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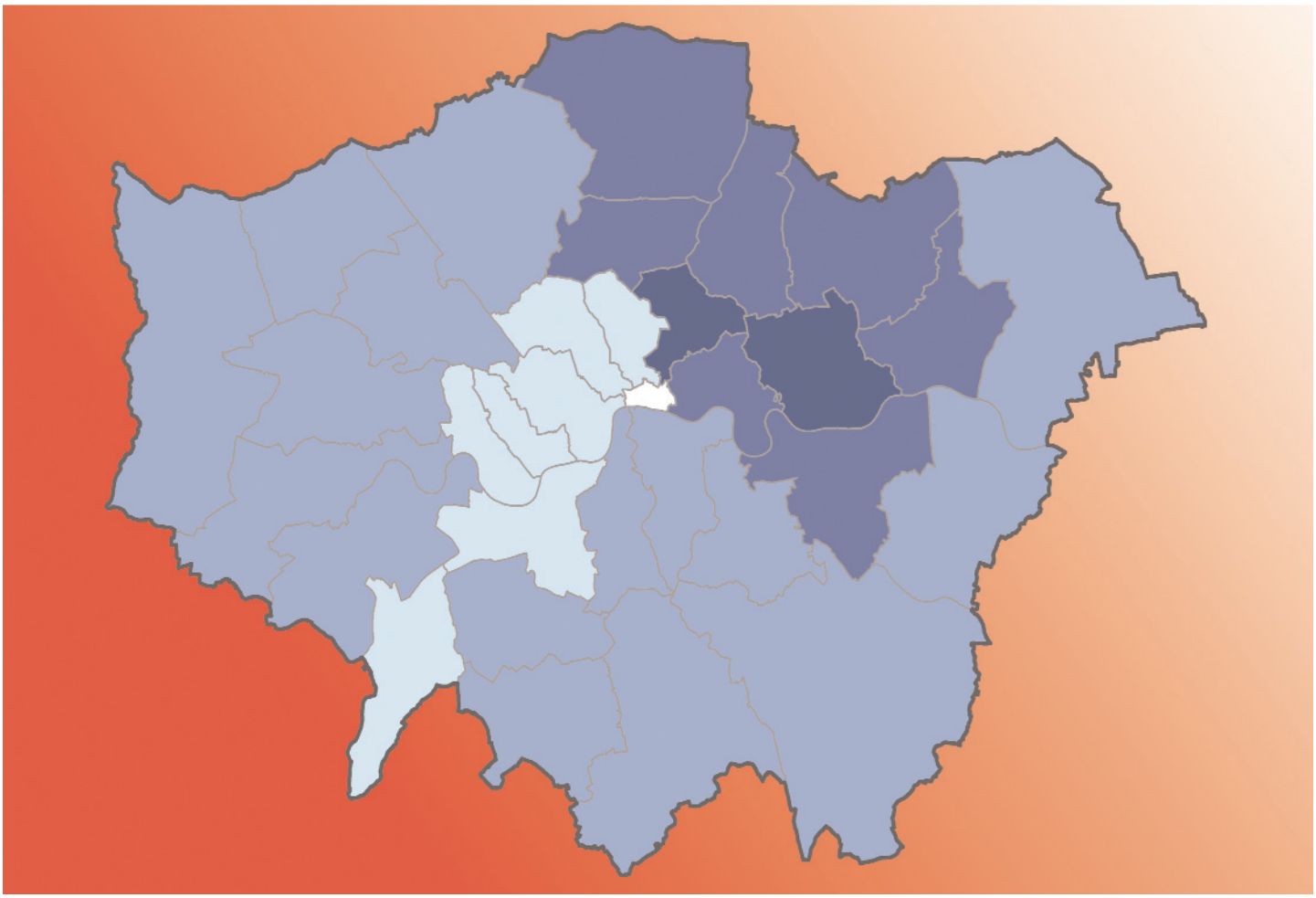
Borough Fertility Rates 2000-02



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Borough Fertility Rates 2000-02

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The data presented on the front cover of this *Briefing* are the 2000-02 Total Period Fertility Rates by borough. Please refer to Table 1 on page 5 for the full results.

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Introduction

As part of the production of the GLA population projections, DMAG regularly prepares smoothed fertility rates by single year of age of mother for each of the London boroughs, with equivalent statistics for borough groups and Greater London. The smoothed borough-level rates, based on the events of three years, give a better understanding of recent fertility and allow future birth rates, and so births, to be projected more accurately.

The smoothing process is carried out using a single-peak Hadwiger expression, which has four parameters that may be interpreted to represent:

- total period fertility rate,
- modal age of childbearing,
- mean age of childbearing and
- the variance of the distribution.

Although these rates are necessary to the projection model, they are also of interest because of the differences in fertility patterns between the boroughs that they help to display.

This *Briefing* presents the 2000-02 fertility rates, based on births for calendar years 2000 to 2002 and the equivalent ONS mid-year population estimates of females. These results update the last set of fertility rates produced using 1995 to 1997 data, and will be used in the GLA 2004 Round of projections.

The results presented here are:

- age-specific fertility rates (ASFR); ie births to mother's aged x per resident population of women aged x, where x ranges from age 15 to 49, and
- total period fertility rates (TPFR); ie the sum of all the ASFRs over the main 35-year fertile age range, giving the average number of children a women would expect to have in her lifetime if the annual rates of 2000-02 were to remain constant.

These data show some stark differences in fertility within London. Some reasons for these differences are presented. The charts clearly show that the single peak Hadwiger function has, since 1995-97, become less useful in describing the fertility of some parts of London and of some groups within the population.

Data Sources

The data used in the Hadwiger model are provided by the Office for National Statistics:

- Births by single years of age of mother, 15 to 49 years, for calendar years 2000 to 2002
- Population by single years of age of woman, 15 to 49 years, from the mid-2000 to mid-2002 population estimates.

Births to women aged below 15 are added to the number at age 15 and any births occurring at ages 50 and above are added to those for age 49. Up to 2001 ONS provided the data as a regular tabulation to order. Due to the introduction of disclosure

control procedures the data for 2002 were issued to the GLA under a special license, and even so any data cell that was less than 5 was suppressed and births at ages 45 and over were provided as a single statistic. This restriction mainly affected births at ages 15 and below. Missing cells were estimated using the average of 2000 and 2001, with the 45+ total being spread amongst single ages as were births in 2000 and 2001.

The mid-year estimates used were the revisions to the 2001 and 2002 estimates that were published together with the 2003 estimates in September 2004.

Both the births and the MYE populations were averaged over the three years to give the raw rate numerators and denominators.

Calculation Issues

Averaging three years worth of births data provides a larger sample and is more statistically reliable. Because, at borough level, numbers of births are relatively small it is possible, with the probability of infrequent random events, that the number of actual births in a single year to be very different to the numbers in adjacent years. Averaging helps to remove the effect of these statistical 'blips', particularly in the cases of the youngest and oldest mothers.

It is customary to take only one year of population data, the middle year of the three-year period. However, the recent changes to the levels of migration affecting London's population imply that the 2001 estimates may not be such a good representation of the average population at risk over the three years so an average of the three years estimates was considered to supply the most reliable set of denominators.

The manipulation of the raw data is basically very simple within each area:

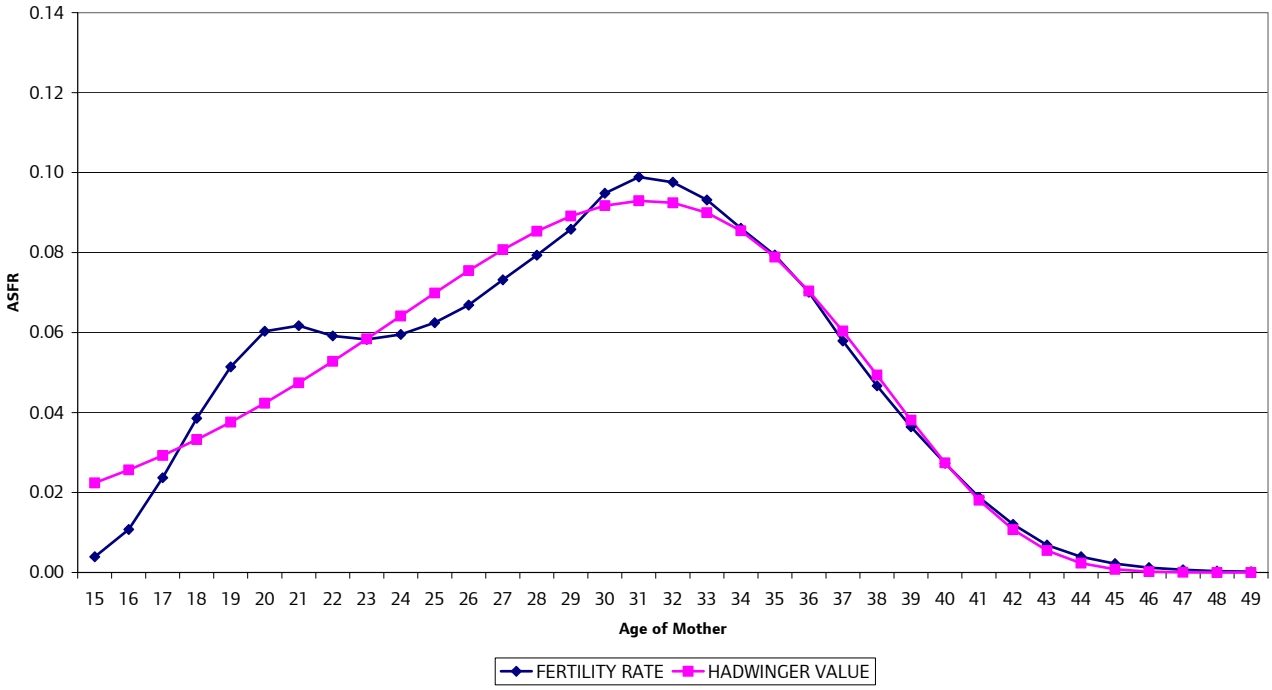
- The single year of age birth data are divided by the relevant female resident populations. This creates the raw age specific fertility rates
- The ASFRs are summed to form the total period fertility rates
- The median age of childbearing is calculated by finding by what age 50% of the TPFR has been achieved in the cumulative ASFRs
- The modal age of childbearing is established by inspection
- The variance is calculated

The only complication takes place within the smoothing program, which converts the 35 'raw' ASFRs for ages 15 to 49 into a smooth mathematical expression (the single-peak Hadwiger curve). The values of the parameters based on the raw data (TPFR, median, mode and variance) described above are fed into the smoothing programme as initial values. Note that the median is used as an initial value of the mean.

Results for London and the borough groups

As well as producing smoothed age-specific fertility rates; the Hadwiger output also includes the raw rates. The chart below shows the raw and smoothed rates for London. In many boroughs, the raw data shows a secondary peak, or 'shoulder', at younger ages than the principal peak age. This secondary peak is smoothed out by the single-peak Hadwiger expression. The existence of a secondary peak suggests that there are distinct populations of women with different childbearing characteristics living within the same area. As the majority of births in London are first births, it seems likely that there are separate groups of women, one with early first birth characteristics and another that defers the onset of childbearing.

Chart 1: Age-specific fertility rates, London, 2000-02



The early peak for London follows a rapid rise in rates to age 20, a peak at 21 and then virtually constant rates to age 26, after which the rates increase more gradually up to the second peak at around age 31. There is a rapid decline in rates from about age 34 to 44, with very low rates in the late 40s.

Charts 2 and 3 on the following page show the ASFRs for Inner London and Outer London. The secondary peak effect in the raw rates is more striking in Inner London. Outer London merely demonstrates a shoulder and therefore the smoothed rates are a better representation of the raw data.

Chart 2: Age-specific fertility rates, Inner London, 2000-02

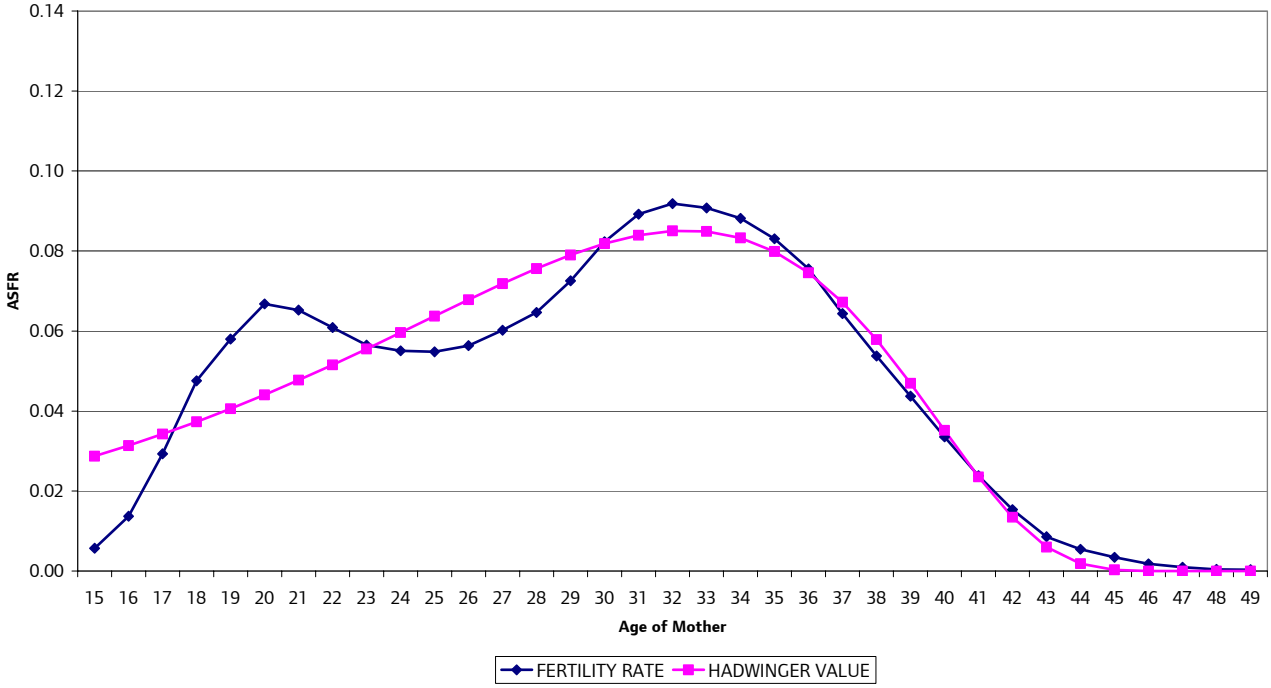
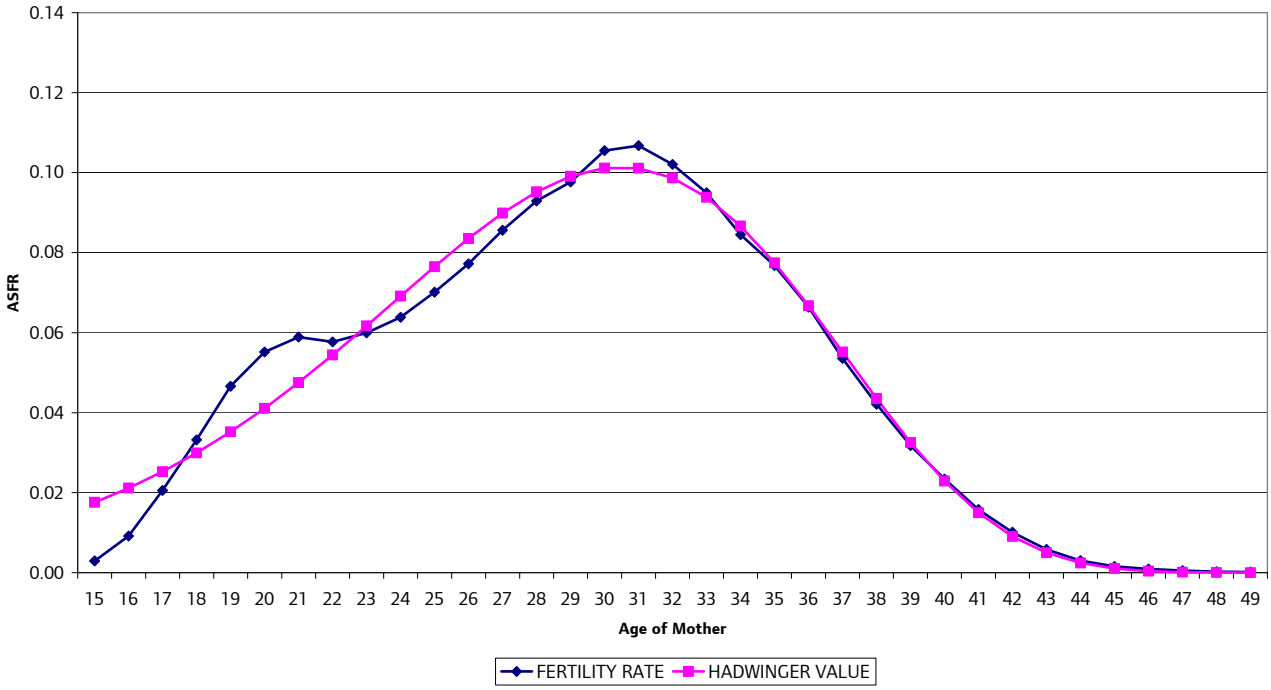


Chart 3: Age-specific fertility rates, Outer London, 2000-02



Inner London has a pronounced early peak, rates rising sharply to age 20 and then gradually dipping back down to a low at age 25. The main peak is at age 32 and after age 34 the rates gradually decline. For Outer London the early peak at age 21 is a lower and flatter peak than in Inner London. There are almost constant rates at ages 20 to 23, after which the rates gradually increase to the principal peak at age 31. Rates decline steadily after age 32.

Results for London Boroughs

There are even greater differences at a borough level. Table 1 below shows parameters output by the model – both the raw and the smooth. Charts 4 and 5 show the TPFRs and mean ages of childbearing by borough.

Table 1: Smoothed Parameters, 2000-02

	TPFR	Mode	Mean
Barking and Dagenham	1.88	25.86	**27.00**
Barnet	1.55	31.18	30.48
Bexley	1.72	29.30	28.34
Brent	1.69	30.40	29.12
Bromley	1.59	31.39	29.49
Camden	1.33	33.62	30.37
Croydon	1.71	29.35	28.37
Ealing	1.63	31.48	29.31
Enfield	1.77	29.76	28.85
Greenwich	1.78	29.17	28.31
Hackney	2.12	24.92	28.88
Hammersmith and Fulham	1.40	34.13	30.88
Haringey	1.77	31.95	29.07
Harrow	1.56	30.34	30.30
Havering	1.59	29.30	28.54
Hillingdon	1.67	29.60	28.59
Hounslow	1.71	29.77	28.65
Islington	1.40	33.13	29.61
Kensington and Chelsea	1.28	34.12	31.82
Kingston upon Thames	1.41	31.76	31.52
Lambeth	1.65	32.30	28.87
Lewisham	1.65	30.70	28.76
Merton	1.53	32.00	29.76
Newham	**2.30**	25.94	28.12
Redbridge	1.75	29.02	29.24
Richmond upon Thames	1.50	33.53	**32.12**
Southwark	1.69	31.64	29.07
Sutton	1.54	29.78	28.99
Tower Hamlets	1.88	24.19	28.55
Waltham Forest	1.85	29.11	28.40
Wandsworth	1.35	34.27	31.35
Westminster	**1.27**	33.45	30.72
Central boroughs	1.30	33.82	30.80
Rest of inner London	1.70	31.83	28.87
Inner London	1.61	32.42	29.16
Outer London	1.66	30.47	29.00
Greater London	1.63	31.22	29.07
Maximum	**2.30**	**34.27**	**32.12**
Minimum	**1.27**	**24.19**	**27.00**

Data for the City of London is included in the appropriate borough groups, however, the City has too small a population and too few births to provide statistically significant rates

Chart 4: Total Period Fertility Rates by borough, Smoothed, 2000-02

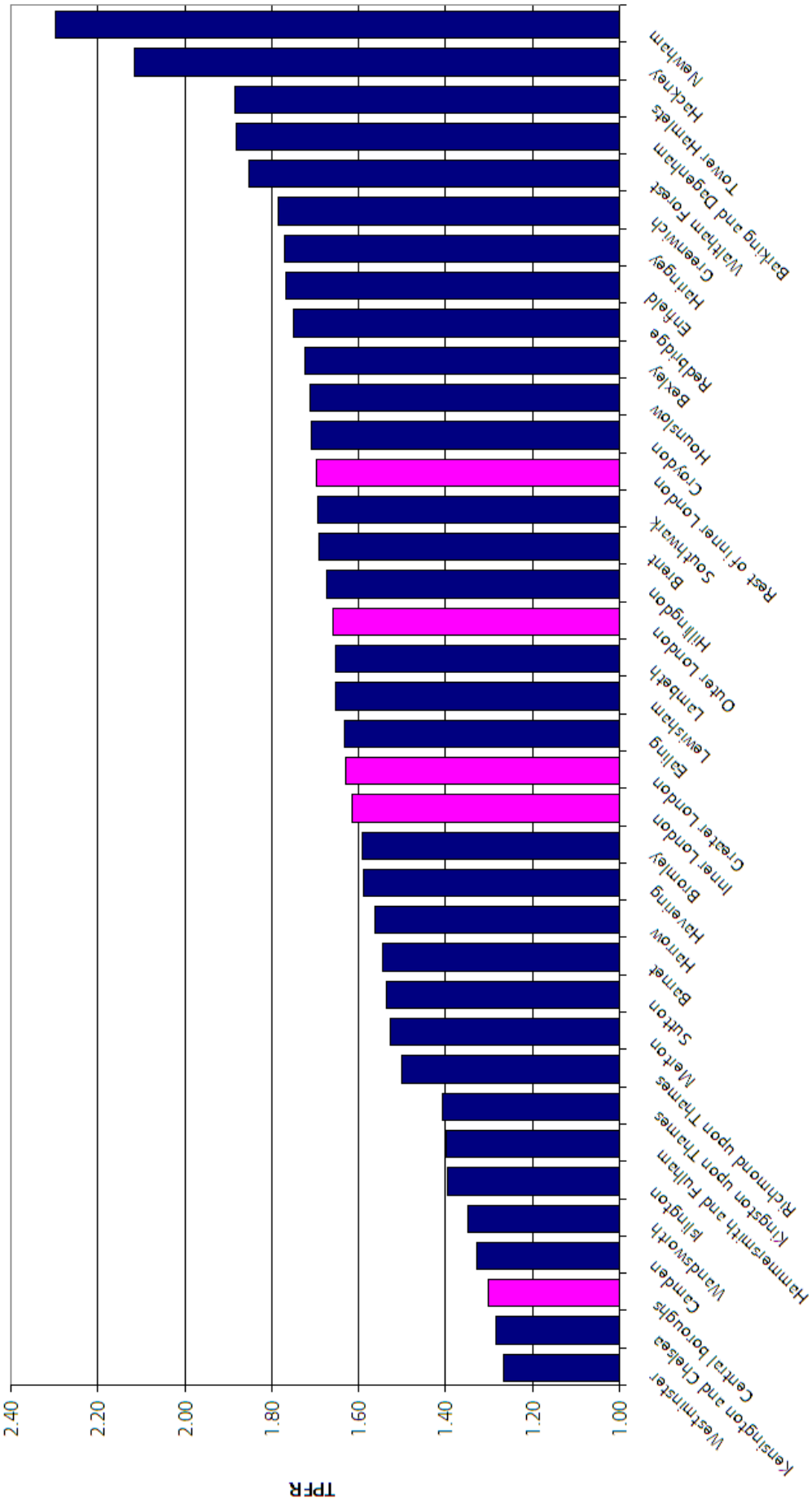
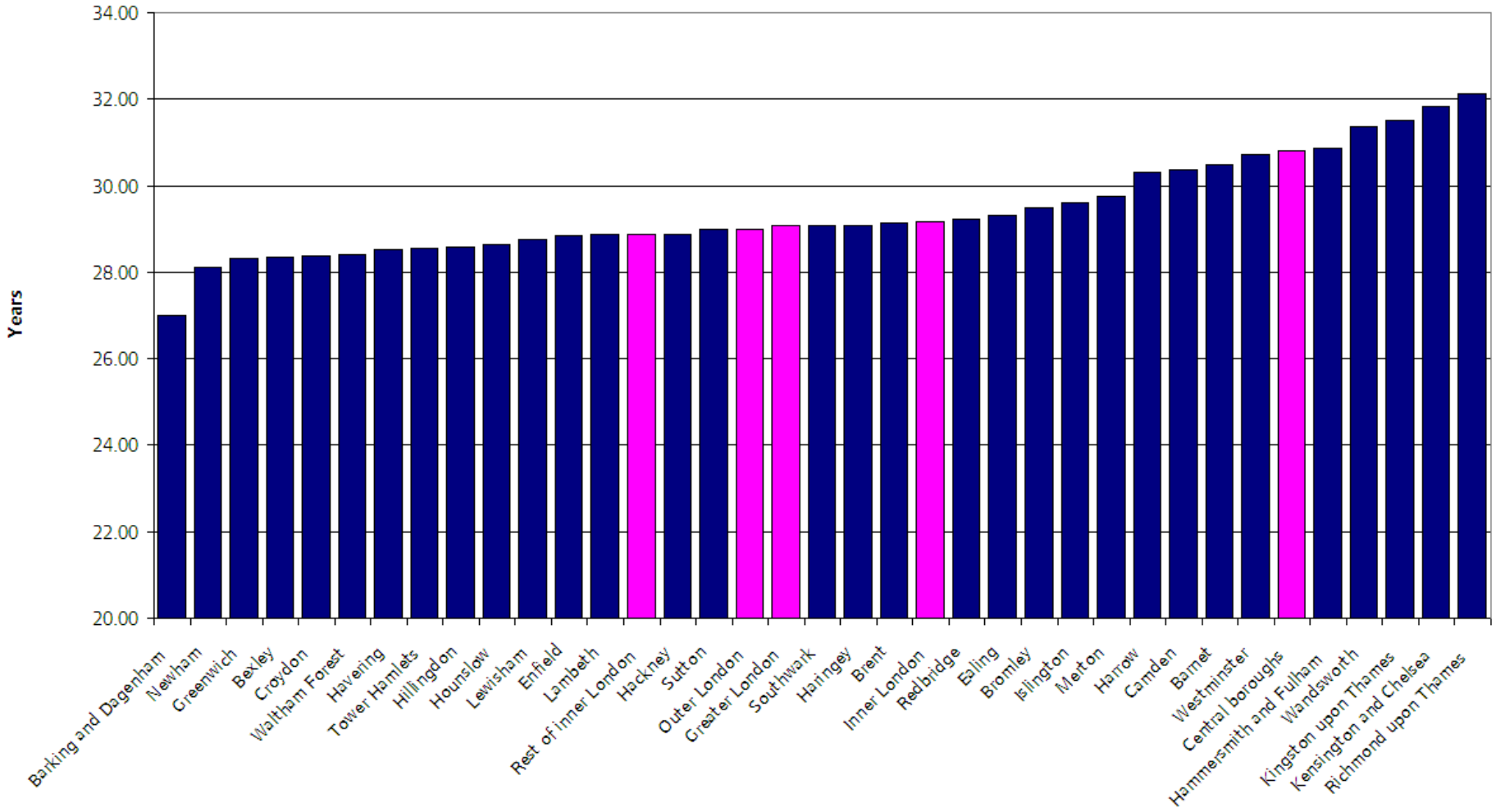


Chart 5: Mean age of mother, Smoothed, 2000-02



The main parameters resulting from fitting the smooth Hadwiger expression are different from the raw data parameters partly due to the smoothing process itself. As the TPFR is in fact a scale variable for the distribution the minor differences are not very relevant. The differences between the raw and smoothed modal and mean ages are reflecting the underlying differences in the representations of the curves and, in some areas, are pointing to the problems of using a single–peak expression to represent the much more complicated pattern of childbearing that has emerged in the last decade. Alternatives to the single-peak are discussed further on.

As Table 1 and the preceding charts show, there is a great deal of variation between the boroughs. The following comparisons look solely at the smoothed data.

Taking the TPFR, the lowest values are found in central/inner London boroughs: the lowest value is 1.27 for Westminster, with Kensington & Chelsea, Camden, Wandsworth, Hammersmith & Fulham and Islington all having values below 1.40. In outer London the only boroughs to match these levels are Kingston upon Thames (1.41) and Richmond upon Thames (1.50). All of these boroughs also have mean ages of childbearing significantly above the London average (29.1); the highest mean in this group being 32.1years for Richmond upon Thames.

The highest TPFR values occur in east London, with Newham at 2.30, followed by 2.12 in Hackney; these are the only boroughs with fertility above replacement level (about 2.06). The next highest fertility levels are found in Tower Hamlets and Barking & Dagenham (both at 1.88). The actual age patterns of fertility in these four boroughs are quite different, but all have below average mean ages of childbearing, as low as 27.0 years in the case of Barking & Dagenham.

The modal age of childbearing is about 2 years higher than the mean in London as a whole, but the four boroughs with the highest fertility rates, together with Redbridge, are the only ones to have the mean age higher than the modal age, by about 4 years in the cases of Hackney and Tower Hamlets. These boroughs are therefore showing patterns of extremely high fertility at younger ages.

There are four boroughs where the modal age is at least 3 years higher than the mean age, these are the low and delayed fertility boroughs of Camden, Hammersmith & Fulham and Islington together with Lambeth, which has an extreme pattern of fertility that will be discussed later.

Considering the raw data, the highest and lowest rates of fertility occur in different boroughs at different ages.

	Highest	**Lowest**
15-19	Haringey	Kingston
	Lambeth	Harrow
	Barking & Dagenham	Richmond
	Tower Hamlets	Westminster
20-29	Hackney	Kingston
	Newham	Kensington & Chelsea
		Wandsworth
		Hammersmith & Fulham
30-39	Bexley	Camden
	Barnet	Westminster
	Richmond	Barking & Dagenham
		Havering
40-44	Lambeth	Barking & Dagenham
	Hackney	Havering
		Bexley
		Sutton

Several boroughs appear in both the high and low lists at different ages: Barking & Dagenham having high teenage fertility but low fertility at ages over 30, Bexley has high fertility in the 30s and low in the 40s, Richmond has low fertility in the teenage years and high in the 30s. High fertility at ages below 30 is seen in inner boroughs together with Barking and Dagenham, whereas high late fertility (in the 30s) is seen in outer boroughs and in the 40s once again in inner London. Low fertility below age 30 is seen in high-status outer and central boroughs, but in the 30s and 40s, while still apparent in central London, it becomes a feature of lower status outer London boroughs.

ONS has recently published statistics (Conceptions: women aged under 18; 24 February 2005) indicating that 9-10% of girls aged 15-17 in Lambeth became pregnant in each of the years 2001 to 2003. This statistic is the highest for any LA in England & Wales and is based on about 400 conceptions a year – only about a quarter of which result in births.

Charts of fertility rates for selected boroughs are presented on the following pages; however, all charts and the Hadwiger output are available on request from DMAG, see later for details. These charts help to illustrate the different fertility patterns and variation across London, and also help to explain some of the more unusual results of the smoothing.

Chart 6: Age-specific fertility rates, Brent, 2000-02

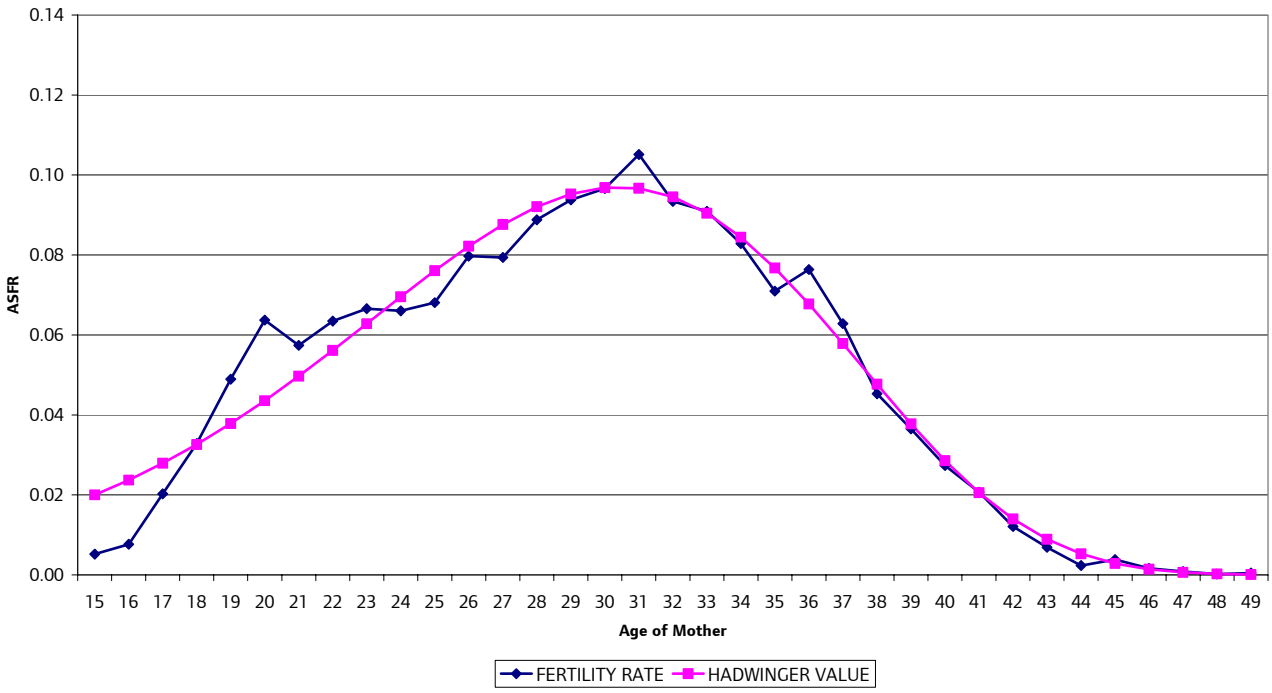


Chart 7: Age-specific fertility rates, Harrow, 2000-02

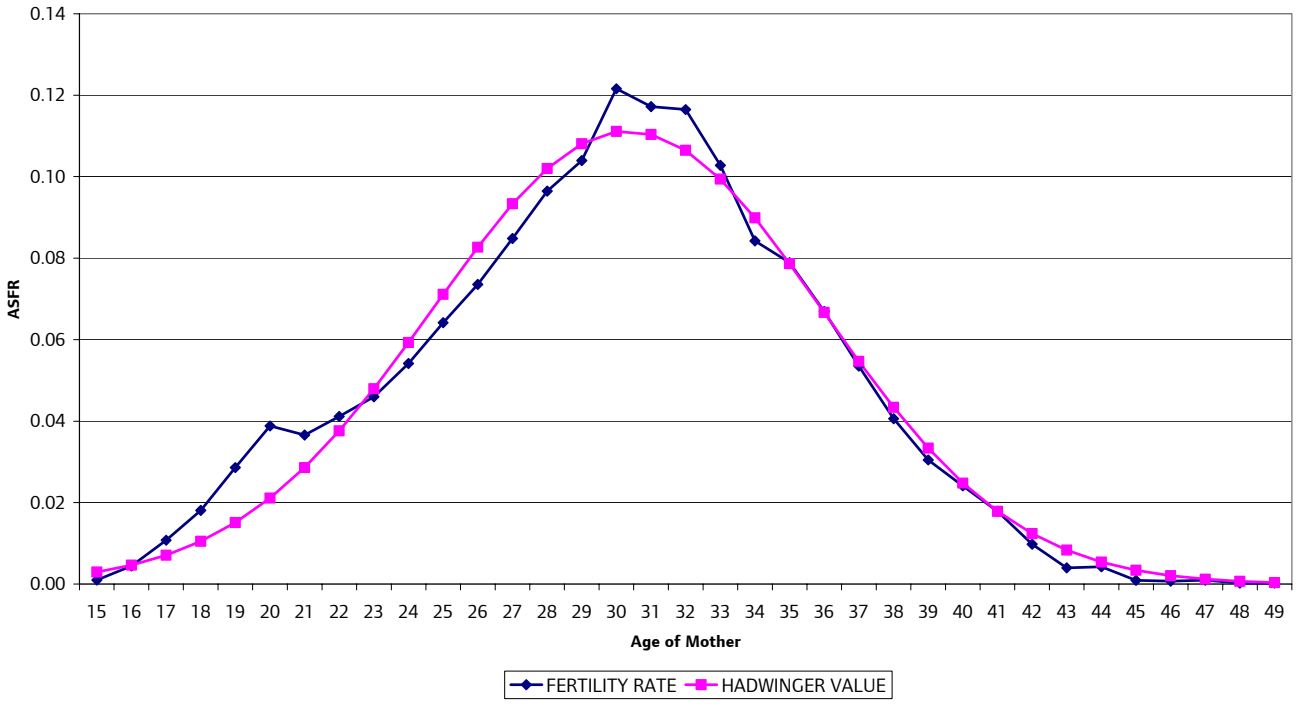


Chart 8: Age-specific fertility rates, Kingston upon Thames, 2000-02

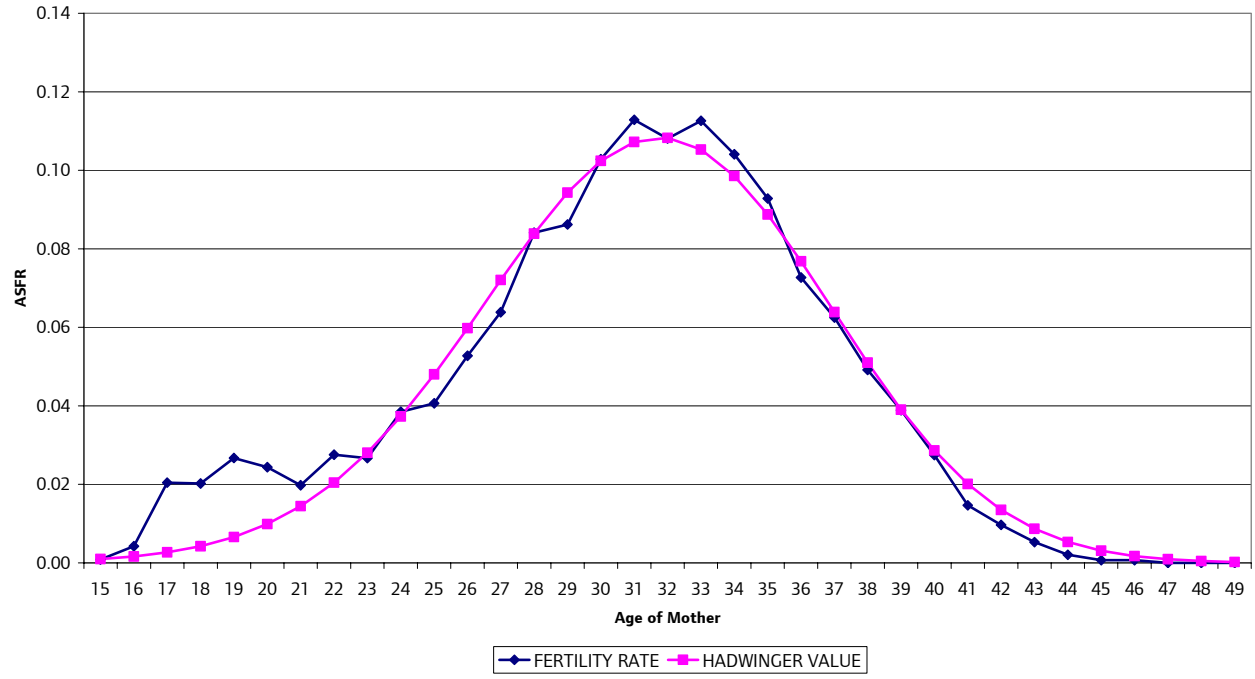


Chart 9: Age-specific fertility rates, Lambeth, 2000-02

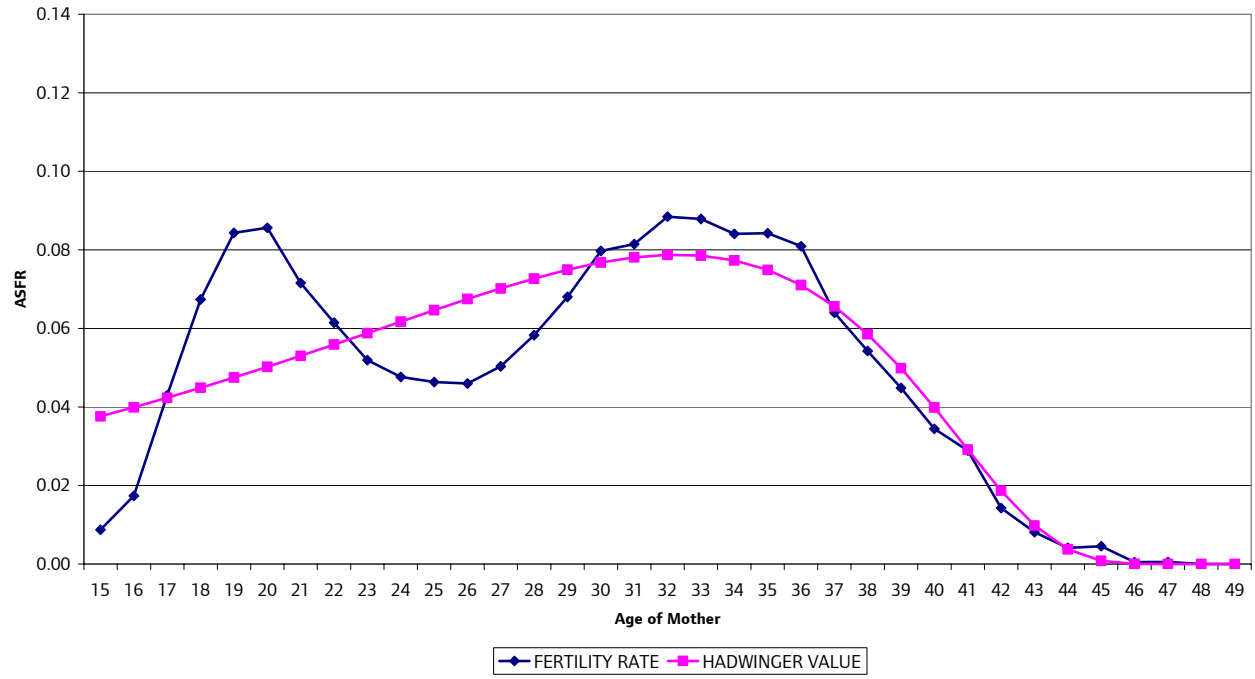


Chart 10: Age-specific fertility rates, Newham, 2000-02

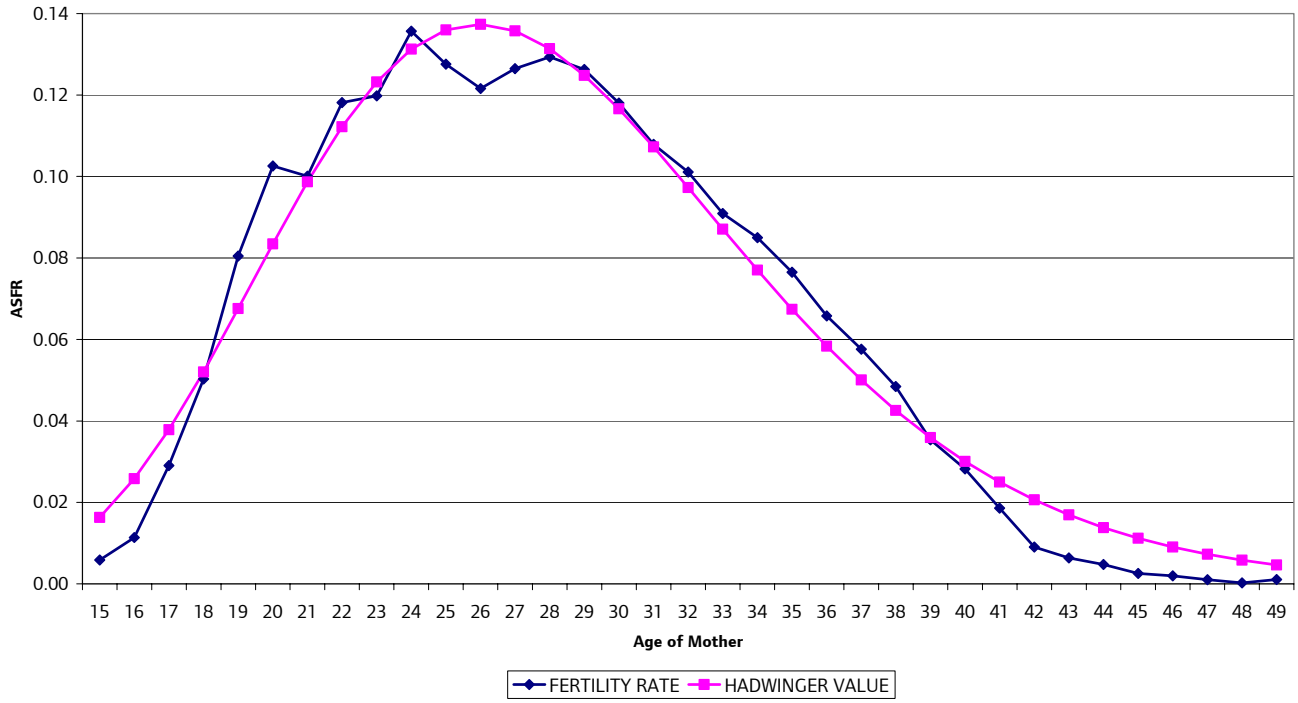


Chart 11: Age-specific fertility rates, Tower Hamlets, 2000-02

When dealing with areas such as boroughs, where small numbers of 'events' take place, care must be taken in placing too much significance on small differences in the raw fertility rates. The following commentary offers explanations for the different patterns, but these are by no means the only factors involved.

The raw data for Brent shows some evidence of an early peak, but the underlying fertility characteristics of Brent, one of the most ethnically diverse boroughs - with the White women making up only 43% of the female population aged 15-49, compared with 29% for the Asian and 23% for the Black populations - is quite similar to that of Greater London, but with a slightly younger modal age.

Harrow and Kingston upon Thames both show typical fertility patterns to that of Outer London, with the lower early peak followed by a second peak in the late twenties and early thirties. For Harrow the early peak is at quite a low level and is not apparent after age 21. Although Harrow's TPFR is below the London average its modal and mean ages are very close (both 30.3 years) producing a more peaked graph. In Kingston, although the general pattern is the same, the early peak is at a very low level and is only apparent at ages 17 to 20. The TPFR is low and the mean age of childbearing is about 2.5 years above the London average.

Lambeth has one of the most extreme fertility patterns, with two clear peaks and, what seems to be, two totally distinct populations. There is a sharp increase in fertility rates to an early peak at ages 19 and 20. The rates dip down again and then start rising at age 26 to a second peak in the early thirties. The later peak is only slightly higher than the early peak. This example clearly demonstrates the shortcomings of using the Hadwiger smoothing method. The variance of the distribution – some measure of goodness of fit to the raw data - is more than twice the value of any other borough. Lambeth's female population shows a bi-polar approach to childbearing with one group exhibiting high teenage and early twenties fertility and a second group that delays until their thirties. Lambeth has a high mixture of deprived inner city areas in the north and central parts of the borough coupled with affluent areas to the south. Lambeth has a large white majority (62% of women of childbearing ages) but only 40% of the 15-19 year old women are white. There is a large Black population (29% of the women aged 15-49) including 46% of those aged 15-19. When the ethnic distribution of Lambeth's female population is considered together with the fertility rates of London's main ethnic groups (see, *DMAG Briefing 2004/24 Fertility of Ethnic Groups in London, 2002-03*) a composite fertility picture of the borough emerges which, when viewed in five-year age bands, is similar to the age-specific rates shown here, though not quite so extreme at ages 15-24. Therefore part of the shape of Lambeth's fertility curve is due to the ethnic mix of the borough's female population.

The highest fertility rates are found in Newham. The pattern here is not similar to the London 'shoulder' pattern, and instead there is a single very high peak with young modal and mean ages. In Newham fertility is high right through from the late teens to the late thirties. This is likely to be related to Newham's extremely ethnically diverse population, with only 36% of women aged 15-49 being from the White group, together with 33% from the Asian group (large numbers of residents being Indian, Pakistani and Bangladeshi) and 26% from the Black group, mainly Black African. Using, again, the different fertility rates of London's main ethnic groups from *DMAG Briefing 2004/24* to create composite rates for Newham produces a fertility curve very similar to that presented here, but with slightly lower rates at the younger ages.

Tower Hamlets exhibits a pattern of very early childbearing and it has the youngest modal age of all boroughs – 24.2 years even with the smoothed data. The raw rates are higher than the smoothed rates at around ages 19-21 and through much of the thirties. The pattern suggests that there is such a high early peak that it swamps a lower later

peak. This again suggests some bi-polarity within the resident population. This is almost certainly associated with Tower Hamlet's large, young Bangladeshi population. *DMAG Briefing 2004/24* shows that the Bangladeshi group have the highest fertility rates of any major London ethnic population. Tower Hamlets' female population aged 15-49 is 52% white and 35% Asian – mainly Bangladeshi. At ages 15-19 the split is 27% white and 56% Bangladeshi. The female Bangladeshi population has nearly equal numbers (3700-3900) in the age groups 15-19, 20-24 and 25-29, while the White population has 2300 aged 15-19, 6000 aged 20-24 and 8300 aged 25-29. When the London ethnic fertility rates are applied to the Tower Hamlets population the resulting rates show a similar pattern to that presented here, with very high rates at ages 20-24. Once again this shows that the ethnic make-up of the borough explains much of the overall borough fertility pattern.

Projecting Borough Fertility Rates

The GLA projection model has throughout the last decade used fertility rates calculated as described in this *Briefing* except for the periods 1990-92 and 1995-97. In both those periods the smoothed rates appeared to be good representations of the raw data, although in a number of boroughs in 1995-97 there was evidence of a 'shoulder' in the raw data. As the denominator population used for the 1995-97 rates was the ONS mid-1996 estimate, which was based on the 1991 Census, it was considered that the 'shoulder' might have been a result of the underestimation of young women in some boroughs. The evidence of 2000-02 is convincing that there is genuine bi-polarity in fertility behaviour.

The GLA model uses the four Hadwiger parameters and the Hadwiger expression to generate the individual age-specific rates in all projection years given an underlying national change in the total period fertility rate. The resulting rates used in the projections are, therefore, all smoothed. The emergence of two-peak fertility distributions means that an alternative method of projecting fertility must be employed.

While multi-peak versions of the Hadwiger expression can be used to create smooth representations of these more complicated fertility patterns, the expression does not lend itself to use in projections, particularly as its parameterisation does not include the total period fertility rate.

Pending further investigations, it has been decided that in order to maintain a transparent method of projecting fertility rates, GLA will use in the 2004 Round projections the raw 2000-02 borough rates and project them by scaling using the national TPFR trend as used in the most recent Government Actuary's projection for England and Wales.

Research will seek alternative ways of smoothing the raw data and whether national projected trends in single year or age-group fertility rates can be used without loss of the basic local patterns described here.

Availability of Fertility Rates

All of the raw and smoothed borough, borough group and London fertility rates discussed in this *Briefing* will be available on the GLA Demography Extranet or on application to Georgia.Hay@london.gov.uk. Confidentiality agreements with ONS mean that the actual numbers of births by age of mother for 2002 may not be passed on by the GLA.

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