

## Undergraduate teaching in UK general practice: a geographical snapshot

### Abstract

#### Background

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

#### Aim

To identify the geographical distribution of undergraduate teaching practices and their distance from the host medical school.

#### Design and setting

National survey of all medical schools in the UK.

#### Method

All 33 UK medical schools were invited 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 Transport Direct ([www.transportdirect.info](http://www.transportdirect.info)). The postcodes of every practice in the UK were obtained from the UK's health departments.

#### Results

All 33 UK medical schools responded; 4392 practices contributed to teaching, with a median (minimum–maximum) of 142 (17–385) practices per school. The median (minimum–maximum) distance between a school and a teaching practice was 28 km (0–1421 km), 41 (0:00–23:26) minutes' travel by car and 1 hour 12 (0:00–17:29) minutes' travel by public transport. All teaching practices were accessible by public transport in one school and 90–99% were in a further four schools; 24 schools had >20% of practices that 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. However, this is, at the price of a considerable travel burden.

#### Keywords

education, medical, undergraduate; general practice; geographic mapping; health resources; preceptorship.

### INTRODUCTION

All medical schools in the UK place undergraduate students in general practice. General practice contributes an average of 13% of clinical placements in UK medical schools<sup>1</sup> and thus makes a critical contribution to undergraduate medical education. This is likely to increase, driven by a combination of service and educational factors; in brief, these are as follows:

- a greater proportion of health care is delivered by primary care;
- the locus of learning should reflect the context of practice;<sup>2,3</sup> and
- an increasing proportion of graduates will need to enter general practice training to meet the devolved nations' medical workforce needs.<sup>4</sup>

Although these pressures are increasing and general practice is more likely to be called on 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:

- Practices volunteer to teach: most are semi-independent small businesses, which make individual decisions about the 'non-core' services (such as teaching and training) they wish to provide, and medical schools cannot (nor would they

wish to) compel practices to teach.

- Geography: by and large, teaching practices need to be accessible, or made accessible,<sup>5</sup> 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, a national survey was undertaken to identify: the distribution of undergraduate teaching practices across the UK; their distance from the medical school with which they are linked; their accessibility by car and public transport; and the residual capacity of practices not currently teaching.

### METHOD

#### Gathering data

The UK postcode is an alphanumeric code of between five and eight characters in two groups that are 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 location.<sup>6</sup>

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## How this 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 the number of teaching practices, their locations, and for which medical schools they teach. It shows that, although in some areas most practices teach, there are areas where there is likely to be spare capacity and that geographical location need not prevent a practice from teaching medical students. This study gives medical schools that wish to increase their general practice placement programmes indicators to highlight where they are more likely to recruit new practices. It also should encourage individual practices that wish to teach, irrespective of location, to find a medical school with which to work.

maintains a current list of the general practice teaching leads in all UK medical schools. Each head of teaching was asked to provide a spreadsheet containing the postcodes of all practices that 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 December 2012.

The postcodes of all practices in the UK and Northern Ireland were obtained from the NHS Health and Social Care Information Centre (England),<sup>7</sup> NHS Wales,<sup>8</sup> NHS National Services Scotland,<sup>9</sup> and Health and Social Care in Northern Ireland (Business Services Organisation).<sup>10</sup> The health departments for the devolved nations had up-to-date websites; an update was obtained for the Department of Health (England) by submitting a freedom-of-information request, under the Freedom of Information Act 2000.

## Analysis

*Data processing: school-level data.* Postcodes were often repeated within schools' datasets and may have reflected duplications of the postcodes of single practices. This could have been accidental or because practices contributed to multiple courses for a school and the school's course administrators maintained course-specific databases that were simply amalgamated in response to the researchers' request. Alternatively, multiple practices could share a single postcode. All duplicate postcodes

were checked against the dataset from each nation's health department and with Google to determine the number of practices at the postcode. For example, if a postcode was repeated four times in a dataset and the study found three separate practices with that postcode, we included the postcode three times in the school's dataset.

*National data.* The de-duplication procedure was repeated for the combined national dataset.

*Numbers of practices.* The total number of teaching practices was summed and the median and range by medical school calculated.

*Distance between teaching practices and medical school.* The Transport Direct website ([www.transportdirect.info](http://www.transportdirect.info)) — a non-profit service funded by the UK Department for Transport, the Welsh Assembly Government and the Scottish Government — was used. 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'. This planner was used to determine the distance in kilometres, as well as the 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.

The website was also used to determine whether or not practices were accessible by public transport. An accessible practice was defined as one that a student could reach by 9 am by travelling for <1 hour 30 minutes by public transport; accessibility by car was defined as a travel time of <1 hours. There is no equivalent public-transport information website for Northern Ireland so, for this location, distance and car travel times were determined using Google Maps.

The travel time and distance data were highly skewed by the use of a few extremely distant placements by some medical schools so medians and ranges were used for their representation. The median and range of distances was calculated in kilometres, along with the median and range of the estimated travel time by car and by public transport. The proportion of practices that was inaccessible by car and public transport was categorised by medical school.

Differences between nations in terms of the proportions of practices that taught

**Table 1. Practice distance, travel time, and inaccessibility, by nation**

Nation	Practices associated with medical schools, <i>n</i>	Median practices per school, <i>n</i> (min–max)	Median distance, km (min–max)	Median travel time, hours:minutes (min–max)		Practices inaccessible by	
				Car	Public transport	Car, <sup>a</sup> median (min–max)	Public transport, <sup>b</sup> median (min–max)
UK	4392 <sup>c</sup>	142 (17–385)	28 (0–1421)	0:41 (0:00–23:26)	1:12 (0:00–17:29)	29 (0–76)	34 (0–76)
England	3861	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	142 (36–169)	31 (0–455)	0:33 (0:00–4:56)	1:20 (0:00–12:04)	22 (6–38)	40 (25–54)
Scotland	513	99 (48–176)	35 (0–504)	0:42 (0:01–21:39)	1:06 (0:04–16:13)	29 (4–74)	33 (2–76)
Northern Ireland	142	142	37 (0–137)	0:33 (0:00–1:52)	n/a	32	n/a

<sup>a</sup>A practice was deemed inaccessible by car if it could not be reached in <1 hour. <sup>b</sup>A practice was deemed inaccessible by public transport if it could not be reached by 9 am in <1 hour 30 minutes. <sup>c</sup>The total number of teaching practices in the UK is smaller than the total number of practices with associated schools in each nation because of cross-border teaching. The figures given may include duplicate practices.

were compared using a  $\chi^2$  test; the schools' median distances and travel times were analysed using a one-way analysis of variance (ANOVA) using StatsDirect (version 2.7.98).

**Residual capacity.** The total number of practice postcodes supplied by the national health departments was used as the denominator to calculate the proportion of practices that teach nationally in each devolved nation and by postcode sector. The number of non-teaching practices was also calculated by postcode sector.

**Geographical distribution of teaching practices.** Spatial point software (Microsoft MapPoint) was used to map the number and proportion of practices teaching in each postcode sector (that is, the first 'group' of the postcode, for example ST5). Currently, this software does not offer this function for Northern Ireland. The proportion of practices per postcode sector, and the residual capacity of practices not teaching were also mapped.

## RESULTS

Data from all 33 medical schools in the UK were obtained, although one school supplied postcode sectors only and the number of practices that taught in each one. There were 5004 postcodes supplied by the responding schools, of which 612 (12%) were removed in the within- and between-school de-duplication process; this left 4392 practices; the maximum possible number

of undergraduate teaching practices. There were 4138 unique postcodes, which represent the minimum number of undergraduate teaching practices. There were 10 448 practices in the health departments' databases, although another 642 practice postcodes in the schools' datasets (15% of the postcodes) were confirmed as representing practices. Using the departments' denominator, nationally, between 40% and 42% of all practices teach. It was assumed that non-teaching practices were as likely as teaching practices to be missing from this denominator; in such a case, it was estimated that there were 11 974 practices nationally, and that between 35% and 37% of them taught undergraduates.

Table 1 shows the sums of the numbers of practices with which schools placed students; this contains duplications between schools and cross-border practices, which were defined as those practices in one nation that taught for a school in another nation. After removal of between-school duplications and cross-border practices, the number of practices that taught in each devolved nation were as follows:

- England: 3564 (43%) of 8344;
- Wales: 196 (29%) of 671;
- Scotland: 488 (45%) of 1080; and
- Northern Ireland: 142 (40%) of 353.

The difference between nations was:  $\chi^2 = 22.8$ , degrees of freedom [df] = 3,  $P < 0.0001$ . A smaller proportion of practices

**Table 2. Practice distance, travel time, and inaccessibility by school**

Medical school <sup>a</sup>	Practices, <i>n</i>	Median distance, km (min–max)	Median travel time, hours:minutes, (min–max)		Practices inaccessible by:	
			Car	Public transport	Car, <sup>b</sup> %	Public transport, <sup>c</sup> %
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

<sup>a</sup>School identifiers were pseudorandomly generated. <sup>b</sup>A practice was deemed inaccessible by car if it could not be reached in <1 hour. <sup>c</sup>A practice was deemed inaccessible by public transport if it could not be reached by 9am in <1 hour 30 minutes.

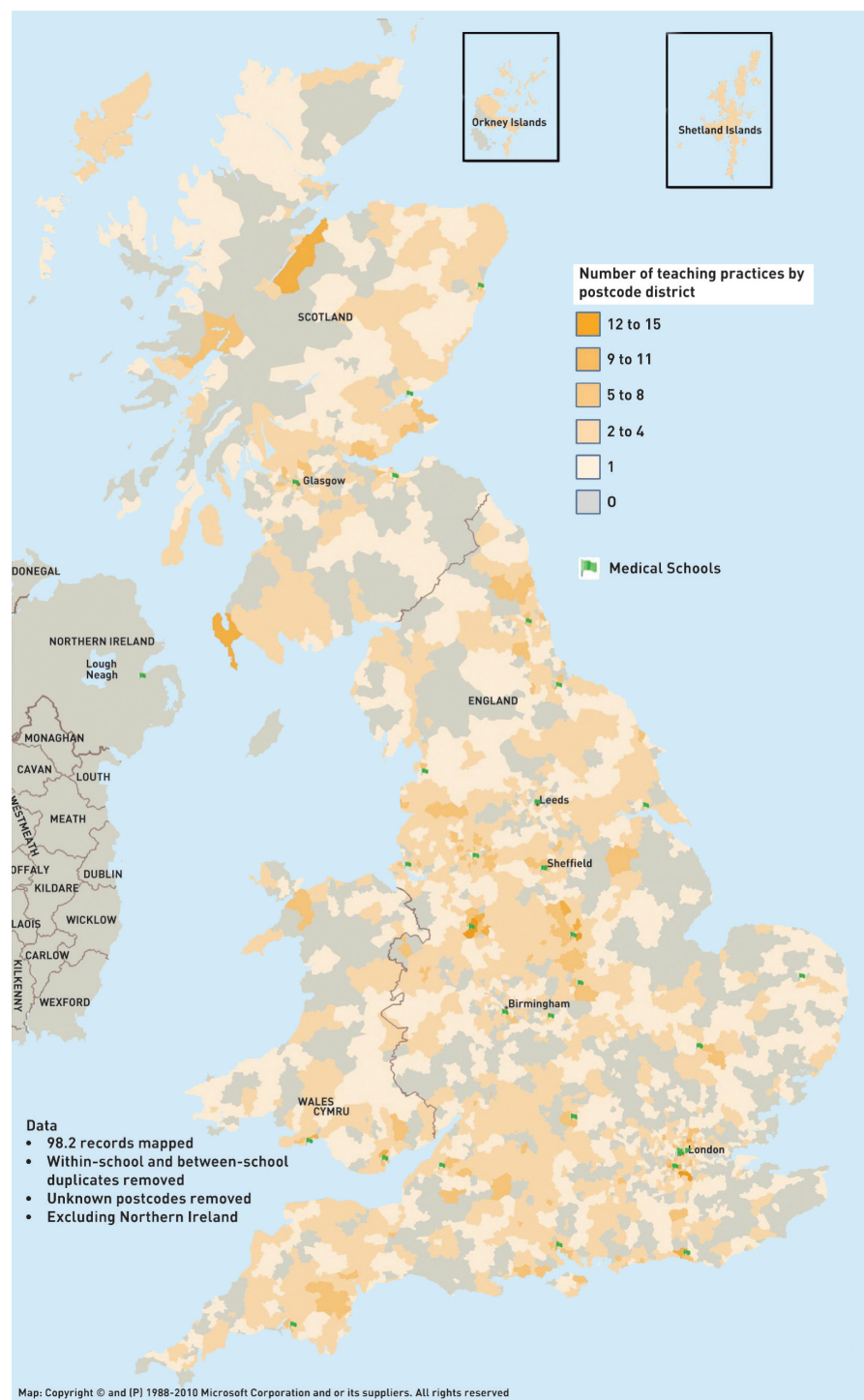
teach in Wales than in England ( $\chi^2 = 20.5$ ,  $df = 1$ ,  $P < 0.0001$ ), Scotland ( $\chi^2 = 19.6$ ,  $df = 1$ ,  $P < 0.0001$ ), and Northern Ireland ( $\chi^2 = 6.5$ ,  $df = 1$ ,  $P = 0.01$ ). There was no statistically significant difference in the proportions of practices that teach in England and Scotland ( $\chi^2 = 0.9$ ,  $df = 1$ ,  $P = 0.3$ ), England and Northern Ireland ( $\chi^2 = 0.2$ ,  $df = 1$ ,  $P = 0.7$ ), or Northern Ireland and Scotland ( $\chi^2 = 0.7$ ,  $df = 1$ ,  $P = 0.4$ ).

In England, Wales, Scotland, and

Northern Ireland, 15%, 14%, 14%, and 11% of teaching practices respectively were missing from their health departments' datasets. Using these percentages to 'correct' the denominators, 37%, 26%, 40%, and 37% of practices teach in each nation respectively. The differences in proportions were unaffected.

There was a median (minimum–maximum) of 142 [17–385] practices teaching for each school (Table 1). There

**Figure 1. Distribution of UK undergraduate teaching practices by postcode district.**



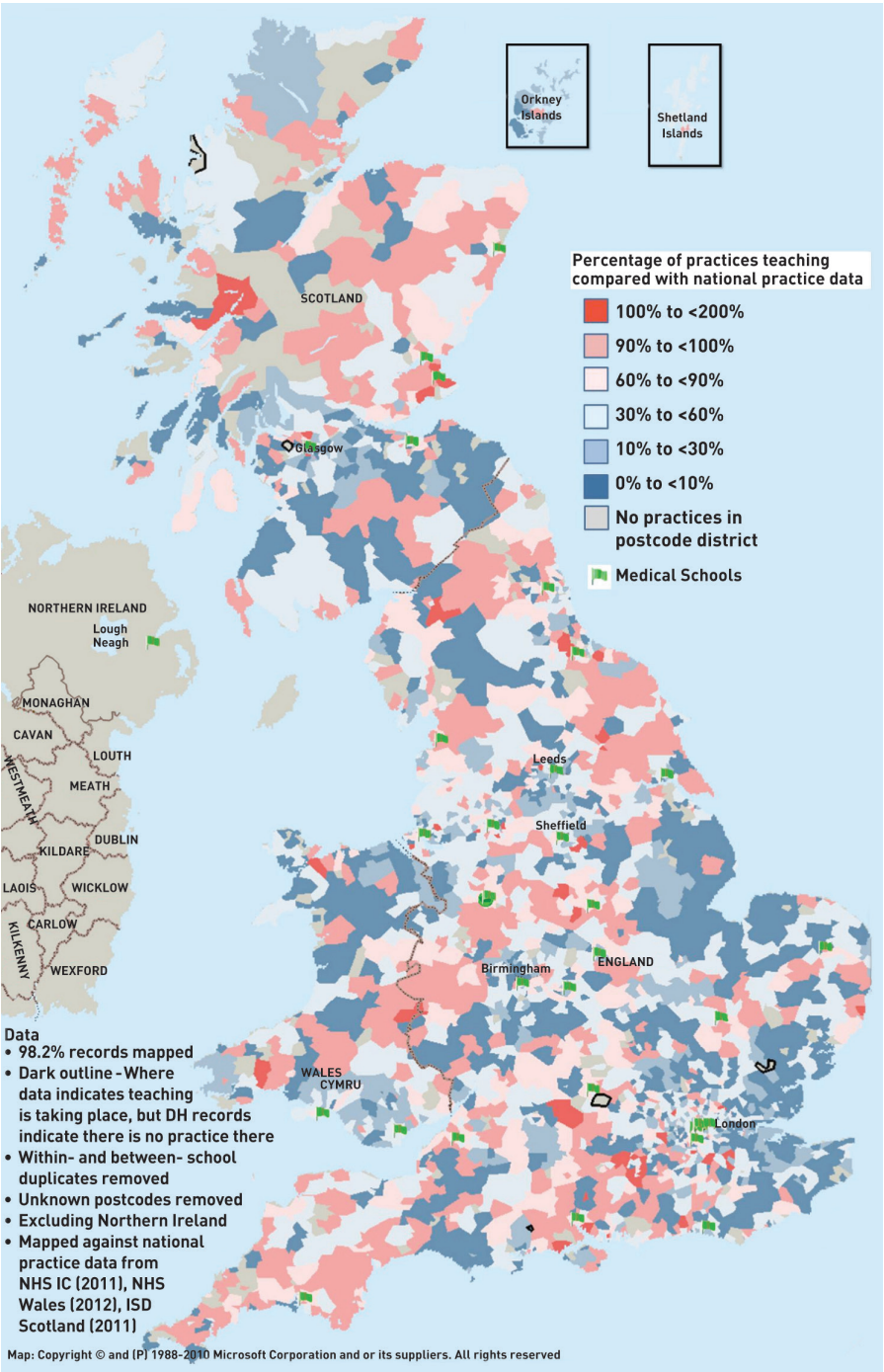
was no difference in the number of practices teaching for each medical school between the nations (one-way ANOVA  $F = 0.54$ ,  $df = 3$ ,  $P = 0.7$ ).

All but 84 practice postcodes (84/4392) were successfully mapped using either Transport Direct or Google Maps. The median (minimum–maximum) distance between a practice and the medical school for which it provides placements was 28 km (0–1421 km) (Table 1). These distances were

27 km (0–1421 km) for English schools, 31 km (0–455 km) for those in Wales, 35 km (0–504 km) for those in Scotland and 37 km (0–137 km) for those in Northern 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 that were >59 km away (that is, in the highest quartile for distance)



Figure 2. UK Undergraduate teaching practices saturation by postcode district.



was 144.5 km [97 km]; these figures were 22 km [19 km] for practices in the other three quartiles.

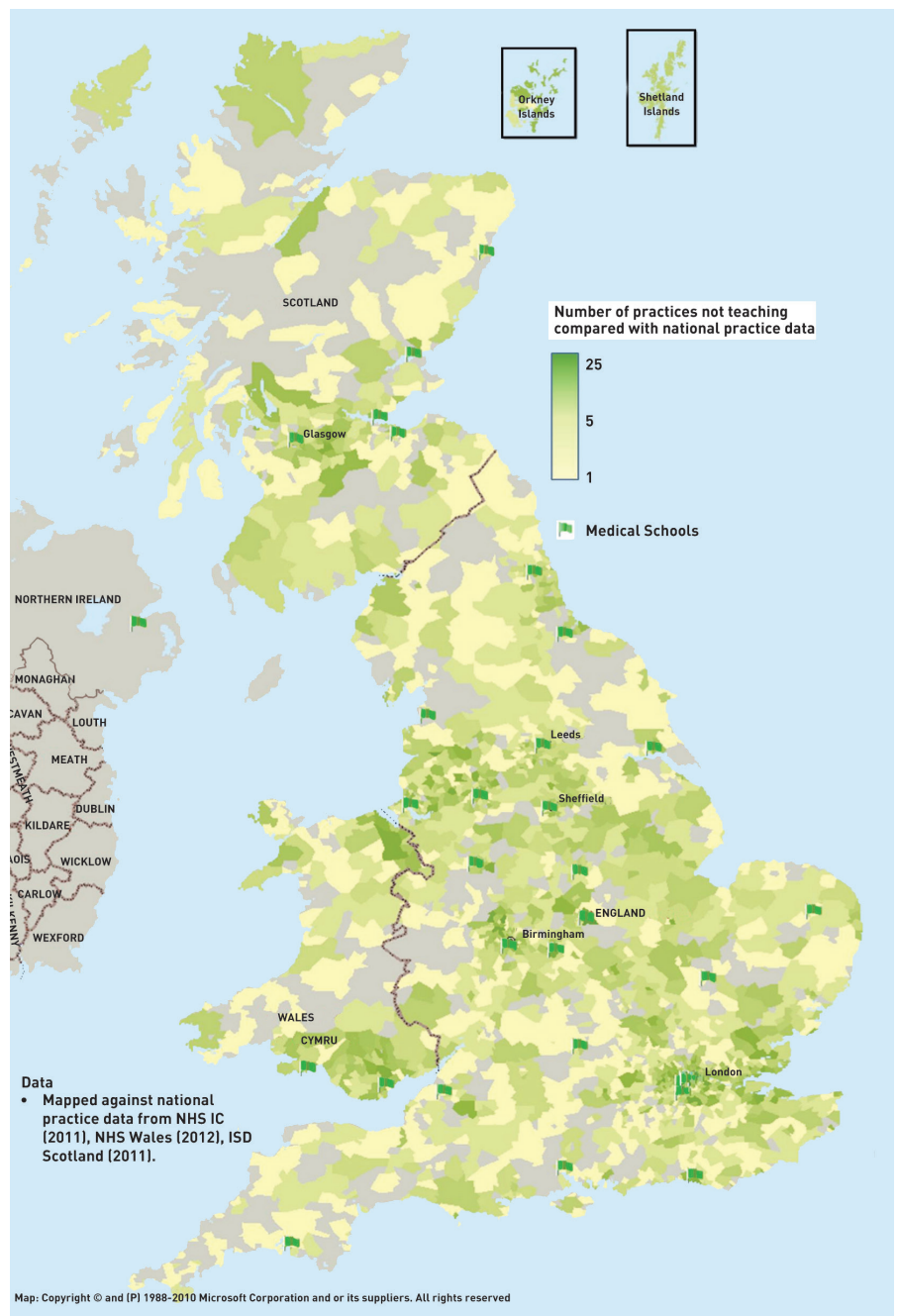
Travel times (Table 1) reflected distance with a median (minimum–maximum) travel time for schools of 0 hours 41 minutes (0:00–23:26). No statistically significant differences between nations were noted (one-way ANOVA  $F = 0.9$   $P = 0.4$ ). In England, Scotland, and Wales, the median (minimum–maximum) travel time by public transport from school to practice was 1 hour 12 minutes (0:00–17:29). There

was no statistically significant difference between nations (one-way ANOVA  $F = 0.3$ ,  $P = 0.7$ ), although a median (minimum–maximum) of 34% (0–76%) of practices were inaccessible by public transport by our definition (Table 1). Equivalent data was not available for Northern Ireland.

The national UK summary data by school are shown in Table 2; school identifiers were pseudorandomly generated.

The distribution of undergraduate teaching practices is shown in Figure 1. Practices from Cornwall to the Shetlands

**Figure 3. Number of UK practices not teaching undergraduates by postcode district**



and from the west of Wales to the east of England were involved in teaching.

The datasets from the four health departments contain 2530 unique postcode sectors indicating that there were practices in 85% of the 2983<sup>11</sup> UK postcode sectors. There were confirmed practices in 15 postcode sectors in the school datasets that were not included in the datasets of the nations' health departments. The medical school datasets show there were teaching practices in 1901 postcode sectors: 64% of all 2983<sup>11</sup> postcode sectors and 75% of postcode sectors with practices.

The postcode sectors that contain undergraduate teaching practices had a median (minimum–maximum) of two (1–17) such practices. There were 406 postcode sectors within which practices took students from more than one school. Practices in 62 postcode sectors took students from at least two London schools. Of the 2530 postcode sectors with practices, 665 (26%) had <10% of practices that teach and 565 (22%) had >80% of practices that teach (Figure 2; Table 3). Figure 3 displays the distribution of practices not currently teaching undergraduates.

**Table 3. Proportions of teaching practices by postcode sector**

	Proportion of practices that teach in a postcode sector (%)						Total
	0 – <1	1 – <10	10 – <40	40 – <80	80 – <100	≥100	
Postcode sectors, <i>n</i> (%)	646 (25.4)	19 (0.7)	584 (22.9)	716 (28.1)	516 (20.3)	49 (1.9)	2530 <sup>a</sup>

<sup>a</sup>There were 15 confirmed practices in the school datasets that were not included in the datasets of each nation's health department.

## DISCUSSION

### Summary

These data provide a complete snapshot of the distribution of undergraduate teaching general practices in the UK. It has been estimated that 4392 practices teach nationally; the percentage of practices that teach is uncertain but lies between 35% and 42%. A smaller proportion of practices teach in Wales than the rest of the UK. Teaching practices are widely distributed, with there being at least one teaching practice in 64% of all geographical postcodes.

This geographical spread of undergraduate teaching practices comes at the price of distance: the median distance between a school and its teaching practices is 28 km (Table 1), although the data are skewed by some metropolitan English schools that place students throughout the UK (the mean and maximum distances are 46 km and 1421 km respectively). In England, Scotland, and Wales, 34% of teaching practices are inaccessible by public transport (Table 1) by the study's definition (either no public transport or with a journey time of >1 hour 30 minutes) with up to 75% inaccessible at one school (Table 2).

### Strengths and limitations

These data have come from the current databases of every medical school in the UK and, as such, are 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.

Published sources were used to determine the number of geographical postcode sectors and the data have been mapped using standard software. There are, however, incompatibilities between the NHS' datasets and those of the medical schools: the schools reported 642 practice postcodes that this study has confirmed represent practices that are absent from the health departments' datasets; consequently, more undergraduate teaching practices are shown in 15 sectors

than are shown in the health departments' datasets. This results in more than 100% of practices being recorded as teaching in some postcode sectors (Table 3). This however only affects around 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 that are involved in foundation and vocational training. As such, the proportion of practices with an educational commitment (either undergraduate teaching and/or postgraduate training of foundation or general practice trainees) will be greater by an unknown amount.

By necessity, a single 'central' postcode was used 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 that use distant practices for longer-term placements during which the student lives in the practice locality for the duration of the placement and perhaps only requires a single return journey to the medical school. 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 1-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.

Although schools were asked to provide the postcodes of their current teaching practices, there may be an unknown number of practices that 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 that is delivered in primary care or 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, but these questions cannot be answered by the dataset. Notwithstanding these caveats, this article provides a novel picture of the distribution of undergraduate teaching practices in the UK, including potential gaps where capacity may be found.

### Comparison with existing literature

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 of one-third.<sup>12</sup>

### Implications for practice

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

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 that is aligned with the curriculum of the medical school whose students they wish to take.

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 in postgraduate training. Although 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 in these sectors, although educational support of remote practices may create challenges.

Schools are already aware that their students face a considerable travel burden. Given students' financial pressures, this could become another barrier to widening participation. Schools may need to manage this burden so students are not disadvantaged by distant placements and also consider whether it can be reduced through either financial support for travel or by supporting peripheral accommodation.<sup>5</sup>

The policy implications for the NHS are that nationally, an average of approximately 13% of undergraduate teaching is delivered in general practice<sup>1</sup> and there are strong imperatives for further increases.<sup>2</sup> 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 quality,<sup>13-15</sup> and that undergraduate teaching status is not geographically restricted, the inclusion of teaching status in the UK's Quality and Outcomes Framework (QOF) would broaden the QOF's base.

Finally, given that it is likely that if a graduate learns in an underserved area, he or she is more likely to choose to work in an underserved area,<sup>16-19</sup> locality policy makers for underserved areas should consider how they could support students to come to, and live and learn in, and with, their communities, perhaps later returning to work with them.

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### Ethical approval

Not required.

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### Competing interests

The authors have declared no competing interests.

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### Discuss this article

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