

Briefing May 2019

# The gender pay gap in the English NHS

## Analysis of some of the underlying causes

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### Key findings

- The median gender pay gap for directly employed staff in the English NHS in December 2017 was 8.6% in favour of men, equivalent to an earnings gap of £207 over that month.
- Within staff groups, gender pay gaps range from 3.7% in favour of women for support to scientific and technical staff to 16.2% in favour of men for central functions staff. Women tend to be on lower pay bands within the same occupation.
- The gender pay gap across the 88% of staff paid according to Agenda for Change pay bands is 3.9% in favour of women. However, the gender pay gap within the highest pay bands is in favour of men. These bands have a disproportionately high number of men.
- The overall pay gap across all non-Agenda for Change staff (in general, doctors and very senior managers) is 47% in favour of men.
- For younger age groups the pay gap favours women, but this reverses between the ages of 30 and 34, and continues to widen across older age groups.
- The gender pay gap varies by ethnicity and is in favour of men for most ethnic groups – only for Black/Black British staff is it in favour of women.
- Statistical decomposition of the overall pay gap indicated that occupational segregation is the main driver of pay differences between men and women.

# Introduction

This briefing looks at differences in basic pay between men and women employed by the NHS in England based on data from the NHS electronic staff record for one month (December 2017). As well as drawing on previous analyses<sup>1</sup> to describe the extent of overall pay differences by staff group, pay band, age and ethnicity, it also identifies factors that drive those differences.

## Background

From its adoption of the Whitley Council system to determine pay and terms of conditions of its staff in 1948, the NHS has come a long way in developing fairer and more appropriate ways of setting remuneration for its employees. The publication of the Agenda for Change white paper in 1999 set out reasons to overhaul the Whitley system, to provide a consistent set of pay bands and job evaluations that cut across occupational groups and aimed to provide equal pay for work of equal value. An important goal of Agenda for Change was to ensure the NHS had a pay system that addressed unwarranted differences in the pay of men and women in the NHS.

Now, around 88% of NHS staff in England are included in the Agenda for Change system. The pay and terms of conditions of remaining staff – largely senior managers and doctors – are determined through other locally and nationally negotiated contracts.

Legislation has also developed to tackle discrimination and promote equality in the workplace. Most recently, in early 2018, came the requirement that all organisations employing more than 250 people should publish headline details of their gender pay gap – a requirement of the 2017 amendment to the 2010 Equality Act. This data revealed that around nine out of 10 NHS organisations in England had a median hourly pay gap that favoured men, ranging from 0.1% of median hourly pay to 52.5%.<sup>2</sup> While these figures are useful in highlighting the extent of the problem, they say little about underlying causes and possible policy prescriptions.

In the light of these headline results and efforts to address unwarranted pay differences between men and women, this briefing reports findings from more detailed analyses of NHS staff level pay data, by factors such as staff group and

age, in order to explore the reasons behind the current gender pay gap. It aims to establish overall pay differences between men and women and to identify how these differ by personal characteristics. The analysis also reveals how much of the pay gap can be described by characteristics available in the data, and how much remains unexplained.

## Methodology

### Data

Analyses were based on a special extract from the NHS Electronic Staff Record (ESR) held by NHS Digital.<sup>3</sup> The ESR is a payroll and human resources system used by all but two NHS trusts in England and covers over 1.2 million directly employed staff. Pay data were for December 2017 and included monthly basic and non-basic pay, as well as total earnings.

Pay data were rounded to the nearest £100. The data were anonymous, with 98.4% (1,186,823) of records aggregated on the basis of the seven non-pay characteristics included in the data extract (i.e. where staff group, grade, primary area of work, age group, gender, ethnicity and specialty group matched). Aggregated groups varied in size from two to over 6,500. Records were disaggregated based on headcount figures, and pay data then averaged across those staff in each aggregation. Disaggregation resulted in 1,206,138 individual records.

All analyses were based on median basic pay paid per one full-time equivalent (FTE) post in the month (of December 2017). 739 records (0.06%) had missing basic pay data and were excluded, resulting in a total of 1,205,399 records included for analysis. Some indicative analysis using total (basic and non-basic) pay plus basic pay per head (to explore differences in pay due to differences in hours worked between men and women) was also carried out.

The pay data does not cover contracted staff – in particular general practitioners, dentists and their staff.

## **Data limitations**

Median pay figures were calculated on a disaggregated data set, where the pay data was averaged across those staff in each aggregation. This will have affected the median figures estimated. It is not possible with the data supplied by NHS Digital to calculate the size of this difference from the actual median (based on actual staff-level data within each aggregated block). Given the method of aggregation (on seven non-pay characteristics, including pay grade), it is not thought the difference between the estimated median and the true median is substantial. Moreover, as one point of triangulation shows, NHS trusts' published Equality Act data shows that the hourly 'median of the medians' basic pay gap is around 10.3% – compared to the December 2017 month pay gap figure we have calculated of 8.6%.

## **Definitions**

In this briefing, the gender pay gap is defined as the difference in median female pay and median male pay, expressed as a percentage of the median male pay. The median pay is the middle value of the pay distribution, such that 50% of people earn more than this and 50% earn less. It takes account of the skewed distribution of pay and is a better measure of average pay than the mean, since a small proportion of staff earn very high pay, which drives the mean upwards and gives this group undue weight.

## **Statistical techniques**

Where differences in pay were found to be statistically insignificant (using a cut off for the probability of no actual difference of 5%) these are indicated in charts and text.

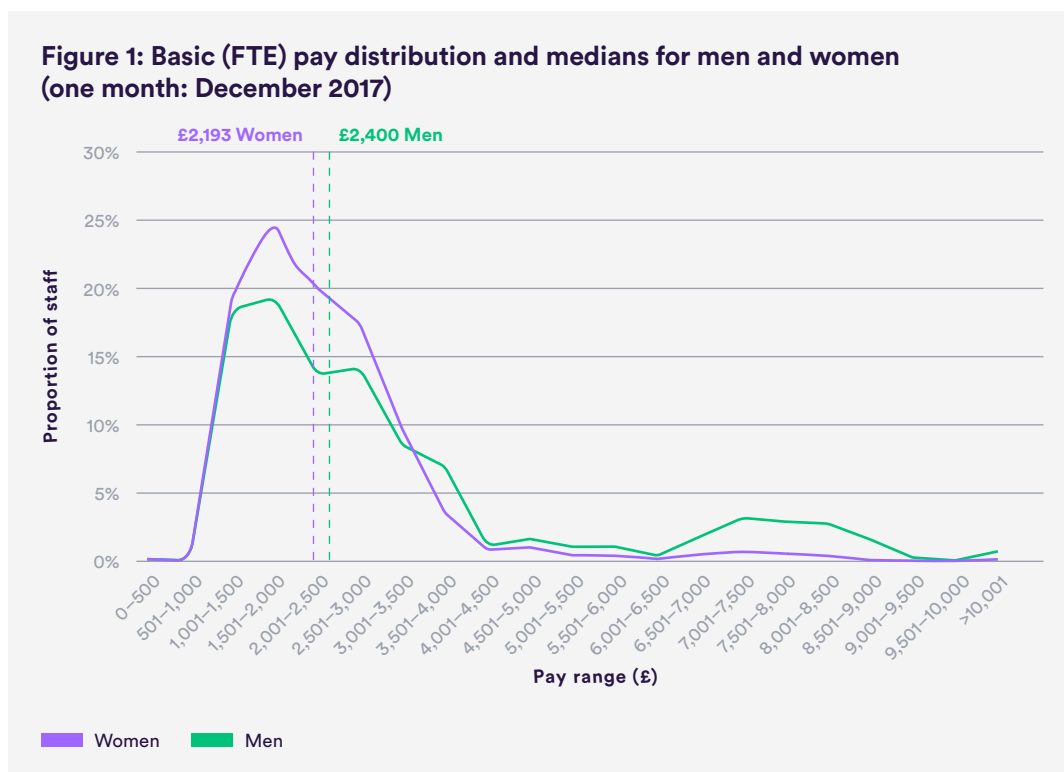
The statistical approach used to investigate factors explaining (but not, it should be noted, necessarily justifying) pay differences is described in Appendix 1 on page 20.

# Findings

## 1. The overall gender pay gap

For directly employed NHS staff in the English health service – 77% of whom are women and 23% are men – the estimated median basic full-time equivalent (FTE) pay gap for the month of December 2017 was 8.6% in favour of men. This was equivalent to an earnings gap of £207 over that month, equivalent to around £2,500 a year.

Figure 1 shows the distribution of monthly basic pay for men and women separately (plus the median basic FTE pay). The basic FTE earnings for the majority of staff ranged from £500 to £4,500 a month. However, the distribution is very skewed and there is a noticeable group – mainly men – with earnings between £6,000 and £9,500 a month.



While the rest of this briefing remains focused on basic pay per FTE data directly provided by NHS Digital, it is possible to estimate FTE pay data for non-basic and total earnings that was originally provided by NHS Digital on a headcount basis (which is not an appropriate measure for calculating pay gaps). There are, however, some issues in terms of the accuracy of these estimates and the sensitivity of the size of medians calculated. Nevertheless,

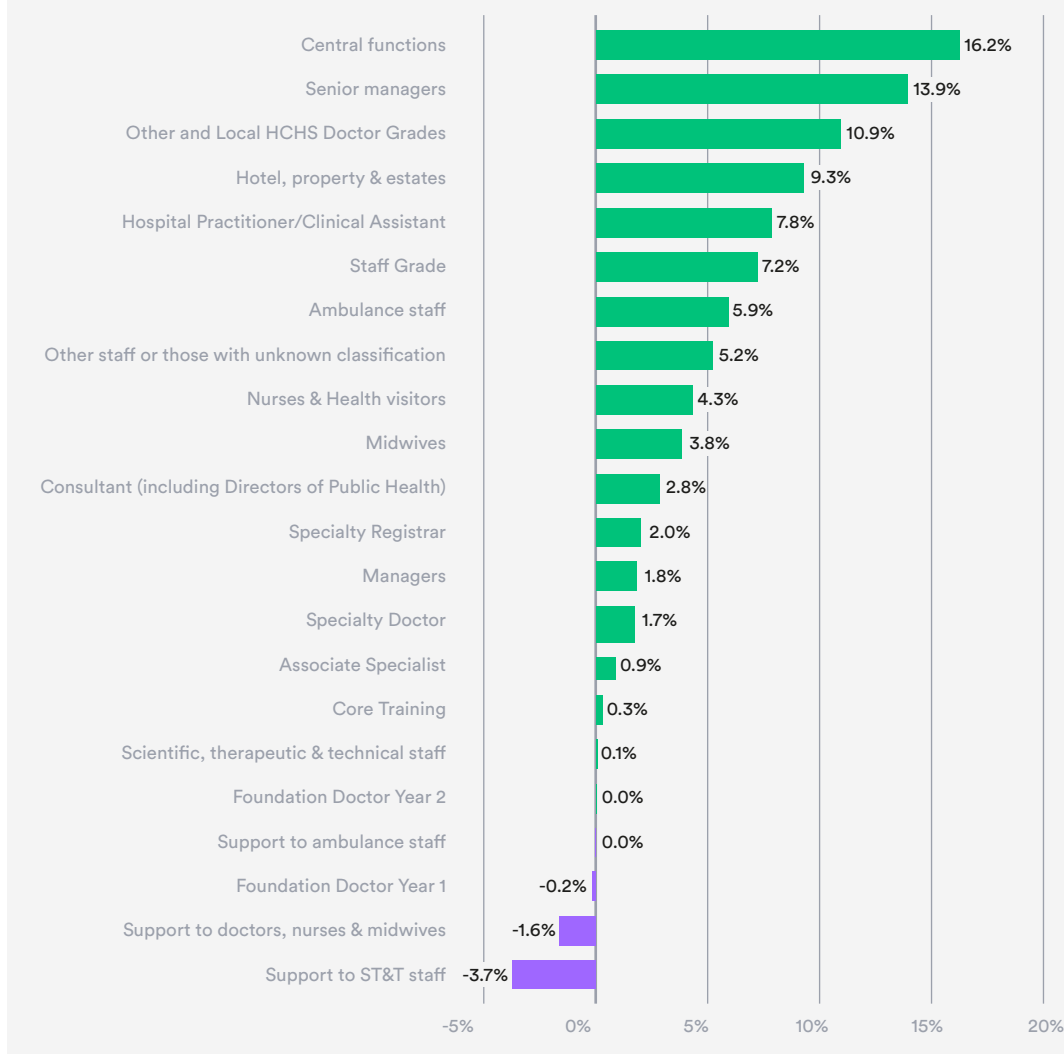
the estimates of the pay gaps for non-basic pay and total earnings reflect differences between men and women in the amount of overtime worked. Details of these non-basic and total earnings pay gaps are provided in Appendix 1 on page 20.

Furthermore, our use of full-time equivalents means that differences in part-time working between men and women are obscured. Unfortunately, the nature of the original aggregation of the pay data means that it is not possible to get an accurate picture of these differences and how they affect pay differences on a headcount basis. However, very broadly, we are able to tell that on average men work 0.94 of a full-time equivalent, women work 0.84, and that the basic pay per headcount (which will reflect differences in hours worked) suggests a median pay gap of around 19% in favour of men, with the difference between this figure and the FTE-based gap of 8.6% being accounted for by the difference in average FTE for men and women.

## **2. How the pay gap varies by personal and job characteristics**

The overall gender pay gap of 8.6% in favour of men is an aggregate figure for all staff across the NHS, which is a highly diverse workforce in respect to job roles, pay grades and personal characteristics. Here we present pay gaps for distinct groups of staff to explore how the gender pay gap varies across the NHS and by different factors.

**Figure 2: Gender pay gap (median basic pay per FTE) for all NHS staff groups**



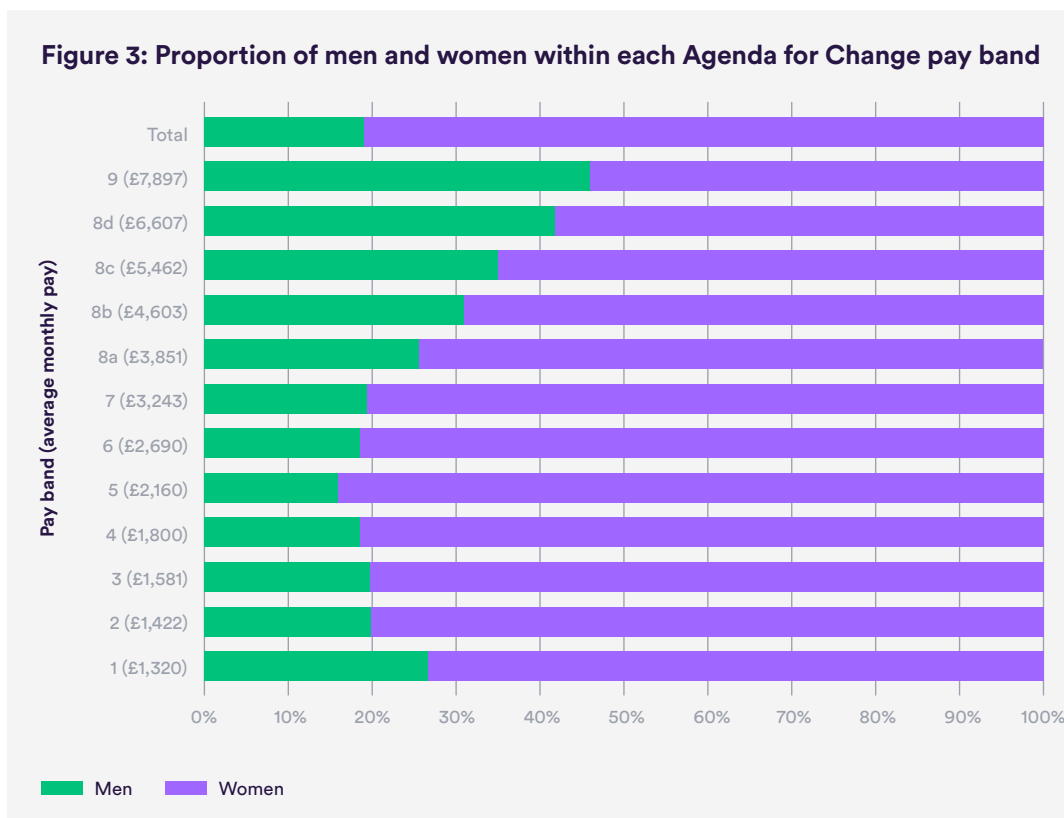
Note: Pay gaps for Foundation Doctor Year 1, Core Training, Associate Specialist, Midwives, Nurses & Health visitors and Other staff or those with unknown classification are not statistically significant at  $p < 0.05$ .

### The gender pay gap by staff and pay groups

Figure 2 shows the basic FTE pay gap for all 22 staff groups within the NHS. They range from 3.7% in favour of women – for support to scientific, therapeutic and technical (ST&T) staff – to 16.2% in favour of men for central functions. More than half of staff groups have statistically significant pay gaps in favour of men and two staff groups – support to ST&T staff and support to doctors, nurses and midwives – have significant pay gaps in favour of women.

Part of the explanation for these pay gaps is that men may be disproportionately represented in higher pay grades and/or in staff groups with generally high pay.

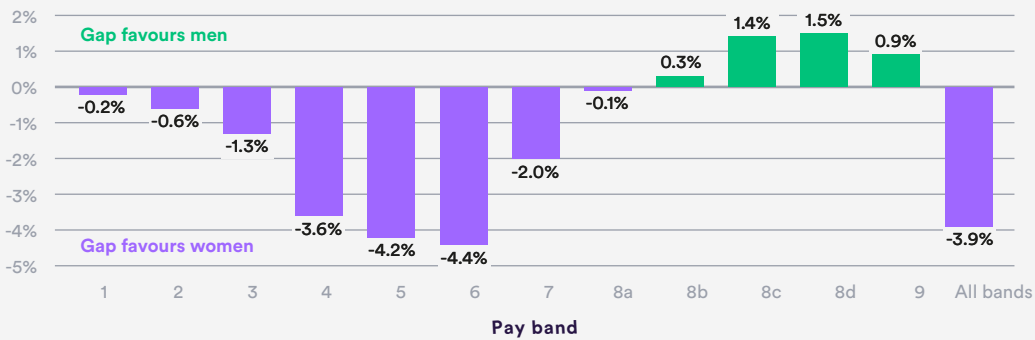
The pay of the vast majority of NHS staff – around 88% – are set within the Agenda for Change pay system, introduced in 2004 partly to address gender pay differences. As is clear from Figure 3, for these 1.1 million NHS staff on Agenda for Change pay bands, men tend to be disproportionately represented in higher pay grades. While the average gender split across all bands is 81% women and 19% men, for the highest grades (8a to 9) the proportion of men ranges from 26% to 46%.



However, how this translates into median pay gaps is not necessarily straightforward. Across all Agenda for Change pay bands, there is a pay gap of 3.9% – but in favour of women (as shown in Figure 4). Within each pay band, however, there is a link between the median pay gap and the proportion of men in each band, with higher pay bands (with a disproportionate proportion of men) showing a (small) pay gap in favour of men.



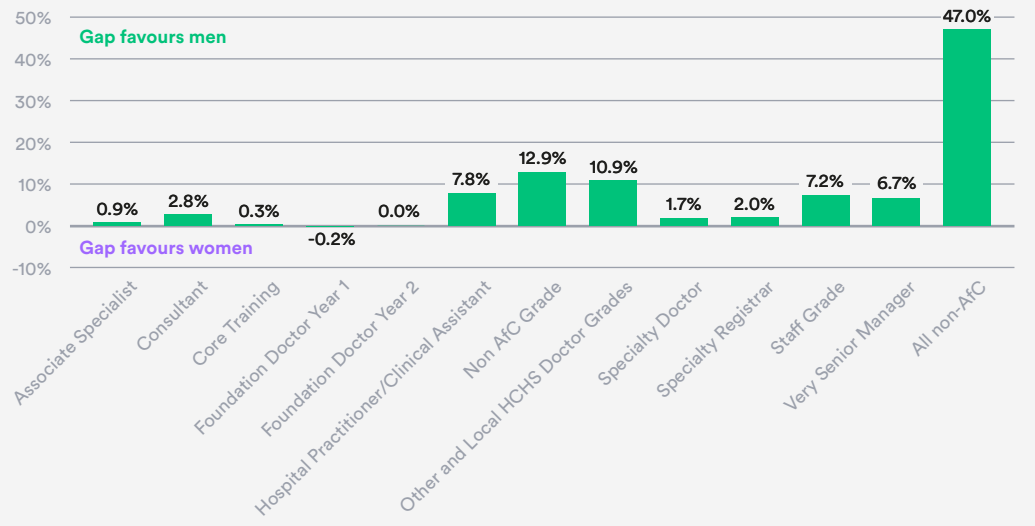
**Figure 4: Gender pay gap (median basic pay per FTE) for NHS staff on Agenda for Change pay scales**



Note: The pay gap for band 8b is not statistically significant at  $p < 0.05$ .

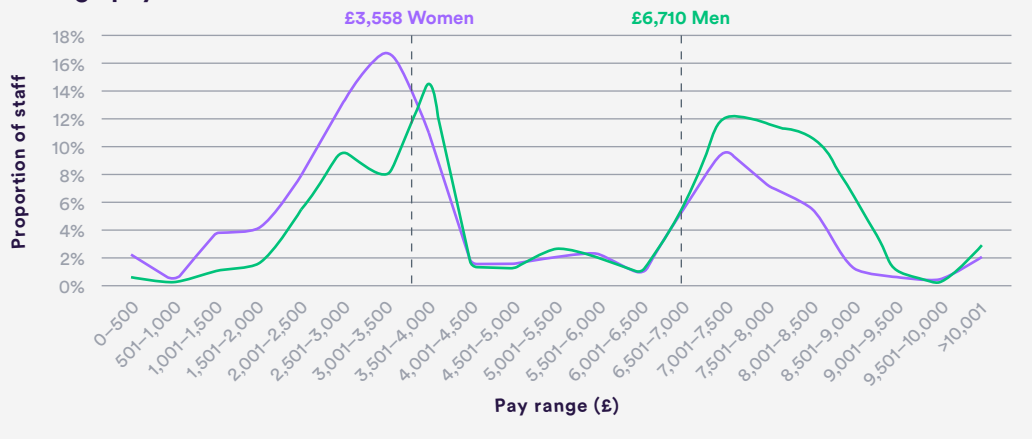
However, for the 12% (around 135,000) of NHS staff not covered by Agenda for Change – who are mainly doctors and some managers – the overall pay gap is 47% in favour of men (as shown in Figure 5). This gap is driven by the combination of two sets of staff groups (evident from Figure 6), which combines junior doctors on relatively low pay with consultants and others on relatively high pay.

**Figure 5: Gender pay gap (median basic pay per FTE) for NHS staff on non-Agenda for Change pay scales**



Note: Pay gaps for Associate specialist, Core training and Foundation doctor year 1 are not statistically significant at  $p < 0.05$ .

**Figure 6: Pay distribution and medians for men and women on non-Agenda for Change pay scales**



For associate specialists, those on core training and first year foundation doctors, the gap is not statistically significant – that is, there is a greater than one in 20 chance that there is no pay gap. For other non-Agenda for Change staff, the gender pay gaps ranges from fractionally over 0% (for foundation year 2 doctors) to 12.9% for staff on other non-AFC grades (Figure 5).

With regards to the overall gender pay gap across all NHS staff of 8.6%, clearly an important factor is the influence of a fairly small, non-Agenda for Change group of relatively highly paid staff that disproportionately consist of men.

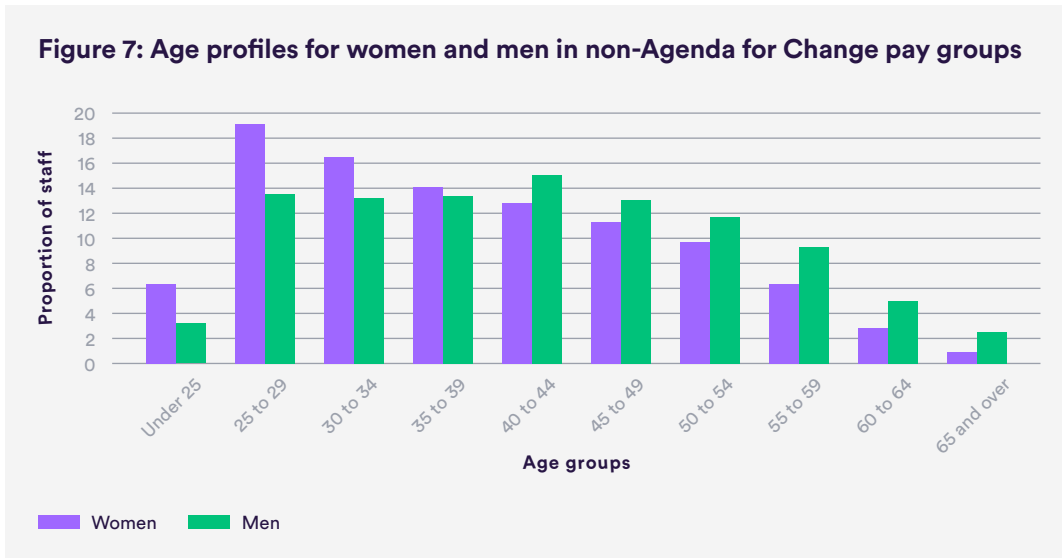
52% of the staff in non-Agenda for Change staff groups are men, compared to 19% of those within Agenda for Change. It is also notable that, within the non-Agenda for Change group, one relatively highly paid group of staff – consultants – not only make up the largest proportion (around 50,000), but is also dominated by men.

#### The gender pay gap by age group

As the Office of National Statistics have pointed out,<sup>4</sup> an important characteristic that influences someone’s pay is their age – with the assumption that age is a proxy for experience and on-the-job training. So, one explanation for the overall pay gap across NHS staff might be that there is a higher proportion of men in older age groups than women, and that men’s higher earnings reflect this difference.

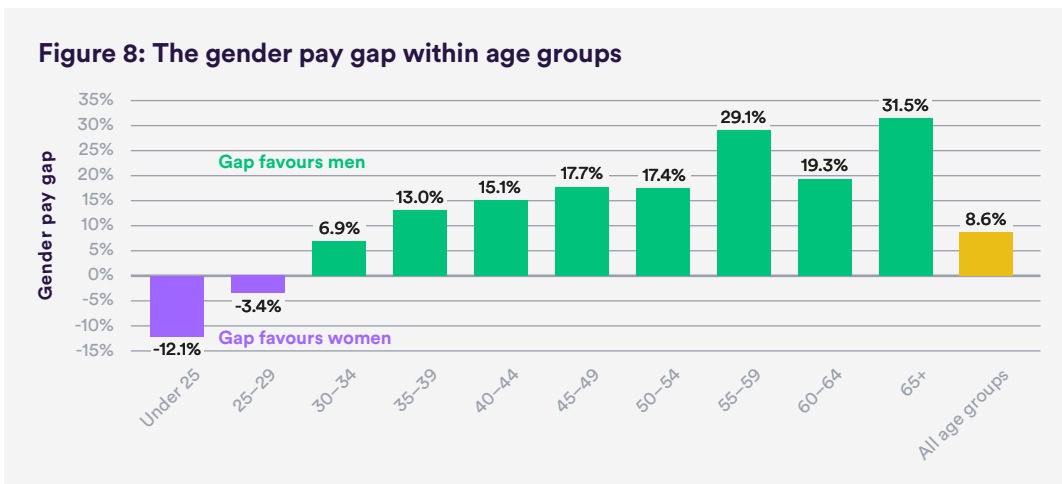
But in fact, the proportion of men and women in each age group is very similar in the NHS, and their median age (group) is the same – 40 to 44 years old. This is not, it should be noted, true for all staff groups. For example, for

non-Agenda for Change staff (with a gender pay gap of 47% – see above) there is a noticeable difference in age profiles with higher proportions of men in older age groups (Figure 7).



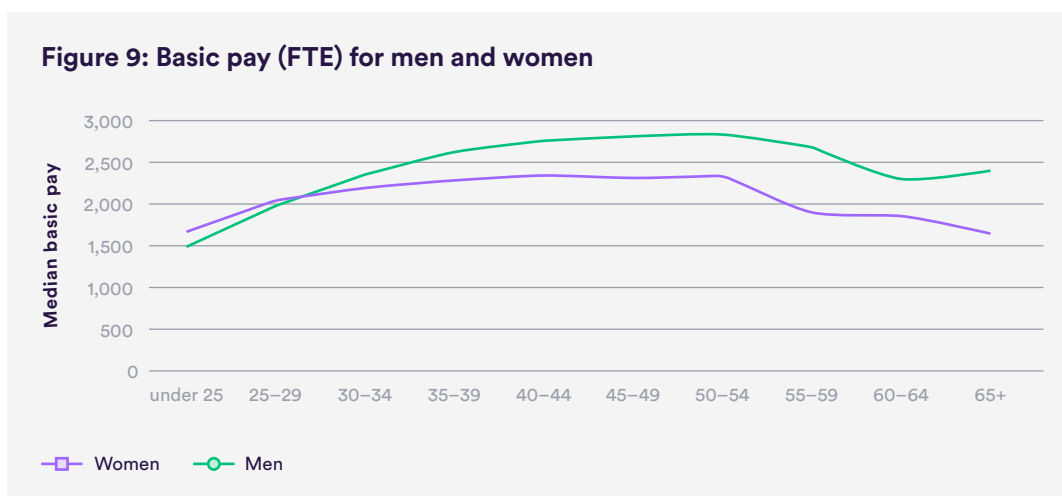
While age may contribute to an explanation for pay groups within certain staff groups, overall the relative age profiles of men and women seems less relevant. However, when we look at the gender pay gap *within* each age group, there are some big differences.

As Figure 8 shows, while at younger ages there is a pay gap that favours women, this reverses between the ages of 30 and 34, and continues to grow across older age groups. The gender pay gap for women and men aged between 55 and 59 is 29.1% in favour of men. For those over 65, that gap extends to 31.5%.



Another way of looking at this is the median basic pay for men and women at different ages. As Figure 9 shows, while women earn more than men in younger age groups (£1,677 versus £1,488), men’s median pay grows faster in older age groups. It overtakes women’s median pay between the ages of 30 and 34, and reaches a peak between the ages of 50 and 54 (£2,833). For this age group, men’s pay is 90% more than men under the age of 25.

But for women, pay grows more slowly from 30 to 34, and peaks (£2,342) at a younger age (40 to 44) – at which point it is only 40% higher than the median pay for women aged under 25.



What this data also reveals is that age (and gender) may well influence pay – not necessarily as a proxy for experience, but due to the negative impact on pay of having children. The average age for first time mothers is 28.8 years (and for all births, 30.4 years).<sup>5</sup>

Evidence on the gender pay gap suggests that having children has a big impact on pay gaps. Using Danish pay data between 1980 and 2013, researchers at the National Bureau for Economic Research have shown that the arrival of children creates a gender pay gap of around 20% in the long run, and that in 2013 this ‘child penalty’ accounted for 80% of the pay inequality in Denmark between men and women.<sup>6</sup>

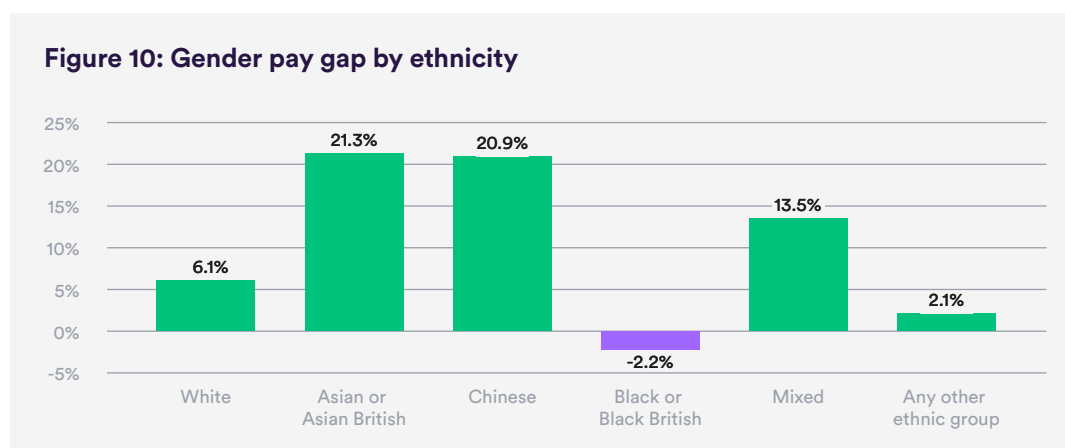
While this explanation applies to total earnings – where the choice and/or necessity of part-time work by women with children will influence the earnings gap – and our NHS data uses basic pay for full-time equivalent posts, their research found the pay gap was in part driven by wage rates (not just reduced working hours through part-time work). It was also associated with

workplace promotions and how family friendly (or unfriendly) the employer might be.

### The gender pay gap by ethnicity

Research by the Fawcett Society has shown that the pay gap between men and women in Britain is also shaped by ethnic inequality.<sup>7</sup> So does the gender pay gap exist *within* different ethnic groups in the NHS?

For most ethnic groups, the gender pay gap is in favour of men (Figure 10) (see Appendix 3 on page 25 for details on ethnic categorisation). Asian/Asian British and Chinese women experience the largest gender pay gap at 21.3% and 20.9% respectively, followed by those of Mixed Ethnicity (13.5%), White women (6.1%) and women of Any Other Ethnic background (2.1%). Only for Black/Black British staff is the gender pay gap in favour of women (2.2%).



With our initial analysis above showing that women face different pay inequalities compared to men of the same ethnicity, it shows the importance of exploring the combined impact of gender and ethnicity on pay and position in the workforce. We need to gain a deeper understanding of pay inequalities and ensure that the gender pay gap closes for women of all ethnic backgrounds.

It also highlights which inequalities to target. For example, policies directed at minimising the overall gender pay gap across all staff may do little to correct gender pay inequalities on other levels (such as within ethnic groups).

It is likely that the many complex factors that shape gender pay differences – such as occupational segregation, age, maternity and childcare, as well as

cultural norms and direct discrimination – exert varying degrees of influence when it comes to different ethnic groups.

More work is needed to untangle the root causes of these gender pay gaps. Effective policies will not only seek to address factors and barriers common to all women (such as the number in lower grade jobs with lower pay), but target inequalities faced by women belonging to specific groups, based on characteristics such as ethnicity, age and profession.

### **3. Drivers of the pay gap**

The overall basic pay gap of 8.6% in favour of men across 1.2 million NHS staff directly employed by the NHS in England is similar to that found nationally across all industries.<sup>8</sup> As might be expected, pay gaps vary by occupation – for example, male consultant basic pay per FTE is 2.8% higher than for females, and is 13.7% higher for managers and senior managers.

Although there is a 3.9% pay gap in favour of women across the nearly one million staff paid on Agenda for Change pay scales, within the Agenda for Change pay bands the pay gaps favour women on lower pay bands, and favour men on higher paid grades. For staff on non-Agenda for Change pay grades – so doctors and managers, in the main – the overall pay gap is 47% in favour of men.

The factors driving these pay differences are multiple, and will include the fact that women are more likely to work in occupations with lower pay that may be compounded by pay differences due to ethnicity and – for some occupations – differences in their age profile compared to men.

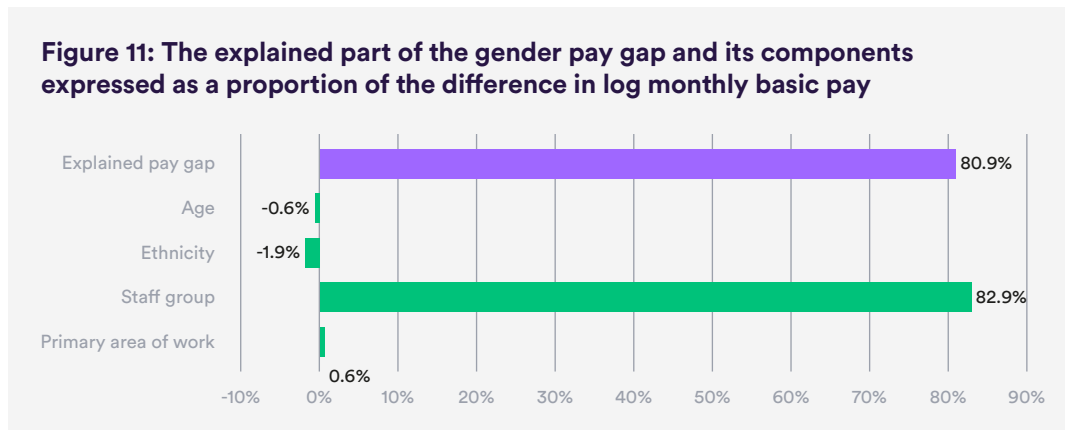
Untangling these factors is not easy – in particular, untangling those that may be warranted (due to free choices about occupation, for example) from those that are not, such as direct discrimination or unfairness in opportunities for promotion due to non or pre-work circumstances such as educational opportunities, child care responsibilities.

One part of the approach to untangling or decomposing the drivers of pay gaps is statistical – using information about (for example) age profiles, occupation and other work and staff characteristics to quantify the impacts of such factors on the overall pay gap. The next section details findings from such an analysis of the overall gender pay gap.

### Decomposing the gender pay gap

We explore possible explanatory factors further using a statistical approach to analysing the pay gap – the Blinder–Oaxaca decomposition (Blinder, 1973;<sup>9</sup> Oaxaca, 1973<sup>10</sup>). This approach breaks the pay gap down into factors that vary between men and women, and allows us to explore whether and by how much group differences in these factors contribute to overall pay differences observed. A detailed description of this technique is available in Appendix 2 on page 21.

The statistical analysis reveals that 80.9% of the difference between men’s and women’s mean pay can be statistically explained by group differences in the characteristics included in the model (Figure 11). In other words, age, ethnicity, staff group and primary area of work all have an impact on the pay gap.

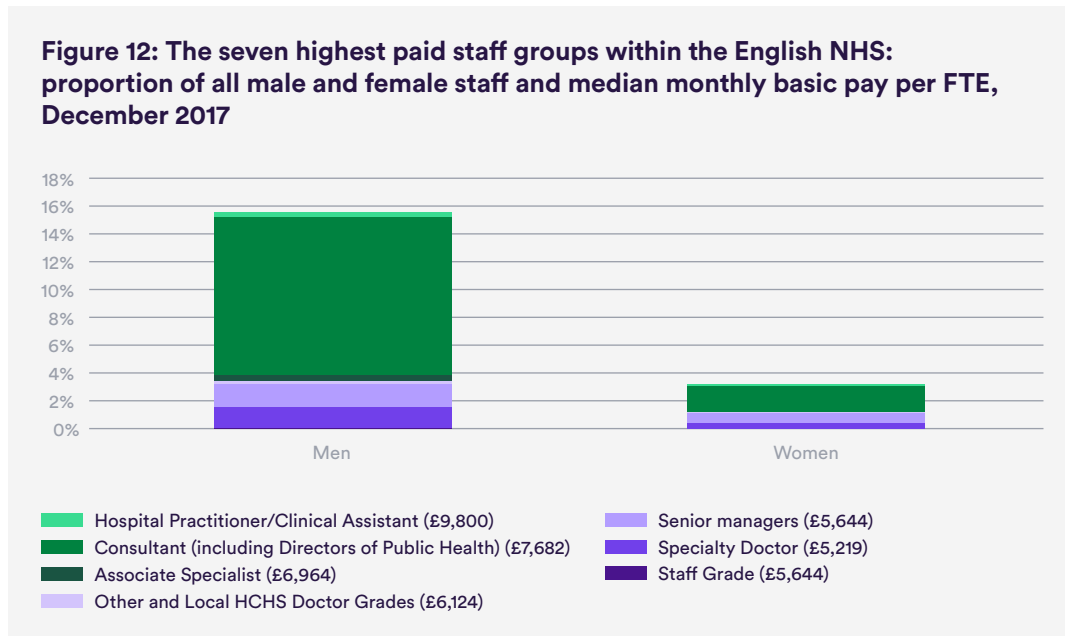


As the figure above shows, some of these factors are ‘positive’ – that is, contributing to overall pay differences in favour of men – and some are ‘negative’ – that is, contributing to closing the pay gap. Values close to zero indicate similar distribution of characteristics among men and women where that characteristic has little effect on pay.

Overall, factors contributing to pay differences in favour of men outweigh the countervailing factors. And it is clear that staff group has the largest effect – accounting for 82.9% of the difference in pay. Gender differences in primary area of work<sup>11</sup> and age explain almost none of the gap, whereas ethnicity has a small effect in closing the gap.

### Occupational segregation

Occupational segregation is the main reason underlying the overall gender pay gap – a finding reported in other analyses of factors driving the gender pay gap.<sup>12</sup> Senior doctors and senior managers are the top earners in the NHS with median monthly basic pay ranging from around £4,700 to £9,700 – 15.4% of all male staff work in these occupations compared to 3.2% of female staff (Figure 12).



NB: The Hospital practitioner/clinical assistant grade represents a very small number of staff (around 1,800) working on average around 0.25 FTEs.

In comparison, a slightly higher proportion of women than men work in the lowest paid staff groups with median earnings of £1,200 to £1,600 (37.4% of all women compared to 32.9% of all men) – see Figure 13.



**Figure 13: The five lowest paid staff groups within the English NHS: proportion of all male and female staff and median monthly basic pay per FTE, December 2017**



The reasons why women tend to work in lower paid occupations whereas men tend to work in higher paid occupations are manifold. It may, in part, reflect life choices by men and women, starting long before their working lives, such as in education. It will also reflect life chances and opportunities, employment policies (for example, concerning promotion and work opportunities post maternity) and cultural and straightforward discrimination.

Not all choices are free, of course. While our statistical analysis may ‘explain’ much of the pay gap, it does not necessarily justify it.

Moreover, while we know more about what drives a very high proportion of the difference in pay, nearly a fifth of the gap remains unexplained. Even if women had, on average, the same characteristics as men (in terms of the factors in our analysis), they would earn less. On the one hand, it is possible that direct gender discrimination makes up part of this unexplained component. It is also possible that part of it is due to factors not included in our model, such as full-time/part-time status, education, or family structures – all of which are known to also impact on the gender pay gap.<sup>13</sup>

An important limitation of our analyses is the focus on basic pay per FTE, which does not include clinical excellence awards, overtime or other additional pay that may be more discretionary and where further inequalities may be found. The pay gap for total earnings is likely to be wider than for basic pay – as our estimates in Appendix 1 indicate.

Overall pay differences do not necessarily imply pay discrimination – that is, like for like paid differently – but can point towards more structural issues, such as occupational segregation. However, increasing the proportion of women in higher paid groups may not be sufficient to address pay differences – in fact, as we have shown, pay differs *within* staff groups and these warrant further investigation.

While the policy requirement to publish gender pay gaps is a step in the right direction, it is important to move beyond the headline figures and explore the reasons driving the gap. How are men and women distributed across the workforce, what do gaps look like within different groups, and what are the underlying reasons?

## What next?

This briefing has summarised our work to date on the extent and nature of the gender pay gap among over 1.2 million directly employed NHS staff in England. For the first time, it has used data from the electronic staff record – a relatively new national source of pay and related data. There are a number of key findings from our analysis.

First, while there is an overall pay gap favouring men of 8.6%, depending on the way the data is grouped, this varies considerably. For example, across nearly one million staff paid under the Agenda for Change pay system, the pay gap actually favours women (by around 3.2%). However, within the Agenda for Change pay bands, the pay gap moves from favouring women on lower pay bands to favouring men at higher grades.

Second, the overall pay gap is largely driven by the 12% or so of staff not paid on the Agenda for Change system – in the main, managers, senior managers and doctors. On this latter group, the ongoing review of the gender pay gap among medical staff headed by Dame Jane Dacre with analytical support from Professor Carol Woodhams will provide an extremely important evidence base for further policy to tackle unwarranted gender pay differences.<sup>14</sup>

Third, statistical analysis of the factors that might account for the overall pay gap – for example, differences in men and women’s age profiles or ethnicity. However, it is differences in the distribution of men and women across

different occupations that are the main driver – in particular the fact that proportionally more men work in generally higher paid occupations.

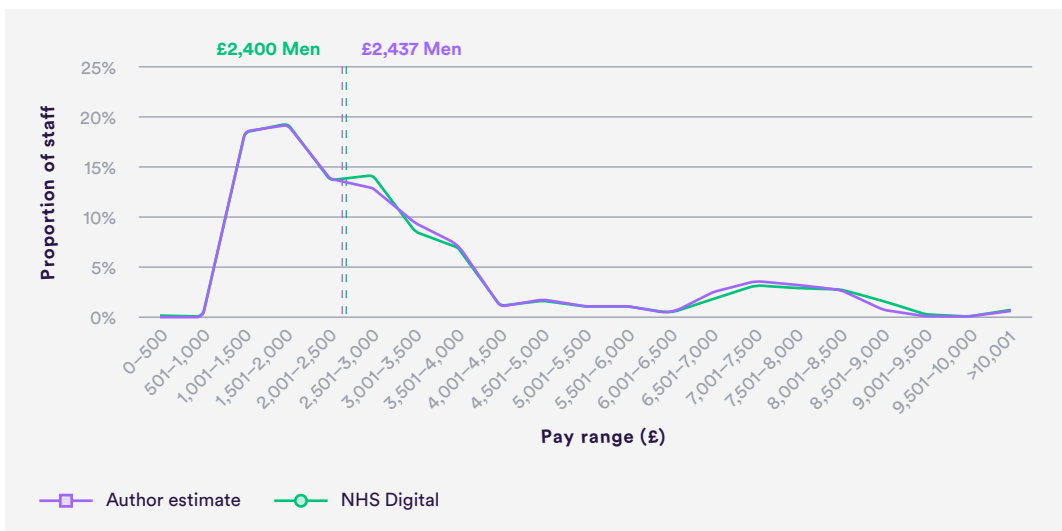
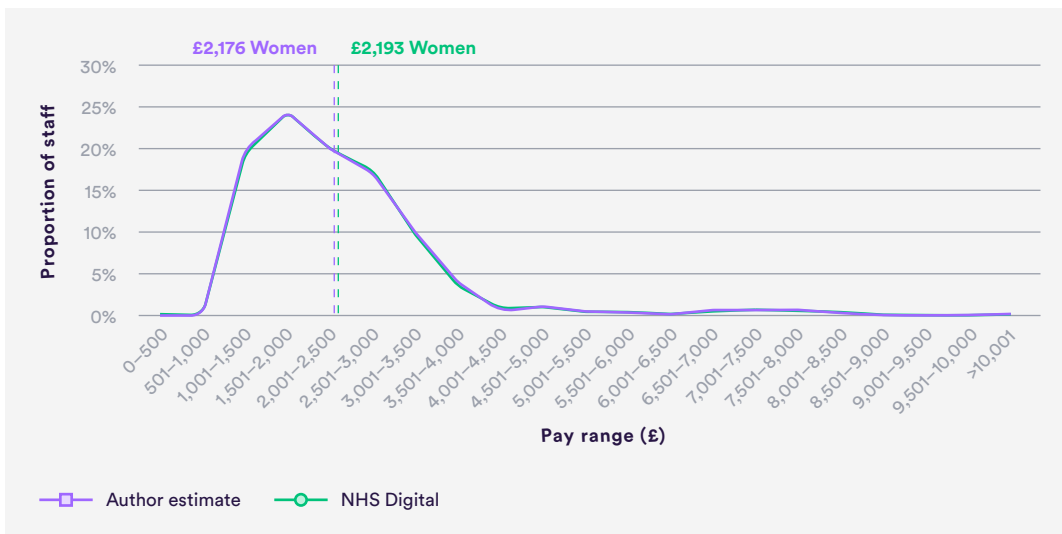
However, disentangling the reasons for the gender pay gap not only needs much more data (and local analysis) than is currently published, but a view about what may justify pay differences between men and women. The causes of the gender pay gap are complex. Men and women can be influenced by social and cultural pressures and norms that impact on all aspects of their lives, from educational and career choices to the types of professions they work in. While pay gaps may exist even if a business pays equally for equal work, there may be wider societal inequalities that account for pay differences and which need to be tackled.

The gender pay gap isn't just a matter of fairness for staff. For the NHS, we know from staff surveys that employees believe that having equal opportunities for career progression or promotion within their trust has an effect on how satisfied patients are with the care provided.<sup>15</sup> Ensuring all staff are treated fairly in their pay and other factors, such as career progression, is likely therefore to not only be the right thing to do for staff, but for patients too.

# Appendices

## Appendix 1: Pay gap estimates for non-basic pay and total earnings

Data supplied by NHS Digital allow us to produce an estimate for non-basic and total earnings per FTE. These have been derived from data from NHS Digital on pay per *head*. A check comparison with basic pay per FTE provided by NHS Digital suggests a fairly high degree of similarity (around 97% of the estimated basic pay per FTE for individual staff was within +/- 5% of the pay data provided by NHS Digital), pay distributions were very similar and there were relatively small differences in median pay (see charts).



Nevertheless, and despite these apparently small differences, the gender pay gap calculated on the estimated basic pay per FTE is 10.7% in favour of men compared to 8.6% using the basic pay per FTE from NHS Digital. Bearing in mind this discrepancy, the table below shows the median basic, non-basic and total earnings for men and women based on our FTE pay estimates.

**Basic, non-basic and total earnings median pay per FTE: (December 2017)**

	Basic pay	Non-basic pay	Total earnings
Men	2,437	367	2,878
Women	2,176	234	2,480
Pay gap	10.7%	36.2%	13.8%

NB: Total earnings are not necessarily the sum of the basic and non-basic pay as figures are medians.

While being cautious about the accuracy of these estimated median pay figures, the calculated pay gaps suggest men’s median non-basic pay per FTE is around 36% higher than women’s, and that this has a knock-on effect on total earnings, with men’s pay estimated to be around 14% higher than women’s.

Although the large pay gap for non-basic pay may be warranted in the sense that working paid overtime is an individual choice, it could also reflect differences between men and women in opportunities to work overtime as well as personal choices reflecting non-work commitments – for example, related to childcare.

**Appendix 2. Blinder-Oaxaca decomposition**

The Blinder-Oaxaca decomposition is based on ordinary least squares (OLS) regression modelling of the relationship between pay and factors that determine pay (“predictors”), estimated separately for men and women. It is important to note that the regression is based on the mean; hence the decomposition provides information on the average gender pay gap, and does not take into account different distributions of the gap among people of the same group.

Although the decomposition is based on regression analysis, it differs from the usual approach to regression in important ways. In regression modelling, the analysis takes the outcome of interest (pay, in this case), and seeks to understand what factors impact on pay and by how much, taking all factors and their interactions together. With decomposition analysis, the outcome of interest is the difference between two groups.

The factors that determine pay are modelled separately for men and women. Then the difference between them is estimated and partitioned into two aspects:

- 1 an explained part, which is the proportion of the pay differences that arises because men and women hold, on average, different job and personal characteristics
- 2 a remaining part that cannot be explained by these group differences, which may be gender discrimination, or may result from unobserved factors. This part of the pay gap would exist even if women had, on average, the same characteristics as men.

The standard method is based on the assumption that men receive non-discriminatory pay and that similar characteristics should result in similar pay. The decomposition then estimates women's mean pay if they had the same financial returns to their characteristics as men, and estimates whether women should earn more or less than men depending on whether they have, on average, lower or higher levels of a given characteristic compared to men.

#### Application

The regression models included the log of basic pay per FTE as the dependent variable and following explanatory variables: age in five-year bands, staff group, primary area of work and ethnicity.

The distribution of pay was positively skewed – that is, the majority of people were grouped towards the lower end of the pay scale with few people earning higher salaries. Thus, pay was log transformed to help normalise the distribution.

All independent variables were categorical and were included as indicator variables. One factor was omitted from each variable to avoid perfect

multi-collinearity; this factor was the base category to which the other groups were compared to. The base categories for each variable were:

- Age: Under 25
- Ethnicity: White
- Primary area of work: Facilities
- Staff group: Hotel, property and estates

Staff with missing data on basic pay, ethnicity or primary area of work were not included in the analyses, resulting in a total of 1,147,390 available records used (95.1%).

The Blinder-Oaxaca decomposition was performed as described and implemented by Jann (2008)<sup>16</sup> using Stata and Jann's 'oaxaca' implementation. The command 'oaxaca' first calculates the regression estimates for men and women and tells us how much of the pay differences are explained and unexplained. Moreover, it is possible to estimate the contribution of individual predictors or sets of predictors.

A twofold decomposition was computed using men's pay structure as the non-discriminatory benchmark and estimating women's mean pay if they had the same financial returns to their characteristics as men. In other words, it is assumed that similar characteristics should result in similar pay and that men's financial returns to these characteristics are non-discriminatory, whereas women are discriminated against.

The corresponding equations are as follows.

The linear regression models for men and women, respectively, can be expressed as:

$$\begin{aligned}\overline{\ln(\text{pay}_M)} &= \bar{X}_M \hat{\beta}_M + \varepsilon_M \\ \overline{\ln(\text{pay}_F)} &= \bar{X}_F \hat{\beta}_F + \varepsilon_F\end{aligned}$$

where  $\overline{\ln(\text{pay})}$  is the estimated mean log of pay,  $\bar{X}$  is the mean value for individual predictors (e.g. age or occupation),  $\hat{\beta}$  is the vector for coefficients (i.e. the estimated effect of individual predictors on pay), and  $\varepsilon$  is the random error term.

The gender pay gap, which is the difference in mean log pay for men and women, is equal to

$$\overline{\ln(\text{pay}_M)} - \overline{\ln(\text{pay}_F)} = \bar{X}_M \hat{\beta}_M - \bar{X}_F \hat{\beta}_F$$

The method then decomposes this difference into an explained and an unexplained component.

The corresponding equation is:

$$\underbrace{\overline{\ln(\text{pay}_M)} - \overline{\ln(\text{pay}_F)}}_{\text{Gender pay gap}} = \underbrace{(\bar{X}_M - \bar{X}_F) \hat{\beta}_M}_{\text{Explained component}} + \underbrace{\bar{X}_F (\hat{\beta}_M - \hat{\beta}_F)}_{\text{Unexplained component}}$$

where  $(\bar{X}_M - \bar{X}_F)$  is the part of the pay difference that is explained by group differences in the distribution of the predictors  $X$  (“explained component”) and  $(\hat{\beta}_M - \hat{\beta}_F)$  is the part of the gap due to differences in the coefficients  $\hat{\beta}$  (“unexplained component”). Thereby, men’s pay structure is used as the non-discriminatory benchmark, that is, male coefficient estimates  $(\hat{\beta}_M)$  are used as weights for the differences in the predictors  $X$  and the female distributions of the predictors  $(\bar{X}_F)$  are used as weights for the differences in the coefficients  $\beta$ .

#### Limitations

Because the decomposition is based on ordinary least squares regression, it estimates the pay gap based on mean pay for the average man and the average woman. Hence, it does not take into account that the extent of the gap, and the extent to which it can be explained may be different for different groups along the pay distribution. Those at the lower end of the pay distribution may have different characteristics than those at the top and may also face different barriers and challenges.



## Appendix 3. Ethnic categorisation as provided by NHS Digital

### 1 **White**

White British  
White Irish  
Any Other White Background

### 2 **Black/Black British**

African  
Caribbean  
Any Other Black Background

### 3 **Asian/Asian British**

Bangladeshi  
Indian  
Pakistani  
Any Other Asian Background

### 4 **Chinese**

### 5 **Mixed**

White & Asian  
White & Black African  
White & Black Caribbean  
Any Other Mixed Background

### 6 **Any Other Ethnic Group**

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