

# A review of pacemaker and ICD implantation practice in 2004 and 2005



## North West London CHD Network



commissioned by the Department of Health and  
prepared by the Cardiac Networks Device Survey Group



# Coronary Heart Disease

National  
Service  
Framework

## Chapter Eight

### Arrhythmias and Sudden Cardiac Death

8

**This report was generated by the Cardiac Networks Survey Group and includes contributions from Dr Richard Charles, Dr David Cunningham, Dr Janet McComb, Dr Chris Plummer and Mrs Morag Cunningham. The work of creating the reports was supported by grants from the Department of Health Heart Team and from the British Cardiac Society.**

**If you wish further information please contact the Heart Team at:**

**403 Wellington House  
133-155 Waterloo Road  
London  
SE1 8UG  
England  
Phone: 0207 972 2000**

**[www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/CoronaryHeartDisease](http://www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/CoronaryHeartDisease)**

**or the National Pacemaker and ICD Database at:**

**PO Box 9205  
Bridge of Weir  
Renfrewshire PA11 3DZ**

**Tel: 01505 612829  
[david.cunningham@ccad.org.uk](mailto:david.cunningham@ccad.org.uk)  
[www.ccad.org.uk](http://www.ccad.org.uk)**

# Contents

## Analysis of Regional Provision of Pacemakers and ICDs for North West London CHD Network

1	Contents and Data Quality Statement
2	Map of the Network
3	PCTs in the Network
4	Age and sex profile of Network and PCTs
5	Deprivation profile of Network
6	National need for pacemakers and ICDs
7	Local need for pacemakers and ICDs
8	Implants in this network
9	Which Hospitals serve which PCTs?
10	Pacing mode of new implants: how does it compare?
11	Pacing mode by hospital
12	Pacing indications
13	Expected and actual pacing implant rates
14	Comparison of pacing rates with Western European average
15	Expected and actual ICD implant rates
16	Comparison of ICD rates with Western European average
17	Maps of pacing and ICD rates by PCT
18	PCTs: average deficit or excess in pacing implant rate
19	PCTs: average deficit or excess in ICD implant rate
20	Shortfall in pacemaker implants by PCT
21	Pacemaker implant rate and Deprivation
22	Ageism in Pacemaker Prescription
23	Conclusions

## Data Quality Statement

The quality of the analyses in this report is only as good as the quality of the data that supports it. That data is submitted by hospitals to the National Pacemaker Database. If there is a deficit in registration, or if registrations do not contain a valid postcode, then analysis errors are inevitable.

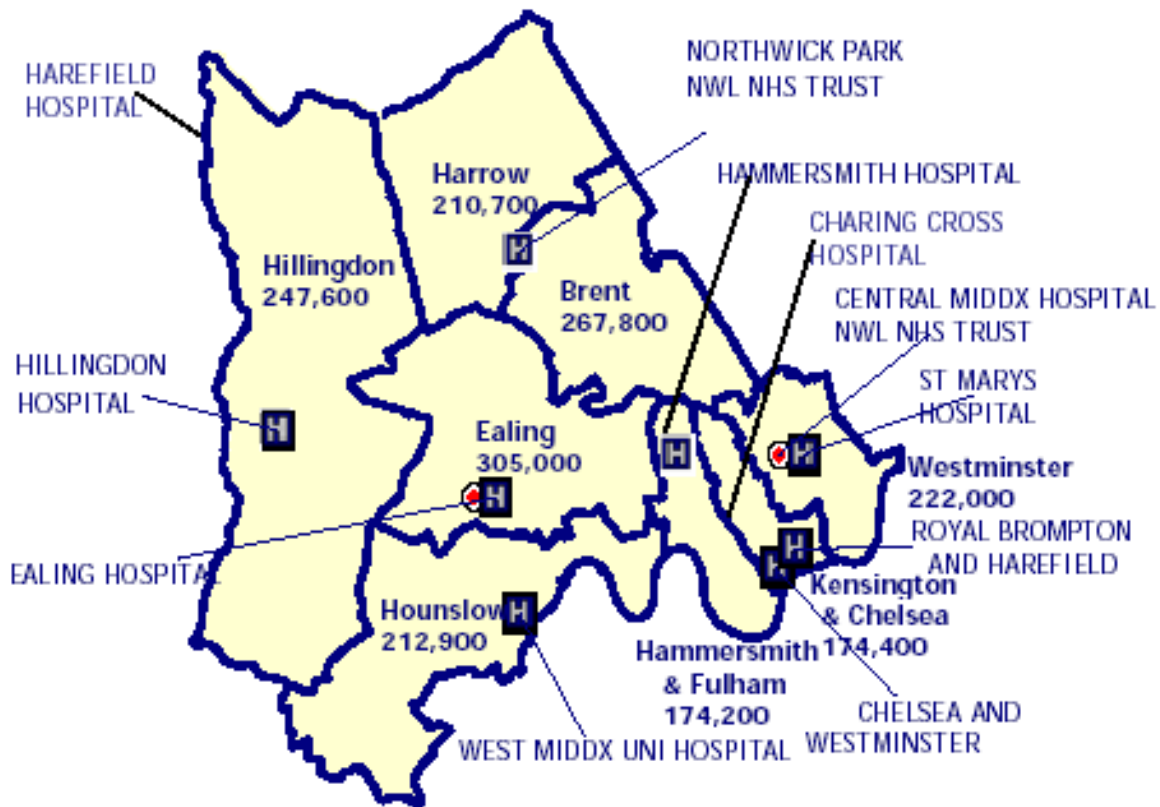
To minimise the risk of these errors, a threshold of 98% for registration and postcode completeness is sought for each hospital. Overall network completeness MUST reach 98% or a report will not be issued.

The Network Device Survey Group make every effort to ensure this report is as accurate as possible - however please contact us if you identify any residual problem and we will try to correct the error promptly. Below is a list of important hospitals for this network and their completeness of VALID postcodes during the study period.

	Valid postcodes
Network average	99.19%
CMH. Central Middlesex Hospital	98.40%
HAM. Hammersmith Hospital	97.24%
HH. Harefield Hospital	99.93%
HHW. Wellington Hospital North	99.24%
HSC. Harley Street Clinic	98.96%
NHB. Royal Brompton Hospital	99.72%
NPH. Northwick Park Hospital	98.66%
STM. St Marys Hospital Paddington	98.13%

# Map of the Network

## North West London CHD Network



# PCTs in the Network

*Population data from ONS, based on mid 2004 projections.*

## North West London CHD Network

*Total population 1.81 million.*

*Note: a PCT may be in a different Strategic Health Authority from the other PCTs in the Cardiac Network.*

<b>Code</b>	<b>PCT</b>	<b>Population</b>	<b>SHA</b>
5AT	Hillingdon	247,600	North West London
5H1	Hammersmith and Fulham	174,200	North West London
5HX	Ealing	305,000	North West London
5HY	Hounslow	212,900	North West London
5K5	Brent	267,800	North West London
5K6	Harrow	210,700	North West London
5LA	Kensington and Chelsea	174,400	North West London
5LC	Westminster	222,000	North West London

# Age and Sex Distribution

Population data from ONS, based on mid-2004 population estimates

Data for England (for comparison):	Average age	<b>39.50</b>
	% aged 65+	<b>16.0%</b>
	% aged 75+	<b>7.6%</b>

## North West London CHD Network

PCT	Population					
	Age	Male	Female	Age	Male	Female
<b>5AT Hillingdon</b>						
Population: 247,600	0-5:	8,100	7,500	46-50:	8,000	7,800
Average age: 37.9	6-10:	8,400	7,700	51-55:	7,000	7,100
% aged 65+ 10.4%	11-15:	8,200	7,900	56-60:	6,600	7,000
% aged 75+ 5.3%	16-20:	8,200	8,000	61-65:	4,800	5,200
	21-25:	9,100	9,000	66-70:	4,500	5,000
	26-30:	8,400	8,900	71-75:	3,800	4,600
	31-35:	10,000	10,400	76-80:	2,800	3,900
	36-40:	10,700	10,900	81-85:	2,000	3,300
	41-45:	9,400	9,300	85+:	1,200	2,900
<b>5H1 Hammersmith and Fulham</b>						
Population: 174,200	0-5:	5,400	5,100	46-50:	4,500	4,800
Average age: 36.1	6-10:	4,300	4,300	51-55:	3,900	4,000
% aged 65+ 7.7%	11-15:	3,600	3,900	56-60:	3,500	3,700
% aged 75+ 4.0%	16-20:	4,200	4,100	61-65:	2,600	3,100
	21-25:	6,500	7,700	66-70:	2,400	2,600
	26-30:	12,800	12,500	71-75:	2,000	2,200
	31-35:	12,500	10,600	76-80:	1,500	2,000
	36-40:	9,000	8,000	81-85:	1,100	1,700
	41-45:	6,100	6,100	85+:	600	1,500
<b>5HX Ealing</b>						
Population: 305,000	0-5:	9,700	9,300	46-50:	9,300	9,900
Average age: 36.7	6-10:	9,000	8,900	51-55:	8,200	8,500
% aged 65+ 8.6%	11-15:	9,000	8,500	56-60:	6,900	7,400
% aged 75+ 4.4%	16-20:	10,200	8,800	61-65:	5,600	5,800
	21-25:	11,000	10,600	66-70:	5,000	5,200
	26-30:	16,400	14,800	71-75:	3,800	4,400
	31-35:	16,900	14,400	76-80:	2,900	4,100
	36-40:	14,900	13,400	81-85:	2,100	3,200
	41-45:	11,500	11,600	85+:	1,300	2,600

## North West London CHD Network

PCT	Population					
	Age	Male	Female	Age	Male	Female
<b>5HY Hounslow</b>						
Population: 212,900	0-5:	7,100	6,800	46-50:	6,500	6,900
Average age: 36.6	6-10:	6,600	6,300	51-55:	6,000	6,000
% aged 65+ 8.6%	11-15:	6,600	6,300	56-60:	5,100	5,500
% aged 75+ 4.2%	16-20:	7,400	6,600	61-65:	3,900	4,000
	21-25:	8,000	7,500	66-70:	3,500	3,600
	26-30:	10,100	9,400	71-75:	2,800	3,200
	31-35:	11,100	9,900	76-80:	1,900	2,700
	36-40:	10,400	9,200	81-85:	1,400	2,300
	41-45:	7,800	7,800	85+:	900	1,800
<b>5K5 Brent</b>						
Population: 267,800	0-5:	8,600	8,300	46-50:	7,900	8,500
Average age: 36.5	6-10:	7,800	7,600	51-55:	6,600	7,100
% aged 65+ 8.6%	11-15:	7,900	7,800	56-60:	5,700	6,200
% aged 75+ 3.9%	16-20:	9,100	8,400	61-65:	5,200	5,500
	21-25:	10,600	10,100	66-70:	5,000	5,000
	26-30:	14,500	12,600	71-75:	3,900	4,100
	31-35:	13,900	12,500	76-80:	2,400	3,200
	36-40:	12,600	11,700	81-85:	1,600	2,300
	41-45:	9,900	10,400	85+:	1,000	2,300
<b>5K6 Harrow</b>						
Population: 210,700	0-5:	6,300	5,900	46-50:	7,000	7,100
Average age: 38.7	6-10:	6,500	6,100	51-55:	6,200	6,600
% aged 65+ 10.9%	11-15:	7,200	6,500	56-60:	5,700	6,300
% aged 75+ 5.7%	16-20:	7,800	6,600	61-65:	4,300	4,800
	21-25:	6,500	6,300	66-70:	4,000	4,500
	26-30:	8,500	7,700	71-75:	3,300	3,900
	31-35:	8,600	8,400	76-80:	2,400	3,400
	36-40:	8,700	8,800	81-85:	1,700	2,800
	41-45:	7,800	8,200	85+:	1,300	2,900
<b>5LA Kensington and Chelsea</b>						
Population: 174,400	0-5:	5,200	4,900	46-50:	4,900	5,100
Average age: 38.1	6-10:	4,500	4,100	51-55:	4,800	5,100
% aged 65+ 8.9%	11-15:	3,400	3,100	56-60:	4,400	5,200
% aged 75+ 4.6%	16-20:	3,900	3,900	61-65:	3,400	4,100
	21-25:	6,300	7,900	66-70:	2,700	3,000
	26-30:	9,400	10,000	71-75:	2,200	2,600
	31-35:	10,200	10,000	76-80:	1,700	2,200
	36-40:	9,000	8,200	81-85:	1,300	1,900
	41-45:	6,800	6,300	85+:	1,000	1,700

## North West London CHD Network

PCT	Population					
	Age	Male	Female	Age	Male	Female
5LC	<b>Westminster</b>					
Population: 222,000	0-5:	5,800	5,400	46-50:	5,600	5,800
Average age: 37.4	6-10:	4,500	4,400	51-55:	5,300	5,700
% aged 65+ 8.5%	11-15:	3,900	3,600	56-60:	5,500	5,700
% aged 75+ 4.3%	16-20:	5,900	5,600	61-65:	3,900	4,100
	21-25:	10,600	12,700	66-70:	3,400	3,700
	26-30:	15,300	14,500	71-75:	2,900	3,300
	31-35:	14,800	12,700	76-80:	2,200	2,800
	36-40:	11,000	9,600	81-85:	1,500	2,200
	41-45:	7,900	7,200	85+:	1,000	2,000

# Deprivation Status

**Population data from ONS. Deprivation data from the Office of the Deputy Prime Minister.**

There are 304 PCTs in England. Each contains on average 100 Super Output Areas (SOAs), the basic census building block for Deprivation Status assessment. The deprivation status by PCT below is averaged across all SOAs in a PCT. The national average for the Index of Multiple Deprivation (IMD) is 21.9 (max. 86.4 = most deprived, min. 0.6 = least deprived). The Index of Health Deprivation national average is -0.027 (max. 3.87= most unhealthy, min. -3.26 = least unhealthy).

The PCT Ranking is from 1 (most deprived/unhealthy) to 304 (least deprived/unhealthy) - the median value is 153. Any ranking number lower than 153 suggests deprivation or lack of health.

## North West London CHD Network

Average IMD for Network: **24.45** Rank (out of 31) **14** (*1 = most deprived*)  
 Average Health score for network **-0.28** Rank (out of 31) **20** (*1 = most unhealthy*)

	IMD	IMD Rank	IMD Summary	Health Index	Health Rank	Health Summary
5AT. Hillingdon	18.49	170	<i>average</i>	-0.26	192	<i>slightly healthier than average</i>
5H1. Hammersmith and Fulham	29.35	79	<i>moderately deprived</i>	0.06	152	<i>average</i>
5HX. Ealing	23.99	114	<i>slightly deprived</i>	-0.02	157	<i>average</i>
5HY. Hounslow	24.45	112	<i>slightly deprived</i>	0.06	151	<i>average</i>
5K5. Brent	28.54	87	<i>moderately deprived</i>	0.01	153	<i>average</i>
5K6. Harrow	14.20	218	<i>slightly affluent</i>	-0.59	230	<i>moderately healthy</i>
5LA. Kensington and Chelsea	18.33	173	<i>average</i>	-1.43	300	<i>very healthy</i>
5LC. Westminster	28.08	89	<i>slightly deprived</i>	-0.24	185	<i>slightly healthier than average</i>



# The Need for Pacemakers and ICDs

## *Relationship to Age and Sex of the Population*

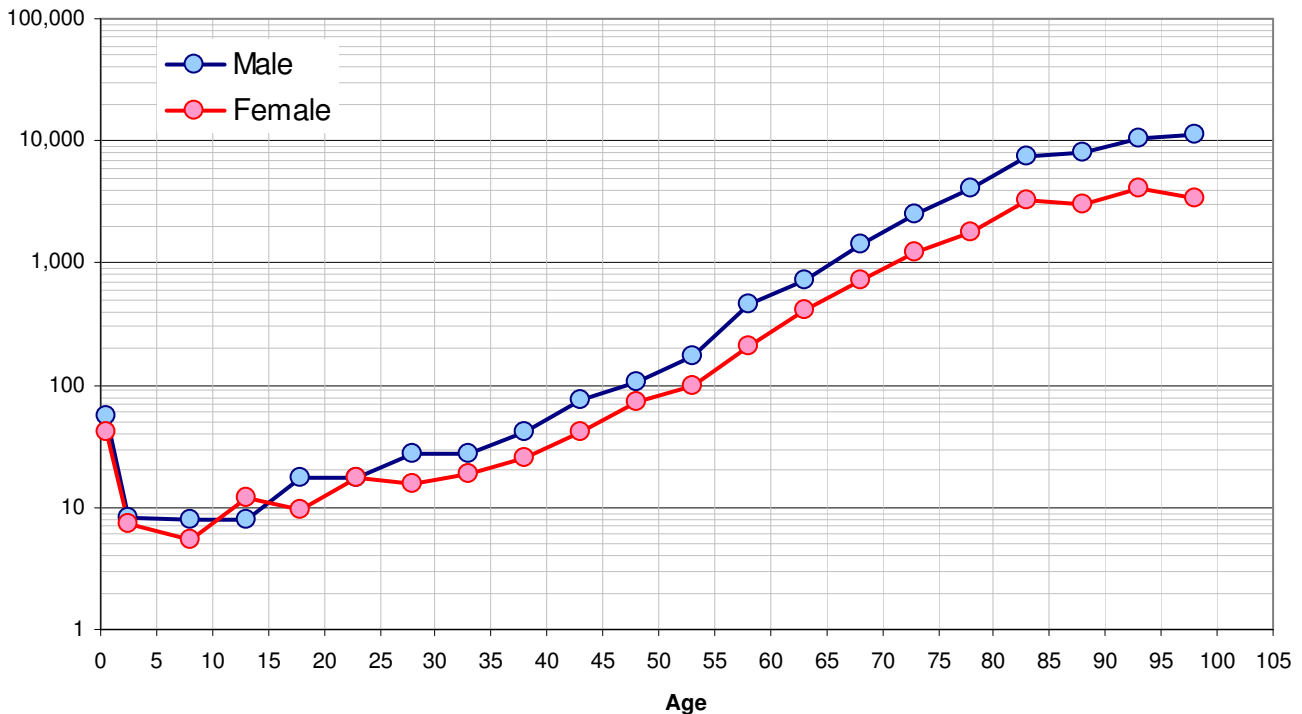
Older people are more likely to need a pacemaker. The diseases which often lead to pacemaker implant (myocardial infarction, cardiomyopathy and particularly conduction tissue fibrosis [as part of the aging process]) naturally are more prevalent in the old. It is therefore necessary to examine the national implant rate as a function of age and sex, and then we can relate the local need for pacemakers or ICDs to the local population age and sex profile.

The graphs below show the annualised pacemaker and ICD implant rates as a function of age and sex for all of England for 2005. Note for pacemakers the y-axis is on a logarithmic scale. It is quite clear there is a very strong relationship between pacemaker implant rate and age. The relationship is also there for ICDs although less apparent. Clearly correction for these factors must be made before we can assess whether local implant rates are adequate.

## Pacemakers

There were 42,468 new pacemaker implants in England in 2004 and 2005, an annual new implant rate of 437 per million population. The profile below shows new implant rate (log scale) against age for males and females. The rate is strongly dependent on age, doubling for every decade above 25 years of age. Although the average rate for all ages is 437/million, in 90 year old men the rate is over 10,000.

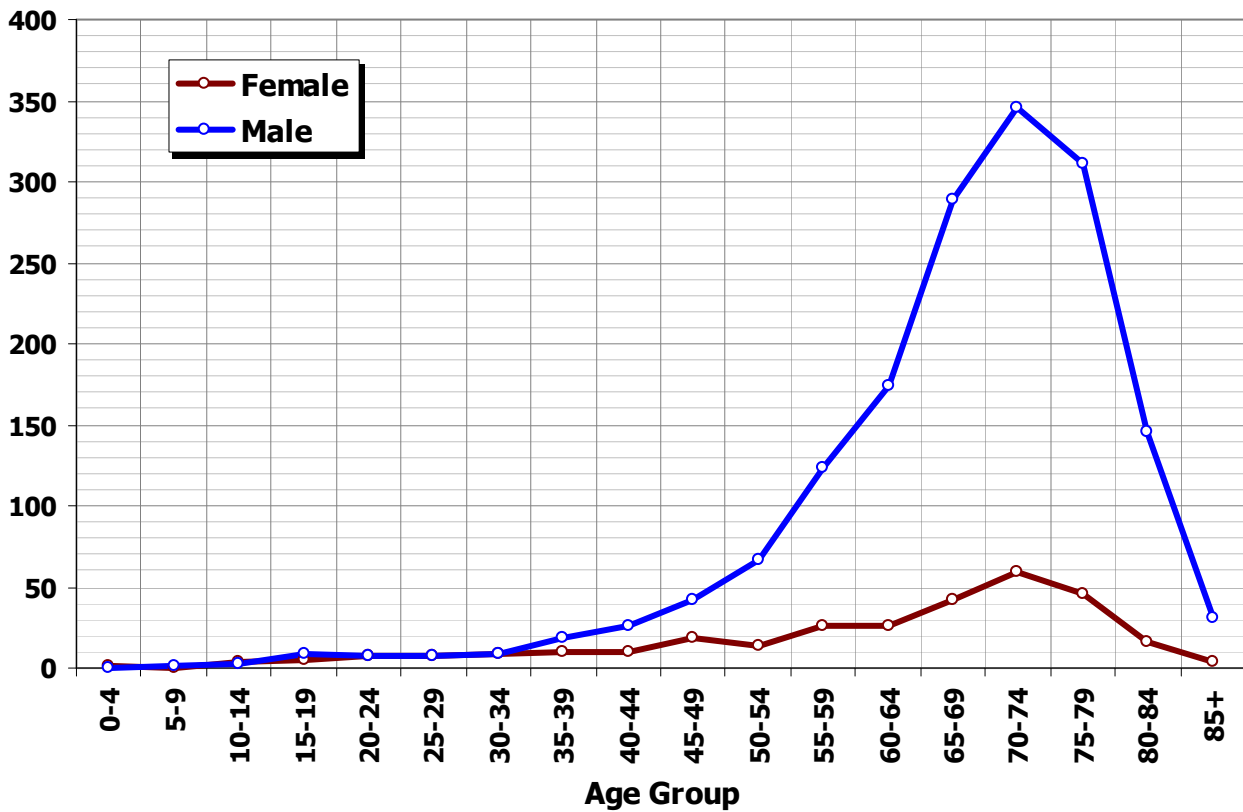
**New Implant Rate 2005 (England)**



# ICDs

The need for ICD implantation increases less with age, and begins to decrease after the age of 70. This is unlikely to be due to ageism, because the pattern is exactly the same in a number of other European countries. It is likely that the observed relationship reflects the different clinical aetiology of ICD patients.

There were 4,669 new ICD implants in 2004 and 2005, a mean annual new implant rate of 48.1 per million population. The implant rate, on the Y axis, is NOT logarithmic. Implant rates in men are generally at least 5 times higher than in similarly aged women.



# Relative need for Pacemakers and ICDs

## North West London CHD Network

### National new implant rate

average for England  
2004 and 2005

Pacemakers: **437.1**

ICD: **48.1**

Average age: **39.44**

A PCT with a relatively OLD population will need relatively MORE pacemaker and ICD implants compared to a PCT with a young population, because the incidence of indications for pacing and ICD is higher in older people.

		Average age	Expected pacing new implant rate	Compared to national average	Expected ICD new implant rate	Compared to national average
5AT	Hillingdon	37.9	387.3	88.6%	43.5	90.4%
5H1	Hammersmith and Fulham	36.1	298.1	68.2%	36.1	75.1%
5HX	Ealing	36.7	327.8	75.0%	39.0	81.1%
5HY	Hounslow	36.6	323.5	74.0%	39.2	81.4%
5K5	Brent	36.5	313.4	71.7%	39.7	82.6%
5K6	Harrow	38.7	410.0	93.8%	43.9	91.2%
5LA	Kensington and Chelsea	38.1	357.1	81.7%	41.5	86.3%
5LC	Westminster	37.4	351.9	80.5%	41.7	86.6%

## Cardiac Network - Relative Need for New Implant Rate

<b>North West London CHD Network</b>	336.6	77.0%	39.5	82.2%
--------------------------------------	-------	-------	------	-------

## National - England

<b>England</b>	437.1	100.0%	48.1	100.0%
----------------	-------	--------	------	--------

Note: "Expected" pacing and ICD rates are relative to national average rate, but are corrected depending on the age and sex distribution of the local population (see Page 4).

For Pacemakers, the expected implant rate will be higher if the percentage of older people in the PCT is higher.

For ICDs, the same general rule applies, but the pattern is slightly different, because ICD implant rates peak at age 70 and then decrease rapidly.

These relative rates will be used to correct the observed rates and produce a truer reflection of local implant rates vs. local need.

# New and Total PM and ICD Implants

## North West London CHD Network

### Pacemakers

The following hospitals implanted pacemakers in patients from this cardiac network in 2004 and 2005.

		<b>2004</b>		<b>2005</b>		<b>Replacement implants</b>
Centre		New Implants	Total Implants	New Implants	Total Implants	% of total
<b>HH</b>	<b>Harefield Hospital</b>	<b>117</b>	<b>160</b>	<b>145</b>	<b>205</b>	<b>28.2%</b>
<b>NPH</b>	<b>Northwick Park Hospital</b>	<b>135</b>	<b>173</b>	<b>105</b>	<b>163</b>	<b>28.6%</b>
<b>HAM</b>	<b>Hammersmith Hospital</b>	<b>141</b>	<b>175</b>	<b>129</b>	<b>158</b>	<b>18.9%</b>
<b>CMH</b>	<b>Central Middlesex Hospital</b>	<b>68</b>	<b>79</b>	<b>44</b>	<b>57</b>	<b>17.6%</b>
<b>NHB</b>	<b>Royal Brompton Hospital</b>	<b>50</b>	<b>72</b>	<b>36</b>	<b>57</b>	<b>33.3%</b>
<b>STM</b>	<b>St Marys Hospital Paddington</b>	<b>52</b>	<b>62</b>	<b>44</b>	<b>54</b>	<b>17.2%</b>
<b>HHW</b>	<b>Wellington Hospital North</b>	<b>21</b>	<b>33</b>	<b>42</b>	<b>51</b>	<b>25.0%</b>
<b>HSC</b>	<b>Harley Street Clinic</b>	<b>33</b>	<b>37</b>	<b>27</b>	<b>30</b>	<b>10.4%</b>
<b>UCL</b>	<b>University College Hospital</b>	<b>10</b>	<b>14</b>	<b>6</b>	<b>11</b>	<b>36.0%</b>
<b>STH</b>	<b>St Thomas Hospital</b>	<b>6</b>	<b>7</b>	<b>7</b>	<b>8</b>	<b>13.3%</b>
<b>BNT</b>	<b>Barnet General Hospital</b>	<b>6</b>	<b>9</b>	<b>4</b>	<b>5</b>	<b>28.6%</b>
<b>LBH</b>	<b>London Bridge Hospital</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>7</b>	<b>45.5%</b>
<b>HHH</b>	<b>Hemel Hempstead General Hospital</b>	<b>2</b>	<b>2</b>	<b>7</b>	<b>7</b>	
<b>RFH</b>	<b>The Royal Free Hospital</b>	<b>2</b>	<b>2</b>	<b>5</b>	<b>6</b>	
<b>BAL</b>	<b>Barts and the London</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	

<b>SPH</b>	<b>St Peter's Hospital</b>			<b>1</b>	<b>3</b>
<b>KCH</b>	<b>King's College Hospital</b>	<b>1</b>	<b>3</b>		
<b>WDH</b>	<b>Dorset County Hospital</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>ANT</b>	<b>St Anthony's Hospital</b>			<b>1</b>	<b>2</b>
<b>GUY</b>	<b>Guy's Hospital</b>			<b>0</b>	<b>2</b>
<b>GEO</b>	<b>St George's Hospital</b>			<b>1</b>	<b>2</b>
<b>BAT</b>	<b>Royal United Hospital Bath</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>MAY</b>	<b>Mayday Hospital</b>			<b>2</b>	<b>2</b>
<b>GOS</b>	<b>The Hospital for Sick Children</b>	<b>1</b>	<b>1</b>		
<b>BOU</b>	<b>Royal Bournemouth General Hospital</b>	<b>1</b>	<b>1</b>		
<b>BAS</b>	<b>Basildon Hospital</b>			<b>0</b>	<b>1</b>
<b>BHL</b>	<b>Cardiothoracic Centre</b>	<b>1</b>	<b>1</b>		
<b>LEW</b>	<b>Lewisham General Hospital</b>	<b>1</b>	<b>1</b>		
<b>WRG</b>	<b>Worthing Hospital</b>	<b>0</b>	<b>1</b>		
<b>MPH</b>	<b>Taunton &amp; Somerset Hospital</b>			<b>0</b>	<b>1</b>
<b>NGS</b>	<b>Northern General Hospital</b>	<b>1</b>	<b>1</b>		
<b>NIN</b>	<b>Ninewells Hospital</b>	<b>1</b>	<b>1</b>		
<b>PAP</b>	<b>Papworth Hospital</b>			<b>1</b>	<b>1</b>
<b>RSC</b>	<b>Royal Sussex County Hospital</b>			<b>1</b>	<b>1</b>
<b>SAL</b>	<b>Salisbury District Hospital</b>			<b>0</b>	<b>1</b>
<b>VIC</b>	<b>Blackpool Victoria Hospital</b>			<b>1</b>	<b>1</b>
<b>WAL</b>	<b>Walsgrave Hospital</b>	<b>1</b>	<b>1</b>		
<b>KTH</b>	<b>Kingston Hospital</b>	<b>1</b>	<b>1</b>		

A new pacemaker centre will implant nearly 100% new implants, and the longer a centre has been implanting, the higher the percentage of replacements implants.

The national average for replacement implants is 23.8% of the total workload.

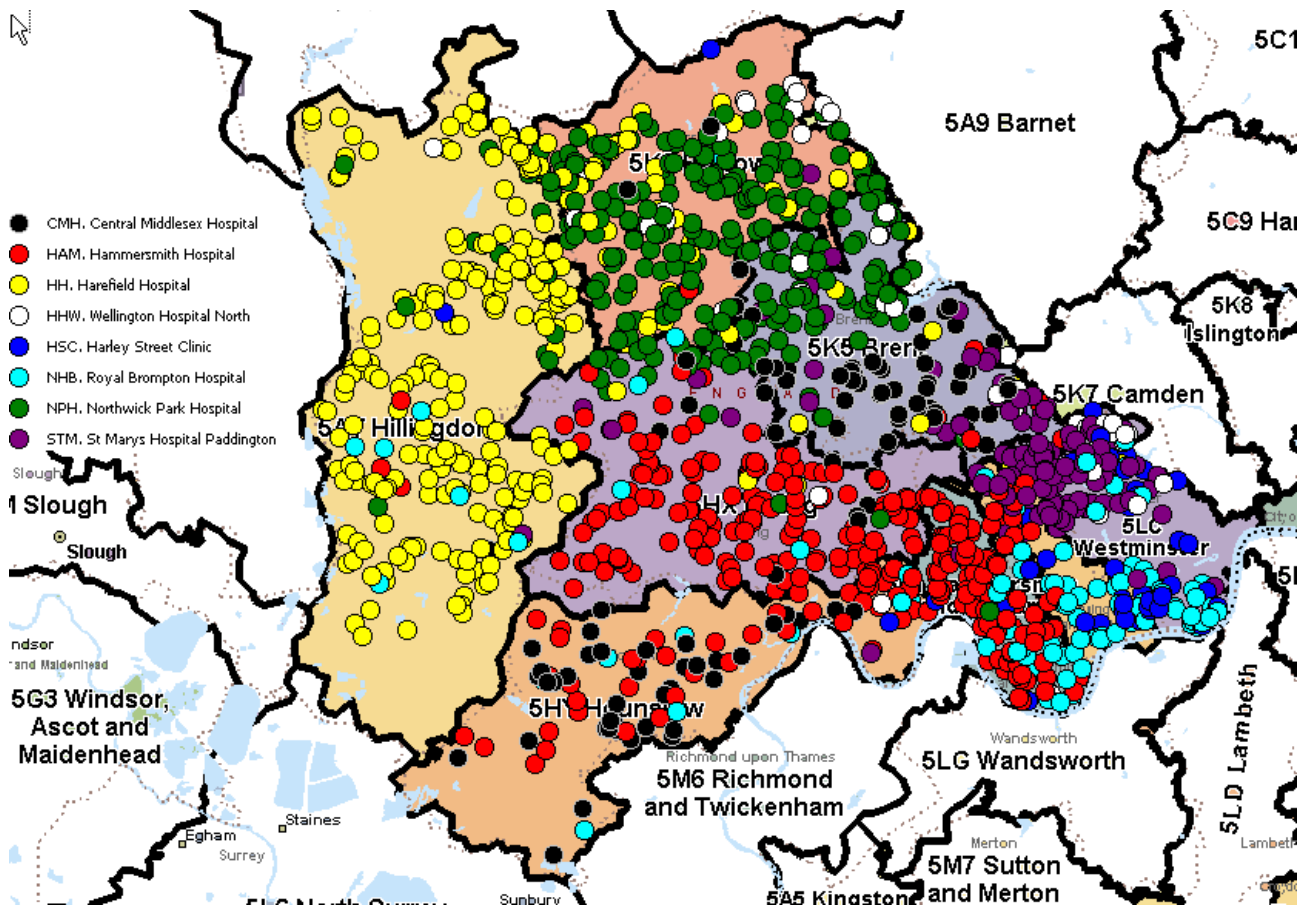
This should always be borne in mind when forecasting future workload.

# Geographical location of pacemaker implants

*for this cardiac network*

**North West London CHD Network**

**Geographical location of new pacemaker implants**



# New and Total PM and ICD Implants

## *for this cardiac network*

### North West London CHD Network

#### Implantable Cardiac Defibrillators (ICDs)

The following hospitals implanted ICDs in patients from this cardiac network in 2004 and 2005.

		2004		2005		Replacement implants
Centre		New Implants	Total Implants	New Implants	Total Implants	% of total
HH	Harefield Hospital	13	21	19	30	37.3%
HAM	Hammersmith Hospital	8	11	12	25	44.4%
STM	St Marys Hospital Paddington	12	13	11	13	11.5%
UCL	University College Hospital	5	6	11	13	15.8%
NHB	Royal Brompton Hospital	6	8	7	8	18.8%
HSC	Harley Street Clinic	7	8	4	4	8.3%
HHW	Wellington Hospital North	6	6	1	3	
LBH	London Bridge Hospital	2	2	1	1	
GEO	St George's Hospital	1	2	0	1	
STH	St Thomas Hospital	1	2			

# CRT implants in this network

## North West London CHD Network

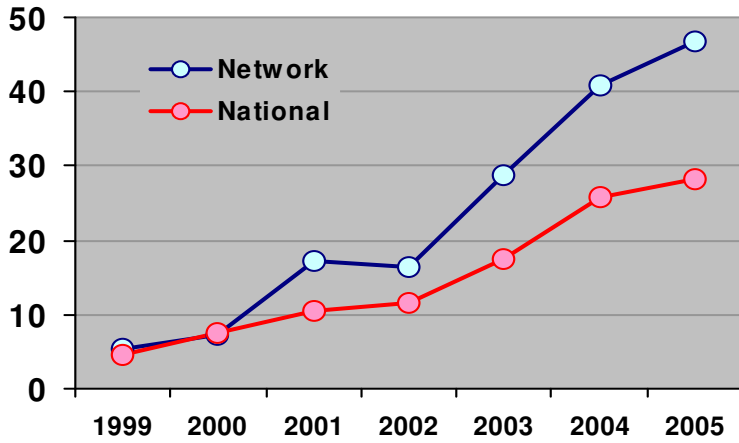
Year	Implanting Centre	CRT-D	CRT-P
1999	Harefield Hospital		10
2000	Harefield Hospital	1	10
	Northwick Park Hospital		2
2001	Hammersmith Hospital	3	6
	Harefield Hospital	2	7
	Northwick Park Hospital	2	6
	St Marys Hospital Paddington		4
	Wellington Hospital North	1	
2002	Hammersmith Hospital	3	6
	Harefield Hospital	2	3
	London Bridge Hospital		1
	Northwick Park Hospital		4
	Royal Brompton Hospital	1	4
	St Marys Hospital Paddington	4	2
2003	Hammersmith Hospital	1	10
	Harefield Hospital	14	6
	Harley Street Clinic	1	
	Northwick Park Hospital	1	
	Royal Brompton Hospital	8	5
	St Marys Hospital Paddington	4	1
	University College Hospital	1	
2004	Barts and the London	1	
	Guy's Hospital	1	

2004	Hammersmith Hospital	2	4
	Harefield Hospital	15	17
	Harley Street Clinic	3	
	Northwick Park Hospital		8
	Royal Brompton Hospital	4	1
	St George's Hospital		1
	St Marys Hospital Paddington	2	11
	University College Hospital	1	
	Wellington Hospital North	2	1

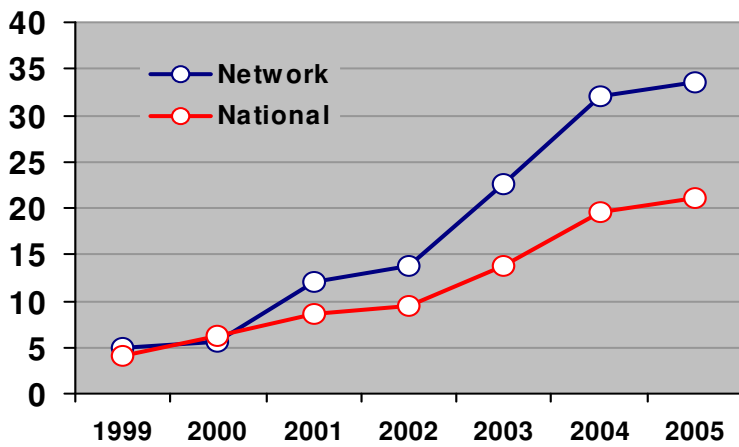
---

2005	Hammersmith Hospital	20	5
	Harefield Hospital	18	9
	London Bridge Hospital	1	
	Northwick Park Hospital		6
	Royal Brompton Hospital	10	2
	St Marys Hospital Paddington	7	4
	University College Hospital	2	
	Wellington Hospital North	1	

### CRT Total Implants Network v National



### CRT New Implants Network v National



Page8d

Low voltage CRT devices ( CRT-P) pace both the left and right ventricles.

High voltage CRT devices (CRT-D) combine this function with a defibrillation capability.

# Which hospitals serve which PCTs?

## *all implants for this cardiac network*

### North West London CHD Network

#### Pacemakers

*Principal implant centres are shown in bold.*

<b>5AT</b>	<b>Hillingdon</b>	<b>Total Implants 2004 and 2005</b>
<b>HH</b>	<b>Harefield Hospital</b>	<b>291</b>
NPH	Northwick Park Hospital	22
NHB	Royal Brompton Hospital	15
HHH	Hemel Hempstead General Hospital	7
HAM	Hammersmith Hospital	4
HHW	Wellington Hospital North	3
CMH	Central Middlesex Hospital	2
HSC	Harley Street Clinic	2
STH	St Thomas Hospital	2
STM	St Marys Hospital Paddington	1
UCL	University College Hospital	1
GEO	St George's Hospital	1
WDH	Dorset County Hospital	1

<b>5H1</b>	<b>Hammersmith and Fulham</b>	<b>Total Implants 2004 and 2005</b>
<b>HAM</b>	<b>Hammersmith Hospital</b>	<b>87</b>
NHB	Royal Brompton Hospital	21
HSC	Harley Street Clinic	7
STM	St Marys Hospital Paddington	3
UCL	University College Hospital	2
HHW	Wellington Hospital North	2
BAL	Barts and the London	1
WDH	Dorset County Hospital	1
PAP	Papworth Hospital	1
KTH	Kingston Hospital	1
GUY	Guy's Hospital	1
CMH	Central Middlesex Hospital	1
GOS	The Hospital for Sick Children	1

<b>5HX</b>	<b>Ealing</b>	<b>Total Implants 2004 and 2005</b>
<b>HAM</b>	<b>Hammersmith Hospital</b>	<b>162</b>

NPH	Northwick Park Hospital	22
CMH	Central Middlesex Hospital	21
HH	Harefield Hospital	15
NHB	Royal Brompton Hospital	11
STM	St Marys Hospital Paddington	4
HSC	Harley Street Clinic	2
HHW	Wellington Hospital North	1
NIN	Ninewells Hospital	1
SAL	Salisbury District Hospital	1
GEO	St George's Hospital	1

<b>5HY Hounslow</b>	<b>Total Implants 2004 and 2005</b>
---------------------	-------------------------------------

<b>HAM</b>	<b>Hammersmith Hospital</b>	<b>47</b>
<b>CMH</b>	<b>Central Middlesex Hospital</b>	<b>43</b>
NHB	Royal Brompton Hospital	7
SPH	St Peter's Hospital	3
STH	St Thomas Hospital	2
HSC	Harley Street Clinic	2
HHW	Wellington Hospital North	2
KCH	King's College Hospital	1
BAL	Barts and the London	1
NPH	Northwick Park Hospital	1
ANT	St Anthony's Hospital	1
STM	St Marys Hospital Paddington	1
UCL	University College Hospital	1
HH	Harefield Hospital	1

<b>5K5 Brent</b>	<b>Total Implants 2004 and 2005</b>
------------------	-------------------------------------

<b>NPH</b>	<b>Northwick Park Hospital</b>	<b>84</b>
<b>CMH</b>	<b>Central Middlesex Hospital</b>	<b>65</b>
STM	St Marys Hospital Paddington	21
HHW	Wellington Hospital North	13
HH	Harefield Hospital	8
HAM	Hammersmith Hospital	5
BNT	Barnet General Hospital	5
NHB	Royal Brompton Hospital	4
UCL	University College Hospital	3
RFH	The Royal Free Hospital	2
HSC	Harley Street Clinic	1
VIC	Blackpool Victoria Hospital	1
WAL	Walsgrave Hospital	1

**5K6 Harrow** **Total Implants 2004 and 2005**

<b>NPH</b>	<b>Northwick Park Hospital</b>	<b>207</b>
HH	Harefield Hospital	48
HHW	Wellington Hospital North	30
BNT	Barnet General Hospital	9
NHB	Royal Brompton Hospital	5
UCL	University College Hospital	4
HAM	Hammersmith Hospital	4
CMH	Central Middlesex Hospital	4
RFH	The Royal Free Hospital	2
HHH	Hemel Hempstead General Hospital	2
HSC	Harley Street Clinic	1
LBH	London Bridge Hospital	1
MPH	Taunton & Somerset Hospital	1
BOU	Royal Bournemouth General Hospital	1
STM	St Marys Hospital Paddington	1
BHL	Cardiothoracic Centre	1
BAL	Barts and the London	1

**5LA Kensington and Chelsea** **Total Implants 2004 and 2005**

<b>NHB</b>	<b>Royal Brompton Hospital</b>	<b>38</b>
HSC	Harley Street Clinic	23
HAM	Hammersmith Hospital	20
STM	St Marys Hospital Paddington	15
HHW	Wellington Hospital North	7
LBH	London Bridge Hospital	5
STH	St Thomas Hospital	3
KCH	King's College Hospital	2
HH	Harefield Hospital	2
LEW	Lewisham General Hospital	1
MAY	Mayday Hospital	1
RFH	The Royal Free Hospital	1
RSC	Royal Sussex County Hospital	1

**5LC Westminster** **Total Implants 2004 and 2005**

<b>STM</b>	<b>St Marys Hospital Paddington</b>	<b>70</b>
HSC	Harley Street Clinic	29
NHB	Royal Brompton Hospital	28
HHW	Wellington Hospital North	26
UCL	University College Hospital	14
STH	St Thomas Hospital	8

LBH	London Bridge Hospital	5
HAM	Hammersmith Hospital	4
RFH	The Royal Free Hospital	3
BAT	Royal United Hospital Bath	2
NGS	Northern General Hospital	1
MAY	Mayday Hospital	1
BAS	Basildon Hospital	1
ANT	St Anthony's Hospital	1
WRG	Worthing Hospital	1
GUY	Guy's Hospital	1

## Implantable Cardioverter Defibrillators (ICDs)

<b>5AT Hillingdon</b>		<b>Total Implants 2004 and 2005</b>
<b>HH</b>	<b>Harefield Hospital</b>	<b>31</b>
HAM	Hammersmith Hospital	3
HHW	Wellington Hospital North	2
NHB	Royal Brompton Hospital	1
STM	St Marys Hospital Paddington	1
UCL	University College Hospital	1
GEO	St George's Hospital	1
<b>5H1 Hammersmith and Fulham</b>		<b>Total Implants 2004 and 2005</b>
<b>HAM</b>	<b>Hammersmith Hospital</b>	<b>4</b>
<b>NHB</b>	<b>Royal Brompton Hospital</b>	<b>4</b>
LBH	London Bridge Hospital	2
UCL	University College Hospital	1
<b>5HX Ealing</b>		<b>Total Implants 2004 and 2005</b>
<b>HAM</b>	<b>Hammersmith Hospital</b>	<b>10</b>
STM	St Marys Hospital Paddington	7
UCL	University College Hospital	3
HH	Harefield Hospital	3
HSC	Harley Street Clinic	2
NHB	Royal Brompton Hospital	2
GEO	St George's Hospital	2
<b>5HY Hounslow</b>		<b>Total Implants 2004 and 2005</b>
<b>HAM</b>	<b>Hammersmith Hospital</b>	<b>12</b>
STM	St Marys Hospital Paddington	1
UCL	University College Hospital	1
<b>5K5 Brent</b>		<b>Total Implants 2004 and 2005</b>
<b>UCL</b>	<b>University College Hospital</b>	<b>4</b>
<b>STM</b>	<b>St Marys Hospital Paddington</b>	<b>4</b>
HH	Harefield Hospital	3
HHW	Wellington Hospital North	2
HAM	Hammersmith Hospital	1
<b>5K6 Harrow</b>		<b>Total Implants 2004 and 2005</b>
<b>HH</b>	<b>Harefield Hospital</b>	<b>14</b>
UCL	University College Hospital	6
HSC	Harley Street Clinic	4
HHW	Wellington Hospital North	3
STM	St Marys Hospital Paddington	3
HAM	Hammersmith Hospital	1

NHB Royal Brompton Hospital 1

**5LA Kensington and Chelsea Total Implants 2004 and 2005**

**NHB Royal Brompton Hospital 7**

**HAM Hammersmith Hospital 5**

HSC Harley Street Clinic 2

STM St Marys Hospital Paddington 2

UCL University College Hospital 1

HHW Wellington Hospital North 1

LBH London Bridge Hospital 1

**5LC Westminster Total Implants 2004 and 2005**

**STM St Marys Hospital Paddington 8**

HSC Harley Street Clinic 4

UCL University College Hospital 2

STH St Thomas Hospital 2

HHW Wellington Hospital North 1

NHB Royal Brompton Hospital 1

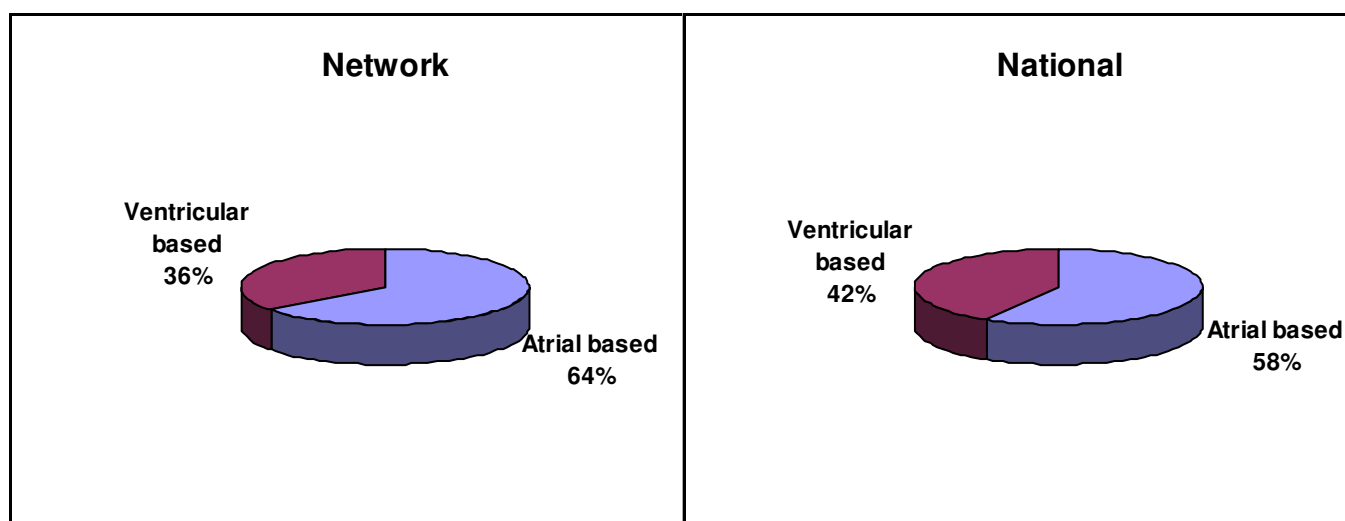
# Pacing Mode for New Implants

## for this cardiac network

### North West London CHD Network

#### Pacemakers

Mode	% for this Cardiac Network	National %
<b>DDDR</b>	<b>35.8%</b>	<b>29.6%</b>
<b>DDD</b>	<b>27.9%</b>	<b>25.8%</b>
<b>VVIR</b>	<b>19.0%</b>	<b>25.8%</b>
<b>VVI</b>	<b>16.6%</b>	<b>16.0%</b>
<b>AAIR</b>	<b>0.2%</b>	<b>0.8%</b>
<b>DDR</b>	<b>0.2%</b>	<b>0.1%</b>
<b>DDI</b>	<b>0.2%</b>	<b>0.3%</b>
<b>VDD</b>	<b>0.1%</b>	<b>0.8%</b>
<b>DDIR</b>	<b>0.1%</b>	<b>0.2%</b>



# Pacing Mode for New Implants

*major implanting hospitals in this cardiac network*

## North West London CHD Network

	VVI	VVIR	AAI	AAIR	DDD	DDDR	VDD	VDDR	All Dual Chamber
<b>NATIONAL</b>	16.0%	25.8%	0.35%	0.80%	25.8%	29.6%	0.8%	0.2%	55.5%
<b>This network</b>	17.0%	18.8%		0.25%	27.7%	36.1%	0.1%		63.9%
<b>BNT. Barnet General Hospital</b>	22.2%	33.3%			22.2%	22.2%			44.4%
<b>CMH. Central Middlesex Hospital</b>	19.6%	24.1%			32.1%	24.1%			56.3%
<b>HAM. Hammersmith Hospital</b>	19.3%	33.3%			3.0%	44.4%			47.4%
<b>HH. Harefield Hospital</b>	33.7%	1.5%		0.38%	64.0%	0.4%			64.4%
<b>HHW. Wellington Hospital North</b>	4.4%	14.7%			42.6%	35.3%			77.9%
<b>HSC. Harley Street Clinic</b>	19.7%	11.5%		1.64%	52.5%	14.8%			67.2%

<b>LBH. London Bridge Hospital</b>		<b>50.0%</b>		<b>50.0%</b>		<b>50.0%</b>
<b>NHB. Royal Brompton Hospital</b>	<b>2.4%</b>	<b>22.6%</b>		<b>21.4%</b>	<b>53.6%</b>	<b>75.0%</b>
<b>NPH. Northwick Park Hospital</b>	<b>7.3%</b>	<b>20.3%</b>		<b>18.1%</b>	<b>53.9%</b>	<b>72.0%</b>
<b>STH. St Thomas Hospital</b>	<b>7.7%</b>	<b>15.4%</b>		<b>23.1%</b>	<b>53.8%</b>	<b>76.9%</b>
<b>STM. St Marys Hospital Paddington</b>	<b>1.1%</b>	<b>15.1%</b>		<b>1.1%</b>	<b>81.7%</b>	<b>82.8%</b>
<b>UCL. University College Hospital</b>	<b>6.3%</b>	<b>31.3%</b>		<b>25.0%</b>	<b>31.3%</b>	<b>6.3%</b>

# Pacing Mode for Sick Sinus Syndrome

There is ample evidence from major clinical trials and support from NICE guidelines (NICE Technology Appraisal 88, 2005) that use of ventricular pacing modes in patients with sick sinus syndrome can lead to poor outcomes, notably an increased incidence of atrial fibrillation and pacemaker syndrome. Pacing modes in sick sinus syndrome should be atrial based (i.e. dual chamber or atrial).

The Western European average in 2005 was 92% atrial based pacing for SSS. In the UK the average was 76%.

Any percentage of ventricular based pacing greater than 10% has been listed in bold red, and may be considered higher than desirable. A percentage greater than 20% is considered definitely excessive and is shown in a shaded red box.

	<b>New Implants for Sick Sinus Syndrome</b>	<b>Atrial-based Implants</b>	<b>Ventricular-based Implants</b>
<b>CMH. Central Middlesex Hospital</b>	14	42.9%	<b>57.1%</b>
<b>HH. Harefield Hospital</b>	76	85.5%	<b>14.5%</b>
<b>NHB. Royal Brompton Hospital</b>	25	96.0%	<b>4.0%</b>
<b>NPH. Northwick Park Hospital</b>	47	83.0%	<b>17.0%</b>

## References

1. TA88 Bradycardia - dual chamber pacemakers: Information for the public. NICE 23 February 2005. [www.nice.org.uk/page.aspx?o=243316](http://www.nice.org.uk/page.aspx?o=243316).
2. Cost benefit analysis of single and dual chamber pacing for sick sinus syndrome and atrioventricular block : an economic sensitivity analysis of the literature. Sutton R and Bourgeois I. European Heart Journal. 1996, 17: 574-582.
3. Deleterious effects of long-term single-chamber ventricular pacing in patients with sick sinus syndrome: the hidden benefits of dual-chamber pacing Hesselson AB, Parsonnet V, Bernstein AD, Bonavita GJ. J Am Coll Cardiol, 1992; 19:1542-1549.

# ECG Indication for New Implants

## North West London CHD Network

	Complete HB	Incomplete HB	AF + HB/brady	Sick sinus syndrome	Other
<b>National</b>	<b>26.3%</b>	<b>20.1%</b>	<b>23.9%</b>	<b>28.4%</b>	<b>1.3%</b>
<b>This network</b>	<b>26.5%</b>	<b>18.7%</b>	<b>25.0%</b>	<b>29.0%</b>	<b>0.8%</b>
<b>5AT. Hillingdon</b>	<b>21.6%</b>	<b>12.5%</b>	<b>31.9%</b>	<b>33.6%</b>	<b>0.4%</b>
<b>5H1. Hammersmith and Fulham</b>	<b>27.6%</b>	<b>17.2%</b>	<b>6.9%</b>	<b>44.8%</b>	<b>3.4%</b>
<b>5HX. Ealing</b>	<b>28.6%</b>	<b>8.6%</b>	<b>28.6%</b>	<b>34.3%</b>	
<b>5HY. Hounslow</b>	<b>28.6%</b>	<b>21.4%</b>	<b>7.1%</b>	<b>35.7%</b>	<b>7.1%</b>
<b>5K5. Brent</b>	<b>35.6%</b>	<b>18.4%</b>	<b>16.1%</b>	<b>28.7%</b>	<b>1.1%</b>
<b>5K6. Harrow</b>	<b>31.2%</b>	<b>23.7%</b>	<b>19.1%</b>	<b>25.4%</b>	<b>0.6%</b>
<b>5LA. Kensington and Chelsea</b>	<b>20.6%</b>	<b>27.0%</b>	<b>31.7%</b>	<b>20.6%</b>	
<b>5LC. Westminster</b>	<b>24.3%</b>	<b>22.6%</b>	<b>28.7%</b>	<b>23.5%</b>	<b>0.9%</b>

*AF: atrial fibrillation*  
*HB: heart block*  
*Brady: bradycardia*

## Expected and Actual New Implant Rates

### *Pacemakers*

Explanatory note:

The "Raw" new implant rate is the actual implant rate of new pacemakers per million population in each PCT. The "Corrected" rate is the raw rate, adjusted for relative need - so if a PCT has an aging population, its relative need is > 100% and its corrected rate will be reduced to reflect that need.

Comparisons between PCTs and with network and national averages should be made using Corrected rate.

**National average  
2004 and 2005** **437.5**

#### **North West London CHD Network**

Network average (unadjusted) **349.9**

**Network average  
(corrected for age and sex)** **454.4**

	Population	Relative need for PM	New Implant Rate 2004		New Implant Rate 2005	
			Raw	Corrected	Raw	Corrected
5AT. Hillingdon	247,600	88.6%	468.5	528.8	593.7	670.1
5H1. Hammersmith and Fulham	174,200	68.2%	373.1	547.1	241.1	353.5
5HX. Ealing	305,000	75.0%	288.5	384.7	298.4	397.8
5HY. Hounslow	212,900	74.0%	230.2	311.0	187.9	253.9
5K5. Brent	267,800	71.7%	369.7	515.6	235.3	328.1
5K6. Harrow	210,700	93.8%	512.6	546.5	541.1	576.8
5LA. Kensington and Chelsea	174,400	81.7%	292.4	357.9	258.0	315.8
5LC. Westminster	222,000	80.5%	364.9	453.2	319.8	397.3

## How much does the implant rate vary in this network?

Of course there will always be some random variation in implant rate. This NORMAL CAUSE variation is not considered likely to exceed 5% of the total implant rate for pacing. Variation IN EXCESS of 10% may be considered due to another (SPECIAL) cause, such as referral patterns or varying implantation policies between trusts.

### Variability Index for this Cardiac Network

**24.4%**

RATING: very high variation in implant rates between PCTs

## New Pacemaker Implant Rates

The Western European average new implant rate for 2003 and 2004 is 703 per million population. This figure is also now the HUK target and will be used as the basis for comparison.

**National average** **437.5**

### North West London CHD Network

Network average (unadjusted) **349.9**

**Network average  
(corrected for age and sex)** **454.4**

	Population	Corrected New Implant Rate 2004	Deficit/ Excess 2004 <i>compared to rate of 703</i>	Corrected New Implant Rate 2005	Deficit/ Excess 2005 <i>compared to rate of 703</i>
5AT. Hillingdon	247,600	528.8	-24.8%	670.1	-4.7%
5H1. Hammersmith and Fulham	174,200	547.1	-22.2%	353.5	-49.7%
5HX. Ealing	305,000	384.7	-45.3%	397.8	-43.4%
5HY. Hounslow	212,900	311.0	-55.8%	253.9	-63.9%
5K5. Brent	267,800	515.6	-26.7%	328.1	-53.3%
5K6. Harrow	210,700	546.5	-22.3%	576.8	-17.9%
5LA. Kensington and Chelsea	174,400	357.9	-49.1%	315.8	-55.1%
5LC. Westminster	222,000	453.2	-35.5%	397.3	-43.5%

## Expected and Actual New Implant Rates

### *Implantable Cardioverter Defibrillators (ICDs)*

Explanatory note:

The "Raw" new implant rate is the actual implant rate of new ICDs per million population in each PCT. The "Corrected" rate is the raw rate, adjusted for relative need - so if a PCT has an aging population, its relative need is > 100% and its corrected rate will be reduced to reflect that need.

Comparisons between PCTs should be made using Corrected rate.

**National average** **48.1**

North West London CHD Network

Network average  
(unadjusted) **35.0**

**Network average**  
**(corrected for age and sex)** **42.6**

	Population	Relative need for ICDs	New Implant Rate 2004		New Implant Rate 2005	
			Raw	Corrected	Raw	Corrected
5AT. Hillingdon	247,600	90.4%	48.5	<b>53.6</b>	60.6	<b>67.0</b>
5H1. Hammersmith and Fulham	174,200	75.1%	23.0	<b>30.6</b>	11.5	<b>15.3</b>
5HX. Ealing	305,000	81.1%	23.0	<b>28.3</b>	32.8	<b>40.4</b>
5HY. Hounslow	212,900	81.4%	18.8	<b>23.1</b>	28.2	<b>34.6</b>
5K5. Brent	267,800	82.6%	18.7	<b>22.6</b>	26.1	<b>31.6</b>
5K6. Harrow	210,700	91.2%	57.0	<b>62.4</b>	57.0	<b>62.4</b>
5LA. Kensington and Chelsea	174,400	86.3%	51.6	<b>59.8</b>	40.1	<b>46.5</b>
5LC. Westminster	222,000	86.6%	36.0	<b>41.6</b>	31.5	<b>36.4</b>

## New ICD Implant Rates

A target figure of 100 implants per million is used as a basis for comparison.

**National average** **48.1**

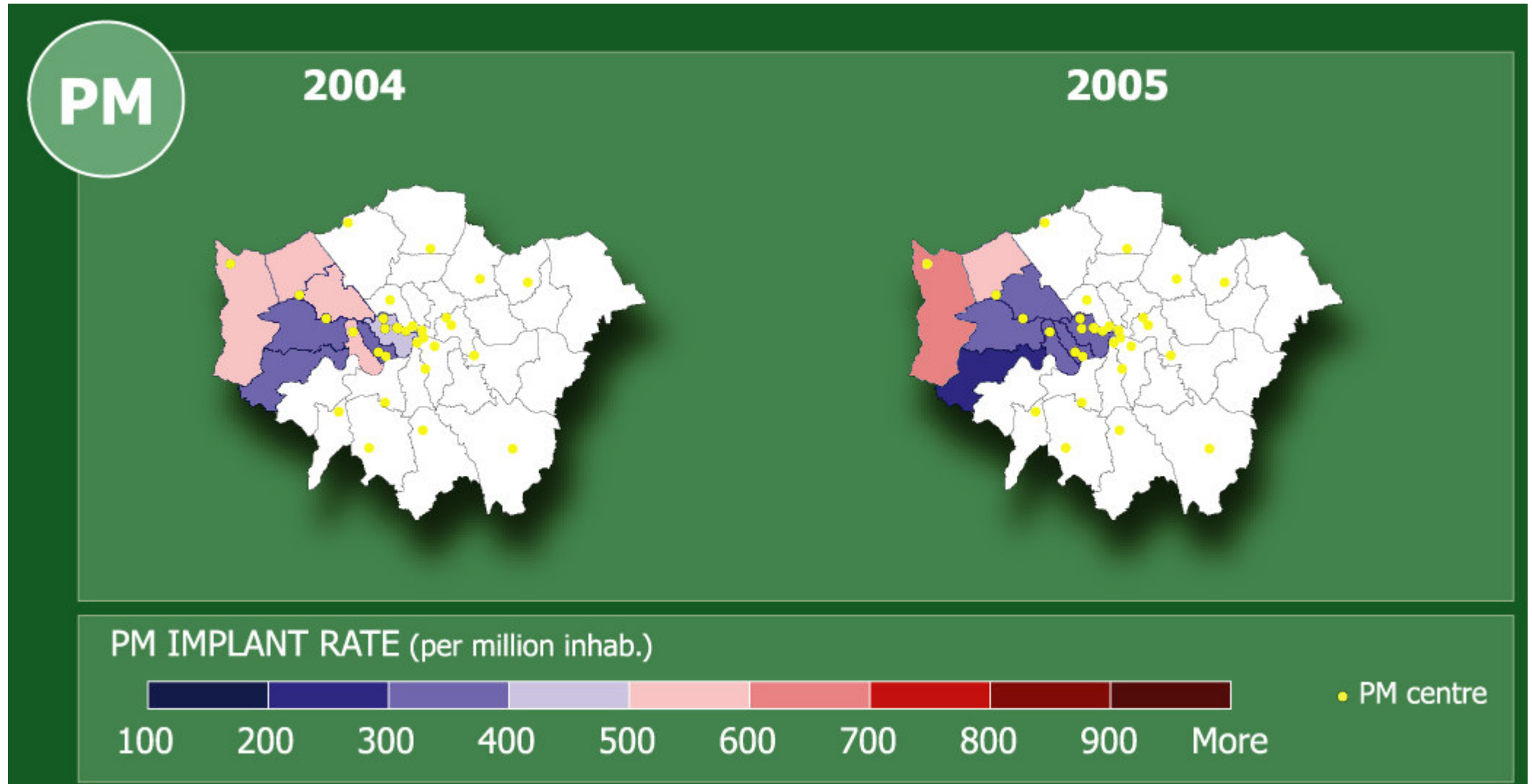
### North West London CHD Network

Network average (unadjusted) **35.0**

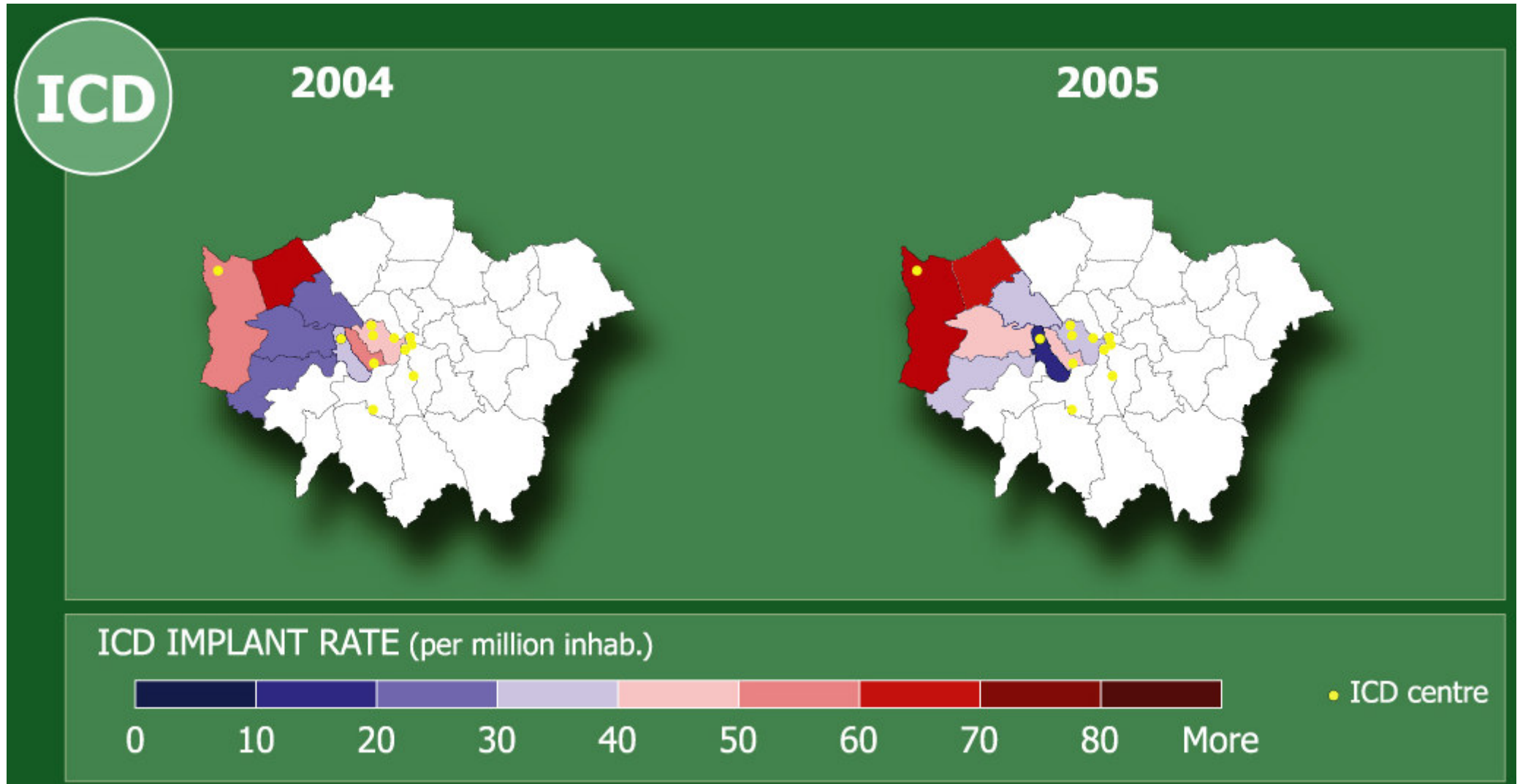
**Network average** **42.6**  
**(corrected for age and sex)**

	Population	Corrected New Implant Rate 2004	Deficit/ Excess 2004 <i>compared to rate of 100</i>	Corrected New Implant Rate 2005	Deficit/ Excess 2005 <i>compared to rate of 100</i>
5AT. Hillingdon	247,600	53.6	-46.4%	67.0	-33.0%
5H1. Hammersmith and Fulham	174,200	30.6	-69.4%	15.3	-84.7%
5HX. Ealing	305,000	28.3	-71.7%	40.4	-59.6%
5HY. Hounslow	212,900	23.1	-76.9%	34.6	-65.4%
5K5. Brent	267,800	22.6	-77.4%	31.6	-68.4%
5K6. Harrow	210,700	62.4	-37.6%	62.4	-37.6%
5LA. Kensington and Chelsea	174,400	59.8	-40.2%	46.5	-53.5%
5LC. Westminster	222,000	41.6	-58.4%	36.4	-63.6%

## Pacemakers



## Implantable Cardioverter Defibrillators (ICDs)



# Average new pacing implant rate 2004 and 2005

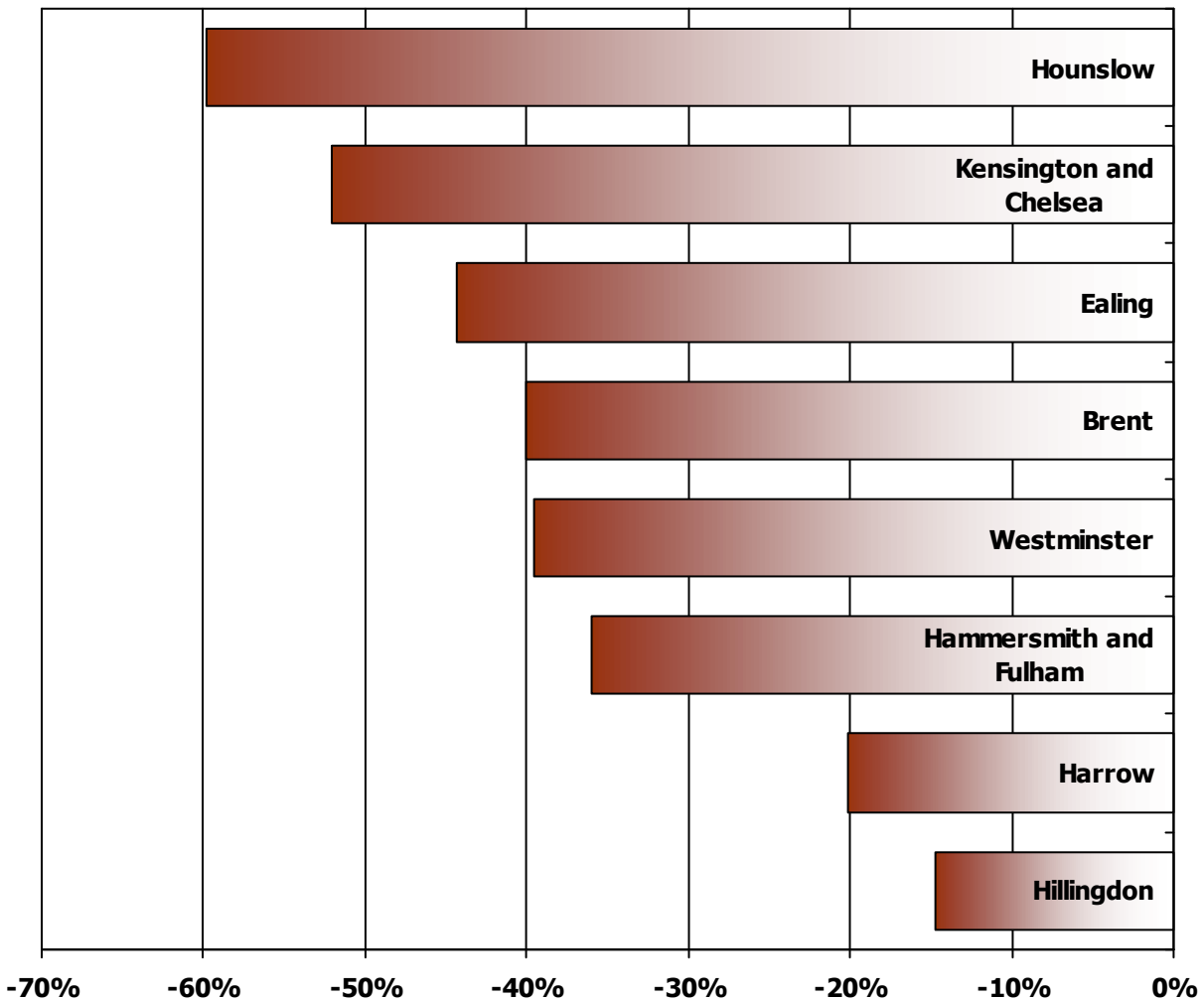
*comparison with Heart Rhythm UK target (703)*

## North West London CHD Network

### PM Implants 2004/5

*adjusted for age and sex*

*compared to HRUK recommendations (same as Western European average)*

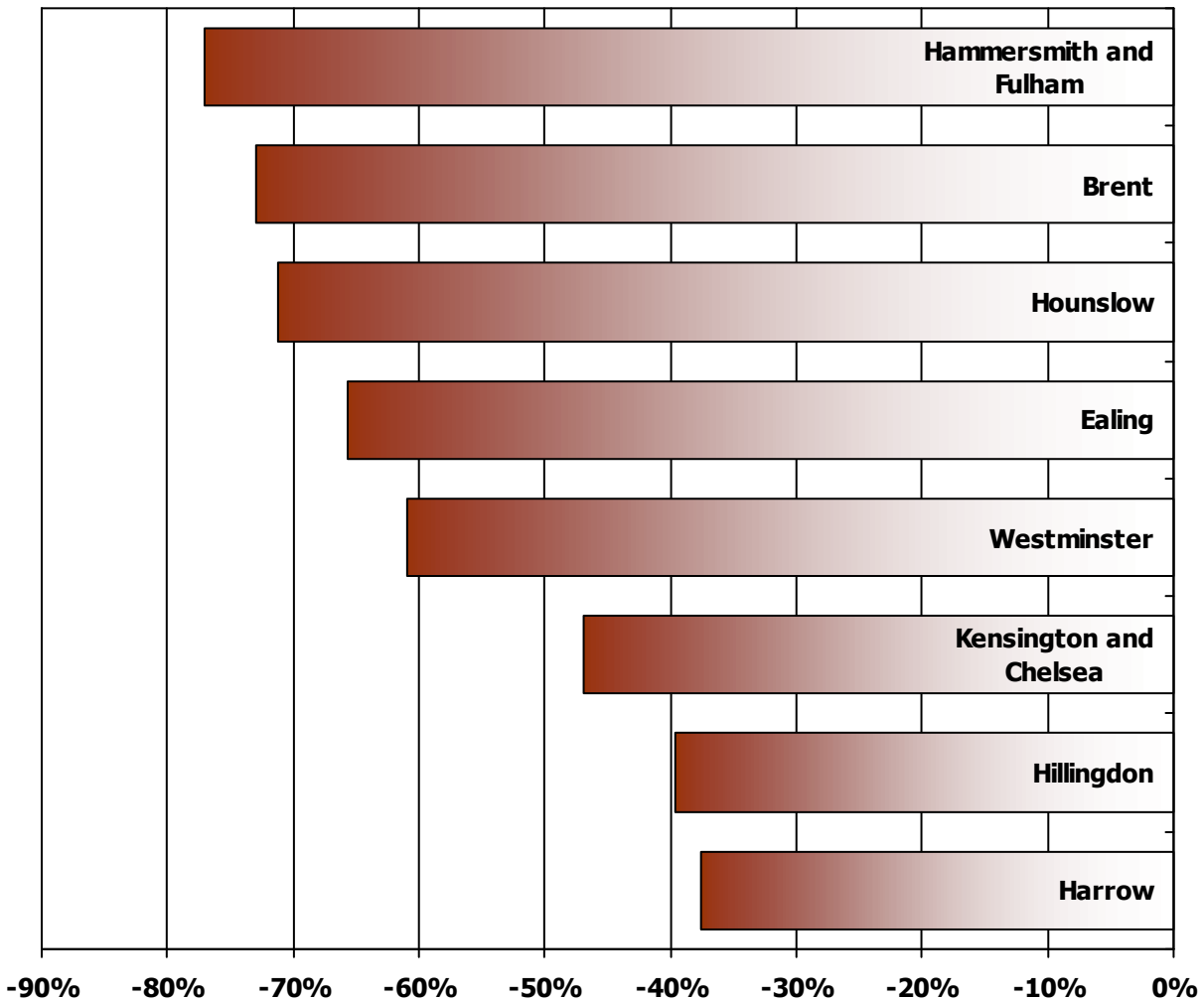


# Average ICD implant rate 2004 and 2005

## North West London CHD Network

### ICD Implants 2004/5

*adjusted for age and sex  
compared to target figure of 100 per million*



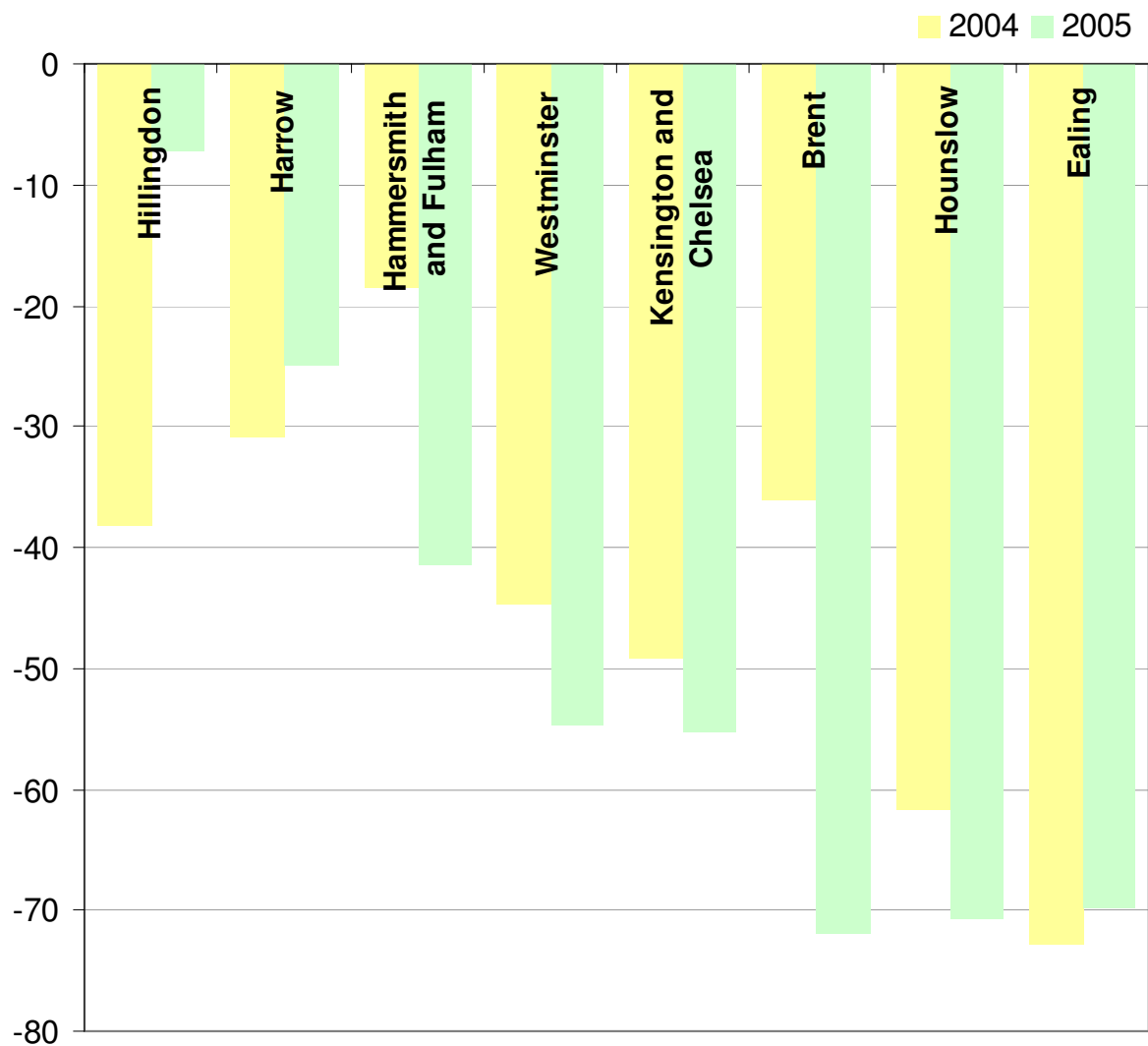
# Pacing Implant Deficit in 2004 and 2005

*comparison with HRUK recommendations*

## North West London CHD Network

### Deficit in New Pacemaker Implants

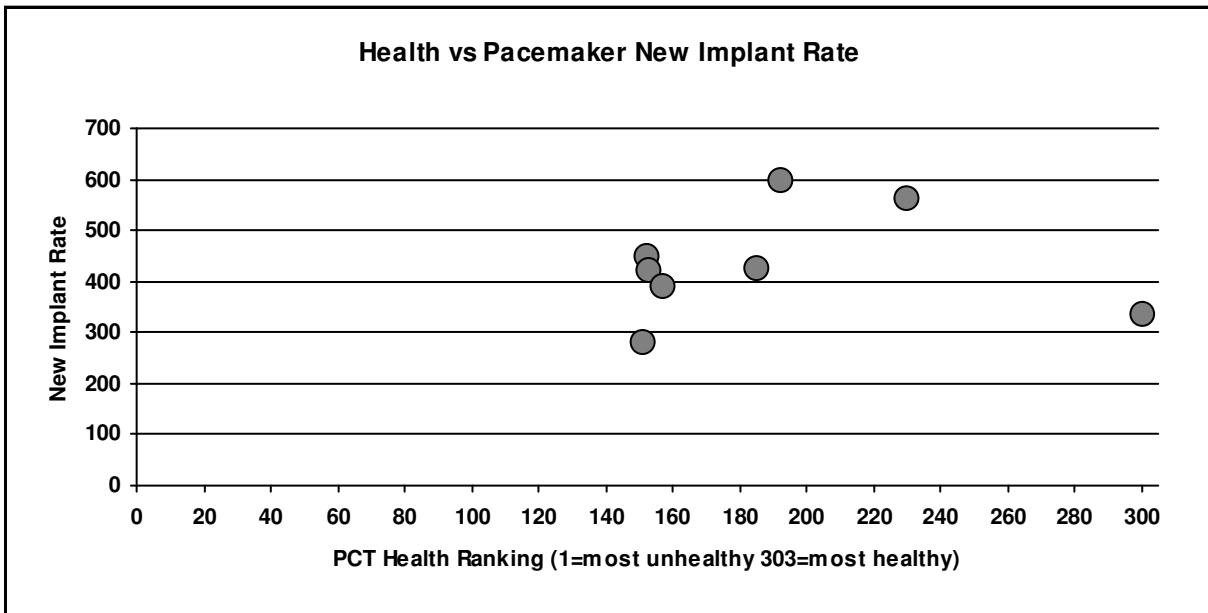
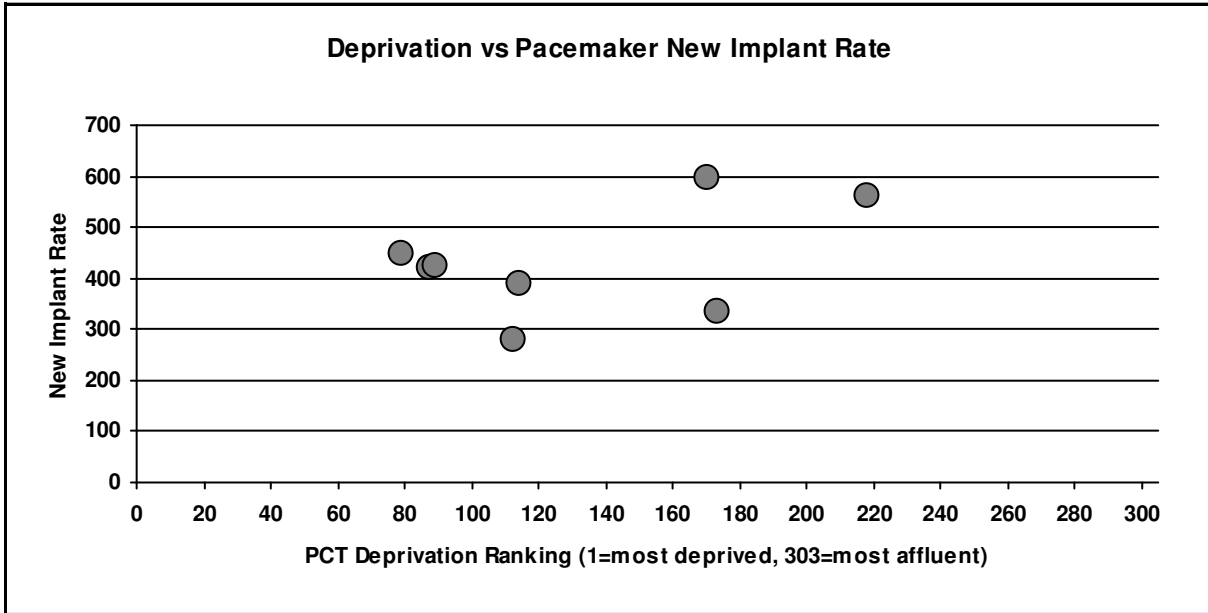
*compared to Western European average for same period (703) - now adopted as the recommended rate by Heart Rhythm UK*



# Deprivation and pacemaker implant rate

## North West London CHD Network

It is generally the case that provision of therapy for heart disease is biased towards areas of greater affluence, and deprived areas receive relatively less therapy compared to need. The graphs below examine average new pacing rate, corrected for age and sex, for each LHB, compared to national ranking of IMD (Index of Multiple Deprivation) and Health Index (note: 1=most deprived/unhealthy, 22=most affluent/healthy).



It is clear that pacing rate is NOT related to deprivation or health. This is the same for the other cardiac networks that have been studied to date.

# Conclusions

## North West London CHD Network

- \* Suburban areas are mainly served by Northwick Park and Harefield and Hammersmith. Inner city areas are served by St Mary's, Brompton and UCL. All of these centres except Northwick Park also implant ICDs. All implant CRT devices.
- \* The 2004/2005 new pacemaker rate remains above the national rate; decreased activity was noted at Central Middlesex.
- \* The ICD implant rates is below the national average, but it should be noted that the CRT implant rate is well above the national average.
- \* The VVI pacing rate is high at Harefield but this may reflect the generator mode at the end of the procedure and not longer term, as Harefield have stated they do not purchase VVI generators.
- \* Central Middlesex implant a very high % of sick sinus patients with ventricular-based implants. In contrast, 96% of Brompton SSS patients received atrial-based pacing.