

Title: Undergraduate teaching in UK general practice: A geographical snapshot

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Abstract:**Introduction:**

Learning in general practice is an essential component of undergraduate medical education; currently 13% of clinical placements in the UK are in general practice. Whether general practice can sustainably deliver more undergraduate placements is uncertain.

Aim:

We have undertaken a national survey to identify the geographical distribution of undergraduate teaching practices and their distance from the host medical school.

Method:

We invited all medical schools in the UK to provide the postcodes of their undergraduate teaching practices. These were collated, de-duplicated and mapped. The distance in kilometres and journey times by car and public transport between each medical school and its teaching practices was estimated using 'transportdirect.info'[™]. The postcodes of every practice in the UK were obtained from the UK Departments of Health.

Results:

All 33 UK medical Schools responded; 4392 practices contributed to teaching with a median (minimum-maximum) of 143(17-385) practices per school. The median (minimum - maximum) distance between a school and a teaching practice was 26(0-1,421)km requiring 40(0-1,406) minutes travel by car and 71(0-1,049) minutes by public transport. All teaching practices were accessible by public transport in one school and 90%-99% in a further four schools. 24 schools had over 20% of practices which were inaccessible by public transport.

Conclusion:

The 4392 undergraduate teaching general practices are widely distributed and potentially any practice, no matter how isolated, could contribute to undergraduate education. This is however at the price of a considerable travel burden.

How this study fits in:

Placements in service general practices are a key component of undergraduate medical education yet there is no national picture of how many practices teach and where they are. This study has produced the first national picture of how many practices teach, where they are and for which medical schools they teach. It shows that while in some areas, most practices teach, there are areas where there is likely to be spare capacity and that geographical location need not be a bar to a practice teaching medical students. This study provides indicators to medical schools which wish to increase their general practice placement programmes as to where they are more likely to recruit new practices and should encourage individual practices, irrespective of location, which wish to teach to find a medical school with which to work.

Keywords:

General Practice

Education, Medical, Undergraduate

Geographic Mapping

Preceptorship

Health Resources

Introduction:

All medical schools in the United Kingdom (UK) place undergraduate students in general practice. General practice contributes an average of 13% of clinical placements in UK medical schools¹ and thus makes a critical contribution to undergraduate medical education which is likely to increase. This increase is being driven by a combination of service and educational factors. These are, in brief, a greater proportion of health care is delivered by primary care and the locus of learning should reflect the context of practice^{2;3} and an increasing proportion of graduates will need to enter general practice training to meet the nations' medical workforce needs.⁴ While these pressures are increasing and general practice is more likely to be called upon to deliver more education rather than less, the capacity of general practice to deliver a larger proportion of undergraduate education is uncertain.

The ability of medical schools to place more undergraduate students in general practice is limited by a number of factors. The first is that ultimately practices volunteer to teach: most are semi-independent small businesses which make individual decisions about which 'non-core' services (such as teaching and training) they wish to provide and medical schools can neither (nor would they wish to) compel practices to teach. The second limiting factor is geography: by and large, teaching practices need to be accessible or made accessible⁵ for an affordable and practicable daily commute from students' accommodation. As schools recruit more of their 'local' willing practices, they are likely to experience increasing difficulty in expanding their practice teaching capacity.

With this in mind we have undertaken a national survey to identify the distribution of undergraduate teaching practices across the United Kingdom, their distance from the medical school with which they are linked and their accessibility by car and public transport.

Method:

Gathering the data: The Society for Academic Primary Care (SAPC) Heads of Teaching (HoTs) group maintains a current list of the general practice teaching leads in all UK medical schools. Each HoT was asked to provide a spread sheet containing the postcodes of all practices which contributed to their school's undergraduate teaching. The invitation was repeated up to three times for those who did not respond. The first invitation was sent in May 2011 and responses were collected between May 2011 and Dec 2012.

We obtained the postcodes of all practices in the UK and Northern Ireland (NI) from the NHS Information Centre for Health and Social Care (England),⁶ NHS Wales,⁷ NHS National Services Scotland⁸ and the Health and Social Care in Northern Ireland (Business Services Organisation).⁹ The Departments of Health for the devolved nations had up-to-date websites, an update was obtained for the English Department by submitting a Freedom of Information request.¹⁰

The UK postcode is an alphanumeric code of five to eight characters in 2 groups separated by a space. The first group, the postcode sector, roughly corresponds to a town or city suburb. The full postcode represents a postal delivery 'walk', usually one side of a residential road. Although developed to mechanise the sorting of mail, postcodes are used by a wide range of agencies to provide spatial information, such as the distance between the centroid of two postcodes or to identify services close to a given postcode.¹¹

Analysis:

Data processing - School level data: Postcodes were often repeated within schools' data sets and may have reflected duplications of single practices' postcodes. This could have been accidental or, because practices contributed to multiple courses for a school and the school's course administrators maintained course specific data bases which were simply amalgamated in response to our request. Alternatively, there could be multiple practices sharing a single postcode. All duplicate postcodes were checked against the dataset from the Departments of Health and with Google™ to determine the number of practices at the postcode. We allowed one occurrence of a duplicate postcode for each practice we found at that postcode: for example, if a postcode was repeated four times in a data set and we found three separate practices with that postcode, we included the postcode three times in the school's data set.

National data: The de-duplication procedure was repeated for the combined national data set.

Numbers of practices: We summed the total number of teaching practices and calculated the median and range by medical school.

Distance between teaching practices and medical school: We used www.transportdirect.info™, a non-profit service funded by the UK Department for Transport, the Welsh Assembly Government and the Scottish Government.¹² The site claims to be the "only website" offering "door-to-door travel information for both public transport and car journeys around Britain". Its 'Batch Journey Planner' is an automated service 'for anyone wanting to obtain detailed directions or statistics for a large number of journeys'. We used the Batch Journey Planner to determine the distance in kilometres and estimated travel time by car and public transport between the full postcode of the main address of each medical school and the full postcode of each teaching practice. We also used the site to determine whether practices were accessible by public transport. We defined an accessible practice as a practice which a student could reach by 9am with less than a 90 minute journey by public transport. We defined accessibility by car as a travel time of less than 60 minutes by car. There is no equivalent public transport site for N. Ireland for which we determined distance and car travel times using Google Maps™.

The data were highly skewed so we have used medians and ranges to represent them. We calculated the median and range of distances in kilometres and median and range of the estimated travel time by car and by public transport and proportion of practices which were inaccessible by car and public transport by medical

school. Differences between nations in proportions of practices which taught were compared using χ^2 -and the schools' median distances and times using one way analysis of variance using StatsDirect (v2.7.98).¹³

Residual capacity: The total number of practice postcodes supplied by the Departments of Health was used as the denominator to calculate the proportion of practices which teach nationally, in each devolved nation and by postcode sector. We also calculated the number of non-teaching practices by postcode sector.

Geographical distribution of teaching practices: We used spatial point software (Microsoft MapPoint®) to map the number and proportion of practices teaching in each postcode sector (i.e. the first 'group' of the postcode, e.g. SY8). Currently this software does not offer this facility for N. Ireland.

Results:

We obtained data from all 33 medical schools in the UK although one school supplied postcode sectors only and the number of practices which taught in each one. There were 5,004 postcodes supplied by the responding schools of which 612 (12.2%) were removed in the within and between school de-duplication process leaving 4,392 practices, the maximum possible number of undergraduate teaching practices. There were 4,138 unique postcodes which represents the minimum number of undergraduate teaching practices. There were 10,448 practices in the Departments of Health databases although there were another 642 practice postcodes in the schools' datasets (14.6% of the postcodes) which we have confirmed represent practices. Using the Departments' denominator, nationally, between 39.6% and 42.0% of all practices teach. If we assume that non-teaching practices are as likely as teaching practices to be missing from the Departments' denominator we estimate there are 11,974 practices nationally and that between 34.6% and 36.7% practices teach undergraduates.

Table 1 shows the sums of the numbers of practices with which schools place students although this contains duplications between schools and 'cross border' practices. 'Cross border' practices are the practices in one nation which teach for a school in another. After removal of between school duplications and 'cross border' practices, in England 3,564 (42.7%) of 8,344, in Wales 196 (29.2%) of 671, in Scotland 488 (45.2%) of 1,080 and in N. Ireland 144 (40.8%) of 353 practices teach ($\chi^2 = 22.8$, $df=3$ $p < 0.0001$). A smaller proportion of practices teach in Wales than in England ($\chi^2 = 20.5$, $df=1$, $p < 0.0001$), Scotland ($\chi^2 = 19.6$, $df=1$, $p < 0.0001$), and N. Ireland ($\chi^2 = 6.5$, $df=1$, $p=0.01$). There was no statistically significant difference in the proportions of practices which teach in England and Scotland or N. Ireland ($\chi^2 = 0.9$, $df=1$, $p=0.3$ and $\chi^2 = 0.2$, $df=1$, $p=0.7$) respectively and N. Ireland than Scotland ($\chi^2 = 0.7$, $df=1$, $p=0.4$).

In England, Wales, Scotland and N. Ireland respectively 14.9%, 14.3%, 13.9% and 11.1% of teaching practices were missing from their Departments' datasets. Using these percentages to 'correct' the denominators 37.2%, 25.6%, 39.7% and 36.7% of practices teach in each nation respectively. The differences in proportions were unaffected.

All but 84 practice postcodes (1.8%) were successfully mapped using either Transport Direct™ or Google Maps™. The median (minimum to maximum) distance between a school and a teaching practice was 26(0-1,421)km requiring 40(0-1,406) minutes travel by car and 71(0-1,049) minutes by public transport (table 1).

The national UK summary data by school are shown in table 2 (the school identifiers have been pseudo-randomly generated) which shows the number of practices with which each school places students, distance between schools and their practices, corresponding travel times and accessibility by car and public transport. There was a median (minimum-maximum) of 142(17-385) practices teaching for each school. There was no difference in the number of practices teaching for each medical school between the nations (one way analysis of variance $F = 0.54$, $df=3$, $p=0.7$).

The median (minimum-maximum) distance between a practice and the medical school for which it provides placements is 28(0-1,421)km (table 1). These distances were 27(0-1,421)km for English schools, 31(0-455)km for Welsh, 35(0-504)km for Scottish and 37(0-137)km for N. Ireland; there were no statistically significant differences between nations (one way analysis of variance $F = 1.44$ $p = 0.3$). Travel distances were highly skewed: the mean (median) distance between a school and teaching practices more than 59.33km from its school (i.e. in the highest quartile for distance) is 144.5(97.3)km and 22.2(19.0)km for practices in the other three quartiles. Travel times by car reflected distance with a median (minimum-maximum) travel time for schools of 41 (0-1406) minutes with no statistically significant differences between nations (one way analysis of variance $F = 0.9$ $p = 0.4$). In England, Scotland and Wales, the median (minimum-maximum) travel time by public transport from school to practice was 41(0-1049) minutes with no statistically significant differences between nations (one way analysis of variance $F = 0.3$ $p = 0.7$) although a median (minimum-maximum) of 34(0-76)% of practices were inaccessible by public transport by our definition. Equivalent data is not available for N. Ireland.

The distribution of undergraduate teaching practices is shown in figure 1. Practices from the west of Cornwall to the Shetlands and from the west of Wales to the east of England are involved in teaching.

The four Departments of Health datasets contains 2,530 unique postcode sectors indicating that there are practices in 84.8% of the 2983¹⁴ UK postcode sectors. There were confirmed practices in 15 postcode sectors in the school datasets which were not included in the DH datasets.

These data show there are teaching practices in 1901 postcode sectors, 64.2% of all 2983¹⁴ postcode sectors and 75.1% of postcode sectors with practices. The postcode sectors which contain undergraduate teaching practices have a median (minimum-maximum) of 2(1-17) undergraduate teaching practices. There are 406 postcode sectors in which practices take students from more than one school. Practices in 62 postcode sectors took students from at least two London schools. Of the 2,530 postcode sectors with practices, 665(26.3%)

have less than 10% of practices which teach and 565(22.3%) have over 80% of practices which teach (table 3 and figure 3).

Discussion

These data provide a complete snapshot of the distribution of undergraduate teaching general practices in the UK. We estimate that 4392 practices teach nationally. The percentage of practices which teach is uncertain but lies between 34.6% and 42.0%. A smaller proportion of practices teach in Wales than the rest of the UK. Teaching practices are widely distributed with at least one teaching practice in 64% of all geographical postcodes. This geographical spread of undergraduate teaching practices is however at the price of distance: the median distance between a school and its teaching practices is 28.5km although the data is skewed by some metropolitan English schools which place students throughout the UK (the mean and maximum distances are 46km and 1421km respectively). In England, Scotland and Wales 36% of teaching practices are inaccessible by public transport by our definition (either no public transport or more than 90 minute journey) with up to 75% inaccessible at one school.

This is the most comprehensive analysis of undergraduate teaching practices so far conducted and shows that a larger proportion of practices may be involved with undergraduate teaching than the previous estimate that one third of practices teach medical undergraduates.¹⁵ These data have come from the current databases of every medical school in the UK and are thus the most complete and accurate available. The data were collected over an 18 month period so no data was more than 18 months old when collected. We have used published sources to determine the number of geographical postcode sectors and the data have been mapped using standard software. There are however incompatibilities between the NHS data set and those of the medical schools: the schools reported 642 practice postcodes which we have confirmed represent practices which are absent from the DH datasets and, consequently, more undergraduate teaching practices in 14 sectors than the DH datasets show. This however only affects less than 1% of sectors.

Notwithstanding the strengths of these data, there are limitations to the analysis. These data are for undergraduate teaching practices only and omit practices which are involved in foundation and vocational training. Therefore the proportion of practices with an educational commitment (either undergraduate teaching and/or post graduate training of foundation or general practice trainees) will be greater by an unknown amount. We have of necessity used a single 'central' postcode for each medical school. This is likely to systematically overestimate the true travel burden, especially in 'joint' schools established between two universities, schools with multiple campuses and schools which use distant practices for longer term placements but the student lives in the practice locality for the duration of the placement and perhaps only a single return journey is required. Furthermore, the distance between the centre and the practice does not necessarily reflect the travel burden: a long placement at a practice 10 km from the school may involve more travel than a one week placement at a practice 30 km away. Neither does the analysis take account of the extent to which schools accommodate students' preferences which could minimise travel for individuals.

While we asked schools to provide the postcodes of their current teaching practices, there may be an unknown number of practices which have offered to teach or may have taught in the past but have not taught undergraduates recently. Finally, these data tell us little about the proportion of a school's curriculum which is delivered in primary care nor the amount of undergraduate teaching delivered by individual practices: one school could use a small group of practices intensively to deliver a large proportion of the curriculum and another school could use a large group of practices sparingly to deliver a much smaller proportion of the curriculum: these questions cannot be answered by the dataset. Notwithstanding these caveats, this paper provides a novel picture of the distribution of undergraduate teaching practices in the UK including potential gaps where capacity may be found.

These data have implications for national educational and national and local health policymakers, medical schools and individual practices.

Firstly, for individual practices, the most obvious implication is that geography need not be a bar to becoming a teaching practice: some medical schools can accommodate an enormous geographical distribution of placements. Notwithstanding these opportunities, practices need to be confident that they can provide a high quality educational experience which is aligned with the curriculum of the medical school whose students they wish to take.

Secondly, for schools concerned about the sustainability or expansion of their general practice teaching programmes, a large proportion of the suitable practices are already likely to be engaged with undergraduate education with a further unknown proportion involved with postgraduate training. While the capacity for further expansion of practice numbers and for existing practices to take more students is uncertain, the maps show 'cool spots': postcode sectors with a smaller proportion of teaching practices. It would seem sensible to target practice recruitment on these sectors although educational support of remote practices may create challenges. Schools are already aware that their students face a considerable travel burden. Given the financial pressures faced by students this could become another barrier to widening participation. Schools may need to manage this burden so that students are not disadvantaged by distant placements and consider whether it can be reduced through either financial support for travel or by supporting peripheral accommodation.⁵

The policy implications for the NHS are that nationally, approximately 13% of undergraduate teaching is delivered in general practice¹ and there are strong imperatives for further increases.² Further increases will require greater use of more dispersed practices with consequential impacts on the travel burden or a need to provide accommodation while on distant placements. These costs will not be inconsequential and should be included in the discussion on the costs of teaching. Furthermore, given that teaching and training status are a marker of practice quality¹⁶⁻¹⁸ and undergraduate teaching status is not geographically restricted, the inclusion of teaching status in the UK Quality Outcomes framework would broaden the base of the framework. Lastly, given that it is likely that learning in underserved areas increases the likelihood of a graduate choosing to work

in underserved areas,¹⁹⁻²² locality policy makers for underserved areas should consider how they could support students to come and live and learn in and with their communities and perhaps return to work with them.

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Table 1: Median (minimum and maximum) number of practices associated with medical schools in the UK and devolved nations and the distance, travel time and proportion which are inaccessible by public transport from the associated school.

Nation (number of practices associated with its schools)	Median (min-max) number practices	Median (min-max) distance in km	Median (min-max) travel time in hours and minutes by		Median (min-max) percentage of practices inaccessible by	
			Car	Public transport	Car*	Public transport**
UK Overall (4392)***	142 (17-385)	28 (0-1421)	0:41 (0:00-23:26)	1:12 (0:00-17:29)	29 (0-76)	34 (0-76)
Scotland (513 practices)	99 (48-176)	35 (0-504)	0:42 (0:01-21:39)	1:06 (0:04-16:13)	29 (4-74)	33 (2-76)
England (3861 practices)	154 (17-385)	27 (0-1421)	0:41 (0:00-23:26)	1:16 (0:00-17:29)	25 (0-19)	35 (0-76)
Wales (205 practices)	142 (17-385)	31 (0-455)	0:33 (0:00-4:56)	1:20 (0:00-12:04)	22 (6-38)	40 (25-54)
N. Ireland (142 practices)	142	37 (0-0)	0:33 (0:00-0:00)	N/A	32	N/A

* A practice inaccessible by car could not be reached with less than a 60 minute journey.

** A practice inaccessible by public transport could not be reached by 9am with less than a 90 minute journey.

*** The total number of teaching practices in the UK is smaller than the total associates with schools in each nation because of cross border teaching

Table 2: Median (minimum and maximum) number of practices associated with each medical school in the UK and devolved nations and the distance, travel time and proportion which are inaccessible by public transport.

Medical School*	Practices (n)	Median (min-max) distance in km	Median (min-max) travel time in hours and minutes by		Percentage of practices inaccessible by	
			Car	Public transport	Car **	Public transport***
6	56	10(2-76)	0:20(0:06-1:25)	0:51(0:12-1:52)	4	2
21	166	12(1-48)	0:53(0:12-1:46)	0:45(0:11-1:18)	36	0
13	182	14(1-689)	0:36(0:04-7:01)	0:50(0:06-10:16)	24	15
26	134	158(2-451)	2:18(0:06-21:39)	3:09(0:16-11:19)	72	76
25	176	16(1-151)	0:20(0:02-2:34)	0:48(0:05-5:05)	5	7
24	123	16(2-112)	0:28(0:03-1:32)	0:57(0:18-2:52)	2	11
33	36	18(0-67)	0:21(0:00-1:06)	1:04(0:00-2:41)	6	25
10	68	18(2-68)	0:26(0:05-1:20)	0:50(0:23-3:08)	9	21
19	197	19(1-158)	0:27(0:02-2:01)	0:52(0:11-4:39)	25	25
1	196	20(2-166)	0:27(0:04-2:20)	0:56(0:09-4:40)	10	23
15	110	21(1-81)	0:26(0:04-1:19)	1:05(0:12-2:05)	2	6
9	154	21(2-105)	0:45(0:04-2:10)	1:18(0:15-3:40)	32	44
5	333	21(2-991)	0:53(0:06-11:35)	1:01(0:20-10:43)	39	27
20	104	21(4-98)	0:31(0:08-1:29)	1:07(0:24-2:25)	1	20
18	385	22(1-158)	0:27(0:01-1:20)	1:02(0:07-2:27)	6	22
7	232	27(2-175)	0:36(0:04-2:54)	1:18(0:13-5:20)	29	41
14	55	28(1-99)	0:31(0:06-1:17)	1:16(0:08-3:16)	2	35
2	83	30(4-81)	0:36(0:10-1:35)	1:08(0:20-2:32)	8	22
8	34	34(4-94)	0:43(0:12-1:34)	1:29(0:27-3:04)	32	50
11	156	35(3-129)	0:46(0:09-2:20)	1:46(0:16-7:04)	36	58
32	48	35(3-504)	0:42(0:05-20:14)	1:06(0:08-7:52)	29	33
31	142	37(0-137)	0:33(0:00-1:52)	N/A	32	N/A
17	210	41(0-104)	0:41(0:00-2:26)	1:42(0:00-3:21)	17	64
28	169	44(1-455)	0:46(0:04-4:56)	1:36(0:07-12:04)	38	54
27	194	48(1-201)	0:46(0:03-2:14)	1:38(0:09-6:40)	25	53
16	310	49(1-1421)	1:13(0:10-23:26)	1:36(0:16-17:29)	59	56
3	101	50(0-141)	0:52(0:01-2:04)	1:45(0:04-6:12)	41	57
12	153	50(1-376)	0:50(0:04-4:05)	1:52(0:07-7:54)	33	61
30	101	55(1-163)	0:51(0:03-2:03)	1:57(0:07-5:12)	41	63
22	22	57(5-95)	0:46(0:11-1:28)	1:39(0:21-6:35)	36	59
4	175	62(3-168)	1:00(0:06-2:16)	2:25(0:14-5:50)	52	76
23	99	72(0-501)	1:01(0:01-21:20)	1:43(0:04-16:13)	52	52
29	17	9(2-37)	0:21(0:07-0:40)	0:43(0:12-1:30)	0	6

* School identifiers pseudo-randomly generated.

** A practice inaccessible by car could not be reached with less than a 60 minute journey.

*** A practice inaccessible by public transport could not be reached by 9am with less than a 90 minute journey.

Table 3: Proportions of teaching practices in those postcode districts with practices

	Proportion of practices which teach in a postcode sector						Total
	0%	1-10%	10-40%	40-80%	80%-100%	100%+	
N(%) Postcode sectors	646(25.4%)	19(0.7%)	584(22.9%)	716(28.1%)	516(20.3%)	49(1.9%)	2530*

* There were 15 confirmed practices in the school datasets which were not included in the DH datasets

Fig 1:
Distribution of UK Undergraduate Teaching Practices by Postcode District

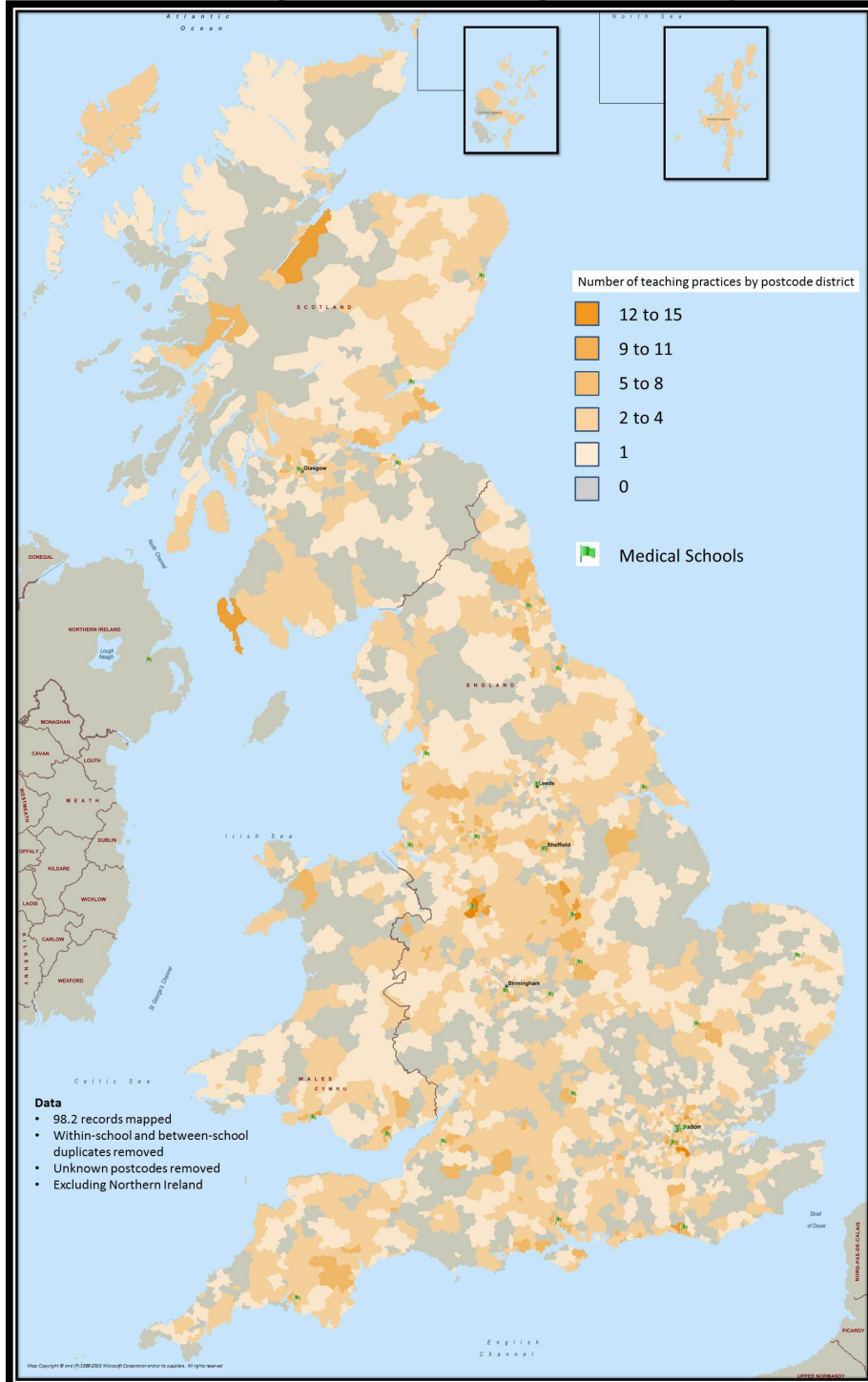


Fig 2:
UK Undergraduate Teaching Practices Saturation by Postcode District

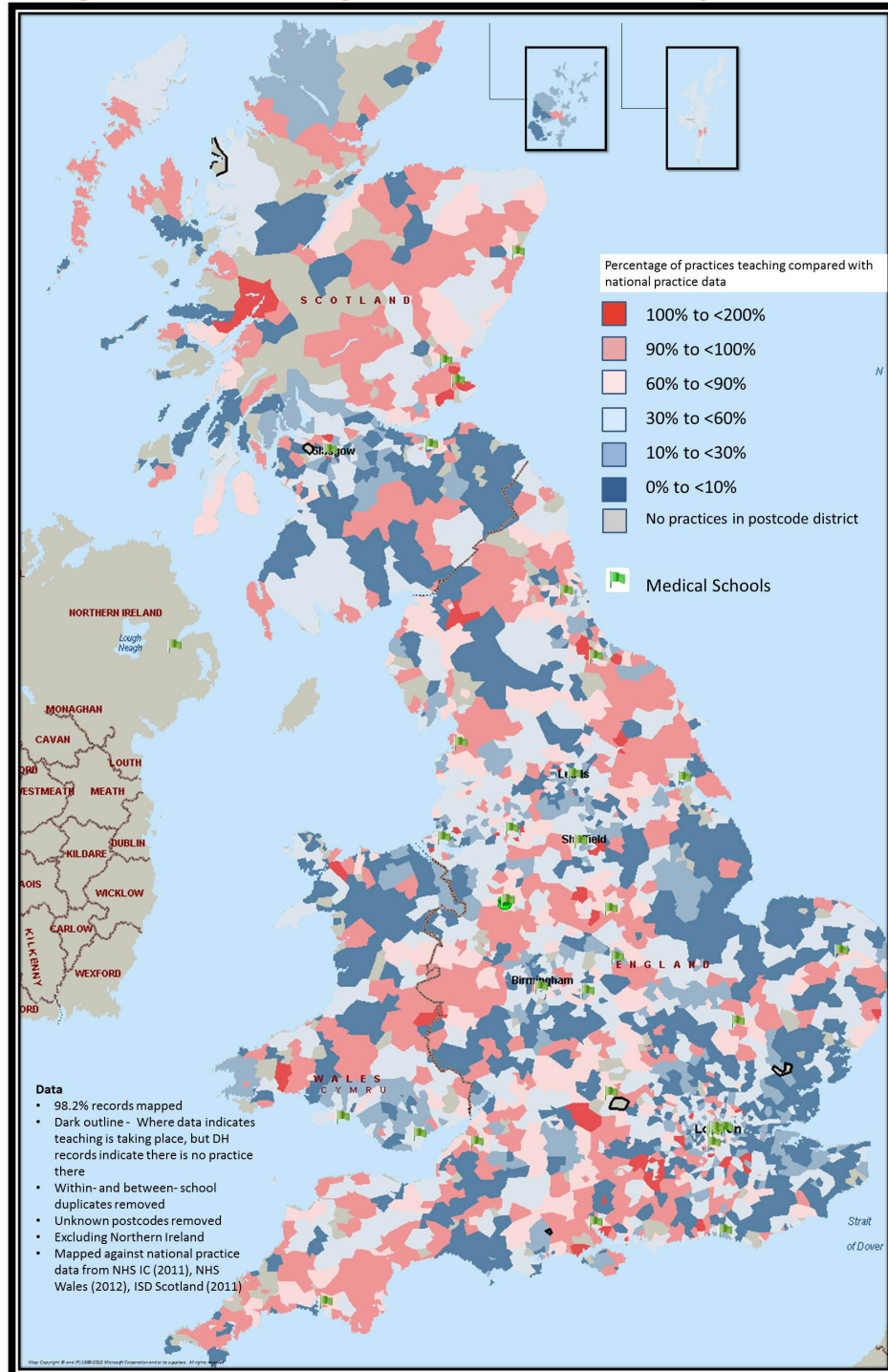


Fig3:
Number of UK Practices Not Teaching Undergraduates by Postcode District

