMW (it is assumed that employers do not deliberately falsify data). LFS respondents do not have the same incentive.

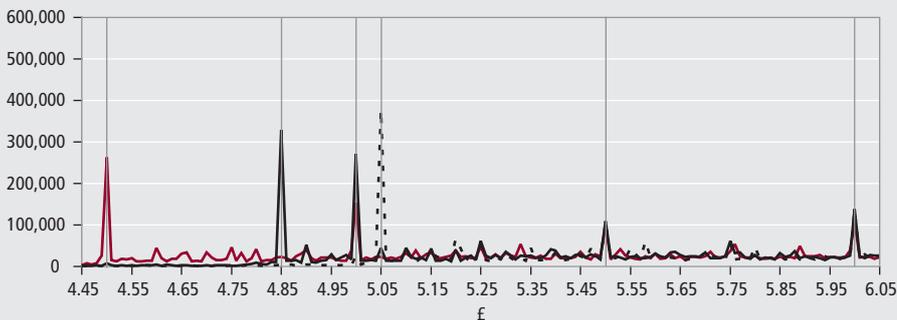
For the stated rate in ASHE (part (c)), peaks are clearly visible at the NMW and at focus points. For the LFS stated rate, earnings are all focused on 5p bands, with higher peaks at focus points (for example, no respondent reports £5.23, only £5.20 or £5.25 is observed). In 2006 the LFS stated rate (part (d)) shows a peak at £5.00 and at the NMW value of £5.05. The peak at £5.00 is much lower in 2006 than for previous years and seems to have shifted to the £5.05 point. Concern that individuals being paid at £5.05 are rounding to £5.00 is still justified, but not as problematic as anticipated. The stated rate is generally being reported accurately.

These charts therefore support the current methodologies for ASHE and LFS. The derived rate in ASHE shows peaks at the NMW, suggesting a derived rate based on actual earnings and hours measures hourly rates well. The stated rate shows almost no individuals being paid less than the NMW. There is the counter argument that employers are aware their information is being used to measure the low paid, and care is taken to ensure the calculation would

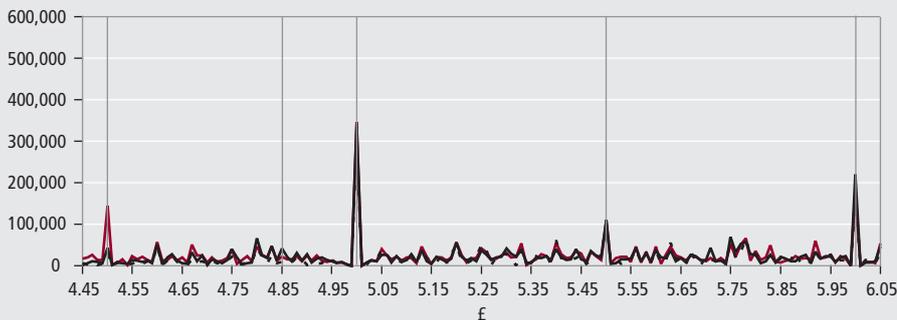
Figure 3
Earnings for individuals aged 22 and over

Numbers

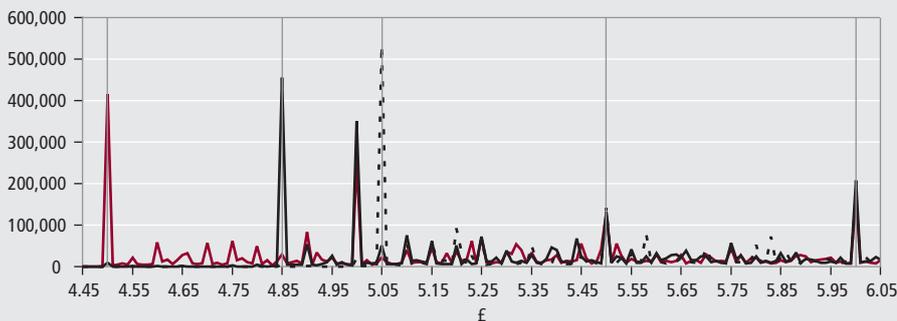
(a) ASHE derived rate of pay



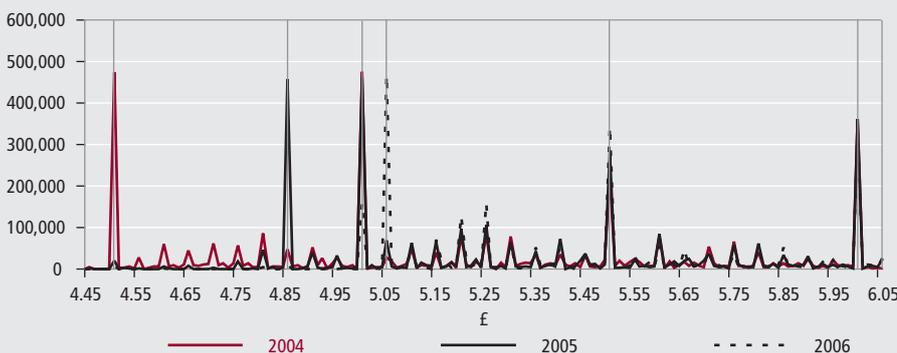
(b) LFS derived rate of pay



(c) ASHE stated rate of pay



(d) LFS stated rate of pay



Note:

LFS March-May quarter.

be correct at this level. This is, however, still more reliable than the stated rate in ASHE, as employers will be even more reluctant to write down a stated rate less than the minimum wage.

Rounding in the LFS

For the LFS, there is no concentration around the NMW values for the derived

rate, suggesting either rounding or a mismatch in earnings and hours makes the measure unreliable. The stated rate shows clearly peaks at the NMW values, suggesting that individuals are aware of their hourly rates and do not round these. The derived rate is used to inform the imputation of the stated rate when a stated rate is not provided (Ormerod, 2006).

Comparing responses to the derived and stated rate at this level therefore helps to understand the nature of the LFS low pay estimates.

Figure 4 shows the number of respondents with derived and hourly rate values around the NMW in 2006. The size of the point is related to the number of respondents. Most respondents have a derived rate of £5.00. Half of these also have a stated rate of £5.00, but the other half have a stated rate of £5.05. For all the respondents with a stated rate of £5.05, a variety of derived rates are provided. This suggests that for individuals having both a stated and derived rate, the stated rate is more accurate. This is based on the assumption that a reported hourly rate of £5.05 is correct; it is unlikely that an individual would report such a value when estimating or rounding.

This is intuitively sensible. Employees are likely to know their hourly rate, as this does not change from week to week. Weekly hours and earnings can, however, vary from week to week which makes recalling them more difficult. On examining the data closely, the majority of rounding appears to relate to total earnings causing a round hourly rate to be provided.

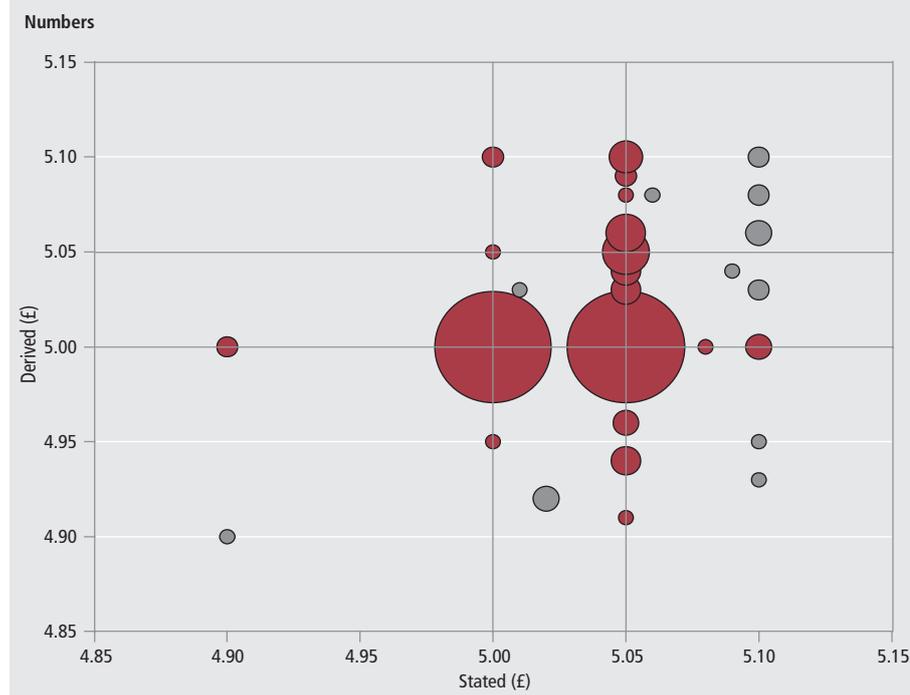
Bad memory, bad knowledge or bad records?

It was noted above that two of the concerns about the accuracy of the LFS relate to the use of proxy responses and the lack of supporting documentation. A natural question to ask is whether these contribute to the rounding effect. **Table 2** shows the types of responses and whether documentation was used for hourly rates quoting £5.00 or £5.05.

Where the stated and derived value are both £5.05, the respondents are more likely to have provided the response themselves and with reference to documentation. Although it is impossible to tell whether the rates have been provided accurately, it can be assumed that quoting such a number and obtaining a derived rate exactly equal to it suggests the information is accurate. This is borne out by the fact that 90 per cent of these individuals provided the information themselves.

Only a small number of cases have a stated rate of £5.00 and a derived of £5.05; hence the numbers are not shown here. Where the stated rate is 'accurate' at £5.05 and the derived rate is rounded to £5.00, this is more likely to be a personal response. In all cases proxy responses are more likely to round one or both rates.

Figure 4
Number of respondents aged 22 and over with stated and derived hourly rate values between £4.85 and £5.15, March to May 2006



Note:
 Small numbers have been randomly adjusted to maintain confidentiality.

The table supports the idea that documentation is a source of error: correct answers are more likely to be supplied with documentation.

Effect of rounding on low pay estimates

Interpretation of the percentage of jobs paid below the NMW in LFS can be improved by understanding the way individuals respond to questions on hours and earnings. A margin of 1 per cent in a response does not appear to be important to respondents when

calculating earnings; however, when looking at specific cut off points in the distribution like the NMW, this can cause estimates to vary from year to year. It is therefore likely that the LFS estimate would be more accurate if the NMW were placed on a focus point; for example the £4.50 value in 2004. This explains the similarity between the ASHE and LFS estimates in Figure 1.

So, when the NMW is just above a 'round' number, for example the £5.05 rate in 2006, misreporting in the LFS can cause an overestimate in the estimate of the

percentage of jobs paid below the NMW. It is conceivable that an NMW of, for example, £5.95, would conversely cause the estimate to be lower than the true value, as respondents would report £6.00. Analysis of the NMW using the LFS therefore needs to be aware that the value of the NMW can directly affect both the number of low paid and the estimate of the low paid.

The importance of timing
Calendar versus seasonal quarters

The Government makes a change in the NMW (called an uprating) in October and employers are legally obliged to comply with the new NMW immediately. Uprates are advertised well in advance and employers are expected to prepare for the uprating. The ASHE survey takes place in April so there is a six-month gap between the uprating of the NMW and the official ONS measurement of the low paid. The LFS is collected on a quarterly basis and therefore estimates of low pay can be produced at four points during the year. The LFS has recently moved from collecting on a seasonal to calendar quarters basis and ONS has produced a back series on a calendar quarters basis for comparison. The process of examining the effect of the move from seasonal to calendar quarters involved examining all LFS low pay estimates for all quarters on both bases. **Figure 5** shows the LFS low pay estimates for all quarters from 2003 using the old and revised methodology on calendar and seasonal quarters bases.

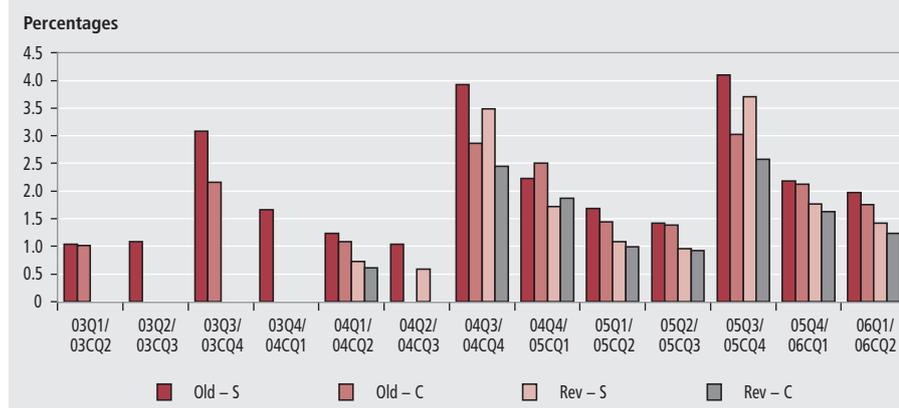
This investigation showed that there is little effect between the estimates in corresponding calendar and seasonal quarters, except in the quarter containing October. The seasonal quarter estimate covers responses to the LFS taken in

Table 2
Percentage of respondents aged 22 and over with £5.00 and £5.05 hourly rate measures: by proxy response and whether documentation was used, March to May 2006

	Type of response			Documentation used					
	Stated (£)	Derived (£)	Personal (per cent)	Proxy (per cent)	Brought forward ¹ (per cent)	Payslip (per cent)	Statement ² (per cent)	Other (per cent)	None (per cent)
5.00	5.00	5.00	46	54	-	7	-	2	92
5.00	5.05	5.05	*	*	-	-	-	-	*
5.05	5.00	5.00	79	21	-	13	-	-	87
5.05	5.05	5.05	90	10	-	30	-	-	70
	Other		72	27	1	20	-	2	78
	Total		72	27	1	20	-	2	78

Notes:
 1 Information brought forward from previous quarter.
 2 Bank or building society statement.
 * Frequency suppressed for confidentiality reasons.
 - Zero or less than 0.5 per cent.

Figure 5
Quarterly estimates of the percentage of jobs paid below the NMW



Notes:

Old LFS old methodology
 Rev LFS revised methodology, applicable from 2004
 S Seasonal quarter (quarters 1 to 4 are DJF, MAM, JJA, SON)
 C Calendar quarter (quarters 1 to 4 are JFM, AMJ, JAS, OND)
 A full back series for calendar quarters is not available, therefore some estimates cannot be calculated
 03Q1/03CQ2 'Q' refers to the seasonal quarter, 'CQ' to the calendar quarter, this is, March to May 2003 and April to June 2003

September, October and November; all these are measured against the October rate. This estimate is therefore expected to be higher than the true value as there will be a number of respondents from September who are being measured against an NMW rate which is not a legal requirement until October. The calendar quarter estimate is therefore a better measure over this period as it covers one NMW rate throughout the entire quarter.

Why do differences persist through the year?

On all measures, the estimate of the percentage of jobs paid below the NMW is highest in the quarter containing October and then decreases throughout the year until the next uprating is made. While low pay estimates attempt to measure the number of jobs that are paid below the NMW, the estimates cannot be used directly as a measure of non-compliance with the legislation. This is because it is not possible to discern from data sources on earnings whether an individual is eligible for the minimum wage; for example, apprentices and those undergoing training, who are exempt from the minimum wage or are entitled to lower rates. If employees receive free accommodation, employers are entitled to offset hourly rates to reflect this.

However, if the issues in recording discussed above were the only issues in the measurement, the estimate would be expected to drop from the quarter containing October and then remain steady throughout the year. This is not the case, and the estimates continue to drop

throughout the year. This suggests that companies are taking time to respond to the October rate, and the trend in the LFS figures can provide some evidence about compliance or patterns of compliance.

There are two obvious possibilities why compliance might be expected to change over time. First, large companies often have complex pay negotiations with workforces which may run into several months. The LFS is not updated retrospectively, so if an employee appears to be earning below the NMW in October but later receives back pay to cover this period, the October value will not be adjusted. Hence, for large companies, it might be expected that there is a delay in complying with pay legislation due to organisational inertia.

The second possibility is that large companies, even if involved in complex pay negotiations, would be more likely to implement NMW changes quickly than smaller companies. Larger companies:

- are more likely to be targeted by regulatory bodies checking on compliance
- will have a significant public presence and so be more promising targets for low pay campaigners
- have dedicated human resources departments, who should be aware of legislative changes and who can calculate complex wage changes accurately

Small companies may not have the information to set an acceptable wage level. They have a low probability of prosecution,

and penalties imposed have been relatively small. Small firms may therefore conclude that keeping up with the latest legislation is not a high priority.

These competing hypotheses can be examined. The LFS asks respondents how many employees are at the respondent's workplace. **Figure 6** shows the estimate of the percentage of jobs paid less than the NMW across all quarters from 2004, by company size. It can be seen that smaller companies have a higher percentage of jobs paid less than the NMW. The pattern in the high-level estimate (shown under 'Total') is apparent across all groups. This pattern is more pronounced in the smaller companies and is almost non-existent for companies with over 500 employees. This suggests that smaller companies are taking time to respond to the uprating in the NMW while large companies respond immediately.

To identify whether these apparent differences are statistically significant, a probit model was estimated:

$$p(\text{lowpaid}) = f(\text{industry, region, quarter, company size})$$

As well as identifying the size of the impacts, the aim was to ascertain whether this apparent difference between big and small companies was due to the characteristics of the companies or whether there is a pure size effect in line with the two hypotheses outlined above. **Table 3** shows the regression coefficients.

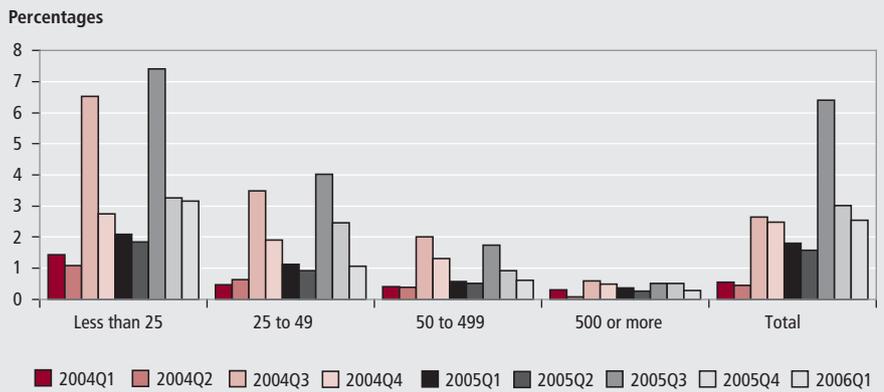
While there are some regional and industry effects, the interest here is on the timing and size variables. First, it is clear that, for all size classes, there is no significant difference between the last two quarters in the year. That is, the effect of the NMW appears to have settled down by the April to June quarter. This is important, as April is the reference date for the low pay National Statistic. There is, however, an adjustment period which lasts up to six months.

Second, the first column of results shows that there is a significantly higher probability of being paid below the NMW for those working for small companies. This is taking account of employment characteristics, and so it suggests there is a pure size effect. Hence this may be the first indirect evidence of non-compliance with the legislation, at least immediately after the uprating.

Implications of timing on official low pay estimates

It is not possible to carry out the same analysis using ASHE as it is an annual survey. There is no reason to believe that

Figure 6
Estimates of the percentage of jobs paid below the NMW:
by company size



Note:

LFS revised methodology used. Seasonal quarters shown, as full back series of calendar quarters not available.

the employers' surveys would produce a significantly different outcome from the household survey. Official low pay estimates are taken at a point in time, six months after the uprating, and should be interpreted as such and not as an annual average. The LFS figures do show that this is a relatively stable phenomenon so the ASHE figures can be compared from year to year. Moreover, the above analysis also demonstrates that the quarter containing April does not seem to be significantly different from the remainder of the NMW period, and so can be taken as a reasonable indicator of the impact of the NMW.

Conclusion

These linked investigations do support the current methods of estimating low pay using ASHE and the LFS. They also go some way to reconciling the differences between the two sources of low pay estimates: ASHE and

Table 3
Regression coefficients used to test timing and quarter, 2004 to 2005

	Coefficient	Significance level	Coefficient	Significance level	Coefficient	Significance level	Coefficient	Significance level
	All companies		Big companies ¹		Medium-sized companies ²		Small companies ³	
Industry (default = manufacturing)								
Health and education	-0.02		-0.39	***	0.11		0.09	
Retail	0.30	***	0.10		0.42	***	0.38	***
Hotels	0.59	***	0.21		0.71	***	0.69	***
Public services – other	-0.25	***	-0.45	***	-0.27	**	-0.10	
Other	-0.26		-	-	-0.23		-0.07	
Region (default = London)								
North East	0.36	***	0.20		0.09		0.59	***
North West and Merseyside	0.22	***	0.26		0.12		0.31	**
Yorkshire and The Humber	0.09		0.16		-0.03		0.18	
East Midlands	0.12		0.13		0.04		0.20	
West Midlands	0.25	***	0.28		0.11		0.36	***
East	-0.06		-0.08		-0.16		0.05	
South East	-0.03		0.00		-0.37	**	0.17	
South West	0.12		0.34		-0.06		0.20	
Wales	0.17	*	0.14		0.03		0.30	**
Scotland	0.16	*	0.08		-0.04		0.33	***
Northern Ireland	0.44	***	0.57	**	0.12		0.60	***
Company size and quarter (default = medium, quarter 3)								
Small quarter 4 ⁴	0.68	***	0.25	*	0.44	***	0.43	***
Small quarter 1 ⁵	0.61	***	0.22	*	0.34	***	0.36	***
Small quarter 2 ⁶	0.34	***	0.13		-0.09		0.08	
Small quarter 3 ⁷	0.25	***						
Medium quarter 4 ⁴	0.44	***						
Medium quarter 1 ⁵	0.34	***						
Medium quarter 2 ⁶	-0.09							
Large quarter 4 ⁴	0.07							
Large quarter 1 ⁵	0.04							
Large quarter 2 ⁶	-0.06							
Large quarter 3 ⁷	-0.18							

Notes:

- 1 250 or more employees.
- 2 Between 25 and 249 employees.
- 3 Less than 25 employees.
- 4 October to December 2004.
- 5 January to March 2005.
- 6 April to June 2005.
- 7 July to September 2005.
- * Significant at the 10 per cent level.
- ** Significant at the 5 per cent level.
- *** Significant at the 1 per cent level.

the LFS. Nevertheless, they also suggest that 'the number of low paid' can be a misleading construct without an awareness of these background issues: timing, the choice of measure of hourly earnings, the way people respond to survey questions and so on.

These results also suggest that the level of the NMW has implications beyond simply setting a floor for wages. Lam *et al* (2006) showed that companies do use some flexibility in setting wages, and the level of the NMW affects this. The more detailed examination presented here supports this, in that companies do round up to 'memorable' focus points as long as these are not too far from the NMW. This raises the intriguing possibility that certain levels of the NMW could be used to influence firm behaviour more widely. For example, an NMW of £5.95 would almost certainly lead to a large number of employers rounding wages up to £6.00. But with the measurement issues involved in the LFS, it would not be possible to determine whether earnings reported at £6.00 were a true value or as a result of rounding. In contrast, the 2007 NMW has been set at £5.52, and similar levels of potential misclassification in the LFS are expected to be observed, as happened in 2006.

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REFERENCES

- Griffiths C, Ormerod C and Ritchie F (2006) 'Measuring low pay: Methods and precision' at www.statistics.gov.uk/cci/article.asp?id=1732
- Lam K, Ormerod C, Ritchie F and Vaze P (2006) 'Do company pay policies persist in the face of minimum wages?', *Labour Market Trends* 114(3), pp 69–81 and at www.statistics.gov.uk/downloads/theme_labour/lmt_mar06.pdf
- Low Pay Commission (2005), *National Minimum Wage Low Pay Commission Report 2005*, HMSO: Norwich
- Low Pay Commission (2007), *National Minimum Wage Low Pay Commission Report 2007*, HMSO: Norwich
- Madouros V (2006), 'Impact of the switch from seasonal to calendar quarters in the *Labour Force Survey*', *Labour Market Trends* 114(6), pp 191–202 and at www.statistics.gov.uk/downloads/theme_labour/lmt_jun06.pdf
- Milton J (2004), 'New methodology for low pay estimates' at www.statistics.gov.uk/cci/article.asp?id=992
- Ormerod C (2006) 'LFS low pay estimates: Method of dealing with second jobs', *Labour Market Trends*, 114(7), pp 233–9 and at www.statistics.gov.uk/downloads/theme_labour/lmt_july06.pdf
- Ormerod C and Ritchie F (2006a) 'Measuring low pay: Focus points and rounding' at www.statistics.gov.uk/cci/article.asp?id=1731
- Ormerod C and Ritchie F (2006b) 'Measuring low pay: The importance of timing' at www.statistics.gov.uk/cci/article.asp?id=1730