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THE INCIDENCE AND PREVALENCE OF PARKINSON'S IN THE UK

Results from the Clinical Practice Research Datalink
Reference Report

The incidence and prevalence of Parkinson's in the UK

Results from the Clinical Practice Research Datalink

Alison Smith

Data and Analytics Adviser, Parkinson's UK

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1 Introduction

Parkinson's is a progressive neurological condition that causes a variety of motor symptoms (such as tremor, rigidity, and slowness of movement) and non-motor symptoms (such as cognitive and mood disorders, pain, and sleep disturbances). The cause is unknown but believed to involve both genetic and environmental factors. Parkinson's more commonly occurs in people over the age of 60 and men are more often affected than women¹.

The prevalence of Parkinson's is the total number of people diagnosed and living with the condition in the population. The incidence of Parkinson's is the number of new diagnoses that arise in a specific time period. Therefore, prevalence indicates how widespread Parkinson's is and incidence provides information about the risk of developing Parkinson's. Clearly, these two epidemiological concepts are distinct but related to each other. For a long-term progressive condition such as Parkinson's, prevalence will be higher than incidence.

Understanding both prevalence and incidence is important in terms of supporting people living with Parkinson's. Furthermore, as Parkinson's is more common in older people and as the UK population is increasingly ageing (as life expectancy increases) we might expect to see the prevalence and incidence of Parkinson's increasing over time. This increase could impact on associated health and social care services for people with Parkinson's.

This research report estimates age and gender-specific prevalence and incidence rates for Parkinson's in the UK in 2015 using data from the Clinical Practice Research Datalink. It then applies these rates to the whole population to provide estimates of the number of people living with Parkinson's in the UK (Section 3) and the number of new diagnoses in a year (Section 4). Predictions for the future are also made by applying these rates to projected UK populations (Section 5). Comparisons are made with other published studies in Section 6.

2 Methodology

Information for the study was obtained from the Clinical Practice Research Datalink (CPRD), using the primary care database (GOLD). GOLD comprises the anonymised, longitudinal medical records of patients registered with contributing GP practices across the UK. The database currently includes over 22 million patients from 1987 onwards, of which information is currently being collected on over 5 million active patients. These patients are considered representative of the general UK population with respect to age, sex and ethnicity².

Data for this study was taken from the May 2016 static version of CPRD GOLD. The study period for the analysis was 1 January 1988 to 31 December 2015. The study population consisted of patients aged 20 or over with a record for Parkinson's in their clinical or referral file on or before 31 December 2015. Patients aged under 20 were excluded because the likely prevalence and incidence of Parkinson's in those aged under 20 are too small to calculate from this data source.

¹ Kalia LV, Lang AE. Parkinson's disease. *Lancet*. 2015 Aug 29;386(9996):896-912. Epub 2015 Apr 19.

² Herrett E, Gallagher AM, Bhaskaran K, Forbes H, Mathur R, van Staa T, Smeeth L. Data resource profile: Clinical Practice Research Datalink (CPRD). *Int J Epidemiol* 2015;44:827–36.

The data was supplied as a series of large tables with counts of the population and the number identified with Parkinson's split by year, age (in five-year bands), gender, and country. Table cells comprising 0-4 people with Parkinson's were recorded as "<5" in line with CPRD small cell policy and in these instances the population counts were recorded as "Not reported". This means that at times, it is not possible to calculate prevalence and incidence rates for every age and gender group in each country of the UK because of the small number of cases identified in the CPRD data.

2.1 Identifying cases of Parkinson's in the CPRD

For the purposes of this analysis, five separate cohorts of Parkinson's patients were identified using the definitions outlined below by 31 December 2015. Cohorts are not mutually exclusive.

- Cohort 1: Patients with a Read code³ for Parkinson's (definite or suggestive) within their clinical or referral records.
- Cohort 2: Patients with a definite Read code for Parkinson's.
- Cohort 3: Patients with a Read code for Parkinson's (definite or suggestive) and a prescription record for Parkinson's related medications.
- Cohort 4: Patients with a Read code for Parkinson's (definite) and a prescription record for Parkinson's related medications.
- Cohort 5: Patients with a Read code for Parkinson's (definite) and a subsequent referral to a specialist (geriatrician, physiotherapist, speech therapist or neurologist) six months before or six months after the date of Parkinson's diagnosis. Referral events were identified by assessing the NHS Speciality, Family Health Services Authority (FHSA) Speciality classification or Read codes for Parkinson's related referrals.

The Read codes and Parkinson's medications related to these definitions are listed in Section 9.

The index date of Parkinson's was defined as the first date that the GP records a medical diagnosis of Parkinson's in the patient clinical or referral record. The age of the patient was the difference between the year of birth of the patient and the calendar year of interest. Patients were excluded from the study if they had a record for Parkinson's but had died or de-registered from the CPRD before 1 January 1988. Patients with less than 6 months of up-to-standard follow-up in the CPRD were also excluded as a case. Up-to-standard follow-up is the period of patient follow-up that had occurred on or after the date when a practice was regarded as having high quality data recorded (see Section 10 for further details). For the purposes of this study, up-to-standard follow-up was defined as the latest of the patient first registration date and the practice up-to standard date.

2.1.1 Prevalence

Prevalence of Parkinson's was defined as a medical diagnosis of Parkinson's (new or pre-existing) documented in the patient clinical or referral record on or before 31 December 2015. Parkinson's could have been recorded during the practice up-to-standard or non-up-to-standard period. Only

³ Read codes are a coded thesaurus of clinical terms used in the NHS since 1985. They provide the standard vocabulary by which clinicians can record patient findings and procedures in health and social care IT systems across primary and secondary care (e.g. General Practice surgeries and pathology reporting of results). For further details, see <https://data.gov.uk/dataset/uk-read-code/resource/2c472e86-25ed-4c36-bfc9-cca21a6d4caf>.

patients who fulfilled the case definition for Cohorts 1-4 above were considered in this analysis.

Cohort 1-2: The numerator consisted of the total number of Parkinson's patients who fulfilled the case definition for Cohort 1-2, and who had their Parkinson's diagnosis documented on or before the 31 December of the calendar year of interest. Patients were alive and registered in a CPRD practice on or before the 31 December of the study year of interest.

Cohorts 3-4: The numerator consisted of the total number of Parkinson's patients who were prescribed Parkinson's medications, had at least one day of follow-up in the calendar year of interest and had at least one prescription for Parkinson's medication documented on or before the 31 December of the study year of interest. For example, patients with a medical diagnosis of Parkinson's documented in 1988 and Parkinson's treatment recorded in 1990 were counted as a treated Parkinson's case in 1990 and onward.

Denominator data consisted of the count of all acceptable patients in the GPRD who were alive and registered at a GPRD contributing practice at the mid-point (1 July) of each calendar year of interest.

The start of observation was defined as the maximum of the patient first registration date, the practice up-to-standard date, or the 1 July of the calendar year of interest. The end of observation was defined as the minimum of the practice last collection date, the patient transfer out date, CPRD derived death date or 1 July of the calendar year of interest.

Prevalence rates have been calculated as the total number of cases occurring on or before the 1 July of the calendar year of interest (numerator) divided by the total number of unique individuals in the denominator population. In this report, prevalence rates are expressed as the number of cases affected by the condition per 100,000 patients and 95% confidence intervals for these rates have been calculated using a Poisson distribution.

2.1.2 Incidence

The incidence of Parkinson's was defined as the first ever medical diagnosis of Parkinson's that the GP recorded in the patient clinical or referral record during the period 1 January 1988-31 December 2015 inclusive. A Parkinson's diagnosis was counted only once during the study period.

Cohort 1-2: The numerator consisted of the total number of patients who fulfilled the case definition for Cohort 1-2, during each calendar year of interest. Patients had at least one day of follow up during the calendar year of interest.

Cohorts 3-4: The numerator consisted of the total number of Parkinson's patients who were also prescribed Parkinson's medications up to six months prior to their Parkinson's diagnosis date or at any time post diagnosis in the study period. Patients were counted in the calendar year of their Parkinson's medical diagnosis, regardless of the year in which Parkinson's medication was recorded. For example, patients with Parkinson's treatment recorded in 2007 with a first ever diagnosis of Parkinson's documented in 2006 were counted as incident and treated in 2006.

Cohort 5: The numerator consisted of the total number of Parkinson's patients who were also referred to one or more Parkinson's related speciality up to six months before or after the date of their Parkinson's diagnosis. Patients were counted in the calendar year of their Parkinson's medical diagnosis regardless of the year in which their referral was recorded. For example, patients with a Parkinson's related referral record documented in 2007 and with a first ever diagnosis of Parkinson's documented in 2006 was counted as incident and referred in 2006.

Denominator data consisted of the sum of the person years of follow-up of patients who were alive and registered at a CPRD contributing practice at any time during each calendar year of interest. The start of observation was defined as the maximum of the patient first registration date, the practice up-to-standard date, or the 1 January of the calendar year of interest. The end of observation was defined as the minimum of the practice last collection date, the patient transfer out date, CPRD derived death date or 31 December of the calendar year of interest.

Incidence rates have been calculated by dividing the number of incident cases by the calculated person-time for that year or period. In this report, incidence rates are expressed as the number of newly diagnosed cases per 100,000 person-years and 95% confidence intervals for these rates have been calculated using a Poisson distribution.

2.2 Definition of Parkinson's used in this report

In summary, the five cohorts identified in the data are:

- Cohort 1: Patients with a Read code for Parkinson's (definite or suggestive) within their clinical or referral records.
- Cohort 2: Patients with a definite Read code for Parkinson's.
- Cohort 3: Patients with a Read code for Parkinson's (definite or suggestive) and a prescription record for Parkinson's related medications.
- Cohort 4: Patients with a Read code for Parkinson's (definite) and a prescription record for Parkinson's related medications.
- Cohort 5: Patients with a Read code for Parkinson's (definite) and a subsequent referral to a specialist (geriatrician, physiotherapist, speech therapist or neurologist) six months before or six months after the date of Parkinson's diagnosis. Referral events were identified by assessing the NHS Speciality, Family Health Services Authority (FHSA) Speciality classification or Read codes for Parkinson's related referrals.

Cohorts 3 and 4 are likely to underestimate the prevalence and incidence of Parkinson's because not all patients will be prescribed Parkinson's-related medication straight after diagnosis and some patients will be prescribed medication by their Consultant in secondary care (which will not be recorded in the data). It is possible that Cohort 1 will overstate prevalence and incidence because of the inclusion of suggestive Read codes for Parkinson's whereas Cohort 2 may possibly underestimate prevalence and incidence if a suggestive rather than definite Read code is being used (perhaps at an early stage of diagnosis).

Table 1 and Table 2 shows the overall incidence and prevalence rates for Parkinson's in the CPRD data according to which definition is used. Using the Cohort 1 definition does increase the

prevalence of Parkinson's by around 21% compared with Cohort 2 definition although incidence is only slightly higher (around 5%). As expected, using Cohort 3 and Cohort 4 definitions does result in lower estimates of prevalence and incidence than using Cohort 1 or Cohort 2 because not all people with Parkinson's will be prescribed Parkinson's-related medication by their GP. The overall prevalence rate for Cohorts 3 and 4 suggest that 73.7% of those in Cohort 1 and 87.9% of those in Cohort 2 had a prescription record for Parkinson's-related medication. Using the Cohort 5 definition for incidence results in a much lower estimate of incidence than all the other definitions which suggests it is not a reliable measure of incidence perhaps because of data recording issues with referral data.

Table 1 Comparison of 2015 overall CPRD prevalence rate by Parkinson's cohort definition

Cohort	Year	N subjects	Parkinson's cases	Prevalence rate per 100,000 person years	95% confidence interval	
1	2015	2,551,470	9,045	354.5	347.3	361.9
2	2015	2,551,470	7,309	286.5	279.9	293.1
3	2015	2,551,470	6,667	261.3	255.1	267.6
4	2015	2,551,470	6,421	251.7	245.6	257.9

Table 2 Comparison of 2015 overall CPRD incidence rate by Parkinson's cohort definition

Cohort	Year	N subjects	N person years	Parkinson's cases	Incidence rate per 100,000 person years	95% confidence interval	
1	2015	2,934,861	2,513,196	885	35.2	32.9	37.6
2	2015	2,934,861	2,513,196	840	33.4	31.2	35.8
3	2015	2,934,861	2,513,196	622	24.8	22.8	26.8
4	2015	2,934,861	2,513,196	615	24.5	22.6	26.5
5	2015	2,934,861	2,513,196	243	9.7	8.5	11.0

Overall, it seems likely that the Cohort 2 definition is the most reliable definition in terms of confidence in the classification of Parkinson's. However, it is perhaps a conservative estimate that may underestimate the prevalence and incidence of Parkinson's to some degree. Going forward, this paper primarily uses the Cohort 2 definition of prevalence and incidence although Section 11 compares rates and numbers for the Cohort 1 and Cohort 2 definitions.

2.3 Comparison of CPRD data to UK population

This section compares the age and gender distribution of the CPRD data to that of the UK population to consider how representative the CPRD data is likely to be. The UK population data is the Office of National Statistics population estimates for the UK for mid-2015⁴ and has been used to calculate the population estimates of prevalence and incidence discussed later in the report.

The CPRD population is people aged 20 or above. In the UK population data, 23.6% of the UK

⁴ Office of National Statistics population estimates for UK for mid-2015 available from <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/latest> (accessed 07/04/2017)

population are aged under 20 and so these have been excluded from the analysis in this report. Overall, the CPRD population in 2015 comprises 5.1% of the UK population aged 20 or above.

Table 3 compares the two populations. The CPRD population appears to be slightly older than the UK population as a whole which may suggest that young people are somewhat less likely than older people to register with a GP practice. There is also a very small difference with regard to gender as there are slightly more males in the CPRD population than in the UK population as a whole. The differences are relatively small and there is no evidence that the CPRD population is markedly different from the UK population as a whole in terms of age and gender. However, to get the most accurate population estimates, it is necessary to use age and gender-specific prevalence rates rather than the overall rates shown in Table 1 and Table 2. As the incidence and prevalence of Parkinson's is more common in men and increases markedly by age, applying the overall CPRD rates from Table 1 and Table 2 would over-estimate population numbers.

Table 3 Comparison of CPRD population with UK population by age and gender

Gender	Age	CPRD population			UK population	
		N	% of total	% of UK population	N	% of total
All	20-29	398,753	15.6%	4.6%	8,735,917	17.6%
All	30-39	424,020	16.6%	5.0%	8,460,461	17.0%
All	40-49	471,034	18.5%	5.3%	8,930,109	17.9%
All	50-54	244,505	9.6%	5.4%	4,565,337	9.2%
Female	55-59	105,418	4.1%	5.3%	2,000,046	4.0%
Male	55-59	107,060	4.2%	5.5%	1,950,616	3.9%
Female	60-64	92,268	3.6%	5.2%	1,787,098	3.6%
Male	60-64	90,868	3.6%	5.3%	1,714,621	3.4%
Female	65-69	96,793	3.8%	5.2%	1,859,641	3.7%
Male	65-69	92,335	3.6%	5.3%	1,754,948	3.5%
Female	70-74	75,414	3.0%	5.3%	1,428,791	2.9%
Male	70-74	68,778	2.7%	5.3%	1,296,372	2.6%
Female	75-79	60,822	2.4%	5.2%	1,170,205	2.4%
Male	75-79	51,606	2.0%	5.2%	991,844	2.0%
Female	80-84	48,544	1.9%	5.4%	904,614	1.8%
Male	80-84	36,600	1.4%	5.4%	678,895	1.4%
Female	85-89	33,203	1.3%	5.5%	602,891	1.2%
Male	85-89	20,527	0.8%	5.6%	366,700	0.7%
All	90+	32,922	1.3%	5.9%	556,266	1.1%
Female	All 20+	1,301,726	51.0%	5.1%	25,549,401	51.4%
Male	All 20+	1,249,744	49.0%	5.2%	24,205,971	48.6%
All	All 20+	2,551,470	100.0%	5.1%	49,755,372	100.0%

Table note: UK population data is the Office of National Statistics population estimates for UK for mid-2015.

3 The prevalence of Parkinson's in the UK

This section discusses the prevalence of Parkinson's based on the Cohort 2 definition: the presence of a definite Read code for Parkinson's within the CPRD data.

3.1 Prevalence rates

As Parkinson's is known to be more common in men and in older people, it is important to calculate age and gender-specific prevalence rates. Calculating rates, as opposed to numbers, enables the data to be standardised so different gender and age-groups can be compared. Another benefit of calculating rates is that these rates can then be applied to any population (where there is an age and gender breakdown of the population available) to estimate the numbers of people living with Parkinson's in a particular geographical area or by gender and age-group.

Age and gender-specific prevalence rates for the UK in 2015 are shown in Table 4. This analysis demonstrates that the prevalence of Parkinson's does increase with age and is also higher in men than in women. Parkinson's is rare in those aged under 40 as the prevalence rate is just one or two people in every 100,000 aged 20-29 and four or five people in every 100,000 aged 30-39. Prevalence increases sharply with age with the prevalence for those aged 80-84 being 1,696 per 100,000 people which is equivalent to around 1.7% of this age-group. From age 85 onwards prevalence rates seem to level off and even fall but this may be related to other factors such as a higher mortality rate in very old people and the difficulty in diagnosing Parkinson's in very elderly people where symptoms such as stiffness and slowness in movement may be attributed to ageing or other health concerns. Interestingly, prevalence rates almost double every five year interval between 50 and 69 years for both men and women.

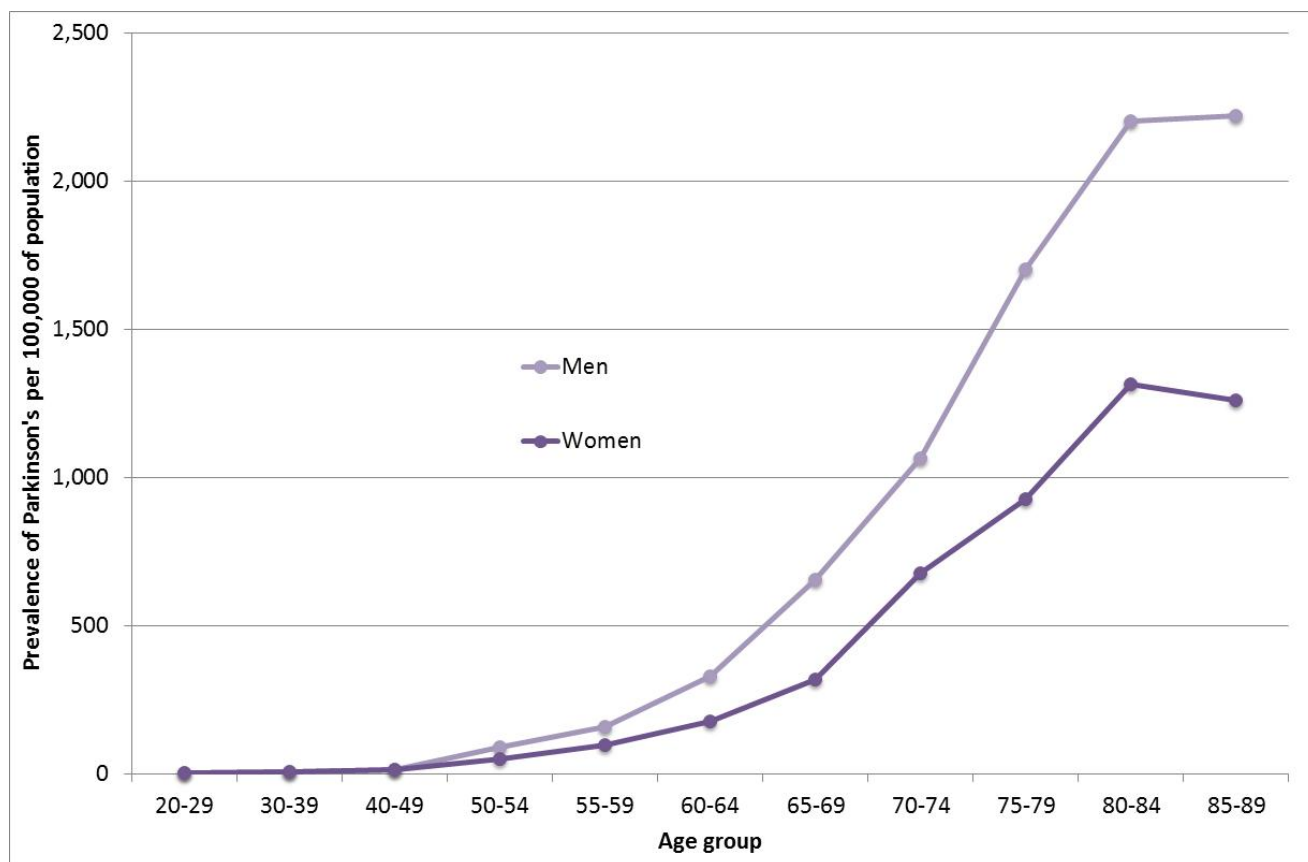
Table 4 shows prevalence rates split by gender (where numbers allow) which indicates significantly lower prevalence rates in women. Prevalence rates for men aged 50-89 were more than 1.5 times higher (1.58-2.06) than rates for women in the same age-group. Figure 1 summarises these differences by age and gender.

Table 4 UK 2015 prevalence rates of Parkinson's by age and gender

Gender	Age	CPRD population	Number with Parkinson's	Prevalence rate per 100,000	95% confidence interval	
All	20-29	398,753	7	1.8	0.7	3.6
All	30-39	424,020	19	4.5	2.7	7.0
All	40-49	471,034	67	14.2	11.0	18.1
All	50-54	244,505	160	65.4	55.7	76.4
All	55-59	212,478	272	128.0	113.3	144.2
All	60-64	183,136	464	253.4	230.8	277.5
All	65-69	189,128	912	482.2	451.4	514.6
All	70-74	144,192	1,243	862.0	814.8	911.3
All	75-79	112,428	1,442	1,282.6	1,217.2	1,350.5
All	80-84	85,144	1,444	1,696.0	1,609.6	1,785.7
All	85-89	53,730	874	1,626.7	1,520.6	1,738.2
All	90+	32,922	405	1,230.2	1,113.3	1,356.0
Female	50-54	81,937	40	48.8	34.9	66.5
Female	55-59	105,418	101	95.8	78.0	116.4
Female	60-64	92,268	164	177.7	151.6	207.1
Female	65-69	96,793	308	318.2	283.7	355.8
Female	70-74	75,414	510	676.3	618.8	737.6
Female	75-79	60,822	563	925.7	850.8	1,005.4
Female	80-84	48,544	638	1,314.3	1,214.3	1,420.3
Female	85-89	33,203	418	1,258.9	1,141.1	1,385.6
Male	50-54	84,670	75	88.6	69.7	111.0
Male	55-59	107,060	171	159.7	136.7	185.5
Male	60-64	90,868	300	330.1	293.8	369.7
Male	65-69	92,335	604	654.1	603.0	708.5
Male	70-74	68,778	733	1,065.7	990.0	1,145.8
Male	75-79	51,606	879	1,703.3	1,592.5	1,819.7
Male	80-84	36,600	806	2,202.2	2,052.8	2,359.6
Male	85-89	20,527	456	2,221.5	2,022.2	2,435.0

Table note: the number of people with Parkinson's is too small to be split by gender for those aged 20-49. The number of people aged 90+ is too small to reliably calculate prevalence rates by gender. Rates for age 50-54 split by gender are based on England rather than UK. 95% confidence intervals for rates are calculated using a Poisson distribution.

Figure 1 Prevalence rates (per 100,000) of Parkinson’s in UK by age and gender (2015)



To ensure that the prevalence rates calculated for 2015 seem reasonable, Table 5 and Table 6 compare the prevalence rates for each of the five years between 2011 and 2015. Generally, these prevalence rates are stable with only minor variations from year to year. To some extent, this is not surprising because many of the same people will appear in the data each year because Parkinson’s is a long-term progressive condition. The prevalence data will change each year only to the extent that newly diagnosed people will be added, people who have died will no longer appear in the data, and some people will move address in or out of CPRD GP practices areas.

The degree of overlap in the 95% confidence intervals across the different years suggests that the observed differences between the years reflect random variation in the data rather than statistically significant differences over time. While the 2011-2015 data could be aggregated to calculate average prevalence rates over this time period, this does involve some double-counting of people who appear in multiple years and such an approach does not seem necessary given that the differences between the years are minor and not statistically significant. It therefore seems appropriate to use the 2015 rates as being representative of prevalence rates calculated from the CPRD data.

Table 5 UK prevalence rates (per 100,000) of Parkinson's by age and year

Age	UK prevalence rate per 100,000 (95% confidence interval)				
	2011	2012	2013	2014	2015
20-29	1.5 (0.7-2.8)	0.7 (0.2-1.7)	0.5 (0.1-1.6)	0.8 (0.2-2.1)	1.8 (0.7-3.6)
30-39	4.4 (2.9-6.4)	5.2 (3.5-7.3)	4.4 (2.9-6.6)	4.6 (2.9-7.0)	4.5 (2.7-7.0)
40-49	19.5 (16.4-23.0)	20.7 (17.4-24.3)	20.8 (17.4-24.6)	20.7 (17.1-24.8)	14.2 (11.0-18.1)
50-54	60.2 (52.1-69.2)	59.8 (51.7-68.9)	57.3 (49.2-66.4)	59.3 (50.6-68.9)	65.4 (55.7-76.4)
55-59	131.4 (118.3-145.4)	130.7 (117.6-144.8)	134.4 (120.8-149.1)	128.2 (114.4-143.3)	128.0 (113.3-144.2)
60-64	248.2 (230.3-267.1)	246.5 (228.0-266.2)	247.1 (227.8-267.7)	254.0 (233.2-276.3)	253.4 (230.8-277.5)
65-69	481.0 (454.0-509.2)	498.4 (471.2-526.6)	475.5 (448.5-503.6)	483.3 (454.7-513.3)	482.2 (451.4-514.6)
70-74	850.7 (809.4-893.6)	854.7 (813.1-898.0)	875.5 (832.5-920.2)	839.9 (796.4-885.1)	862.0 (814.8-911.3)
75-79	1325.3 (1268.7-1383.7)	1318.8 (1261.9-1377.8)	1325.7 (1267.2-1386.1)	1341.4 (1279.8-1405.3)	1282.6 (1217.2-1350.5)
80-84	1674.7 (1601.8-1750.0)	1690.9 (1617.3-1767.1)	1680.1 (1604.2-1758.6)	1712.0 (1631.9-1795.1)	1696.0 (1609.6-1785.7)
85-89	1673.0 (1581.6-1768.3)	1669.3 (1576.4-1766.3)	1701.7 (1605.1-1802.7)	1691.2 (1590.7-1796.5)	1626.7 (1520.6-1738.2)
90+	1317.0 (1211.4-1429.3)	1307.4 (1202.9-1418.6)	1258.7 (1153.6-1371)	1234.2 (1126.1-1350)	1230.2 (1113.3-1356)
All 20+	275.8 (270.4-281.2)	280.0 (274.5-285.5)	282.0 (276.3-287.7)	288.3 (282.2-294.4)	286.5 (279.9-293.1)

Table note: 95% confidence intervals for rates are calculated using a Poisson distribution.

Table 6 UK prevalence rates (per 100,000) of Parkinson's by age, gender and year

Age and gender		UK prevalence rate per 100,000 (95% confidence interval)				
		2011	2012	2013	2014	2015
50-54	Female	57.2 (44.6-72.3)	50.7 (38.8-65.1)	47.3 (35.6-61.8)	57.8 (43.9-74.8)	48.8 (34.9-66.5)
55-59	Female	97.2 (81.6-114.9)	98.7 (82.8-116.6)	101.6 (85.1-120.3)	90.1 (73.9-108.8)	95.8 (78.0-116.4)
60-64	Female	172.8 (152.0-195.7)	165.9 (144.8-189.2)	169.8 (147.5-194.4)	189.7 (164.7-217.5)	177.7 (151.6-207.1)
65-69	Female	357.5 (325.2-392.1)	375.0 (342.3-409.9)	342.2 (310.5-376.2)	324.1 (291.7-359.1)	318.2 (283.7-355.8)
70-74	Female	649.0 (599.5-701.5)	664.8 (614.5-718.2)	689.8 (637.5-745.2)	660.3 (607.4-716.6)	676.3 (618.8-737.6)
75-79	Female	1030.3 (963.2-1100.8)	1012.3 (945.0-1083.2)	1011.1 (942.1-1083.7)	1028.4 (955.6-1105.4)	925.7 (850.8-1005.4)
80-84	Female	1287.5 (1204.6-1374.7)	1287.1 (1203.2-1375.2)	1340.0 (1251.2-1433.3)	1306.3 (1214.3-1403.5)	1314.3 (1214.3-1420.3)
85-89	Female	1391.5 (1287.7-1501.4)	1384.5 (1278.8-1496.6)	1354.0 (1245.9-1469.1)	1343.2 (1230.4-1463.5)	1258.9 (1141.1-1385.6)
50-54	Male	66.9 (53.4-82.7)	72.9 (58.7-89.5)	69.1 (54.9-85.9)	71.7 (56.3-90.0)	88.6 (69.7-111.0)
55-59	Male	165.2 (144.8-187.8)	162.5 (142.1-185.1)	167.0 (145.7-190.5)	165.7 (143.6-190.2)	159.7 (136.7-185.5)
60-64	Male	324.6 (295.6-355.6)	328.5 (298.3-361.0)	325.9 (294.5-359.8)	319.5 (286.5-355.3)	330.1 (293.8-369.7)
65-69	Male	610.1 (566.8-656.0)	627.2 (583.9-672.9)	615.1 (571.3-661.3)	650.5 (603.1-700.6)	654.1 (603.0-708.5)
70-74	Male	1073.4 (1006.3-1143.8)	1065.1 (997.9-1135.7)	1081.2 (1012.1-1153.8)	1036.8 (967.1-1110.2)	1065.7 (990.0-1145.8)
75-79	Male	1679.6 (1585.5-1777.9)	1683.0 (1588.1-1782.1)	1697.7 (1600.3-1799.5)	1710.5 (1608.2-1817.7)	1703.3 (1592.5-1819.7)
80-84	Male	2223.7 (2093.6-2359.7)	2250.8 (2120.1-2387.6)	2143.2 (2012.1-2280.7)	2253.8 (2113.9-2400.6)	2202.2 (2052.8-2359.6)
85-89	Male	2170.5 (1998.4-2353.4)	2162.3 (1988.7-2347.0)	2288.3 (2105.6-2482.5)	2267.9 (2079.2-2469.0)	2221.5 (2022.2-2435.0)

Table note: the number of people with Parkinson's is too small to be split by gender for those aged 20-49. The number of people aged 90+ is too small to reliably calculate prevalence rates by gender. Rates for age 50-54 split by gender are based on England rather than UK. 95% confidence intervals for rates are calculated using a Poisson distribution.

3.2 Prevalence numbers

In this section, the age and gender-specific prevalence rates shown in Table 4 are applied to population data to estimate the number of people living with Parkinson's.

These estimates suggest that in 2015, there were around 137,000 people living with Parkinson's in the UK (Table 7). Overall, 57.7% of these people were men. There were around 1,800 people in the UK aged under 50 living with Parkinson's which is 1.3% of those with Parkinson's.

Table 7 Estimated prevalence numbers of people with Parkinson’s in 2015 in UK countries by age and gender

Age	Gender	UK	England	Northern Ireland	Scotland	Wales
20-29	All	153	129	4	13	7
30-39	All	379	323	11	30	16
40-49	All	1,270	1,070	36	106	57
50-54	All	3,124	2,609	88	276	150
50-54	Female	1,129	941	32	102	55
50-54	Male	1,995	1,668	56	175	95
55-59	All	5,032	4,177	143	461	251
55-59	Female	1,916	1,587	54	178	97
55-59	Male	3,116	2,590	89	283	154
60-64	All	8,837	7,331	241	799	466
60-64	Female	3,176	2,634	85	289	168
60-64	Male	5,661	4,697	157	509	298
65-69	All	17,397	14,521	427	1,505	944
65-69	Female	5,917	4,940	146	514	318
65-69	Male	11,480	9,582	281	991	626
70-74	All	23,479	19,553	635	1,991	1,299
70-74	Female	9,662	8,030	264	841	528
70-74	Male	13,816	11,523	371	1,150	771
75-79	All	27,726	23,162	699	2,379	1,486
75-79	Female	10,832	9,010	279	971	572
75-79	Male	16,894	14,152	420	1,409	913
80-84	All	26,840	22,506	654	2,254	1,425
80-84	Female	11,889	9,919	301	1,042	627
80-84	Male	14,951	12,587	353	1,212	798
85-89	All	15,736	13,334	368	1,218	816
85-89	Female	7,590	6,395	187	615	392
85-89	Male	8,146	6,939	181	603	424
90+	All	6,843	5,843	153	490	358
All 20+	Female	57,854	48,338	1,485	4,978	3,053
All 20+	Male	78,963	66,222	1,975	6,544	4,222
All 20+	All	136,816	114,560	3,460	11,522	7,275

Table note: numbers may not always sum to totals because of rounding.

Age and gender-specific rates have been discussed in Section 3.1 but to calculate the percentage of the UK population as a whole living with Parkinson’s it is necessary to adjust for the slight difference between the CPRD population and the UK population as a whole. Therefore, Table 8 summarises the estimated overall prevalence rates for each country and for each gender both as a rate per 100,000 of the population and as a percentage of the UK population in 2015. The differences between the countries of the UK shown in Table 8 reflect differences in the age and gender distribution of people within each country. For example, Wales generally has an older population than England and Northern Ireland has a younger population than England.

These overall figures are similar to the 1 in 500 figures that Parkinson’s UK has previously quoted as a broad measure of prevalence. For example, for the UK as a whole (all ages) in 2015 we can say that around 2 in 1,000 people live with Parkinson’s. More specifically, this equates to 18 in every 10,000 females and 25 in every 10,000 males in the UK. As a percentage of the adult population, around 3 in every 1,000 people live with Parkinson’s. More specifically, 22 in every 10,000 women and 32 in every 10,000 men have been diagnosed with Parkinson’s.

Table 8 Overall prevalence rates of Parkinson’s in 2015 by country

Age	Gender	UK	England	Northern Ireland	Scotland	Wales
<i>Rate per 100,000 population</i>						
All	Female	175.1	174.1	157.6	180.2	194.0
All	Male	246.2	245.0	217.2	250.7	276.8
All	All	210.1	209.1	186.9	214.4	234.7
Adults (18+)	Female	219.8	219.1	203.2	220.4	240.9
Adults (18+)	Male	315.6	314.6	287.6	314.2	350.8
Adults (18+)	All	266.5	265.7	244.1	265.4	294.4
All 20+	Female	226.4	225.7	209.9	226.7	248.3
All 20+	Male	326.2	325.2	298.5	324.4	363.1
All 20+	All	275.0	274.2	252.7	273.5	304.1
<i>As percentage of population</i>						
All	Female	0.175%	0.174%	0.158%	0.180%	0.194%
All	Male	0.246%	0.245%	0.217%	0.251%	0.277%
All	All	0.210%	0.209%	0.187%	0.214%	0.235%
Adults (18+)	Female	0.220%	0.219%	0.203%	0.220%	0.241%
Adults (18+)	Male	0.316%	0.315%	0.288%	0.314%	0.351%
Adults (18+)	All	0.266%	0.266%	0.244%	0.265%	0.294%
All 20+	Female	0.226%	0.226%	0.210%	0.227%	0.248%
All 20+	Male	0.326%	0.325%	0.299%	0.324%	0.363%
All 20+	All	0.275%	0.274%	0.253%	0.273%	0.304%

It has only been possible to estimate prevalence for those aged 20 or over and so Table 8 includes values for those aged 20 or above. However, the prevalence of Parkinson’s in people aged under 20 is so small that it is unlikely to markedly affect the results for the whole population or for all adults.

4 The incidence of Parkinson's in the UK

This section discusses incidence rates for Parkinson's (new diagnoses per year) based on the Cohort 2 definition: the presence of a definite Read code for Parkinson's within the CPRD data.

4.1 Incidence rates

As with prevalence, it is important to calculate age and gender-specific incidence rates as Parkinson's is known to be more common in men and in older people. However, calculating age and gender-specific rates for incidence is more difficult than for prevalence because the incidence of Parkinson's is much lower than the prevalence and so numbers of people identified in the CPRD data are small. For example, the age and gender-specific prevalence rates shown in Table 4 are around 7-8 times higher than the equivalent incidence rates discussed in this section. Furthermore, it is not possible to properly estimate incidence rates for those aged 20-44 from this data source as data was not supplied due to the CPRD small cell policy.

Age-specific incidence rates for the UK as a whole are shown in Table 9. These have been calculated by combining data for five years (2011-2015) to obtain more reliable estimates. This decision was taken because incidence rates calculated for each individual year (shown in Table 10) tend to vary much more than did the equivalent prevalence rates (shown in Table 5) and have much wider 95% confidence intervals reflecting the greater uncertainty around these estimates. Unlike the prevalence data, individuals with Parkinson's will only appear as a new diagnosis in a single year and so there is no double-counting of people resulting from combining the 2011-2015 data. Combining the years allows random fluctuations in the incidence rates to be evened out.

Table 9 UK incidence rates (per 100,000 per year) of Parkinson's by age-group (2011-2015)

Gender	Age	CPRD person years	New diagnosis of Parkinson's	Incidence rate per 100,000	95% confidence interval	
All	45-49	1,581,621.0	64	4.0	3.1	5.2
All	50-54	1,477,500.0	134	9.1	7.6	10.7
All	55-59	1,274,136.0	232	18.2	15.9	20.7
All	60-64	1,187,402.0	398	33.5	30.3	37.0
All	65-69	1,145,651.0	714	62.3	57.8	67.1
All	70-74	854,772.2	969	113.4	106.3	120.7
All	75-79	695,556.9	1,207	173.5	163.9	183.6
All	80-84	527,890.2	1,032	195.5	183.7	207.8
All	85-89	330,044.7	615	186.3	171.9	201.7
All	90-94	155,488.3	179	115.1	98.9	133.3

Table notes: Rates have been calculated by combining data for 2011-2015. The incidence of Parkinson's is too small to estimate incidence for those aged under 45 and those aged 95 or over. 95% confidence intervals for rates are calculated using a Poisson distribution.

Table 10 UK incidence rates (per 100,000 per year) of Parkinson's by age-group and year

Age-group	UK incidence rate per 100,000 per year (95% confidence interval)				
	2011	2012	2013	2014	2015
45-49	5.0 (2.9-7.8)	5.7 (3.5-8.7)	3.0 (1.5-5.6)	3.4 (1.6-6.3)	2.5 (0.9-5.4)
50-54	9.0 (6.0-12.9)	7.5 (4.8-11.1)	9.7 (6.6-13.9)	9.2 (6.0-13.4)	10.4 (6.7-15.3)
55-59	19.6 (14.7-25.5)	18.4 (13.7-24.2)	21.6 (16.4-28.0)	14.5 (10.1-20.1)	16.2 (11.2-22.6)
60-64	29.6 (23.6-36.6)	34.8 (28.1-42.7)	37.1 (29.8-45.5)	41.8 (33.6-51.4)	23.2 (16.7-31.4)
65-69	61.5 (52.1-72.2)	70.9 (60.9-82.1)	57.2 (48.1-67.5)	61.5 (51.5-72.8)	59.4 (48.9-71.5)
70-74	108.4 (93.9-124.5)	108.7 (94.2-124.9)	122.8 (107.0-140.3)	110.8 (95.4-128.0)	117.0 (99.9-136.2)
75-79	171.9 (151.8-193.8)	186.1 (165.0-209.0)	174.8 (154.0-197.7)	183.6 (161.3-208.2)	144.9 (123.4-169.1)
80-84	205.5 (180.4-233.1)	190.1 (165.9-216.8)	190.1 (165.2-217.8)	188.2 (162.3-217.2)	204.7 (175.2-237.6)
85-89	178.5 (149.4-211.5)	181.6 (151.8-215.5)	188.5 (157.2-224.1)	219.3 (184.1-259.2)	162.3 (129.8-200.5)
90-94	102.5 (71.0-143.3)	134.2 (98.3-179.1)	142.3 (104.6-189.3)	82.4 (53.3-121.7)	109.3 (72.0-159.0)
All 20+	33.8 (31.9-35.7)	35.5 (33.6-37.5)	35.6 (33.6-37.7)	36.3 (34.2-38.5)	33.4 (31.2-35.8)

Table notes: The incidence of Parkinson's is too small to estimate incidence for those aged under 45 and those aged 95 or over. 95% confidence intervals for rates are calculated using a Poisson distribution.

The age-specific incidence rates shown in Table 9 confirm that the yearly incidence of Parkinson's increases with age from a low 4 cases per 100,000 in the 45-49 age-group rising to 196 cases per 100,000 people in the 80-84 age-group. Interestingly, for the 45-69 age-groups, the incidence rate almost doubles every 5 years. The incidence rate in the 85-89 age-group was slightly lower than for the 80-84 year old age-group (although still higher than for the 75-79 year old age-group). This is likely to be related to the higher proportion of women in the 85-89 age-group which demonstrates the need to take account of gender and age.

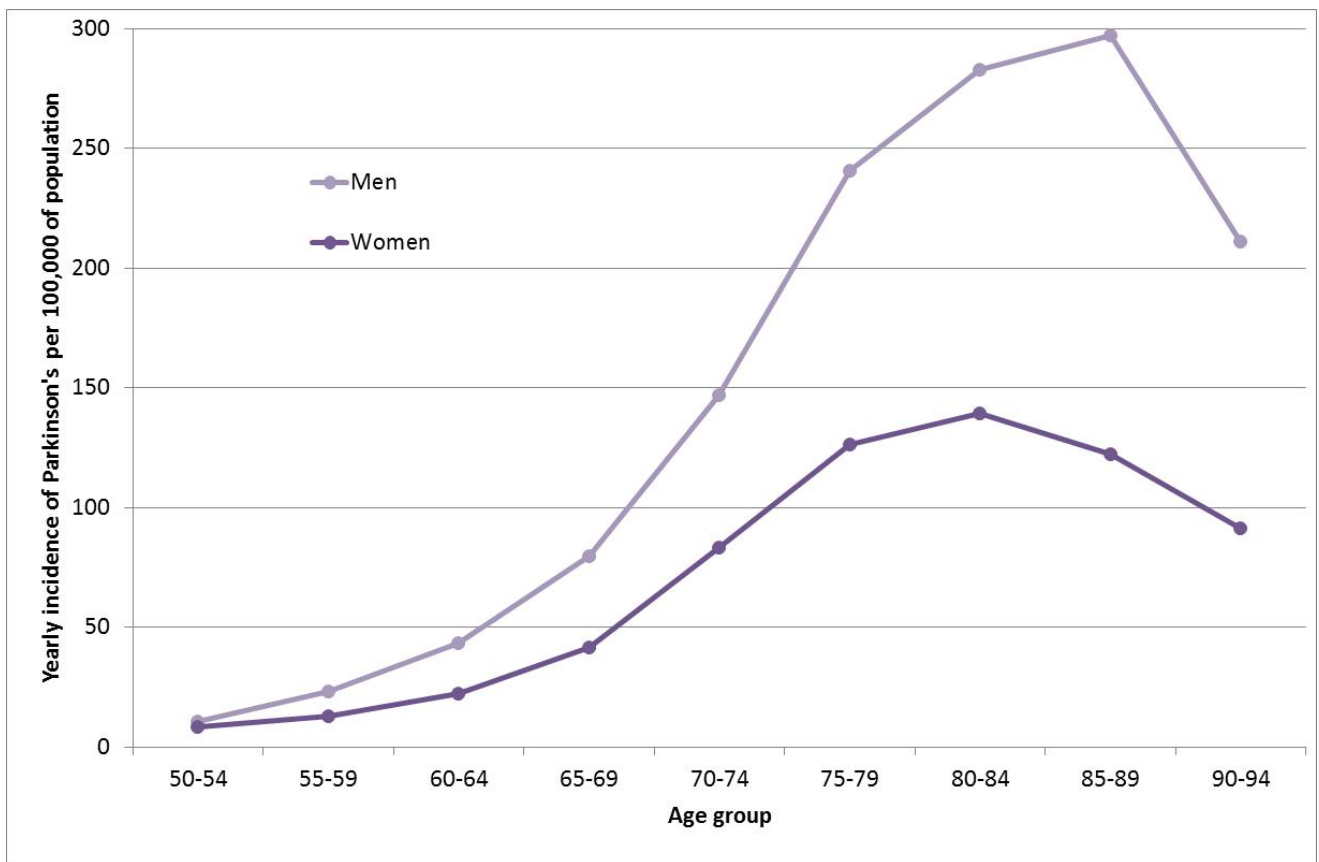
It is possible to estimate age and gender-specific incidence rates for those aged 50-94 in England and these are shown in Table 11 using combined data for 2011-2015 to obtain more reliable estimates. As seen with prevalence, the incidence of Parkinson's was higher in men than in women. Incidence rates for men aged 50-94 were between 1.3 and 2.4 times higher for men than for women in the same age-group. The incidence rate for the 85-89 age-group continued to rise in men but this trend was not seen in women. The incidence rate for the 90-94 age-group was lower in both men and women than for the 75-89 age range. It is possible that other factors such as a higher mortality rate in very old people and the difficulty in diagnosing Parkinson's in very elderly people where symptoms such as stiffness and slowness in movement may be attributed to ageing or other health concerns affect these trends. The trends are summarised graphically in Figure 2.

Table 11 Incidence rates (per 100,000 per year) of Parkinson's by age and gender for England (2011-2015)

Gender	Age	CPRD person years	New diagnosis of Parkinson's	Incidence rate per 100,000	95% confidence interval	
Female	50-54	414,373.7	35	8.4	5.9	11.7
Female	55-59	459,654.1	59	12.8	9.8	16.6
Female	60-64	434,755.5	97	22.3	18.1	27.2
Female	65-69	427,677.2	177	41.4	35.5	48.0
Female	70-74	323,872.9	270	83.4	73.7	93.9
Female	75-79	276,986.8	350	126.4	113.5	140.3
Female	80-84	227,260.6	317	139.5	124.6	155.7
Female	85-89	156,006.3	191	122.4	105.7	141.1
Female	90-94	83,114.5	76	91.4	72.0	114.5
Male	50-54	552,265.7	58	10.5	8.0	13.6
Male	55-59	467,625.6	108	23.1	18.9	27.9
Male	60-64	428,323.1	185	43.2	37.2	49.9
Male	65-69	410,300.1	327	79.7	71.3	88.8
Male	70-74	295,228.0	434	147.0	133.5	161.5
Male	75-79	233,910.2	563	240.7	221.2	261.4
Male	80-84	166,440.4	471	283.0	258.0	309.7
Male	85-89	92,428.0	275	297.5	263.4	334.9
Male	90-94	36,456.1	77	211.2	166.7	264.0

Table notes: Rates have been calculated by combining data for 2011-2015 except for female aged 50-54 where data was not available for 2012 and so only four years of data have been used. The incidence of Parkinson's is too small to estimate incidence by gender for those aged under 50 and those aged 95 or over. 95% confidence intervals for rates are calculated using a Poisson distribution.

Figure 2 UK incidence of Parkinson's (per 100,000 per year) by age and gender (2011-2015)



Age-specific rates for England are shown in Table 12 to compare with those for the UK as a whole. These two sets of rates are very similar which suggests that the age-and gender-specific rates for England shown in Table 11 are reasonable to apply to other geographical areas in the UK.

Table 12 Comparison of incidence rates (per 100,000 per year) of Parkinson’s by age for England and UK (2011-2015)

Country	Age	CPRD person years	New diagnosis of Parkinson’s	Incidence rate per 100,000	95% confidence interval	
England	50-54	966,639.4	93	9.6	7.8	11.8
England	55-59	927,279.8	167	18.0	15.4	21.0
England	60-64	863,078.6	282	32.7	29.0	36.7
England	65-69	837,977.3	504	60.1	55.0	65.6
England	70-74	619,100.9	704	113.7	105.5	122.4
England	75-79	510,897.0	913	178.7	167.3	190.7
England	80-84	393,701.0	788	200.2	186.4	214.6
England	85-89	248,434.3	466	187.6	170.9	205.4
England	90-94	119,570.6	153	128.0	108.5	149.9
England	All 20+	11,852,778.0	4,174	35.2	34.2	36.3
UK	50-54	1,477,500.0	134	9.1	7.6	10.7
UK	55-59	1,274,136.0	232	18.2	15.9	20.7
UK	60-64	1,187,402.0	398	33.5	30.3	37.0
UK	65-69	1,145,651.0	714	62.3	57.8	67.1
UK	70-74	854,772.2	969	113.4	106.3	120.7
UK	75-79	695,556.9	1,207	173.5	163.9	183.6
UK	80-84	527,890.2	1,032	195.5	183.7	207.8
UK	85-89	330,044.7	615	186.3	171.9	201.7
UK	90-94	155,488.3	179	115.1	98.9	133.3
UK	All 20+	16,051,520.0	5,610	34.9	34.0	35.9

Table notes: Rates have been calculated by combining data for 2011-2015. The incidence of Parkinson’s is too small to estimate incidence for those aged under 50 and those aged 95 or over by country. 95% confidence intervals for rates are calculated using a Poisson distribution.

4.2 Incidence numbers

In this section, the age and gender-specific incidence rates shown in Table 9 and Table 11 are applied to population data to estimate the number of new diagnoses of Parkinson’s each year (based on incidence rates for the period 2011-2015). The age and gender-specific incidence rates for England from Table 11 are used for those aged 50-94 whereas the UK age-specific rate from Table 9 is used for those aged 45-49. These incidence numbers are shown in Table 13.

Incidence cannot be properly estimated for those aged under 45 from the CPRD data which means that the overall incidence numbers will be too low although not by a large extent because new diagnoses of Parkinson’s per year are rare in those aged under 45. For example, because of the CPRD small cell policy, we know that there were fewer than 5 people (0-4) newly diagnosed with Parkinson’s in 2015 in the age-groups 20-24, 25-29, 30-34, 35-39 and 40-44 in the CPRD data. This was the same in 2013 and 2014 too. It is possible to calculate a very crude estimation from this data: if there were 4 people (the maximum possible) in each of these 5 age-groups with a new diagnosis of Parkinson’s, this would translate into around 2 new diagnoses of Parkinson’s in 2015

for every 100,000 people aged 20-44⁵. Of course, the true incidence rate would be less than 2 people per 100,000 if the numbers were 0-3 in each age-group instead of 4 so this very crude rate of 2 people per 100,000 is a likely maximum of the extent to which the current incidence numbers may underestimate the true incidence in the UK population as a whole. It is probably more realistic to think that the true incidence rate is around half of these estimates. These possible maximum numbers are shown at the bottom of Table 13 to give a very rough indication of the maximum incidence numbers of people under aged 45 but are not included in the overall incidence numbers because of how uncertain these estimates are.

The age and gender-specific incidence rates for those aged 90-94 have been applied to those aged 90 or above in the population data as the population data is not routinely split further by age after the age of 90 because of small numbers. The trend in Figure 2 suggests that incidence rates may be falling after the age of 90 but it is unclear whether this trend would continue after the age of 94. Therefore, applying the rate for 90-94 year olds does not seem an unreasonable assumption for the 95+ age-group and such an assumption is unlikely to make a large difference to incidence numbers anyway because relatively few people are aged 95 or over. According to population estimates by the Office for National Statistics, 15.9% of men and 23.0% of women in the 90 or over category in the UK are actually aged 95 or over⁶. This 95+ age-group (made up of around 25,950 men and 90,260 women) is equivalent to 0.18% of the full UK population or 0.23% of the adult UK population.

In summary, the incidence numbers suggest that each year, there are around 17,300 new diagnoses of Parkinson's in the UK for people aged 45 or over (Table 13). Overall, 61.0% of these people were men.

⁵ This assumes that the value of person years (used for the denominator) is equal to 90% of the number of persons which is the average across 2011-2015. The denominator is also not supplied as part of the CPRD small cell policy but the number of persons is available from the prevalence data.

⁶ Data was obtained from the Office for National Statistics at: <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/ageing/datasets/midyearpopulationestimatesoftheveryoldincludingcentenariansunitedkingdom> (date accessed 20 April 2017).

Table 13 Estimated numbers of new diagnoses of Parkinson’s per year in UK countries by age and gender

Age	Gender	UK	England	Northern Ireland	Scotland	Wales
45-49	All	187	157	5	16	9
50-54	All	432	361	12	38	21
50-54	Female	195	163	6	18	9
50-54	Male	237	198	7	21	11
55-59	All	707	587	20	65	35
55-59	Female	257	213	7	24	13
55-59	Male	451	375	13	41	22
60-64	All	1,139	945	31	103	60
60-64	Female	399	331	11	36	21
60-64	Male	741	614	20	67	39
65-69	All	2,168	1,810	53	188	118
65-69	Female	770	642	19	67	41
65-69	Male	1,399	1,167	34	121	76
70-74	All	3,097	2,579	84	262	171
70-74	Female	1,191	990	32	104	65
70-74	Male	1,906	1,589	51	159	106
75-79	All	3,866	3,230	97	332	207
75-79	Female	1,479	1,230	38	133	78
75-79	Male	2,387	2,000	59	199	129
80-84	All	3,183	2,670	77	266	169
80-84	Female	1,262	1,053	32	111	67
80-84	Male	1,921	1,617	45	156	103
85-89	All	1,829	1,551	42	141	95
85-89	Female	738	622	18	60	38
85-89	Male	1,091	929	24	81	57
90+	All	705	602	16	50	36
90+	Female	359	306	8	26	19
90+	Male	345	296	7	24	17
All 20+	Female	6,744	5,629	174	585	356
All 20+	Male	10,569	8,865	264	875	565
All 20+	All	17,314	14,493	438	1,460	922
<i>Maximum possible extra numbers (not included in above)</i>						
20-44	All	430	364	12	35	19

Table note: numbers will not always sum to totals because of rounding. The incidence rate for the 90-94 age-group has been applied to all people aged 90 or over as this is the way the population data is grouped. It is not possible to formally estimate incidence for those aged 20-44 from the CPRD data so the estimates for 20-44 year olds are very approximate and could be substantially less than the maximum quoted (see text for further explanation).

Age and gender-specific rates have been discussed in Section 4.1 but to calculate overall incidence rates, it is necessary to adjust for the slight difference between the CPRD population and the UK population as a whole. Therefore, Table 14 summarises the estimated overall incidence of Parkinson’s for each country and for each gender both as a rate per 100,000 of the population and as a percentage of the UK population numbers in 2015. The differences between the countries of

the UK reflect differences in the age and gender distribution of people within each country. For example, Wales generally has an older population than England and Northern Ireland has a younger population than England.

Table 14 Estimated overall incidence rates of Parkinson’s by country

Age	Gender	UK	England	Northern Ireland	Scotland	Wales
<i>As rate per 100,000 of population</i>						
All	Female	20.4	20.3	18.5	21.2	22.6
All	Male	33.0	32.8	29.0	33.5	37.0
All	All	26.6	26.5	23.7	27.2	29.8
Adults (18+)	Female	25.6	25.5	23.8	25.9	28.1
Adults (18+)	Male	42.2	42.1	38.4	42.0	46.9
Adults (18+)	All	33.7	33.6	30.9	33.6	37.3
All 20+	Female	26.4	26.3	24.6	26.6	29.0
All 20+	Male	43.7	43.5	39.9	43.4	48.6
All 20+	All	34.8	34.7	32.0	34.7	38.5
All 45+	Female	45.5	45.6	43.6	44.7	47.1
All 45+	Male	78.6	78.8	73.1	75.7	82.6
All 45+	All	61.3	61.4	57.6	59.3	64.0
<i>As percentage of population</i>						
All	Female	0.0204%	0.0203%	0.0185%	0.0212%	0.0226%
All	Male	0.0330%	0.0328%	0.0290%	0.0335%	0.0370%
All	All	0.0266%	0.0265%	0.0237%	0.0272%	0.0298%
Adults (18+)	Female	0.0256%	0.0255%	0.0238%	0.0259%	0.0281%
Adults (18+)	Male	0.0422%	0.0421%	0.0384%	0.0420%	0.0469%
Adults (18+)	All	0.0337%	0.0336%	0.0309%	0.0336%	0.0373%
All 20+	Female	0.0264%	0.0263%	0.0246%	0.0266%	0.0290%
All 20+	Male	0.0437%	0.0435%	0.0399%	0.0434%	0.0486%
All 20+	All	0.0348%	0.0347%	0.0320%	0.0347%	0.0385%
All 45+	Female	0.0455%	0.0456%	0.0436%	0.0447%	0.0471%
All 45+	Male	0.0786%	0.0788%	0.0731%	0.0757%	0.0826%
All 45+	All	0.0613%	0.0614%	0.0576%	0.0593%	0.0640%

In Section 3.2, it was discussed how the overall prevalence figures suggest that around 22 in every 10,000 women and 32 in every 10,000 men live with Parkinson’s in the UK. The overall incidence figures in Table 14 suggest that around 3 in every 10,000 women and 4 in every 10,000 men will be new diagnoses of Parkinson’s each year. As it has only been possible to properly estimate incidence for those aged 45 or over, Table 14 includes figures for those aged 45 or above. However, the incidence of Parkinson’s in people aged under 45 is small so it is unlikely to markedly affect the results calculated for the whole population or for all adults. For example, if we add in the estimated maximum incidence number of 20-44 year olds from Table 13 and recalculate the incidence of Parkinson’s as a percentage of the population aged 20+, it changes from 0.0348% to 0.0357%.

4.3 Lifetime risk of Parkinson's

A lifetime risk of being diagnosed with Parkinson's can be calculated by using the age and gender-specific incidence rates (from Table 9 and Table 10), the age and gender distribution of the UK population in 2015, and UK age and gender-specific mortality rates for 2013-2015⁷. There are different ways of calculating lifetime risk; the method used here is the current probability method which is suitable for conditions where a person will only be diagnosed once in their life. This method takes account of the competing risk of death and so provides an excellent estimate of lifetime risk⁸.

Basically, this method calculates the total number of new diagnoses of Parkinson's in a hypothetical population that mirrors the age, gender and life expectancy of the UK population in 2015. Therefore, this lifetime risk applies to the UK population as a whole (in terms of age, gender and life expectancy) in 2015. This means that changes to the UK population over time (in terms of age, gender, life expectancy) would change the lifetime risk. It also means that the lifetime risk would be different for different populations and so it is not straightforward to compare different countries for example.

For the UK in 2015, the lifetime risk of being diagnosed with Parkinson's was 2.7%⁹. This is equivalent to 1 in every 37 people being diagnosed with Parkinson's at some point in their life. The lifetime risk was 3.4% for males and 2.1% for females which is equivalent to 1 in every 29 males and 1 in every 48 females.

This lifetime risk should not be interpreted as an individual probability as the probability for an individual person will depend on their age, gender and time of death and so could be higher or lower than 2.7%. For example, if a person died at 30 their lifetime risk of Parkinson's would be negligible whereas for a person who lives to 100 it would be much higher. Therefore, while it is appropriate to refer to this lifetime risk as equivalent to 1 in 37 people being diagnosed with Parkinson's at some point in their life, it would not be appropriate to say that an individual person has a 2.7% chance of being diagnosed with Parkinson's in their lifetime.

⁷ Data on mortality rates for the period 2013-2015 was obtained from:

<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/datasets/nationallifetablesenglandreferencetables> (accessed 22/08/2017).

⁸ Sasieni PD, Shelton J, Ormiston-Smith N, Thomson CS, Silcocks PB. What is the lifetime risk of developing cancer?: the effect of adjusting for multiple primaries. *Br J Cancer*. 2011 Jul 26;105(3):460-5. Epub 2011 Jul 19.

⁹ A number of assumptions have been made for this calculation. It is assumed that the incidence rate for 90-94 year-olds applies for those aged 95 or over and that the incidence in those aged under 45 is very low (approximately half of that estimated as the maximum in Table 13). It is also assumed that the incidence rate for a 5-year age-band applies equally to all 5 years within that band. As mortality rates are calculated for each year for the ages 0-100+ and the UK population data is broken down by age for each year from 0-90+, data on the population aged 90-100+ is taken from the estimates of the very old (see Section 12 for further details).

5 Predicting future prevalence and incidence numbers

Even if prevalence and incidence rates do not change, the prevalence and incidence numbers will vary over time because of changes in the UK population. In particular, as Parkinson's is more common in older people and as the UK population is increasingly ageing (as life expectancy increases), the incidence and prevalence of Parkinson's is likely to increase over time. This increase could impact on associated health and social care services for people with Parkinson's.

A 2007 paper¹⁰ sought to predict the future prevalence of Parkinson's and concluded that the number of people living with Parkinson's in the world's most populous nations would more than double between 2005 and 2030. The largest increases were predicted in countries such as China and India. For the UK, the prediction was that the number of people living with Parkinson's would increase by 44.4% in the 25 years between 2005 and 2030. In the USA, numbers were expected to increase by 79.4% between 2005 and 2030. A 2011 paper¹¹ predicted that the prevalence of Parkinson's would increase in Europe by 40.7% between 2010 and 2030 and by 82.6% between 2010 and 2050. In the USA, the prevalence of Parkinson's was predicted to increase 66.4% between 2010 and 2030 and by 125.6% between 2010 and 2050. A 2017 paper¹² sought to predict the future prevalence of Parkinson's in the USA taking account of both an ageing population and a decrease in smoking. This predicted a 56.0% increase in the number of people living with Parkinson's in the USA in the 35 years between 2005 and 2040.

This section predicts incidence and prevalence numbers for the UK into the future by applying the age and gender-specific prevalence and incidence rates calculated here to projected population numbers calculated by the Office for National Statistics¹³. These projected population numbers are based on complex assumptions about future fertility rates, mortality rates, and migration rates.

It is assumed here that the prevalence rates and incidence rates stay the same over time but the UK population changes. It is of course possible that prevalence and incidence rates will change over time too. For example, changes in life expectancy (for people with and without Parkinson's) would change prevalence and incidence rates to some degree. Similarly, changes in the ways in which Parkinson's is diagnosed (for example, changes in the diagnostic methods used or diagnosing Parkinson's at an earlier stage) will affect both incidence and prevalence rates. However, analysis of the CPRD data (such as that shown in Table 5) suggests that it is unlikely that the rates will change markedly in the short term (under 5 years).

There is then some uncertainty about these projections, particularly into the long term. However,

¹⁰ Dorsey ER, Constantinescu R, Thompson JP, Biglan KM, Holloway RG, Kieburtz K, Marshall FJ, Ravina BM, Schifitto G, Siderowf A, Tanner CM. Projected number of people with Parkinson disease in the most populous nations, 2005 through 2030. *Neurology*. 2007 Jan 30;68(5):384-6. Epub 2006 Nov 2.

¹¹ Bach JP, Ziegler U, Deuschl G, Dodel R, Doblhammer-Reiter G. Projected numbers of people with movement disorders in the years 2030 and 2050. *Mov Disord*. 2011 Oct;26(12):2286-90.

¹² Rossi A, Berger K, Chen H, Leslie D, Mailman RB, Huang X. Projection of the prevalence of Parkinson's disease in the coming decades: Revisited. *Mov Disord*. 2017 Jun 7. doi: 10.1002/mds.27063.

¹³ Data is available from

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/tablea21principalprojectionukpopulationinagegroups> (accessed 26/10/2017)

they are included here because they illustrate the effect of an ageing population on the incidence and prevalence of Parkinson's.

5.1 Short-term projections

Table 15 shows a shorter-term projection of the prevalence and incidence of Parkinson's in the UK by country and age-group for 2018. Table 166 shows the same for 2019. The predicted prevalence of Parkinson's in the UK in 2018 is 145,519 (up 6.4% from 136,816 in 2015) and the predicted incidence is 18,461 (up 6.6% from 17,314 in 2015). The 2019 figures (prevalence of 148,689 and incidence of 18,877) are up 2.2% on the 2018 projections.

Table 15 Projected prevalence and incidence numbers of Parkinson's in 2018, by age and country

	Estimated numbers in UK in 2018				
	England	Northern Ireland	Scotland	Wales	UK
Population	55,997,686	1,879,567	5,449,080	3,139,308	66,465,641
<i>Prevalence:</i>					
All 20+	121,927	3,716	12,184	7,692	145,519
20-29	129	4	13	7	153
30-39	337	11	32	17	396
40-49	1,022	35	98	53	1,208
50-54	2,678	90	276	151	3,195
55-59	4,552	155	491	269	5,466
60-64	7,689	260	847	476	9,272
65-69	13,593	431	1,443	887	16,354
70-74	23,515	694	2,330	1,515	28,054
75-79	24,012	763	2,439	1,577	28,791
80-84	24,010	707	2,375	1,508	28,599
85-89	14,258	402	1,324	867	16,851
90+	6,133	164	516	366	7,180
<i>Incidence:</i>					
All 45+	15,465	472	1,547	977	18,461
45-49	154	5	15	8	182
50-54	370	13	38	21	442
55-59	640	22	69	38	768
60-64	991	34	109	61	1,195
65-69	1,694	54	180	111	2,038
70-74	3,103	91	307	200	3,702
75-79	3,348	106	340	220	4,015
80-84	2,853	84	281	179	3,397
85-89	1,666	47	154	101	1,968
90+	644	17	53	38	753

Table note: numbers may not always sum to totals because of rounding.

Table 16 Projected prevalence and incidence numbers of Parkinson’s in 2019, by age and country

	Estimated numbers in UK in 2019				
	England	Northern Ireland	Scotland	Wales	UK
Population	56,357,466	1,888,062	5,470,324	3,151,569	66,867,421
<i>Prevalence:</i>					
All 20+	124,612	3,809	12,420	7,848	148,689
20-29	128	4	13	7	152
30-39	339	11	32	17	399
40-49	1,014	34	97	52	1,197
50-54	2,672	90	273	149	3,185
55-59	4,675	159	498	275	5,606
60-64	7,867	268	867	482	9,484
65-69	13,481	435	1,438	876	16,230
70-74	23,985	701	2,395	1,549	28,631
75-79	25,044	798	2,505	1,640	29,987
80-84	24,657	731	2,420	1,542	29,350
85-89	14,496	410	1,354	889	17,149
90+	6,254	169	528	370	7,320
<i>Incidence:</i>					
All 45+	15,818	484	1,577	998	18,877
45-49	150	5	15	8	178
50-54	369	12	38	21	440
55-59	657	22	70	39	788
60-64	1,014	35	112	62	1,223
65-69	1,680	54	179	109	2,023
70-74	3,165	92	316	204	3,778
75-79	3,493	111	349	229	4,182
80-84	2,931	87	286	183	3,488
85-89	1,697	48	157	104	2,006
90+	661	18	55	39	772

Table note: numbers may not always sum to totals because of rounding.

5.2 Long-term projections

By 2025, because of population growth and an increasingly ageing population, the estimated prevalence of Parkinson’s is expected to rise to 168,582 from 136,816 in 2015, an increase of 23.2% in 10 years (Table 7). By 2025, the estimated yearly incidence of Parkinson’s is expected to rise to 21,451 from 17,314 in 2015, an increase of 23.9% in 10 years (Table 8). By 2065, the prevalence and incidence numbers are predicted to have almost doubled in 50 years.

Table 17 Projected prevalence numbers of Parkinson's in UK 2015-2065, by age

Age	Estimated prevalence numbers of Parkinson's in UK in year					
	2015	2025	2035	2045	2055	2065
<i>Prevalence:</i>						
All 20+	136,816	168,582	202,117	229,674	243,877	256,609
20-29	153	142	157	155	152	157
30-39	379	407	371	410	404	398
40-49	1,270	1,207	1,288	1,174	1,299	1,282
50-54	3,124	2,929	2,991	3,104	2,762	3,204
55-59	5,032	5,789	5,120	5,694	5,386	5,692
60-64	8,837	11,111	10,468	10,747	11,196	10,009
65-69	17,397	17,895	20,736	18,521	20,722	19,753
70-74	23,479	27,222	34,690	33,081	34,325	35,984
75-79	27,726	38,919	41,128	48,596	44,207	50,112
80-84	26,840	34,176	41,414	54,603	53,453	56,983
85-89	15,736	20,195	30,818	34,725	43,019	41,110
90+	6,843	8,591	12,935	18,864	26,951	31,927
<i>Population:</i>						
All	65,110,034	68,929,547	71,590,766	73,748,141	75,507,483	76,898,078
Aged 20+	49,755,372	52,675,868	55,622,944	57,646,765	58,935,177	60,227,373
Prevalence as % of all aged 20+	0.275%	0.320%	0.363%	0.398%	0.414%	0.426%

Table note: numbers may not always sum to totals because of rounding.

Table 18 Projected incidence numbers (per year) of Parkinson's in UK 2015-2065, by age

Age	Estimated incidence numbers (per year) of Parkinson's in UK in year					
	2015	2025	2035	2045	2055	2065
<i>Incidence:</i>						
All 45+	17,314	21,451	25,608	29,021	30,628	32,303
45-49	187	187	165	183	172	181
50-54	432	438	405	414	428	380
55-59	707	728	813	720	800	758
60-64	1,139	1,150	1,432	1,349	1,386	1,444
65-69	2,168	2,181	2,230	2,585	2,308	2,582
70-74	3,097	3,243	3,591	4,577	4,365	4,530
75-79	3,866	3,854	5,428	5,737	6,779	6,167
80-84	3,183	3,237	4,069	4,937	6,513	6,380
85-89	1,829	1,882	2,378	3,649	4,121	5,110
90+	705	728	938	1,458	2,150	3,096
<i>Population:</i>						
All	65,110,034	68,929,547	71,590,766	73,748,141	75,507,483	76,898,078
Aged 45+	28,259,630	31,124,564	33,885,980	35,683,759	36,609,021	37,916,280
Incidence as % of all aged 45+	0.0613%	0.0689%	0.0756%	0.0813%	0.0837%	0.0852%

Table note: numbers may not always sum to totals because of rounding.

6 Comparisons with other studies

The prevalence and incidence rates calculated in this study depend both on Parkinson's being accurately diagnosed in a patient and then that diagnosis being recorded electronically by a primary care practice. In terms of accurate recording, participation in CPRD is voluntary and practices that do so are presumably confident about the quality of their data. Furthermore, CPRD undertakes a number of data quality checks to identify problems and a number of studies have sought to validate CPRD data (discussed further in Section 10). In terms of accurate diagnosis, some research¹⁴ has found evidence of varying incidence rates across different studies particularly in the most elderly which could suggest that Parkinson's is underdiagnosed in the older age-groups perhaps because of symptoms being attributed to ageing or because of multiple health conditions that make it more difficult to isolate Parkinson's as the cause of particular symptoms. There are also concerns that Parkinson's may be more difficult to diagnose in the early stages of the condition and that this may disproportionately affect younger people.

Therefore, it is important to compare the prevalence and incidence rates estimated in this study to those of other published studies in order to assess the reliability of the results discussed here. This has been done previously with CPRD data in relation to Parkinson's where the authors¹⁵ assessed their incidence rates against other published studies and found them comparable.

There are numerous studies estimating the prevalence and incidence of Parkinson's but not all show age and gender-specific rates. While overall population incidence and prevalence rates can be compared, these will be affected by differences in the age and gender distribution of the study populations. Some studies standardise their rates to a specific population but unless all studies are standardised to the same reference population, comparisons of studies will still be affected by differences in the underlying populations. Hence, the more precise comparisons are of the age and gender-specific rates. However, these age and gender-specific rates may still be affected by changes over time as an increase in life expectancy is likely to increase the incidence and prevalence of Parkinson's over time, particularly in the older age-groups.

As well as studies based on routine data sources such as this one, it is valuable to consider community-based studies as these involve the clinical checking of the diagnosis and may even include a follow-up some time later to confirm the initial diagnosis. These studies are expensive and time-consuming to undertake though and so they tend to be based only in specific geographical areas. While they are likely to be very reliable in terms of accurate diagnosis, these studies may not be fully generalisable to the wider UK population because of differences between the study population and the UK population as a whole. Furthermore, given that Parkinson's is a relatively rare condition, some studies do not have a large enough study population to make accurate estimates. For example, the numbers of people identified with Parkinson's in community-based studies can be very small (for example, fewer than 5 people in a specific age and gender group) and so there will be more uncertainty about estimates based on very small numbers. This is reflected in the width of the 95% confidence intervals for these estimates.

¹⁴ For example: Hirsch L, Jette N, Frolkis A, Steeves T, Pringsheim T. The incidence of Parkinson's disease: a systematic review and meta-analysis. *Neuroepidemiology*. 2016;46(4):292-300. Epub 2016 Apr 23

¹⁵ Hernan MA, Logroscino G, Rodriguez LA. A prospective study of alcoholism and the risk of Parkinson's disease. *J Neurol* 2004; 251 Suppl. 7: vii14-7

Therefore, some differences between the studies considered here should be expected. However, it is useful to compare the results of both types of studies as similarities between them can be informative of the reliability of routine data sources and the generalisability of community-based studies. A third type of study is a meta-analysis where the data from many studies are combined to provide a new set of estimates that are a form of weighted average across the studies. This is done to reduce some of the uncertainty associated with small studies.

The estimates in each study are shown with 95% confidence intervals added. These 95% confidence intervals show the extent of uncertainty that is associated with each measurement and the confidence interval will be wider for estimates based on smaller numbers of people. It can be assumed that the differences in the prevalence or incidence rates across the studies are not statistically significant where the 95% confidence intervals overlap.

6.1 Prevalence

Table 17, Table 18 and Table 19 compare prevalence rates from this study with those of four community-based studies and a global meta-analysis of 47 studies¹⁶. Bearing in mind the differences in time periods and definitions used in the studies, these comparisons show that the prevalence estimates from this study are broadly comparable to those of the community-based studies. The extent of overlap in the 95% confidence intervals confirm that for the vast majority of rates there are no statistically significant differences between the estimates in this study and those in the other published studies. Where significant differences do exist, these can usually be explained by differences in the time periods of the studies or in the definitions of Parkinson's used. For example, estimates for the older age-groups tend to be somewhat higher in this study than in earlier studies but this is likely to be the effect of an ageing population increasing the prevalence of Parkinson's over time. Prevalence rates from the global meta-analysis are perhaps the least similar to all the other studies considered but this is likely to be related to differences in prevalence rates in different parts of the world. The authors discuss that rates in South America were considerably higher and rates in Asia were considerably lower than those for Europe, North America and Australia.

¹⁶ Wickremaratchi MM, Perera D, O'Loughlen C, Sastry D, Morgan E, Jones A, Edwards P, Robertson NP, Butler C, Morris HR, Ben-Shlomo Y. Prevalence and age of onset of Parkinson's disease in Cardiff: a community based cross sectional study and meta-analysis *J Neurol Neurosurg Psychiatry*. 2009 Jul;80(7):805-7.

Schrag A, Ben-Shlomo Y, Quinn NP. Cross sectional prevalence survey of idiopathic Parkinson's disease and Parkinsonism in London. *BMJ*. 2000 Jul 1;321(7252):21-2.

Porter B, Macfarlane R, Unwin N, Walker R. The prevalence of Parkinson's disease in an area of North Tyneside in the North-East of England. *Neuroepidemiology*. 2006;26(3):156-61. Epub 2006 Feb 21.

Mutch WJ, Dingwall-Fordyce I, Downie AW, Paterson JG, Roy SK. Parkinson's disease in a Scottish city. *Br Med J (Clin Res Ed)*. 1986 Feb 22;292(6519):534-6.

Pringsheim T, Jette N, Frolkis A, Steeves TD. The prevalence of Parkinson's disease: a systematic review and meta-analysis. *Mov Disord*. 2014 Nov;29(13):1583-90. Epub 2014 Jun 28. Review.

Table 19 Comparison of study prevalence rates (per 100,000) with other UK studies with 95% confidence intervals (a)

Study:		This study	Wickremaratchi et al 2009	Schrag et al 2000	Pringsheim et al 2014
Area:		UK - CPRD	Cardiff	London	Global
Study type:		Routine data	Community-based	Community-based	Meta-analysis
Study years:		2015	2006	1997	1985-2010
Diagnosis:		Parkinson's	Parkinson's	Probable & possible Parkinson's	Parkinson's
Female	50-59	75.3 (63.3-88.8)	65.2 (31.2-119.8)	70 (19.1-179.2)	41 (24-71)
Female	60-69	249.7 (227.6-273.2)	216.7 (140.2-319.8)	239 (114.6-439.5)	392 (202-762)
Female	70-79	787.6 (741.2-836.2)	656.8 (502.4-843.6)	904 (618.3-1276.1)	813 (433-1524)
Female	80-89	1291.8 (1215.0-1372.1)	1083.4 (865.3-1339.6)	1074 (713.7-1552.3)	1517 (840-2740)
Female	90+	-			
Male	50-59	128.3 (112.8-145.4)	82.8 (45.3-139.0)	145 (66.3-275.3)	134 (63-285)
Male	60-69	493.4 (461.8-526.7)	327.1 (231.5-449.0)	443 (266.7-691.8)	389 (211-715)
Male	70-79	1339.0 (1274.5-1406.1)	830.0 (644.5-1052.2)	1032 (691.2-1482.2)	932 (494-1757)
Male	80-89	2209.1 (2088.9-2334.4)	1676.9 (1316.7-2105.1)	1659 (1026.8-2535.6)	2101 (918-4809)
Male	90+	-			
All	30-39	4.5 (2.7-7.0)	2.3 (0.1-12.5)	8 (1.0-28.9)	-
All	40-49	14.2 (11.0-18.1)	9.9 (2.7-25.3)	12 (1.5-43.3)	41 (20-81)
All	50-59	94.5 (85.8-103.9)	74.4 (47.7-110.7)	109 (58.0-186.4)	107 (54-211)
All	60-69	369.6 (350.4-389.7)	272.1 (209.1-348.1)	342 (156.4-649.1)	428 (235-780)
All	70-79	1046.3 (1007.1-1086.6)	737.9 (616.1-876.8)	961 (735.0-1234.4)	1087 (627-1883)
All	80-89	1669.1 (1601.9-1738.5)	1297.0 (1103.2-1515.0)	1265 (935.7-1672.2)	1903 (1132-3198)
All	90+	1230.2 (1113.3-1356.0)			

Table note: 95% confidence intervals are not shown in Wickremaratchi and Schrag papers and so have been calculated from the raw numbers shown in the papers using a Poisson distribution.

Table 20 Comparison of study prevalence rates (per 100,000) with other UK studies with 95% confidence intervals (b)

Study:		This study	Porter et al 2006	Mutch et al 1986
Area:		UK - CPRD	North Tyneside	Aberdeen
Study type:		Routine data	Community-based	Community-based
Study years:		2015	2002-2003	1983-1984
Diagnosis:		Parkinson's	Parkinson's	Parkinson's
Female	50-54	48.8 (34.9-66.5)	50.9 (6.2-183.9)	38.8 (4.7-140.1)
Female	55-59	95.8 (78.0-116.4)	32.1 (0.8-178.8)	77.2 (21.0-197.7)
Female	60-64	177.7 (151.6-207.1)	234.7 (94.4-483.7)	130.4 (47.9-283.8)
Female	65-69	318.2 (283.7-355.8)	352.9 (169.2-648.9)	211.4 (101.4-388.8)
Female	70-74	676.3 (618.8-737.6)	788.5 (494.2-1193.8)	612.9 (403.9-891.8)
Female	75-79	925.7 (850.8-1005.4)	905.7 (567.6-1371.3)	757.6 (499.2-1102.2)
Female	80-84	1314.3 (1214.3-1420.3)	732.2 (378.3-1278.9)	2077.2 (1497.0-2807.7)
Female	85-89	1258.9 (1141.1-1385.6)	598.1 (194.2-1395.7)	2071.0 (1282.0-3165.8)
Female	90+	-	1425.2 (523.0-3102.0)	
Male	50-54	88.6 (69.7-111.0)	51.3 (6.2-185.2)	132.6 (48.7-288.6)
Male	55-59	159.7 (136.7-185.5)	99.3 (20.5-290.2)	67.3 (13.9-196.7)
Male	60-64	330.1 (293.8-369.7)	219.9 (80.7-478.5)	374.4 (204.7-628.2)
Male	65-69	654.1 (603.0-708.5)	386.5 (185.4-710.9)	346.4 (179.0-605.1)
Male	70-74	1065.7 (990.0-1145.8)	641.0 (350.5-1075.5)	855.9 (548.4-1273.5)
Male	75-79	1703.3 (1592.5-1819.7)	1415.1 (906.7-2105.5)	1558.9 (1027.3-2268.1)
Male	80-84	2202.2 (2052.8-2359.6)	956.4 (437.3-1815.6)	1041.7 (449.7-2052.5)
Male	85-89	2221.5 (2022.2-2435.0)	1392.8 (452.2-3250.2)	2657.8 (1147.5-5236.9)
Male	90+	-	-	

Table note: 95% confidence intervals shown in the Porter paper are incorrect (too narrow) so they have been recalculated using a Poisson distribution. 95% confidence intervals are not shown in Mutch paper and so have been calculated from the raw numbers shown in the paper using a Poisson distribution.

Table 21 Comparison of study prevalence rates (per 100,000) with other UK studies with 95% confidence intervals (c)

Study:		This study	Porter et al 2006	Mutch et al 1986
Area:		UK - CPRD	North Tyneside	Aberdeen
Study type:		Routine data	Community-based	Community-based
Study years:		2015	2002-2003	1983-1984
Diagnosis:		Parkinson's	Parkinson's	Parkinson's
All	40-44	14.2 (11.0-18.1)	6.5 (0.2-36.5)	12.5 (0.3-69.6)
All	45-49			74.6 (30.0-153.7)
All	50-54	65.4 (55.7-76.4)	51.1 (13.9-130.8)	82.6 (35.7-162.8)
All	55-59	128.0 (113.3-144.2)	65.2 (17.8-166.9)	72.6 (29.2-149.6)
All	60-64	253.4 (230.8-277.5)	227.6 (121.2-389.3)	239.8 (146.5-370.4)
All	65-69	482.2 (451.4-514.6)	368.9 (225.4-569.8)	268.5 (168.3-406.5)
All	70-74	862.0 (814.8-911.3)	723.8 (506.9-1002.0)	707.4 (526.7-930.2)
All	75-79	1282.6 (1217.2-1350.5)	1115.2 (816.4-1487.5)	1019.6 (766.0-1330.4)
All	80-84	1696.0 (1609.6-1785.7)	814.0 (503.9-1244.2)	1792.1 (1330.1-2362.7)
All	85-89	1626.7 (1520.6-1738.2)	836.8 (401.3-1538.9)	2205.3 (1476.9-3167.2)
All	90+	1230.2 (1113.3-1356)	1134.2 (416.2-2468.7)	

Table note: The 95% confidence intervals shown in the Porter paper are incorrect (too narrow) so they have been recalculated using a Poisson distribution. 95% confidence intervals are not shown in Mutch paper and so have been calculated from the raw numbers shown in the paper using a Poisson distribution.

6.2 Incidence

Table 21 and Table 20 compare the incidence estimates in this study to three community-based studies, another routine data source (the Health Improvement Network (THIN) database which like CPRD is based on anonymised GP data), and a recent meta-analysis of 27 studies¹⁷. Bearing in mind the slight differences in time periods and definitions used in the studies, the incidence estimates from this study are broadly comparable to the other published studies, particularly the PINE community-based study and the meta-analysis. Again, the extent of overlap in the 95% confidence intervals confirm that for the vast majority of rates there are no statistically significant differences between the estimates in this study and those in the other published studies. Where significant differences do exist, these can usually be explained by differences in the time periods of the studies or in the definitions of Parkinson's used.

Overall, these comparisons are reassuring as they suggest that the prevalence and incidence estimates from this study are in line with those found in other studies, including community-based studies where the diagnosis is checked.

¹⁷ Horsfall L, Petersen I, Walters K, Schrag A. Time trends in incidence of Parkinson's disease diagnosis in UK primary care. *J Neurol*. 2013 May;260(5):1351-7. Epub 2012 Dec 23.

Caslake R, Taylor K, Scott N, Gordon J, Harris C, Wilde K, Murray A, Counsell C. Age-, gender-, and socioeconomic status-specific incidence of Parkinson's disease and parkinsonism in northeast Scotland: the PINE study. *Parkinsonism Relat Disord*. 2013 May;19(5):515-21. Epub 2013 Feb 23.

Duncan GW, Khoo TK, Coleman SY, Brayne C, Yarnall AJ, O'Brien JT, Barker RA, Burn DJ. The incidence of Parkinson's disease in the North-East of England. *Age & Ageing*. 2014 Mar;43(2):257-63. Epub 2013 Jul 23.

Foltynie T, Brayne CE, Robbins TW, Barker RA. The cognitive ability of an incident cohort of Parkinson's patients in the UK. The CamPaIGN study. *Brain*. 2004 Mar;127(Pt 3):550-60. Epub 2003 Dec 22.

Hirsch L, Jette N, Frolkis A, Steeves T, Pringsheim T. The incidence of Parkinson's disease: a systematic review and meta-analysis. *Neuroepidemiology*. 2016;46(4):292-300. Epub 2016 Apr 23.

Table 22 Comparison of study incidence rates (per 100,000) with other UK studies with 95% confidence intervals (a)

Study:		This study	PINE study Carslake et al, 2013		Duncan et al, 2014	Foltynie et al, 2004
Area:		UK - CPRD	North East Scotland		Newcastle Gateshead	Cambridge
Study type:		Routine data	Community-based		Community- based	Community- based
Study years:		2011-2015	2006-2010		2009-2011	2000-2003
Diagnosis:		Parkinson's	Probable Parkinson's	Possible/probable Parkinson's & parkinsonism	Parkinson's	Parkinson's & parkinsonism
F	50-59	10.8 (8.7-13.2)	6.9 (2.2-16.2)	9.7 (3.9-20.0)	14.3 (3.9-36.5)	10.6 (3.0-24.2)
F	60-69	31.8 (28.1-35.8)	26.3 (14.4-44.1)	35.7 (21.5-55.7)	51.0 (26.4-89.1)	41.4 (21.0-69.1)
F	70-79	103.2 (95.2-111.6)	94.2 (67.3-128.2)	136.5 (103.7-176.5)	143.8 (93.9-210.6)	56.8 (30.6-92.1)
F	80-89	132.5 (121.3-144.6)	93.6 (58.7-141.7)	200.0 (147.0-266.0)	162.8 (100.8-248.9)	70.0 (36.7-120.7)
F	90+	91.4 (72.0-114.5)	0.0 (0.0-84.5)	91.6 (25.0-234.5)		
M	50-59	16.3 (13.9-18.9)	16.6 (8.8-28.3)	20.4 (11.7-33.1)	13.4 (3.6-34.2)	8.5 (1.9-21.1)
M	60-69	61.1 (55.9-66.6)	33.4 (19.4-53.4)	51.0 (33.3-74.8)	95.5 (59.8-144.6)	41.0 (20.4-68.8)
M	70-79	188.4 (176.9-200.5)	174.5 (132.1-226.0)	303.0 (246.3-368.9)	311.4 (228.8-414.2)	98.2 (60.4-149.3)
M	80-89	288.2 (267.9-309.6)	252.5 (172.7-356.4)	560.2 (437.5-706.6)	163.8 (84.6-286.0)	117.7 (58.5-209.8)
M	90+	211.2 (166.7-264.0)	156.7 (19.0-566.0)	548.4 (220.5-1129.9)		
All	40-49	4.0 (3.1-5.2)	4.5 (1.9-8.8)	4.5 (1.9-8.8)	7.2 (2.4-16.9)	3.0 (0.4-8.3)
All	50-59	13.3 (12.0-14.7)	11.9 (7.1-18.9)	15.3 (9.7-22.9)	13.8 (6.0-27.2)	9.6 (4.2-18.2)
All	60-69	47.7 (44.9-50.5)	29.7 (20.2-42.2)	43.2 (31.5-57.8)	73.0 (50.6-102.0)	41.2 (26.2-59.8)
All	70-79	140.4 (134.5-146.4)	129.1 (104.7-157.5)	208.9 (177.5-244.3)	220.0 (172.5-276.7)	75.5 (52.9-104.5)
All	80-89	192.0 (182.8-201.5)	149.3 (112.1-194.8)	326.2 (270-390.6)	163.2 (112.3-229.1)	86.2 (54.9-128.7)
All	90+	115.1 (98.9-133.3)	35.4 (4.3-128.0)	194.9 (97.3-348.7)		

Table note: Incidence rates and 95% confidence intervals shown in the Duncan paper appear to be incorrect and so have been recalculated from raw data and 95% confidence intervals have been calculated using a Poisson distribution. 95% confidence intervals are not shown in Carslake and Foltynie papers and so have been calculated from the raw numbers shown in the paper using a Poisson distribution.

Table 23 Comparison of study incidence rates (per 100,000) with other UK studies with 95% confidence intervals (b)

Study:		This study	Horsfall et al 2013	Hirsch et al 2016
Area:		UK - CPRD	UK - THIN	Global
Study type:		Routine data	Routine data	Meta-analysis
Study years:		2011-2015	1999-2009	2001-2014
Diagnosis:		Parkinson's	Parkinson's & dementia in Parkinson's	Parkinson's
Female	50-59	10.8 (8.7-13.2)	-	8.4 (5.7-12.4)
Female	60-69	31.8 (28.1-35.8)	-	30.3 (23.2-39.7)
Female	70-79	103.2 (95.2-111.6)	-	93.3 (63.3-137.6)
Female	80-89	132.5 (121.3-144.6)	-	103.5 (44.7-239.6)
Female	90+	91.4 (72.0-114.5)	-	
Male	50-59	16.3 (13.9-18.9)	-	14.7 (8.7-24.6)
Male	60-69	61.1 (55.9-66.6)	-	58.2 (43.6-77.8)
Male	70-79	188.4 (176.9-200.5)	-	162.6 (122.9-215.2)
Male	80-89	288.2 (267.9-309.6)	-	258.5 (146.5-456.2)
Male	90+	211.2 (166.7-264.0)	-	
All	50-59	13.3 (12.0-14.7)	14.0 (12.9-15.2)	-
All	60-69	47.7 (44.9-50.5)	56.2 (53.6-58.9)	-
All	70-79	140.4 (134.5-146.4)	164.8 (159.5-170.2)	-
All	80-89	192.0 (182.8-201.5)	232.8 (224.1-241.7)	-
All	90+	115.1 (98.9-133.3)	147.5 (131.6-164.7)	-

7 Appendix: Prevalence and incidence estimates for regions and administrative areas

Table 24 Estimated prevalence and incidence numbers for 2015 for England regions

Code	England region	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
E12000001	North East	2,624,621	2,032,324	1,206,008	5,866	744
E12000002	North West	7,173,835	5,474,913	3,164,467	15,256	1,933
E12000003	Yorkshire & The Humber	5,390,576	4,103,444	2,355,141	11,426	1,447
E12000004	East Midlands	4,677,038	3,584,786	2,109,144	10,256	1,300
E12000005	West Midlands	5,751,000	4,342,051	2,491,524	12,329	1,561
E12000006	East	6,076,451	4,639,464	2,738,020	13,701	1,733
E12000007	London	8,673,713	6,533,667	2,900,885	12,268	1,548
E12000008	South East	8,947,913	6,815,433	4,008,363	19,806	2,502
E12000009	South West	5,471,180	4,254,518	2,621,423	13,653	1,725

Table note: prevalence estimates are based on population aged 20+, incidence estimates are based on population aged 45+.

Table 25 Estimated prevalence and incidence numbers for 2015 for Northern Ireland regions

Code	Northern Ireland region	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
N09000001	Antrim & Newtownabbey	140,467	103,735	58,142	264	33
N09000002	Armagh City, Banbridge & Craigavon	207,797	151,308	82,226	366	46
N09000003	Belfast	338,907	253,514	128,713	597	75
N09000004	Causeway Coast & Glens	143,148	106,830	62,302	288	37
N09000005	Derry City & Strabane	149,473	107,924	58,805	248	32
N09000006	Fermanagh & Omagh	115,311	84,341	47,913	217	28
N09000007	Lisburn & Castlereagh	140,205	105,334	61,077	281	36
N09000008	Mid & East Antrim	137,145	104,156	62,281	293	37
N09000009	Mid Ulster	144,002	103,282	53,212	235	30
N09000010	Newry, Mourne & Down	176,369	127,016	70,161	310	39
N09000011	Ards & North Down	158,797	121,570	75,270	361	46

Table note: prevalence estimates are based on population aged 20+, incidence estimates are based on population aged 45+.

Table 26 Estimated prevalence and incidence numbers for 2015 for Scotland regions

Code	Scotland region	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
S12000005	Clackmannanshire	51,360	39,950	24,865	110	14
S12000006	Dumfries & Galloway	149,670	119,461	81,481	423	54
S12000008	East Ayrshire	122,060	95,271	58,896	273	35
S12000010	East Lothian	103,050	79,391	49,797	234	30
S12000011	East Renfrewshire	92,940	69,748	44,798	215	27
S12000013	Na h-Eileanan Siar	27,070	21,569	14,682	76	10
S12000014	Falkirk	158,460	123,022	73,377	333	42
S12000015	Fife	368,080	286,255	175,467	835	106
S12000017	Highland	234,110	183,727	118,515	571	73
S12000018	Inverclyde	79,500	62,817	39,790	185	23
S12000019	Midlothian	87,390	66,813	40,421	184	23
S12000020	Moray	95,510	74,413	46,402	226	29
S12000021	North Ayrshire	136,130	106,430	68,630	331	42
S12000023	Orkney Islands	21,670	17,230	11,388	56	7
S12000024	Perth and Kinross	149,930	118,503	76,753	391	50
S12000026	Scottish Borders	114,030	90,078	61,798	309	39
S12000027	Shetland Islands	23,200	17,856	10,876	51	6
S12000028	South Ayrshire	112,400	89,618	60,081	310	39
S12000029	South Lanarkshire	316,230	246,792	151,333	685	87
S12000030	Stirling	92,830	71,882	42,681	201	25
S12000033	Aberdeen City	230,350	186,570	89,060	412	52
S12000034	Aberdeenshire	261,960	201,590	122,075	548	70
S12000035	Argyll & Bute	86,890	69,590	47,613	244	31
S12000036	City of Edinburgh	498,810	401,620	191,788	896	113
S12000038	Renfrewshire	174,560	136,687	82,945	378	48
S12000039	West Dunbartonshire	89,590	69,809	42,263	186	24
S12000040	West Lothian	178,550	134,843	77,586	324	41
S12000041	Angus	116,900	91,901	59,717	302	38
S12000042	Dundee City	148,210	116,833	61,942	307	39
S12000044	North Lanarkshire	338,260	258,338	150,377	649	83
S12000045	East Dunbartonshire	106,960	83,293	54,865	273	35
S12000046	Glasgow City	606,340	481,445	231,665	1,005	126

Table note: prevalence estimates are based on population aged 20+, incidence estimates are based on population aged 45+.

Table 27 Estimated prevalence and incidence numbers for 2015 for Wales regions

Code	Wales region	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
W06000001	Isle of Anglesey	69,979	55,139	36,530	197	25
W06000002	Gwynedd	122,864	95,643	58,721	320	40
W06000003	Conwy	116,218	92,251	63,275	360	45
W06000004	Denbighshire	94,691	73,177	48,188	254	32
W06000005	Flintshire	154,074	118,677	73,165	354	45
W06000006	Wrexham	136,647	104,224	61,577	300	38
W06000008	Ceredigion	74,642	59,255	36,532	201	25
W06000009	Pembrokeshire	123,464	96,284	64,549	349	44
W06000010	Carmarthenshire	185,123	143,919	93,670	491	62
W06000011	Swansea	242,382	187,772	106,761	548	69
W06000012	Neath Port Talbot	140,992	109,905	67,312	332	42
W06000013	Bridgend	142,092	109,943	66,510	323	41
W06000014	Vale of Glamorgan	127,592	97,896	61,016	302	38
W06000015	Cardiff	357,160	271,110	128,072	597	75
W06000016	Rhondda Cynon Taf	237,411	181,708	105,646	511	65
W06000018	Caerphilly	180,164	137,296	81,151	384	49
W06000019	Blaenau Gwent	69,544	54,127	32,503	157	20
W06000020	Torfaen	91,836	70,484	42,928	212	27
W06000021	Monmouthshire	92,476	72,630	49,830	256	32
W06000022	Newport	147,769	110,606	63,194	304	38
W06000023	Powys	132,642	104,958	72,902	397	50
W06000024	Merthyr Tydfil	59,324	45,413	26,594	126	16

Table note: prevalence estimates are based on population aged 20+, incidence estimates are based on population aged 45+.

Table 28 Estimated prevalence and incidence numbers for 2015 for local authorities in England

Code	Region	Local authority	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated incidence
E06000031	East	Peterborough	193,980	141,860	72,963	336	42
E06000032	East	Luton	214,710	153,384	71,307	322	41
E06000033	East	Southend-on-Sea	178,702	136,344	79,730	403	51
E06000034	East	Thurrock	165,184	120,383	62,892	269	34
E06000055	East	Bedford	166,252	124,363	71,452	342	43
E06000056	East	Central Bedfordshire	274,022	208,774	121,855	555	71
E07000008	East	Cambridge	130,907	102,385	40,512	193	24
E07000009	East	East Cambridgeshire	87,306	66,191	40,098	197	25
E07000010	East	Fenland	99,171	77,273	48,655	256	32
E07000011	East	Huntingdonshire	174,966	134,493	81,258	382	49
E07000012	East	South Cambridgeshire	154,888	117,293	70,854	341	43
E07000066	East	Basildon	181,721	136,172	77,561	367	46
E07000067	East	Braintree	150,360	114,631	70,060	334	42
E07000068	East	Brentwood	76,057	58,731	36,241	185	23
E07000069	East	Castle Point	89,173	70,205	46,517	248	32
E07000070	East	Chelmsford	172,638	132,805	77,719	381	48
E07000071	East	Colchester	183,939	140,415	75,914	368	47
E07000072	East	Epping Forest	129,677	100,134	60,310	299	38
E07000073	East	Harlow	85,397	63,051	34,249	161	20
E07000074	East	Maldon	62,743	49,536	33,976	169	22
E07000075	East	Rochford	85,144	66,480	43,279	224	28
E07000076	East	Tendring	141,183	111,969	79,641	473	60
E07000077	East	Uttlesford	85,119	64,194	40,692	192	24
E07000095	East	Broxbourne	96,217	72,453	41,767	202	26
E07000096	East	Dacorum	151,350	114,529	65,632	308	39
E07000098	East	Hertsmere	102,998	76,985	44,852	219	28
E07000099	East	North Hertfordshire	131,696	100,291	59,063	290	37
E07000102	East	Three Rivers	91,674	68,911	40,920	197	25

Code	Region	Local authority	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated incidence
E07000103	East	Watford	96,403	71,390	34,149	150	19
E07000143	East	Breckland	135,480	106,013	68,615	376	48
E07000144	East	Broadland	126,628	100,433	67,767	368	47
E07000145	East	Great Yarmouth	98,667	76,517	48,939	264	33
E07000146	East	King's Lynn & West Norfolk	151,013	118,877	78,195	438	56
E07000147	East	North Norfolk	103,308	84,722	62,158	377	48
E07000148	East	Norwich	138,872	108,502	49,095	246	31
E07000149	East	South Norfolk	131,010	101,683	67,132	360	46
E07000200	East	Babergh	89,215	69,633	47,853	257	33
E07000201	East	Forest Heath	63,691	48,269	25,643	131	17
E07000202	East	Ipswich	135,600	102,165	54,418	264	33
E07000203	East	Mid Suffolk	99,632	77,837	52,027	267	34
E07000204	East	St Edmundsbury	112,523	87,410	53,641	281	36
E07000205	East	Suffolk Coastal	125,052	98,213	69,525	385	49
E07000206	East	Waveney	116,182	91,182	61,293	352	45
E07000240	East	St Albans	145,797	107,328	61,351	292	37
E07000241	East	Welwyn Hatfield	119,016	90,682	45,606	227	29
E07000242	East	East Hertfordshire	144,719	109,489	65,155	297	38
E07000243	East	Stevenage	86,469	64,884	35,489	160	20
E10000003	East	Cambridgeshire	647,238	497,635	281,377	1,369	173
E10000012	East	Essex	1,443,151	1,108,323	676,159	3,399	430
E10000015	East	Hertfordshire	1,166,339	876,942	493,984	2,343	296
E10000020	East	Norfolk	884,978	696,747	441,901	2,428	307
E10000029	East	Suffolk	741,895	574,709	364,400	1,936	245
E06000015	East Midlands	Derby	254,251	188,463	100,396	490	62
E06000016	East Midlands	Leicester	342,627	249,844	112,194	493	62
E06000017	East Midlands	Rutland	38,046	29,421	19,489	105	13
E06000018	East Midlands	Nottingham	318,901	237,761	100,560	456	57
E06000019	East Midlands	Herefordshire, County of	188,099	148,225	96,934	514	65
E06000020	East Midlands	Telford & Wrekin	171,159	127,527	72,592	325	41
E06000021	East Midlands	Stoke-on-Trent	251,648	189,375	104,321	494	63

Code	Region	Local authority	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated incidence
E06000051	East Midlands	Shropshire	311,380	245,233	161,504	844	107
E07000032	East Midlands	Amber Valley	124,069	97,614	62,195	303	38
E07000033	East Midlands	Bolsover	77,780	60,346	36,938	176	22
E07000034	East Midlands	Chesterfield	104,407	81,877	50,292	247	31
E07000035	East Midlands	Derbyshire Dales	71,145	56,906	40,613	209	27
E07000036	East Midlands	Erewash	114,510	88,793	54,056	264	33
E07000037	East Midlands	High Peak	91,496	71,400	45,461	209	27
E07000038	East Midlands	North East Derbyshire	99,639	79,269	52,577	271	35
E07000039	East Midlands	South Derbyshire	99,319	75,681	45,080	202	26
E07000129	East Midlands	Blaby	96,544	74,119	45,731	226	29
E07000130	East Midlands	Charnwood	176,720	136,759	75,048	368	47
E07000131	East Midlands	Harborough	89,284	68,622	44,902	217	27
E07000132	East Midlands	Hinckley & Bosworth	108,769	85,057	53,679	263	33
E07000133	East Midlands	Melton	50,912	39,611	26,007	125	16
E07000134	East Midlands	North West Leicestershire	97,247	75,051	46,267	218	28
E07000135	East Midlands	Oadby & Wigston	55,833	42,301	26,549	142	18
E07000136	East Midlands	Boston	66,902	51,754	31,101	163	21
E07000137	East Midlands	East Lindsey	137,887	111,323	79,737	450	57
E07000138	East Midlands	Lincoln	97,065	74,713	36,015	173	22
E07000139	East Midlands	North Kesteven	111,876	87,520	56,962	297	38
E07000140	East Midlands	South Holland	91,214	71,818	46,600	256	33
E07000141	East Midlands	South Kesteven	138,909	107,331	69,812	347	44
E07000142	East Midlands	West Lindsey	92,812	72,548	49,118	250	32
E07000150	East Midlands	Corby	66,854	49,293	26,596	112	14
E07000151	East Midlands	Daventry	80,014	61,751	40,014	183	23
E07000152	East Midlands	East Northamptonshire	89,746	68,253	43,164	205	26
E07000153	East Midlands	Kettering	97,650	73,543	43,129	202	26
E07000154	East Midlands	Northampton	222,462	165,441	85,017	383	48
E07000155	East Midlands	South Northamptonshire	89,116	68,021	44,071	204	26
E07000156	East Midlands	Wellingborough	77,184	57,822	34,995	166	21
E07000170	East Midlands	Ashfield	123,574	94,541	56,644	266	34

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E07000171	East Midlands	Bassetlaw	114,533	89,175	56,986	278	35
E07000172	East Midlands	Broxtowe	112,253	88,064	52,855	264	33
E07000173	East Midlands	Gedling	115,889	90,085	55,603	275	35
E07000174	East Midlands	Mansfield	106,556	82,336	49,050	233	30
E07000175	East Midlands	Newark & Sherwood	118,569	92,059	58,643	289	37
E07000176	East Midlands	Rushcliffe	114,474	88,500	54,998	275	35
E07000192	East Midlands	Cannock Chase	98,535	76,051	45,066	209	27
E07000193	East Midlands	East Staffordshire	116,040	88,431	52,792	252	32
E07000194	East Midlands	Lichfield	102,706	80,698	52,288	268	34
E07000195	East Midlands	Newcastle-under-Lyme	127,045	99,444	58,629	294	37
E07000196	East Midlands	South Staffordshire	110,726	88,509	58,356	299	38
E07000197	East Midlands	Stafford	132,488	104,618	65,657	332	42
E07000198	East Midlands	Staffordshire Moorlands	97,881	77,664	52,326	267	34
E07000199	East Midlands	Tamworth	77,141	58,385	33,773	152	19
E07000218	East Midlands	North Warwickshire	62,787	49,187	31,576	152	19
E07000219	East Midlands	Nuneaton & Bedworth	126,319	96,186	57,207	273	35
E07000220	East Midlands	Rugby	103,443	78,079	46,658	230	29
E07000221	East Midlands	Stratford-on-Avon	121,522	96,009	66,034	355	45
E07000222	East Midlands	Warwick	139,931	109,290	60,343	301	38
E07000234	East Midlands	Bromsgrove	95,768	74,660	48,476	251	32
E07000235	East Midlands	Malvern Hills	75,731	60,183	42,914	240	30
E07000236	East Midlands	Redditch	84,743	64,186	36,388	164	21
E07000237	East Midlands	Worcester	101,328	77,409	41,283	195	25
E07000238	East Midlands	Wychavon	121,520	95,819	64,875	338	43
E07000239	East Midlands	Wyre Forest	99,503	78,177	50,772	269	34
E08000025	East Midlands	Birmingham	1,111,307	791,635	378,558	1,773	224
E08000026	East Midlands	Coventry	345,385	258,407	121,404	590	75
E08000027	East Midlands	Dudley	316,464	241,197	145,696	743	94
E08000028	East Midlands	Sandwell	319,455	232,951	123,667	585	74
E08000029	East Midlands	Solihull	210,445	160,162	100,838	517	65
E08000030	East Midlands	Walsall	276,095	204,380	116,748	583	74

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E08000031	East Midlands	Wolverhampton	254,406	189,974	103,849	518	65
E10000007	East Midlands	Derbyshire	782,365	611,886	387,212	1,882	239
E10000018	East Midlands	Leicestershire	675,309	521,520	318,183	1,558	197
E10000019	East Midlands	Lincolnshire	736,665	577,007	369,345	1,935	246
E10000021	East Midlands	Northamptonshire	723,026	544,124	316,986	1,456	185
E10000024	East Midlands	Nottinghamshire	805,848	624,760	384,779	1,881	239
E10000028	East Midlands	Staffordshire	862,562	673,800	418,887	2,073	264
E10000031	East Midlands	Warwickshire	554,002	428,751	261,818	1,311	166
E10000034	East Midlands	Worcestershire	578,593	450,434	284,708	1,457	184
E11000005	East Midlands	West Midlands (Met County)	2,833,557	2,078,706	1,090,760	5,309	671
E09000001	London	City of London	8,760	7,551	3,728	17	2
E09000002	London	Barking & Dagenham	201,979	136,717	60,792	246	31
E09000003	London	Barnet	379,691	282,972	139,509	641	81
E09000004	London	Bexley	242,142	180,636	101,388	483	61
E09000005	London	Brent	324,012	241,737	109,260	457	58
E09000006	London	Bromley	324,857	245,975	140,718	676	85
E09000007	London	Camden	241,059	188,994	76,576	336	42
E09000008	London	Croydon	379,031	277,109	143,442	606	77
E09000009	London	Ealing	343,059	254,633	119,134	499	63
E09000010	London	Enfield	328,433	237,442	119,131	515	65
E09000011	London	Greenwich	274,803	202,255	87,143	350	44
E09000012	London	Hackney	269,009	202,535	67,879	246	31
E09000013	London	Hammersmith & Fulham	179,410	142,172	55,933	223	28
E09000014	London	Haringey	272,864	206,333	83,429	312	40
E09000015	London	Harrow	247,130	185,100	96,164	452	57
E09000016	London	Havering	249,085	189,136	109,057	546	69
E09000017	London	Hillingdon	297,735	219,615	106,032	478	60
E09000018	London	Hounslow	268,770	200,290	89,310	373	47
E09000019	London	Islington	227,692	182,109	63,240	247	31
E09000020	London	Kensington & Chelsea	157,711	126,426	60,862	266	34
E09000021	London	Kingston upon Thames	173,525	131,891	62,172	277	35

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E09000022	London	Lambeth	324,431	255,683	89,600	324	41
E09000023	London	Lewisham	297,325	223,608	92,508	348	44
E09000024	London	Merton	204,565	154,571	71,548	305	38
E09000025	London	Newham	332,817	240,585	84,927	300	38
E09000026	London	Redbridge	296,793	214,807	101,389	447	56
E09000027	London	Richmond upon Thames	194,730	146,972	78,474	342	43
E09000028	London	Southwark	308,901	239,149	88,900	312	39
E09000029	London	Sutton	200,145	149,787	80,596	363	46
E09000030	London	Tower Hamlets	295,236	223,177	62,293	232	29
E09000031	London	Waltham Forest	271,170	200,332	87,060	348	44
E09000032	London	Wandsworth	314,544	248,714	87,874	357	45
E09000033	London	Westminster	242,299	194,654	80,817	348	44
E06000001	North East	Hartlepool	92,493	70,424	42,552	206	26
E06000002	North East	Middlesbrough	139,509	103,416	56,487	266	34
E06000003	North East	Redcar & Cleveland	135,275	104,821	66,711	338	43
E06000004	North East	Stockton-on-Tees	194,803	147,452	85,850	401	51
E06000005	North East	Darlington	105,389	80,484	48,991	242	31
E06000047	North East	County Durham	519,695	405,667	247,599	1,202	153
E06000057	North East	Northumberland	315,263	249,544	166,635	841	107
E08000021	North East	Newcastle upon Tyne	292,883	225,060	105,228	505	64
E08000022	North East	North Tyneside	202,494	157,802	95,554	461	58
E08000023	North East	South Tyneside	148,671	115,960	71,428	345	44
E08000024	North East	Sunderland	277,150	216,027	127,762	606	77
E08000037	North East	Gateshead	200,996	155,667	91,211	454	58
E11000007	North East	Tyne & Wear (Met County)	1,122,194	870,516	491,183	2,370	300
E06000006	North West	Halton	126,528	95,452	55,799	249	32
E06000007	North West	Warrington	207,695	158,625	93,266	429	55
E06000008	North West	Blackburn with Darwen	146,846	104,660	56,393	247	31
E06000009	North West	Blackpool	139,578	107,602	66,819	332	42
E06000049	North West	Cheshire East	375,392	292,477	189,071	960	122
E06000050	North West	Cheshire West & Chester	333,917	259,720	161,474	804	102

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E07000026	North West	Allerdale	96,660	76,515	51,009	261	33
E07000027	North West	Barrow-in-Furness	67,515	52,520	33,129	163	21
E07000028	North West	Carlisle	108,155	84,613	52,160	261	33
E07000029	North West	Copeland	69,647	54,985	35,538	175	22
E07000030	North West	Eden	52,565	42,239	29,409	154	20
E07000031	North West	South Lakeland	103,454	83,613	59,227	326	41
E07000117	North West	Burnley	87,371	65,649	38,276	182	23
E07000118	North West	Chorley	112,969	87,465	52,658	246	31
E07000119	North West	Fylde	77,322	62,058	43,194	238	30
E07000120	North West	Hyndburn	80,228	59,783	34,820	166	21
E07000121	North West	Lancaster	142,283	110,310	63,034	324	41
E07000122	North West	Pendle	90,111	67,286	38,813	187	24
E07000123	North West	Preston	141,302	105,774	53,700	248	31
E07000124	North West	Ribble Valley	58,480	45,356	30,894	154	20
E07000125	North West	Rossendale	69,487	52,766	31,780	141	18
E07000126	North West	South Ribble	109,651	84,873	52,469	258	33
E07000127	North West	West Lancashire	112,742	86,922	54,689	275	35
E07000128	North West	Wyre	109,745	87,559	60,092	340	43
E08000001	North West	Bolton	281,619	208,296	118,333	549	70
E08000002	North West	Bury	187,884	141,188	82,830	386	49
E08000003	North West	Manchester	530,292	394,760	146,885	608	76
E08000004	North West	Oldham	230,823	166,771	92,665	424	54
E08000005	North West	Rochdale	214,195	158,123	88,939	404	51
E08000006	North West	Salford	245,614	185,649	91,833	424	54
E08000007	North West	Stockport	288,733	220,820	134,343	670	85
E08000008	North West	Tameside	221,692	167,669	97,661	445	56
E08000009	North West	Trafford	233,288	174,395	100,939	479	60
E08000010	North West	Wigan	322,022	247,245	146,415	675	86
E08000011	North West	Knowsley	147,231	110,889	65,454	299	38
E08000012	North West	Liverpool	478,580	372,044	182,259	845	107
E08000013	North West	St. Helens	177,612	137,367	83,364	409	52

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E08000014	North West	Sefton	273,707	214,427	139,399	731	92
E08000015	North West	Wirral	320,900	246,448	155,435	785	99
E10000006	North West	Cumbria	497,996	394,485	260,472	1,340	170
E10000017	North West	Lancashire	1,191,691	915,801	554,419	2,760	350
E11000001	North West	Greater Manchester (Met County)	2,756,162	2,064,916	1,100,843	5,065	642
E11000002	North West	Merseyside (Met County)	1,398,030	1,081,175	625,911	3,069	388
E06000035	South East	Medway	276,492	206,241	112,197	496	63
E06000036	South East	Bracknell Forest	118,982	88,262	47,782	198	25
E06000037	South East	West Berkshire	156,020	116,957	71,671	326	41
E06000038	South East	Reading	161,739	120,731	53,333	239	30
E06000039	South East	Slough	145,734	101,856	44,717	176	22
E06000040	South East	Windsor & Maidenhead	147,708	111,170	65,891	321	40
E06000041	South East	Wokingham	160,409	119,651	71,411	328	42
E06000042	South East	Milton Keynes	261,762	190,253	97,651	395	50
E06000043	South East	Brighton & Hove	285,276	225,432	104,052	464	58
E06000044	South East	Portsmouth	211,758	160,833	76,583	354	45
E06000045	South East	Southampton	249,537	190,913	83,858	396	50
E06000046	South East	Isle of Wight	139,395	110,979	76,693	424	54
E07000004	South East	Aylesbury Vale	188,707	141,085	82,203	366	46
E07000005	South East	Chiltern	94,545	70,727	46,804	238	30
E07000006	South East	South Bucks	69,120	52,785	34,076	174	22
E07000007	South East	Wycombe	176,028	131,682	75,705	365	46
E07000061	South East	Eastbourne	102,465	80,082	50,452	292	37
E07000062	South East	Hastings	91,497	69,999	42,409	202	25
E07000063	South East	Lewes	100,693	78,765	53,255	293	37
E07000064	South East	Rother	92,908	74,809	55,256	331	42
E07000065	South East	Wealden	156,501	122,542	85,007	456	58
E07000084	South East	Basingstoke & Deane	173,856	130,898	75,503	336	43
E07000085	South East	East Hampshire	118,077	90,704	60,866	306	39
E07000086	South East	Eastleigh	129,027	98,638	58,690	283	36
E07000087	South East	Fareham	114,799	90,049	58,310	305	39

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E07000088	South East	Gosport	84,672	64,601	38,449	190	24
E07000089	South East	Hart	93,912	70,903	43,396	207	26
E07000090	South East	Havant	122,927	95,281	62,046	333	42
E07000091	South East	New Forest	179,023	142,743	99,819	579	73
E07000092	South East	Rushmoor	95,342	71,965	36,975	157	20
E07000093	South East	Test Valley	120,712	92,813	59,491	294	37
E07000094	South East	Winchester	120,696	91,653	56,801	293	37
E07000105	South East	Ashford	124,250	92,726	56,497	271	34
E07000106	South East	Canterbury	159,965	123,917	69,288	371	47
E07000107	South East	Dartford	103,892	77,454	40,904	187	24
E07000108	South East	Dover	113,228	87,926	57,729	296	38
E07000109	South East	Gravesham	106,299	79,125	44,782	215	27
E07000110	South East	Maidstone	164,499	125,427	74,174	361	46
E07000111	South East	Sevenoaks	118,409	89,817	57,280	289	36
E07000112	South East	Shepway	110,034	86,281	56,288	298	38
E07000113	South East	Swale	142,417	107,052	64,816	308	39
E07000114	South East	Thanet	139,772	106,607	68,273	366	46
E07000115	South East	Tonbridge & Malling	125,713	93,750	57,538	276	35
E07000116	South East	Tunbridge Wells	116,241	87,235	52,998	258	32
E07000177	South East	Cherwell	145,550	110,312	63,804	299	38
E07000178	South East	Oxford	159,574	122,389	47,235	221	28
E07000179	South East	South Oxfordshire	137,412	104,879	65,981	328	42
E07000180	South East	Vale of White Horse	126,663	96,721	59,272	296	38
E07000181	South East	West Oxfordshire	108,611	83,831	51,739	261	33
E07000207	South East	Elmbridge	132,670	97,081	60,000	286	36
E07000208	South East	Epsom & Ewell	78,950	59,422	34,716	167	21
E07000209	South East	Guildford	146,080	112,069	58,838	285	36
E07000210	South East	Mole Valley	86,104	66,388	44,524	234	30
E07000211	South East	Reigate & Banstead	144,100	109,105	63,704	308	39
E07000212	South East	Runnymede	85,594	66,494	35,778	177	22
E07000213	South East	Spelthorne	98,469	75,758	44,218	218	28

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E07000214	South East	Surrey Heath	88,067	67,083	41,218	197	25
E07000215	South East	Tandridge	86,025	65,740	41,552	205	26
E07000216	South East	Waverley	123,315	92,388	59,866	315	40
E07000217	South East	Woking	99,435	74,182	41,897	199	25
E07000223	South East	Adur	63,429	49,311	31,549	172	22
E07000224	South East	Arun	155,732	124,869	85,433	508	64
E07000225	South East	Chichester	116,976	92,448	63,406	364	46
E07000226	South East	Crawley	110,864	82,246	41,096	180	23
E07000227	South East	Horsham	135,868	104,608	69,176	348	44
E07000228	South East	Mid Sussex	145,651	110,707	68,829	342	43
E07000229	South East	Worthing	107,736	84,083	52,613	283	35
E10000002	South East	Buckinghamshire	528,400	396,279	238,788	1,143	145
E10000011	South East	East Sussex	544,064	426,197	286,379	1,574	198
E10000014	South East	Hampshire	1,353,043	1,040,248	650,346	3,284	416
E10000016	South East	Kent	1,524,719	1,157,317	700,567	3,495	442
E10000025	South East	Oxfordshire	677,810	518,132	288,031	1,406	178
E10000030	South East	Surrey	1,168,809	885,710	526,311	2,592	327
E10000032	South East	West Sussex	836,256	648,272	412,102	2,197	277
E06000022	South West	Bath & North East Somerset	184,874	143,260	80,373	414	52
E06000023	South West	Bristol, City of	449,328	343,179	151,015	717	90
E06000024	South West	North Somerset	209,944	163,003	105,975	565	71
E06000025	South West	South Gloucestershire	274,661	210,105	122,869	598	76
E06000026	South West	Plymouth	262,712	202,540	110,092	545	69
E06000027	South West	Torbay	133,373	105,308	71,418	396	50
E06000028	South West	Bournemouth	194,516	153,814	79,611	419	52
E06000029	South West	Poole	150,577	117,449	72,922	391	49
E06000030	South West	Swindon	217,160	163,294	90,045	399	51
E06000052	South West	Cornwall	549,404	430,921	285,194	1,506	191
E06000053	South West	Isles of Scilly	2,324	1,915	1,229	7	1
E06000054	South West	Wiltshire	486,093	371,349	234,014	1,165	147
E07000040	South West	East Devon	138,141	110,698	79,147	478	60

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E07000041	South West	Exeter	127,308	99,729	46,948	237	30
E07000042	South West	Mid Devon	79,510	61,085	40,586	210	27
E07000043	South West	North Devon	94,172	73,929	49,467	267	34
E07000044	South West	South Hams	84,470	67,434	48,527	259	33
E07000045	South West	Teignbridge	128,826	102,412	70,344	379	48
E07000046	South West	Torridge	66,265	52,684	36,781	197	25
E07000047	South West	West Devon	54,385	43,358	30,884	165	21
E07000048	South West	Christchurch	49,057	39,356	28,194	179	23
E07000049	South West	East Dorset	88,690	71,571	52,217	317	40
E07000050	South West	North Dorset	70,713	55,077	36,778	200	25
E07000051	South West	Purbeck	46,212	36,709	25,365	141	18
E07000052	South West	West Dorset	100,747	80,710	58,995	343	43
E07000053	South West	Weymouth & Portland	65,166	51,467	34,302	181	23
E07000078	South West	Cheltenham	116,781	90,680	50,304	255	32
E07000079	South West	Cotswold	85,162	67,507	46,519	246	31
E07000080	South West	Forest of Dean	84,544	66,210	44,896	227	29
E07000081	South West	Gloucester	127,158	95,447	52,853	243	31
E07000082	South West	Stroud	116,627	90,544	59,433	293	37
E07000083	South West	Tewkesbury	86,890	67,582	43,366	222	28
E07000187	South West	Mendip	111,724	85,742	56,988	287	36
E07000188	South West	Sedgemoor	120,260	93,038	61,050	314	40
E07000189	South West	South Somerset	164,982	128,732	85,348	463	59
E07000190	South West	Taunton Deane	114,021	88,300	56,083	298	38
E07000191	South West	West Somerset	34,403	28,380	21,291	129	16
E10000008	South West	Devon	773,077	611,329	402,684	2,192	277
E10000009	South West	Dorset	420,585	334,890	235,851	1,362	172
E10000013	South West	Gloucestershire	617,162	477,970	297,371	1,487	188
E10000027	South West	Somerset	545,390	424,192	280,760	1,491	189
E06000010	Yorkshire/Humber	Kingston upon Hull, City of	258,995	196,623	100,148	457	58
E06000011	Yorkshire/Humber	East Riding of Yorkshire	336,685	266,257	180,987	946	120
E06000012	Yorkshire/Humber	North East Lincolnshire	159,570	121,745	73,555	368	47

Code	Region	Local authority	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated incidence
E06000013	Yorkshire/Humber	North Lincolnshire	169,820	130,955	81,592	398	51
E06000014	Yorkshire/Humber	York	206,856	162,566	85,942	435	55
E07000163	Yorkshire/Humber	Craven	55,801	44,339	31,273	166	21
E07000164	Yorkshire/Humber	Hambleton	90,035	71,443	49,148	257	33
E07000165	Yorkshire/Humber	Harrogate	157,016	120,969	80,899	414	52
E07000166	Yorkshire/Humber	Richmondshire	52,510	40,901	24,490	121	15
E07000167	Yorkshire/Humber	Ryedale	53,052	42,196	29,803	159	20
E07000168	Yorkshire/Humber	Scarborough	107,902	86,242	58,898	321	41
E07000169	Yorkshire/Humber	Selby	85,961	66,524	41,986	193	25
E08000016	Yorkshire/Humber	Barnsley	239,319	184,157	110,796	524	67
E08000017	Yorkshire/Humber	Doncaster	304,813	232,936	137,722	662	84
E08000018	Yorkshire/Humber	Rotherham	260,786	198,495	120,094	578	73
E08000019	Yorkshire/Humber	Sheffield	569,737	434,257	221,926	1,095	138
E08000032	Yorkshire/Humber	Bradford	531,176	377,437	199,568	914	115
E08000033	Yorkshire/Humber	Calderdale	208,402	157,925	94,626	431	54
E08000034	Yorkshire/Humber	Kirklees	434,321	324,302	182,853	852	108
E08000035	Yorkshire/Humber	Leeds	774,060	586,336	295,301	1,413	178
E08000036	Yorkshire/Humber	Wakefield	333,759	256,839	153,534	722	92
E10000023	Yorkshire/Humber	North Yorkshire	602,277	472,614	316,497	1,630	207
E11000003	Yorkshire/Humber	South Yorkshire (Met County)	1,374,655	1,049,845	590,538	2,859	362
E11000006	Yorkshire/Humber	West Yorkshire (Met County)	2,281,718	1,702,839	925,882	4,331	548

Table note: prevalence estimates are based on population aged 20+, incidence estimates are based on population aged 45+.

8 Appendix: Prevalence and incidence estimates for CCGs and health boards

Table 29 Estimated prevalence and incidence numbers for 2015 for health areas and CCGs in England

Code	Health area/CCG	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
E4000001	North of England	15,336,742	11,725,413	6,798,394	32,893	4,168
E39000026	Cheshire and Merseyside	2,441,562	1,887,449	1,125,521	5,512	698
E38000056	NHS Eastern Cheshire	196,525	154,214	102,615	534	67
E38000068	NHS Halton	126,528	95,452	55,799	249	32
E38000091	NHS Knowsley	147,231	110,889	65,454	299	38
E38000101	NHS Liverpool	478,580	372,044	182,259	845	107
E38000151	NHS South Cheshire	178,867	138,263	86,456	426	54
E38000161	NHS South Sefton	158,643	123,250	77,189	379	48
E38000170	NHS Southport and Formby	115,064	91,177	62,210	353	44
E38000172	NHS St Helens	177,612	137,367	83,364	409	52
E38000189	NHS Vale Royal	102,936	78,792	49,322	230	29
E38000194	NHS Warrington	207,695	158,625	93,266	429	55
E38000196	NHS West Cheshire	230,981	180,928	112,152	574	73
E38000208	NHS Wirral	320,900	246,448	155,435	785	99
E39000027	Cumbria and North East	3,128,673	2,431,708	1,470,053	7,224	916
E38000041	NHS Cumbria	504,052	399,384	264,045	1,358	172
E38000042	NHS Darlington	105,389	80,484	48,991	242	31
E38000047	NHS Durham Dales, Easington and Sedgfield	273,951	212,859	134,306	652	83
E38000075	NHS Hartlepool and Stockton-on-Tees	287,296	217,876	128,402	606	77
E38000116	NHS North Durham	245,744	192,808	113,293	550	70
E38000127	NHS North Tyneside	202,494	157,802	95,554	461	58
E38000130	NHS Northumberland	315,263	249,544	166,635	841	107
E38000162	NHS South Tees	274,784	208,237	123,198	604	77
E38000163	NHS South Tyneside	148,671	115,960	71,428	345	44
E38000176	NHS Sunderland	277,150	216,027	127,762	606	77
E38000212	NHS Newcastle Gateshead	493,879	380,727	196,439	959	121
E39000028	Lancashire and Greater Manchester	4,267,454	3,218,536	1,794,266	8,472	1,074

Code	Health area/CCG	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
E38000014	NHS Blackburn with Darwen	146,846	104,660	56,393	247	31
E38000015	NHS Blackpool	139,578	107,602	66,819	332	42
E38000016	NHS Bolton	281,619	208,296	118,333	549	70
E38000024	NHS Bury	187,884	141,188	82,830	386	49
E38000032	NHS Central Manchester	188,866	136,135	44,691	175	22
E38000034	NHS Chorley and South Ribble	172,533	133,007	79,252	372	47
E38000050	NHS East Lancashire	374,223	281,961	168,769	802	102
E38000060	NHS Fylde & Wyre	167,894	134,245	92,434	518	65
E38000065	NHS Greater Preston	202,843	153,984	85,389	409	52
E38000080	NHS Heywood, Middleton and Rochdale	214,195	158,123	88,939	404	51
E38000093	NHS Lancashire North	161,456	125,682	73,886	384	49
E38000123	NHS North Manchester	178,694	133,427	50,189	208	26
E38000135	NHS Oldham	230,823	166,771	92,665	424	54
E38000143	NHS Salford	245,614	185,649	91,833	424	54
E38000158	NHS South Manchester	162,732	125,198	52,005	225	28
E38000174	NHS Stockport	288,733	220,820	134,343	670	85
E38000182	NHS Tameside and Glossop	254,869	193,226	113,453	512	65
E38000187	NHS Trafford	233,288	174,395	100,939	479	60
E38000200	NHS West Lancashire	112,742	86,922	54,689	275	35
E38000205	NHS Wigan Borough	322,022	247,245	146,415	675	86
<i>E39000029</i>	<i>Yorkshire and Humber</i>	<i>5,499,053</i>	<i>4,187,720</i>	<i>2,408,554</i>	<i>11,685</i>	<i>1,480</i>
E38000001	NHS Airedale, Wharfedale and Craven	159,311	121,444	78,351	401	50
E38000006	NHS Barnsley	239,319	184,157	110,796	524	67
E38000008	NHS Bassetlaw	114,533	89,175	56,986	278	35
E38000018	NHS Bradford City	83,883	54,758	19,085	75	9
E38000019	NHS Bradford Districts	337,727	240,675	129,832	585	74
E38000025	NHS Calderdale	208,402	157,925	94,626	431	54
E38000044	NHS Doncaster	304,813	232,936	137,722	662	84
E38000052	NHS East Riding of Yorkshire	315,064	249,138	169,332	889	113
E38000064	NHS Greater Huddersfield	243,814	185,107	106,173	497	63
E38000069	NHS Hambleton, Richmondshire and Whitby	151,825	120,490	79,796	414	53

Code	Health area/CCG	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
E38000073	NHS Harrogate and Rural District	157,016	120,969	80,899	414	52
E38000085	NHS Hull	258,995	196,623	100,148	457	58
E38000094	NHS Leeds North	200,757	152,942	90,283	455	57
E38000095	NHS Leeds South and East	249,654	183,755	89,866	420	53
E38000096	NHS Leeds West	323,649	249,639	115,152	538	68
E38000119	NHS North East Lincolnshire	159,570	121,745	73,555	368	47
E38000121	NHS North Kirklees	190,507	139,195	76,680	355	45
E38000122	NHS North Lincolnshire	169,820	130,955	81,592	398	51
E38000141	NHS Rotherham	260,786	198,495	120,094	578	73
E38000145	NHS Scarborough and Ryedale	110,708	87,842	59,075	317	40
E38000146	NHS Sheffield	569,737	434,257	221,926	1,095	138
E38000188	NHS Vale of York	355,404	278,659	163,051	813	103
E38000190	NHS Wakefield	333,759	256,839	153,534	722	92
E40000002	Midlands and East of England	16,624,530	12,646,531	7,366,867	36,350	4,602
E39000030	Central Midlands	4,569,598	3,453,727	1,978,540	9,434	1,195
E38000010	NHS Bedfordshire	440,274	333,137	193,307	897	114
E38000037	NHS Corby	66,854	49,293	26,596	112	14
E38000049	NHS East and North Hertfordshire	559,105	423,151	238,410	1,134	143
E38000051	NHS East Leicestershire and Rutland	325,899	250,941	160,178	805	102
E38000079	NHS Herts Valleys	588,222	439,143	246,904	1,167	147
E38000097	NHS Leicester City	342,627	249,844	112,194	493	62
E38000099	NHS Lincolnshire East	232,030	184,730	126,022	694	88
E38000100	NHS Lincolnshire West	234,338	182,009	106,870	540	69
E38000102	NHS Luton	214,710	153,384	71,307	322	41
E38000107	NHS Milton Keynes	267,751	194,962	100,957	410	52
E38000108	NHS Nene	640,035	482,865	281,848	1,301	165
E38000157	NHS South Lincolnshire	145,980	114,215	73,922	389	49
E38000165	NHS South West Lincolnshire	124,317	96,053	62,531	311	40
E38000201	NHS West Leicestershire	387,456	300,000	177,494	858	109
E39000031	East	4,290,277	3,302,615	1,996,634	10,224	1,294
E38000007	NHS Basildon and Brentwood	257,778	194,903	113,802	552	70

Code	Health area/CCG	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
E38000026	NHS Cambridgeshire and Peterborough	876,367	666,109	371,552	1,789	226
E38000030	NHS Castle Point and Rochford	174,317	136,685	89,796	472	60
E38000063	NHS Great Yarmouth and Waveney	214,849	167,699	110,232	616	78
E38000086	NHS Ipswich and East Suffolk	399,455	308,630	196,661	1,026	130
E38000106	NHS Mid Essex	385,741	296,972	181,755	883	112
E38000117	NHS North East Essex	325,122	252,384	155,555	841	106
E38000124	NHS North Norfolk	170,574	137,651	98,366	566	72
E38000131	NHS Norwich	198,234	156,006	80,654	425	53
E38000159	NHS South Norfolk	243,357	189,067	122,303	657	83
E38000168	NHS Southend	178,702	136,344	79,730	403	51
E38000185	NHS Thurrock	165,184	120,383	62,892	269	34
E38000197	NHS West Essex	300,193	227,379	135,251	652	82
E38000203	NHS West Norfolk	174,146	137,506	91,639	517	66
E38000204	NHS West Suffolk	226,258	174,897	106,446	558	71
<i>E39000032</i>	<i>North Midlands</i>	<i>3,610,404</i>	<i>2,784,073</i>	<i>1,657,473</i>	<i>8,101</i>	<i>1,027</i>
E38000028	NHS Cannock Chase	134,857	104,549	62,893	296	38
E38000053	NHS East Staffordshire	125,737	95,926	57,859	277	35
E38000058	NHS Erewash	96,317	74,400	44,142	213	27
E38000071	NHS Hardwick	110,471	86,405	53,896	265	34
E38000103	NHS Mansfield and Ashfield	196,378	151,125	90,738	431	55
E38000109	NHS Newark & Sherwood	118,733	92,082	59,076	294	37
E38000115	NHS North Derbyshire	272,898	215,927	140,932	706	90
E38000126	NHS North Staffordshire	216,715	170,466	106,151	534	68
E38000132	NHS Nottingham City	318,901	237,761	100,560	456	57
E38000133	NHS Nottingham North and East	149,477	115,814	70,126	339	43
E38000134	NHS Nottingham West	112,253	88,064	52,855	264	33
E38000142	NHS Rushcliffe	114,474	88,500	54,998	275	35
E38000147	NHS Shropshire	311,380	245,233	161,504	844	107
E38000153	NHS South East Staffordshire and Seisdon Peninsula	224,831	175,765	110,423	548	70
E38000169	NHS Southern Derbyshire	523,753	398,060	232,846	1,121	142
E38000173	NHS Stafford and Surrounds	152,211	120,452	76,757	392	50

Code	Health area/CCG	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
E38000175	NHS Stoke on Trent	259,859	196,017	109,125	521	66
E38000183	NHS Telford and Wrekin	171,159	127,527	72,592	325	41
<i>E39000033</i>	<i>West Midlands</i>	<i>4,154,251</i>	<i>3,106,116</i>	<i>1,734,220</i>	<i>8,591</i>	<i>1,086</i>
E38000012	NHS Birmingham CrossCity	740,797	527,983	264,148	1,253	158
E38000013	NHS Birmingham South and Central	202,277	146,110	67,605	321	41
E38000038	NHS Coventry and Rugby	448,828	336,486	168,062	821	104
E38000046	NHS Dudley	316,464	241,197	145,696	743	94
E38000078	NHS Herefordshire	188,099	148,225	96,934	514	65
E38000139	NHS Redditch and Bromsgrove	180,511	138,846	84,864	415	52
E38000144	NHS Sandwell and West Birmingham	487,688	350,493	170,472	784	99
E38000149	NHS Solihull	210,445	160,162	100,838	517	65
E38000164	NHS South Warwickshire	261,453	205,299	126,377	656	83
E38000166	NHS South Worcestershire	298,579	233,411	149,072	773	98
E38000191	NHS Walsall	276,095	204,380	116,748	583	74
E38000195	NHS Warwickshire North	189,106	145,373	88,783	425	54
E38000210	NHS Wolverhampton	254,406	189,974	103,849	518	65
E38000211	NHS Wyre Forest	99,503	78,177	50,772	269	34
E40000003	London	8,673,713	6,533,667	2,900,885	12,268	1,548
<i>E39000018</i>	<i>London</i>	<i>8,673,713</i>	<i>6,533,667</i>	<i>2,900,885</i>	<i>12,268</i>	<i>1,548</i>
E38000004	NHS Barking and Dagenham	201,979	136,717	60,792	246	31
E38000005	NHS Barnet	379,691	282,972	139,509	641	81
E38000011	NHS Bexley	242,142	180,636	101,388	483	61
E38000020	NHS Brent	324,012	241,737	109,260	457	58
E38000023	NHS Bromley	324,857	245,975	140,718	676	85
E38000027	NHS Camden	241,059	188,994	76,576	336	42
E38000031	NHS Central London (Westminster)	174,141	140,818	60,846	269	34
E38000035	NHS City and Hackney	277,769	210,086	71,607	263	33
E38000040	NHS Croydon	379,031	277,109	143,442	606	77
E38000048	NHS Ealing	343,059	254,633	119,134	499	63
E38000057	NHS Enfield	328,433	237,442	119,131	515	65
E38000066	NHS Greenwich	274,803	202,255	87,143	350	44

Code	Health area/CCG	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
E38000070	NHS Hammersmith and Fulham	179,410	142,172	55,933	223	28
E38000072	NHS Haringey	272,864	206,333	83,429	312	40
E38000074	NHS Harrow	247,130	185,100	96,164	452	57
E38000077	NHS Havering	249,085	189,136	109,057	546	69
E38000082	NHS Hillingdon	297,735	219,615	106,032	478	60
E38000084	NHS Hounslow	268,770	200,290	89,310	373	47
E38000088	NHS Islington	227,692	182,109	63,240	247	31
E38000090	NHS Kingston	173,525	131,891	62,172	277	35
E38000092	NHS Lambeth	324,431	255,683	89,600	324	41
E38000098	NHS Lewisham	297,325	223,608	92,508	348	44
E38000105	NHS Merton	204,565	154,571	71,548	305	38
E38000113	NHS Newham	332,817	240,585	84,927	300	38
E38000138	NHS Redbridge	296,793	214,807	101,389	447	56
E38000140	NHS Richmond	194,730	146,972	78,474	342	43
E38000171	NHS Southwark	308,901	239,149	88,900	312	39
E38000179	NHS Sutton	200,145	149,787	80,596	363	46
E38000186	NHS Tower Hamlets	295,236	223,177	62,293	232	29
E38000192	NHS Waltham Forest	271,170	200,332	87,060	348	44
E38000193	NHS Wandsworth	314,544	248,714	87,874	357	45
E38000202	NHS West London	225,869	180,262	80,833	346	44
E40000004	South of England	14,151,342	10,874,989	6,528,829	33,048	4,175
<i>E39000025</i>	<i>Wessex</i>	<i>2,762,546</i>	<i>2,141,421</i>	<i>1,296,269</i>	<i>6,734</i>	<i>850</i>
E38000045	NHS Dorset	765,678	606,153	388,384	2,172	274
E38000059	NHS Fareham and Gosport	199,471	154,650	96,759	495	63
E38000087	NHS Isle of Wight	139,395	110,979	76,693	424	54
E38000118	NHS North East Hampshire and Farnham	209,171	157,611	90,058	420	53
E38000120	NHS North Hampshire	220,750	166,742	98,570	450	57
E38000137	NHS Portsmouth	211,758	160,833	76,583	354	45
E38000154	NHS South Eastern Hampshire	211,880	163,462	107,489	561	71
E38000167	NHS Southampton	249,537	190,913	83,858	396	50
E38000198	NHS West Hampshire	554,906	430,078	277,875	1,463	185

Code	Health area/CCG	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
<i>E39000034</i>	<i>South Central</i>	<i>3,607,785</i>	<i>2,732,964</i>	<i>1,583,395</i>	<i>7,603</i>	<i>962</i>
E38000003	NHS Aylesbury Vale	207,002	155,427	92,034	419	53
E38000009	NHS Bath and North East Somerset	184,874	143,260	80,373	414	52
E38000017	NHS Bracknell and Ascot	137,012	101,381	56,576	239	30
E38000033	NHS Chiltern	324,044	242,839	148,018	731	92
E38000062	NHS Gloucestershire	617,162	477,970	297,371	1,487	188
E38000110	NHS Newbury and District	106,394	79,816	47,944	219	28
E38000114	NHS North & West Reading	100,332	74,696	45,190	210	27
E38000136	NHS Oxfordshire	663,566	507,312	281,165	1,374	174
E38000148	NHS Slough	145,734	101,856	44,717	176	22
E38000160	NHS South Reading	111,033	83,176	31,870	135	17
E38000181	NHS Swindon	222,769	167,418	92,341	410	52
E38000206	NHS Wiltshire	486,093	371,349	234,014	1,165	147
E38000207	NHS Windsor, Ascot and Maidenhead	141,361	106,813	60,371	295	37
E38000209	NHS Wokingham	160,409	119,651	71,411	328	42
<i>E39000035</i>	<i>South East</i>	<i>4,580,798</i>	<i>3,508,112</i>	<i>2,117,929</i>	<i>10,696</i>	<i>1,350</i>
E38000002	NHS Ashford	124,250	92,726	56,497	271	34
E38000021	NHS Brighton and Hove	285,276	225,432	104,052	464	58
E38000029	NHS Canterbury and Coastal	207,653	161,030	94,396	499	63
E38000039	NHS Crawley	110,864	82,246	41,096	180	23
E38000043	NHS Dartford, Gravesham and Swanley	258,208	194,185	109,930	526	67
E38000054	NHS East Surrey	182,019	137,402	80,603	385	48
E38000055	NHS Eastbourne, Hailsham and Seaford	188,088	148,458	99,317	587	74
E38000076	NHS Hastings and Rother	184,405	144,808	97,665	533	67
E38000081	NHS High Weald Lewes Havens	171,571	132,931	89,397	453	57
E38000083	NHS Horsham and Mid Sussex	230,346	174,979	109,055	530	67
E38000104	NHS Medway	276,492	206,241	112,197	496	63
E38000128	NHS North West Surrey	343,000	260,660	150,494	731	92
E38000156	NHS South Kent Coast	205,463	160,151	103,888	540	68
E38000177	NHS Surrey Downs	287,017	216,800	138,230	690	87
E38000178	NHS Surrey Heath	95,851	73,399	44,138	213	27

Code	Health area/CCG	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
E38000180	NHS Swale	112,528	83,995	49,837	233	30
E38000184	NHS Thanet	139,772	106,607	68,273	366	46
E38000199	NHS West Kent	476,845	358,623	217,746	1,060	134
E38000213	NHS Coastal West Sussex	495,046	391,047	261,951	1,487	187
E38000214	NHS Guildford and Waverley	206,104	156,392	89,167	452	57
<i>E39000036</i>	<i>South West</i>	<i>3,200,213</i>	<i>2,492,492</i>	<i>1,531,236</i>	<i>8,016</i>	<i>1,013</i>
E38000022	NHS Bristol	449,328	343,179	151,015	717	90
E38000089	NHS Kernow	551,728	432,836	286,423	1,512	192
E38000125	NHS North Somerset	209,944	163,003	105,975	565	71
E38000129	NHS Northern, Eastern and Western Devon	890,596	698,047	432,005	2,299	290
E38000150	NHS Somerset	545,390	424,192	280,760	1,491	189
E38000152	NHS South Devon and Torbay	278,566	221,130	152,189	834	105
E38000155	NHS South Gloucestershire	274,661	210,105	122,869	598	76

Table note: prevalence estimates are based on population aged 20+, incidence estimates are based on population aged 45+.

Table 30 Estimated prevalence and incidence numbers for health boards in Northern Ireland

Northern Ireland health board/ trust	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
Eastern Health & Social Services Board	708,429	532,363	295,413	1,380	174
Northern Health & Social Services Board	471,188	350,423	200,770	927	118
Southern Health & Social Services Board	372,976	268,734	143,438	629	80
Western Health & Social Services Board	299,028	217,490	120,481	524	67
Belfast Health & Social Care Trust	353,778	267,133	138,816	653	82
Northern Health & Social Care Trust	471,188	350,423	200,770	927	118
South Eastern Health & Social Care Trust	354,651	265,230	156,597	727	92
Southern Health & Social Care Trust	372,976	268,734	143,438	629	80
Western Health & Social Care Trust	299,028	217,490	120,481	524	67

Table note: prevalence estimates are based on population aged 20+, incidence estimates are based on population aged 45+.

Table 31 Estimated prevalence and incidence numbers for health boards in Scotland

Scotland health board	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
Ayrshire & Arran	370,590	291,319	187,607	913	116
Borders	114,030	90,078	61,798	309	39
Dumfries & Galloway	149,670	119,461	81,481	423	54
Fife	368,080	286,255	175,467	835	106
Forth Valley	302,650	234,854	140,923	644	82
Grampian	587,820	462,573	257,537	1,186	150
Greater Glasgow & Clyde	1,149,890	903,799	496,326	2,241	283
Highland	321,000	253,317	166,128	816	104
Lanarkshire	654,490	505,130	301,710	1,334	170
Lothian	867,800	682,667	359,592	1,638	207
Orkney	21,670	17,230	11,388	56	7
Shetland	23,200	17,856	10,876	51	6
Tayside	415,040	327,237	198,412	1,000	126
Western Isles	27,070	21,569	14,682	76	10

Table note: prevalence estimates are based on population aged 20+, incidence estimates are based on population aged 45+.

Table 32 Estimated prevalence and incidence numbers for health boards in Wales

Wales health board	Total population	Population aged 20+	Population aged 45+	Estimated prevalence	Estimated yearly incidence
Abertawe Bro Morgannwg University Health Board	525,466	407,620	240,583	1,204	92
Aneurin Bevan University Health Board	581,789	445,143	269,606	1,312	102
Betsi Cadwaladr University Health Board	694,473	539,111	341,456	1,784	140
Cardiff and Vale University Health Board	484,752	369,006	189,088	899	68
Cwm Taf University Health Board	296,735	227,121	132,240	638	50
Hywel Dda University Health Board	383,229	299,458	194,751	1,041	82
Powys Teaching Health Board	132,642	104,958	72,902	397	32

Table note: prevalence estimates are based on population aged 20+, incidence estimates are based on population aged 45+.

9 Appendix: Codes used to define Parkinson's in CPRD data

Read codes (version 2) for definite diagnosis of Parkinson's:

F12..00	Parkinson's disease
F120.00	Paralysis agitans
F12z.00	Parkinson's disease not otherwise specified
147F.00	History of Parkinson's disease

Read codes (version 2) for suggestive diagnosis of Parkinson's:

2987	On examination: Parkinson flexion posture
2987.11	On examination: Parkinson posture
2994	On examination: festination/Parkinson gait
2994.11	On examination: Parkinson gait
297A.00	On examination: Parkinsonian tremor
8T06.00	Referral to Parkinson's service
8T06000	Referral to community Parkinson's service
TJ64z00	Adverse Reaction to Anti-Parkinsonism Drugs not otherwise specified
U606711	[X] Adverse reaction to anti-parkinsonism drug
U606712	[X] Adverse reaction to amantadine
U606713	[X] Adverse reaction to levodopa, L-dopa
U606714	[X] Adverse reaction to trihexyphenidyl
U606718	[X] Adverse reaction to anti-parkinsonism drugs not otherwise specified

Drug codes for Parkinson's related medications:

Multilex code	Drug substance	Product name
3046001	amantadine hydrochloride	amantadine hydrochloride capsules 100mg
2419001	amantadine hydrochloride	amantadine hydrochloride oral solution 50mg/5ml
364001	amantadine hydrochloride	LYSOVIR capsules 100mg [ALLIANCE]
911001	amantadine hydrochloride	SYMMETREL capsules 100mg [ALLIANCE]
1311001	amantadine hydrochloride	SYMMETREL syrup 50mg/5ml [ALLIANCE]
11449001	apomorphine hydrochloride	APO-GO injection 10mg/ml [BRITANNIA]
14635001	apomorphine hydrochloride	APO-GO injection 20mg/2ml [GENUS]
14636001	apomorphine hydrochloride	APO-GO injection 30mg/3ml [GENUS]
14637001	apomorphine hydrochloride	APO-GO injection 50mg/5ml [GENUS]
12944001	apomorphine hydrochloride	APO-GO PFS solution for infusion 50mg/10ml [GENUS]
7085001	apomorphine hydrochloride	apomorphine injection 10mg/ml
14632001	apomorphine hydrochloride	apomorphine injection 20mg/2ml
14633001	apomorphine hydrochloride	apomorphine injection 30mg/3ml
14634001	apomorphine hydrochloride	apomorphine injection 50mg/5ml
12943001	apomorphine hydrochloride	apomorphine solution for infusion 50mg/10ml

Multilex code	Drug substance	Product name
7084001	apomorphine hydrochloride	BRITAJECT subcutaneous injection 10mg/1ml [BRITANNIA]
4929001	benserazide/levodopa	benserazide with levodopa capsules 12.5mg+50mg
4929003	benserazide/levodopa	benserazide with levodopa capsules 25mg+100mg
4930002	benserazide/levodopa	benserazide with levodopa capsules 50mg+200mg
4929002	benserazide/levodopa	benserazide with levodopa dispersible tabs 12.5mg+50mg
4930001	benserazide/levodopa	benserazide with levodopa dispersible tabs 25mg+100mg
5585001	benserazide/levodopa	benserazide with levodopa mod release caps 25mg+100mg
6776001	benserazide/levodopa	co-beneldopa capsules 12.5mg+50mg
6776002	benserazide/levodopa	co-beneldopa capsules 25mg+100mg
6776003	benserazide/levodopa	co-beneldopa capsules 50mg+200mg
6777001	benserazide/levodopa	co-beneldopa dispersible tabs 12.5mg+50mg
6777002	benserazide/levodopa	co-beneldopa dispersible tabs 25mg+100mg
6777003	benserazide/levodopa	co-beneldopa modified release capsules 25mg+100mg
3977002	benserazide/levodopa	levodopa with benserazide capsules 100mg+25mg
3977003	benserazide/levodopa	levodopa with benserazide capsules 200mg+50mg
3977001	benserazide/levodopa	levodopa with benserazide capsules 50mg+12.5mg
3978002	benserazide/levodopa	levodopa with benserazide dispersible tabs 100mg+25mg
3978001	benserazide/levodopa	levodopa with benserazide dispersible tabs 50mg+12.5mg
5584001	benserazide/levodopa	levodopa with benserazide mod release caps 100mg+25mg
2949003	benserazide/levodopa	MADOPAR capsules 125mg [ROCHE]
2950002	benserazide/levodopa	MADOPAR capsules 250mg [ROCHE]
2949001	benserazide/levodopa	MADOPAR capsules 62.5mg [ROCHE]
5583001	benserazide/levodopa	MADOPAR CR 125 capsules [ROCHE]
2950001	benserazide/levodopa	MADOPAR dispersible tabs 125mg [ROCHE]
2949002	benserazide/levodopa	MADOPAR dispersible tabs 62.5mg [ROCHE]
4026002	benzatropine mesilate	benzatropine mesilate injection 2mg/2ml
4026001	benzatropine mesilate	benzatropine mesilate tabs 2mg
182002	benzatropine mesilate	COGENTIN injection 1mg/ml [M S D]
15757001	benzatropine mesilate	COGENTIN injection 2mg/2ml [OVATION]
182001	benzatropine mesilate	COGENTIN tabs 2mg [M S D]
4058001	bromocriptine mesilate	bromocriptine mesilate capsules 10mg
4057003	bromocriptine mesilate	bromocriptine mesilate capsules 5mg
4057001	bromocriptine mesilate	bromocriptine mesilate tabs 1mg
4057002	bromocriptine mesilate	bromocriptine mesilate tabs 2.5mg
225009	bromocriptine mesilate	BROMOCRIPTINE tabs 2.5mg [BERK]
3181009	bromocriptine mesilate	BROMOCRIPTINE tabs 2.5mg [GEN (UK)]
227009	bromocriptine mesilate	BROMOCRIPTINE tabs 2.5mg [HILLCROSS]
717001	bromocriptine mesilate	PARLODEL capsules 10mg [NOV/SANDOZ]
17057001	bromocriptine mesilate	PARLODEL capsules 5mg [MEDA]
716003	bromocriptine mesilate	PARLODEL capsules 5mg [NOV/SANDOZ]
17054001	bromocriptine mesilate	PARLODEL tabs 1mg [MEDA]
716001	bromocriptine mesilate	PARLODEL tabs 1mg [NOV/SANDOZ]
17056001	bromocriptine mesilate	PARLODEL tabs 2.5mg [MEDA]
716002	bromocriptine mesilate	PARLODEL tabs 2.5mg [NOV/SANDOZ]
11011001	cabergoline	CABASER tabs 1mg [PHARMACIA]
11011002	cabergoline	CABASER tabs 2mg [PHARMACIA]

Multilex code	Drug substance	Product name
11011003	cabergoline	CABASER tabs 4mg [PHARMACIA]
7201001	cabergoline	cabergoline tabs 0.5mg
11009001	cabergoline	cabergoline tabs 1mg
11009002	cabergoline	cabergoline tabs 2mg
11009003	cabergoline	cabergoline tabs 4mg
7200001	cabergoline	DOSTINEX tabs 0.5mg [PHARMACIA]
15019001	carbidopa/levodopa	CARAMET CR tabs 25mg+100mg [TEVA]
15020001	carbidopa/levodopa	CARAMET CR tabs 50mg+200mg [TEVA]
13885001	carbidopa/levodopa	carbidopa with levodopa intestinal gel 5mg+20mg/ml
5551003	carbidopa/levodopa	carbidopa with levodopa modified release tab 25mg+100mg
5551002	carbidopa/levodopa	carbidopa with levodopa modified release tab 50mg+200mg
3127001	carbidopa/levodopa	carbidopa with levodopa tabs 10mg+100mg
5551001	carbidopa/levodopa	carbidopa with levodopa tabs 12.5mg+50mg
3127003	carbidopa/levodopa	carbidopa with levodopa tabs 25mg+100mg
3127002	carbidopa/levodopa	carbidopa with levodopa tabs 25mg+250mg
13879001	carbidopa/levodopa	co-careldopa intestinal gel 5mg+20mg/ml
6779003	carbidopa/levodopa	co-careldopa modified release tabs 25mg+100mg
6779002	carbidopa/levodopa	co-careldopa modified release tabs 50mg+200mg
17348001	carbidopa/levodopa	co-careldopa oral solution 25mg+100mg/5ml
17347001	carbidopa/levodopa	co-careldopa oral suspension 25mg+100mg/5ml
6778001	carbidopa/levodopa	co-careldopa tabs 10mg+100mg
2966009	carbidopa/levodopa	CO-CARELDOPA tabs 10mg+100mg [TEVA]
6779001	carbidopa/levodopa	co-careldopa tabs 12.5mg+50mg
6778003	carbidopa/levodopa	co-careldopa tabs 25mg+100mg
2966010	carbidopa/levodopa	CO-CARELDOPA tabs 25mg+100mg [TEVA]
6778002	carbidopa/levodopa	co-careldopa tabs 25mg+250mg
2966011	carbidopa/levodopa	CO-CARELDOPA tabs 25mg+250mg [TEVA]
7052001	carbidopa/levodopa	HALF SINEMET CR tabs 25mg+100mg [BMS]
17613001	carbidopa/levodopa	HALF SINEMET CR tabs 25mg+100mg [M S D]
5549003	carbidopa/levodopa	levodopa with carbidopa modified release tab 100mg+25mg
5549002	carbidopa/levodopa	levodopa with carbidopa modified release tab 200mg+50mg
3979001	carbidopa/levodopa	levodopa with carbidopa tabs 100mg+10mg
3979003	carbidopa/levodopa	levodopa with carbidopa tabs 100mg+25mg
3979002	carbidopa/levodopa	levodopa with carbidopa tabs 250mg+25mg
5549001	carbidopa/levodopa	levodopa with carbidopa tabs 50mg+12.5mg
860001	carbidopa/levodopa	SINEMET 110 tabs [BMS]
17616001	carbidopa/levodopa	SINEMET 110 tabs [M S D]
1597001	carbidopa/levodopa	SINEMET 275 tabs [BMS]
17617001	carbidopa/levodopa	SINEMET 275 tabs [M S D]
5550001	carbidopa/levodopa	SINEMET 62.5 tabs [BMS]
17618001	carbidopa/levodopa	SINEMET 62.5 tabs [M S D]
5042001	carbidopa/levodopa	SINEMET CR tabs 50mg+200mg [BMS]
17615001	carbidopa/levodopa	SINEMET CR tabs 50mg+200mg [M S D]
1598001	carbidopa/levodopa	SINEMET PLUS tabs [BMS]
17619001	carbidopa/levodopa	SINEMET PLUS tabs [M S D]
12610001	carbidopa/levodopa	TILOLEC modified release tabs 50mg+200mg [TILLOMED]

Multilex code	Drug substance	Product name
12191001	carbidopa/levodopa/entacapone	levodopa with carbidopa and entacapone tabs 100mg+25mg+200mg
17134001	carbidopa/levodopa/entacapone	levodopa with carbidopa and entacapone tabs 125mg+31.25mg+200mg
12192001	carbidopa/levodopa/entacapone	levodopa with carbidopa and entacapone tabs 150mg+37.5mg+200mg
16221001	carbidopa/levodopa/entacapone	levodopa with carbidopa and entacapone tabs 200mg+50mg+200mg
12190001	carbidopa/levodopa/entacapone	levodopa with carbidopa and entacapone tabs 50mg+12.5mg+200mg
17133001	carbidopa/levodopa/entacapone	levodopa with carbidopa and entacapone tabs 75mg+18.75mg+200mg
12194001	carbidopa/levodopa/entacapone	STALEVO film coated tabs 100mg+25mg+200mg [ORION]
17136001	carbidopa/levodopa/entacapone	STALEVO film coated tabs 125mg+31.25mg+200mg [ORION]
12195001	carbidopa/levodopa/entacapone	STALEVO film coated tabs 150mg+37.5mg+200mg [ORION]
16222001	carbidopa/levodopa/entacapone	STALEVO film coated tabs 200mg+50mg+200mg [ORION]
12193001	carbidopa/levodopa/entacapone	STALEVO film coated tabs 50mg+12.5mg+200mg [ORION]
17135001	carbidopa/levodopa/entacapone	STALEVO film coated tabs 75mg+18.75mg+200mg [ORION]
1674001	entacapone	COMTESS tabs 200mg [ORION]
2445001	entacapone	entacapone tabs 200mg
125001	levodopa	BROCADOPA capsules 125mg [YAMANOUCHI]
125002	levodopa	BROCADOPA capsules 250mg [YAMANOUCHI]
125003	levodopa	BROCADOPA capsules 500mg [YAMANOUCHI]
504001	levodopa	LARODOPA tabs 500mg [CAMBRIDGE]
3975001	levodopa	levodopa capsules 125mg
3975002	levodopa	levodopa capsules 250mg
3975003	levodopa	levodopa capsules 500mg
3976001	levodopa	levodopa tabs 500mg
6231001	lisuride maleate	lisuride tabs 200mcg
6232001	lisuride maleate	REVANIL tabs 200mcg [CAMBRIDGE]
4326001	orphenadrine hydrochloride	BIORPHEN sugar free elixir 25mg/5ml [ALLIANCE]
257001	orphenadrine hydrochloride	DISIPAL tabs 50mg [ASTELLAS]
4325003	orphenadrine hydrochloride	orphenadrine elixir 25mg/5ml
2449001	orphenadrine hydrochloride	orphenadrine sugar free oral solution 50mg/5ml
4325001	orphenadrine hydrochloride	orphenadrine tabs 50mg
7465001	pergolide mesilate	CELANCE starter pack 109 x 50mcg + 57 x 250mcg [LILLY]
8469001	pergolide mesilate	CELANCE starter pack 75 x 50mcg + 6 x 250mcg [LILLY]
1066003	pergolide mesilate	CELANCE tabs 1mg [LILLY]
1066002	pergolide mesilate	CELANCE tabs 250mcg [LILLY]
1066001	pergolide mesilate	CELANCE tabs 50mcg [LILLY]

Multilex code	Drug substance	Product name
8239001	pergolide mesilate	pergolide starter pack 109 x 50mcg + 57 x 250mcg
8020001	pergolide mesilate	pergolide starter pack 75 x 50mcg + 6 x 250mcg
1943003	pergolide mesilate	pergolide tabs 1mg
1943002	pergolide mesilate	pergolide tabs 250mcg
1943001	pergolide mesilate	pergolide tabs 50mcg
17444001	pramipexole dihydrochloride monohydrate	MIRAPEXIN prolonged release tabs 1.05mg [BOEH INGL]
17445001	pramipexole dihydrochloride monohydrate	MIRAPEXIN prolonged release tabs 2.1mg [BOEH INGL]
17442001	pramipexole dihydrochloride monohydrate	MIRAPEXIN prolonged release tabs 260mcg [BOEH INGL]
17446001	pramipexole dihydrochloride monohydrate	MIRAPEXIN prolonged release tabs 3.15mg [BOEH INGL]
17443001	pramipexole dihydrochloride monohydrate	MIRAPEXIN prolonged release tabs 520mcg [BOEH INGL]
10034002	pramipexole dihydrochloride monohydrate	MIRAPEXIN tabs 180mcg [BOEH INGL]
15820001	pramipexole dihydrochloride monohydrate	MIRAPEXIN tabs 350 mcg [BOEH INGL]
10034003	pramipexole dihydrochloride monohydrate	MIRAPEXIN tabs 700mcg [BOEH INGL]
10034001	pramipexole dihydrochloride monohydrate	MIRAPEXIN tabs 88 mcg [BOEH INGL]
17439001	pramipexole dihydrochloride monohydrate	pramipexole prolonged release tabs 1.05mg
17440001	pramipexole dihydrochloride monohydrate	pramipexole prolonged release tabs 2.1mg
17437001	pramipexole dihydrochloride monohydrate	pramipexole prolonged release tabs 260mcg
17441001	pramipexole dihydrochloride monohydrate	pramipexole prolonged release tabs 3.15mg
17438001	pramipexole dihydrochloride monohydrate	pramipexole prolonged release tabs 520mcg
8304002	pramipexole dihydrochloride monohydrate	pramipexole tabs 180mcg
15819001	pramipexole dihydrochloride monohydrate	pramipexole tabs 350 mcg
8304003	pramipexole dihydrochloride monohydrate	pramipexole tabs 700mcg
8304001	pramipexole dihydrochloride monohydrate	pramipexole tabs 88 mcg
4608001	procyclidine hydrochloride	ARPICOLIN syrup 2.5mg/5ml [ROSEMONT]
4608002	procyclidine hydrochloride	ARPICOLIN syrup 5mg/5ml [ROSEMONT]
9506001	procyclidine hydrochloride	KEMADRIN injection 10mg/2ml [AUDEN MCKE]
5067001	procyclidine hydrochloride	KEMADRIN injection 5mg/ml [WELLCOME]
486001	procyclidine hydrochloride	KEMADRIN tabs 5mg [WELLCOME]

Multilex code	Drug substance	Product name
10835001	procyclidine hydrochloride	MUSCINIL tabs 5mg [OPUS]
4607001	procyclidine hydrochloride	procyclidine injection 10mg/2ml
4606002	procyclidine hydrochloride	procyclidine syrup 2.5mg/5ml
4606003	procyclidine hydrochloride	procyclidine syrup 5mg/5ml
4606001	procyclidine hydrochloride	procyclidine tabs 5mg
2275009	procyclidine hydrochloride	PROCYCLIDINE tabs 5mg [ACTAVIS]
904009	procyclidine hydrochloride	PROCYCLIDINE tabs 5mg [HILLCROSS]
1546009	procyclidine hydrochloride	PROCYCLIDINE tabs 5mg [IVAX]
1894009	procyclidine hydrochloride	PROCYCLIDINE tabs 5mg [TEVA]
13171001	rasagiline mesilate	AZILECT tabs 1mg [LUNDBECK]
13170001	rasagiline mesilate	rasagiline tabs 1mg
14005001	ropinirole hydrochloride	ADARTREL tabs 250mcg [GLAXSK PHA]
14008001	ropinirole hydrochloride	ADARTREL tabs 2mg [GLAXSK PHA]
14007001	ropinirole hydrochloride	ADARTREL tabs 500 mcg [GLAXSK PHA]
10331002	ropinirole hydrochloride	REQUIP tabs 1mg [GLAXSK PHA]
10331001	ropinirole hydrochloride	REQUIP tabs 250mcg [GLAXSK PHA]
11108001	ropinirole hydrochloride	REQUIP tabs 250mcg+500mcg+1mg [GLAXSK PHA]
10331003	ropinirole hydrochloride	REQUIP tabs 2mg [GLAXSK PHA]
9434001	ropinirole hydrochloride	REQUIP tabs 500mcg+1mg+2mg [GLAXSK PHA]
10332001	ropinirole hydrochloride	REQUIP tabs 5mg [GLAXSK PHA]
16115001	ropinirole hydrochloride	REQUIP XL prolonged release tabs 2mg [GLAXSK PHA]
16116001	ropinirole hydrochloride	REQUIP XL prolonged release tabs 4mg [GLAXSK PHA]
16117001	ropinirole hydrochloride	REQUIP XL prolonged release tabs 8mg [GLAXSK PHA]
16007001	ropinirole hydrochloride	ropinirole modified release tabs 2mg
16008001	ropinirole hydrochloride	ropinirole modified release tabs 4mg
16009001	ropinirole hydrochloride	ropinirole modified release tabs 8mg
10329002	ropinirole hydrochloride	ropinirole tabs 1mg
10329001	ropinirole hydrochloride	ropinirole tabs 250mcg
7419009	ropinirole hydrochloride	ROPINIROLE tabs 250mcg [WINTHROP]
10779001	ropinirole hydrochloride	ropinirole tabs 250mcg+500mcg+1mg
10329003	ropinirole hydrochloride	ropinirole tabs 2mg
14006001	ropinirole hydrochloride	ropinirole tabs 500 mcg
11120001	ropinirole hydrochloride	ropinirole tabs 500mcg+1mg+2mg
10330001	ropinirole hydrochloride	ropinirole tabs 5mg
17224001	rotigotine	NEUPRO patch 1mg/24 hours [UCB]
13856001	rotigotine	NEUPRO patch 2mg/24 hours [UCB]
13860001	rotigotine	NEUPRO patch 2mg/24hr+4mg/24hr+ 6mg/24hr+8mg/24hr
17225001	rotigotine	NEUPRO patch 3mg/24 hours [UCB]
13857001	rotigotine	NEUPRO patch 4mg/24 hours [UCB]
13858001	rotigotine	NEUPRO patch 6mg/24 hours [UCB]
13859001	rotigotine	NEUPRO patch 8mg/24 hours [UCB]
17222001	rotigotine	rotigotine patch 1mg/24 hours
13851001	rotigotine	rotigotine patch 2mg/24 hours
13855001	rotigotine	rotigotine patch 2mg/24hr+4mg/24hr+6mg/24hr+8mg/24hr
17223001	rotigotine	rotigotine patch 3mg/24 hours
13852001	rotigotine	rotigotine patch 4mg/24 hours

Multilex code	Drug substance	Product name
13853001	rotigotine	rotigotine patch 6mg/24 hours
13854001	rotigotine	rotigotine patch 8mg/24 hours
9967001	selegiline hydrochloride	CENTRAPRYL tabs 5mg [OPUS]
4698003	selegiline hydrochloride	ELDEPRYL syrup 10mg/5ml [ORION]
4698002	selegiline hydrochloride	ELDEPRYL tabs 10mg [ORION]
4698001	selegiline hydrochloride	ELDEPRYL tabs 5mg [ORION]
11133001	selegiline hydrochloride	selegiline hydrochloride lyophilised tabs 1.25mg
4697003	selegiline hydrochloride	selegiline hydrochloride syrup 10mg/5ml
4697002	selegiline hydrochloride	selegiline hydrochloride tabs 10mg
4697001	selegiline hydrochloride	selegiline hydrochloride tabs 5mg
2041010	selegiline hydrochloride	SELEGILINE tabs 10mg [IVAX]
2045010	selegiline hydrochloride	SELEGILINE tabs 10mg [NICHE]
2203010	selegiline hydrochloride	SELEGILINE tabs 10mg [TEVA]
2041009	selegiline hydrochloride	SELEGILINE tabs 5mg [IVAX]
2045009	selegiline hydrochloride	SELEGILINE tabs 5mg [NICHE]
9217002	selegiline hydrochloride	STILLINE tabs 10mg [BERK]
9217001	selegiline hydrochloride	STILLINE tabs 5mg [BERK]
8995002	selegiline hydrochloride	VIVAPRYL tabs 10mg [VIATRIS]
8995001	selegiline hydrochloride	VIVAPRYL tabs 5mg [VIATRIS]
11506001	selegiline hydrochloride	ZELAPAR lyophilised tabs 1.25mg [CEPHALON]
13067001	tolcapone	TASMAR film coated tabs 100mg [MEDA]
11439001	tolcapone	TASMAR film coated tabs 100mg [ROCHE]
11439002	tolcapone	TASMAR film coated tabs 200mg [ROCHE]
11436002	tolcapone	tolcapone film coated tabs 200mg
11436001	tolcapone	tolcapone tabs 100mg
6874001	trihexyphenidyl hydrochloride	ARTANE SUSTETS 5mg [BIO-DIAG]
59001	trihexyphenidyl hydrochloride	ARTANE tabs 2mg [WYETH PHAR]
59002	trihexyphenidyl hydrochloride	ARTANE tabs 5mg [WYETH PHAR]
4780001	trihexyphenidyl hydrochloride	BROFLEX syrup 5mg/5ml [ALLIANCE]
7188001	trihexyphenidyl hydrochloride	trihexyphenidyl hydrochloride sugar free solution 2mg/5ml
4777003	trihexyphenidyl hydrochloride	trihexyphenidyl hydrochloride syrup 5mg/5ml
4777001	trihexyphenidyl hydrochloride	trihexyphenidyl hydrochloride tabs 2mg
4777002	trihexyphenidyl hydrochloride	trihexyphenidyl hydrochloride tabs 5mg
2779009	trihexyphenidyl hydrochloride	TRIHXYPHENIDYL tabs 2mg [BIOREX]
2638009	trihexyphenidyl hydrochloride	TRIHXYPHENIDYL tabs 2mg [DDSA]
2337009	trihexyphenidyl hydrochloride	TRIHXYPHENIDYL tabs 2mg [GENUS]
3287009	trihexyphenidyl hydrochloride	TRIHXYPHENIDYL tabs 2mg [HILLCROSS]
2779010	trihexyphenidyl hydrochloride	TRIHXYPHENIDYL tabs 5mg [BIOREX]
2638010	trihexyphenidyl hydrochloride	TRIHXYPHENIDYL tabs 5mg [DDSA]

10 Appendix: CPRD data quality

This appendix discusses CPRD data quality. CPRD data has been used for hundreds of published research studies. Several published studies have specifically sought to validate the CPRD data.¹⁸

In addition, CPRD undertakes a number of data quality checks to identify practices and patient records where there are likely to be data quality problems. These are detailed below based on documentation supplied by CPRD.

Patients are labelled as acceptable for use in research by a process that identifies and excludes patients with non-continuous follow-up or patients with poor data recording that raises suspicion as to the validity of the that patient's record. If any of the following conditions are true then the patient is labelled unacceptable, and is not recommended for use in research:

- An empty or invalid first registration date
- An empty or invalid current registration date
- Absence of a record for a year of birth
- A first registration date prior to their birth year
- A current registration date prior to their birth year
- A transferred out reason with no transferred out date
- A transferred out date with no transferred out reason
- A transferred out date prior to their first registration date
- A transferred out date prior to their current registration date
- A current registration date prior to their first registration date
- A gender other than Female/Male/Indeterminate
- An age of greater than 115 at end of follow up
- Recorded health care episodes in years prior to birth year
- All recorded health care episodes have empty or invalid event dates
- Registration status of temporary patients.

The overall quality of data in practices is mediated by use of an 'up to standard' (UTS) date, which is deemed as the date at which data in the practice is considered to have continuous high quality data fit for use in research. This is based on an analysis on the total data in the practice, which is refreshed every time a new collection for a practice is processed into the database. It is based on two central concepts: assurance of continuity in data recording (gap analysis), and avoidance of use of data for which transferred out and dead patients have been removed (death recording).

Gap analysis detects meaningful gaps in practice data. A single day gap may reflect a situation where nothing was recorded that day at the practice, i.e. the practice was not open, such as on a bank holiday. A longer gap may reflect a situation where the practice did not offer a service and

¹⁸ Jick H, Jick SS, Derby LE. Validation of information recorded on general practitioner based computerised data resource in the United Kingdom. *BMJ*. 1991 Mar 30;302(6779):766-8.

Jick H, Terris BZ, Derby LE, Jick S. Further validation of information recorded on a general practitioner based computerized data resource in the United Kingdom. *Pharmacoepidemiology and Drug Safety* 1:347-349

Jick SS, Kaye JA, Vasilakis-Scaramozza C, Garcia Rodríguez LA, Ruigómez A, Meier CR, Schlienger RG, Black C, Jick H. Validity of the general practice research database. *Pharmacotherapy*. 2003 May;23(5):686-9.

patients may have been treated elsewhere. If a meaningful gap is found, the earliest date after which there is no significant gap is identified.

In terms of death recording, it is expected that a standard number of deaths will be recorded at a practice over time. Assessment of gaps in death recording is performed taking the size of the practice into account. A safety margin is built in to account for both geographical and seasonal variation in death rates. If a meaningful gap is found, the earliest date after which there is no significant gap is identified. The UTS date is set to the latest of these dates for each practice.

11 Appendix: Comparison of Cohort 1 and Cohort 2 definitions of Parkinson's

In Section 2.2 Cohort 2 (the presence of a definite Read code for Parkinson's) was chosen as the primary definition used in this report. It was noted that this may be too conservative though and result in an under-estimation of Parkinson's. This section calculates rates and numbers for both prevalence and incidence based on the Cohort 1 definition which includes suggestive as well as definite Read codes for Parkinson's (see Section 9 for a list of these codes). Table 31 shows the prevalence rates for the Cohort 1 definition with the age and gender breakdown used earlier for the Cohort 2 definition.

Table 33 UK 2015 prevalence rates of Parkinson's by age and gender (Cohort 1 definition)

Gender	Age	CPRD population	Number with Parkinson's	Prevalence rate per 100,000	95% confidence interval	
All	20-29	398,753	92	23.1	18.6	28.3
All	30-39	424,020	172	40.6	34.7	47.1
All	40-49	471,034	353	74.9	67.3	83.2
Female	50-54	81,937	101	123.3	100.4	149.8
Male	50-54	84,670	148	174.8	147.8	205.3
Female	55-59	105,418	198	187.8	162.6	215.9
Male	55-59	107,060	264	246.6	217.7	278.2
Female	60-64	92,268	251	272.0	239.4	307.9
Male	60-64	90,868	364	400.6	360.5	443.9
Female	65-69	96,793	401	414.3	374.7	456.9
Male	65-69	92,335	697	754.9	699.9	813.0
Female	70-74	75,414	597	791.6	729.4	857.8
Male	70-74	68,778	815	1,185.0	1,105.0	1,269.2
Female	75-79	60,822	630	1,035.8	956.5	1,119.9
Male	75-79	51,606	945	1,831.2	1,716.3	1,951.8
Female	80-84	48,544	689	1,419.3	1,315.3	1,529.4
Male	80-84	36,600	857	2,341.5	2,187.4	2,503.7
Female	85-89	33,203	449	1,352.3	1,230.1	1,483.3
Male	85-89	20,527	490	2,387.1	2,180.4	2,608.1
All	90+	32,922	442	1,342.6	1,220.3	1,473.8

Table note: the number of people with Parkinson's is too small to be split by gender for those aged 20-49. The number of people aged 90+ is too small to reliably calculate prevalence rates by gender. Rates for age 50-54 split by gender are based on England rather than UK. 95% confidence intervals for rates are calculated using a Poisson distribution.

Overall, the inclusion of suggestive codes increases the number of people defined as living with Parkinson's in the CPRD data by 23.3%. However, this increase disproportionately affects younger people. Table 32 compares prevalence rates for the Cohort 1 and Cohort 2 definitions and indicates that the inclusion of suggestive codes results in a much larger proportion of younger people being defined as living with Parkinson's than using only definite Read codes.

Table 34 Comparison of UK 2015 prevalence rates of Parkinson’s by age and gender for Cohort 1 and Cohort 2 definitions

Gender	Age	Prevalence rate per 100,000		Percentage increase in prevalence rate by including suggestive codes
		Cohort 2 (definite)	Cohort 1 (definite and suggestive)	
All	20-29	1.8	23.1	1183.3%
All	30-39	4.5	40.6	802.2%
All	40-49	14.2	74.9	427.5%
Female	50-54	48.8	123.3	152.7%
Male	50-54	88.6	174.8	97.3%
Female	55-59	95.8	187.8	96.0%
Male	55-59	159.7	246.6	54.4%
Female	60-64	177.7	272.0	53.1%
Male	60-64	330.1	400.6	21.4%
Female	65-69	318.2	414.3	30.2%
Male	65-69	654.1	754.9	15.4%
Female	70-74	676.3	791.6	17.0%
Male	70-74	1,065.7	1,185.0	11.2%
Female	75-79	925.7	1,035.8	11.9%
Male	75-79	1,703.3	1,831.2	7.5%
Female	80-84	1,314.3	1,419.3	8.0%
Male	80-84	2,202.2	2,341.5	6.3%
Female	85-89	1,258.9	1,352.3	7.4%
Male	85-89	2,221.5	2,387.1	7.5%
All	90+	1,230.2	1,342.6	9.1%

Table note: the number of people with Parkinson’s is too small to be split by gender for those aged 20-49. The number of people aged 90+ is too small to reliably calculate prevalence rates by gender. Rates for age 50-54 split by gender are based on Great Britain rather than UK. 95% confidence intervals for rates are calculated using a Poisson distribution.

In Section 2.2 it was shown that the inclusion of suggestive codes had a much smaller effect on incidence rates than on prevalence rates. Nevertheless, it is interesting to establish if the same relationship with age that is observed in Table 32 holds for incidence too. Table 33 shows the incidence rates for the Cohort 1 definition with the age and gender breakdown used earlier for the Cohort 2 definition.

Table 35 Incidence rates (per 100,000 per year) of Parkinson’s by age and gender for England (2011-2015) for Cohort 1

Gender	Age	CPRD person years	New diagnosis of Parkinson’s	Incidence rate per 100,000	95% confidence interval	
All	45-49	1,581,621.0	100	6.3	5.1	7.7
Female	50-54	534,222.1	55	10.3	7.8	13.4
Male	50-54	552,265.7	76	13.8	10.8	17.2
Female	55-59	459,654.1	79	17.2	13.6	21.4
Male	55-59	467,625.6	119	25.4	21.1	30.5
Female	60-64	434,755.4	111	25.5	21.0	30.7
Male	60-64	428,323.1	198	46.2	40.0	53.1
Female	65-69	427,677.2	200	46.8	40.5	53.7
Male	65-69	410,300.1	345	84.1	75.4	93.4
Female	70-74	323,872.9	279	86.1	76.3	96.9
Male	70-74	295,228.0	451	152.8	139.0	167.5
Female	75-79	276,986.8	354	127.8	114.8	141.8
Male	75-79	233,910.2	575	245.8	226.1	266.8
Female	80-84	227,260.6	323	142.1	127.0	158.5
Male	80-84	166,440.4	477	286.6	261.4	313.5
Female	85-89	156,006.3	193	123.7	106.9	142.5
Male	85-89	92,428.0	278	300.8	266.5	338.3
Female	90-94	83,114.5	78	93.8	74.2	117.1
Male	90-94	36,456.1	77	211.2	166.7	264.0

Table notes: Rates have been calculated by combining data for 2011-2015. The incidence of Parkinson’s is too small to estimate incidence by gender for those aged under 50 and those aged 95 or over. 95% confidence intervals for rates are calculated using a Poisson distribution.

Overall, the inclusion of suggestive codes increases the number of people defined as newly diagnosed each year with Parkinson’s in the CPRD data by 3.9%. However, while the effect is not as pronounced as with prevalence, this increase again disproportionately affects younger people. Table 34 compares incidence rates for the Cohort 1 and Cohort 2 definitions and indicates that the inclusion of suggestive codes results in a larger proportion of younger people being defined as new diagnoses of Parkinson’s than using only definite Read codes.

Table 36 Comparison of UK 2015 incidence rates of Parkinson’s by age and gender for Cohort 1 and Cohort 2 definitions

Gender	Age	Incidence rate per 100,000		Percentage increase in incidence rate by including suggestive codes
		Cohort 2 (definite)	Cohort 1 (definite and suggestive)	
All	45-49	4.0	6.3	57.5%
Female	50-54	8.4	10.3	22.6%
Male	50-54	10.5	13.8	31.4%
Female	55-59	12.8	17.2	34.4%
Male	55-59	23.1	25.4	10.0%
Female	60-64	22.3	25.5	14.3%
Male	60-64	43.2	46.2	6.9%
Female	65-69	41.4	46.8	13.0%
Male	65-69	79.7	84.1	5.5%
Female	70-74	83.4	86.1	3.2%
Male	70-74	147.0	152.8	3.9%
Female	75-79	126.4	127.8	1.1%
Male	75-79	240.7	245.8	2.1%
Female	80-84	139.5	142.1	1.9%
Male	80-84	283.0	286.6	1.3%
Female	85-89	122.4	123.7	1.1%
Male	85-89	297.5	300.8	1.1%
Female	90-94	91.4	93.8	2.6%
Male	90-94	211.2	211.2	0.0%

Table notes: Rates have been calculated by combining data for 2011-2015. The incidence of Parkinson’s is too small to estimate incidence by gender for those aged under 50 and those aged 95 or over. 95% confidence intervals for rates are calculated using a Poisson distribution.

Table 35 and Table 36 compare estimated prevalence and incidence numbers for the UK for each cohort. Table 35 indicates a large increase in the prevalence of younger people with Parkinson’s based on the Cohort 1 definition. The increases in incidence numbers are less dramatic.

Table 37 Comparison of Cohort 1 and Cohort 2 estimated prevalence numbers of people with Parkinson's in 2015 in UK by age and gender

Age	Gender	Cohort 2 (definite)	Cohort 1 (definite and suggestive)
20-29	All	153	2,016
30-39	All	379	3,432
40-49	All	1,270	6,692
50-54	All	3,124	6,788
50-54	Female	1,129	2,852
50-54	Male	1,995	3,936
55-59	All	5,032	8,567
55-59	Female	1,916	3,757
55-59	Male	3,116	4,810
60-64	All	8,837	11,730
60-64	Female	3,176	4,862
60-64	Male	5,661	6,868
65-69	All	17,397	20,952
65-69	Female	5,917	7,704
65-69	Male	11,480	13,247
70-74	All	23,479	26,672
70-74	Female	9,662	11,311
70-74	Male	13,816	15,362
75-79	All	27,726	30,284
75-79	Female	10,832	12,121
75-79	Male	16,894	18,162
80-84	All	26,840	28,736
80-84	Female	11,889	12,839
80-84	Male	14,951	15,897
85-89	All	15,736	16,906
85-89	Female	7,590	8,153
85-89	Male	8,146	8,753
90+	All	6,843	7,468
All 20+	Female	57,854	74,979
All 20+	Male	78,963	95,264
All 20+	All	136,816	170,242

Table note: numbers may not always sum to totals because of rounding.

Table 38 Comparison of Cohort 1 and Cohort 2 estimated numbers of new diagnoses of Parkinson's per year in UK by age and gender

Age	Gender	Cohort 2 (definite)	Cohort 1 (definite and suggestive)
45-49	All	187	293
50-54	All	432	548
50-54	Female	195	238
50-54	Male	237	310
55-59	All	707	840
55-59	Female	257	344
55-59	Male	451	496
60-64	All	1,139	1,249
60-64	Female	399	456
60-64	Male	741	793
65-69	All	2,168	2,345
65-69	Female	770	870
65-69	Male	1,399	1,476
70-74	All	3,097	3,211
70-74	Female	1,191	1,231
70-74	Male	1,906	1,980
75-79	All	3,866	3,934
75-79	Female	1,479	1,496
75-79	Male	2,387	2,438
80-84	All	3,183	3,231
80-84	Female	1,262	1,286
80-84	Male	1,921	1,946
85-89	All	1,829	1,849
85-89	Female	738	746
85-89	Male	1,091	1,103
90+	All	705	714
90+	Female	359	369
90+	Male	345	345
All 20+	Female	6,744	7,183
All 20+	Male	10,569	11,031
All 20+	All	17,314	18,214

Table note: numbers will not always sum to totals because of rounding. The incidence rate for the 90-94 age-group has been applied to all people aged 90 or over as this is the way the population data is grouped. It is not possible to formally estimate incidence for those aged 20-44 from the CPRD data.

Further advice was sought about the clinical interpretation of the suggestive Read codes and these findings regarding age. Discussions were had with two consultant neurologists and two GPs. They felt that in the main these suggestive codes were too vague to be accurate in diagnosing Parkinson's and could reflect a variety of other issues or conditions. For example, it is possible that the suggestive codes were used because there was clinical suspicion of the condition but not yet a formal diagnosis so while this may reflect some early stage Parkinson's cases it could also include people where the condition does not turn out to be Parkinson's. One of the GPs noted that sometimes suggestive Read codes such as these might not be removed retrospectively if the

confirmed diagnosis turns out to be something else. Likewise, some of the drug codes could be related to conditions such as restless leg syndrome and not just Parkinson's. Both GPs felt that the definitive Read codes were more reliable as they should only be coded as such once the diagnosis was formally confirmed by a neurologist.

In light of these discussions, it was decided to use only the definitive codes for the prevalence and incidence estimates. It would be interesting to look in more detail as to whether there is a set of Read codes that could reliably identify those with Parkinson's who have perhaps not been given a definite diagnosis by a Consultant yet but this would need further work including input from neurologists and GPs.

12 Appendix: Data sources for population data

UK

Office of National Statistics population estimates for UK for mid-2015:

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/latest>

Office for National Statistics estimates of the very old:

<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/ageing/datasets/midyearpopulationestimatesoftheveryoldincludingcentenariansunitedkingdom>

Data on age and gender-specific mortality rates:

<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/datasets/nationallifetablesenglandreferencetables>

Population projections:

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/tablea21principalprojectionukpopulationinagegroups> (accessed 26/10/2017)

England

Administrative area/region (England, Northern Ireland, Scotland and Wales):

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland>

CCG:

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/clinicalcommissioninggroupmidyearpopulationestimates>

Parliamentary constituencies (England and Wales):

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/parliamentaryconstituencymidyearpopulationestimates>

Northern Ireland

All: <https://www.nisra.gov.uk/publications/2015-mid-year-population-estimates-northern-ireland>

Scotland

Health boards:

<http://www.isdscotland.org/Products-and-Services/GPD-Support/Population/Estimates/>

Parliamentary constituencies:

<https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/2011-based-special-area-population-estimates/spc-population-estimates>

Wales

Health boards: <https://statswales.gov.wales/Catalogue>

Imagine not being able to move, sleep, or smile.
Feeling anxious or depressed and struggling to think
or remember. Your body not feeling like your own.
This is what Parkinson's can feel like.

Every hour, someone in the UK is told they have
Parkinson's – a brain condition that turns lives
upside down, leaving a future full of uncertainty.

Parkinson's UK is here to make sure people have
whatever they need to take back control – from
information to inspiration.

We want everyone to get the best health and social
care. So we bring professionals together to drive
improvements that enable people to live life to the full.

Ultimately, we want to end Parkinson's. That's why
we inspire and support the international research
community to develop life-changing treatments,
faster. And we won't stop until we find a cure.

**Together we can bring forward the day
when no one fears Parkinson's.**

Parkinson's UK
215 Vauxhall Bridge Road
London SW1V 1EJ

Free confidential helpline **0808 800 0303**
(Monday to Friday 9am–7pm,
Saturday 10am–2pm). Interpreting available.
Text Relay **18001 0808 800 0303**
(for textphone users only)

hello@parkinsons.org.uk
parkinsons.org.uk