

Hard to reach communities and a hard to reach university

Abstract:

We propose a methodology capturing the perception of geographical, monetary and transportation distance between secondary state schools in some Scottish remote communities and a hard to reach university located in a small town on the north-east coast of rural Fife, i.e. the University of St Andrews. The location of St Andrews and the absence of a railway station mean that it is often interpreted as being geographically isolated. As a result, the University of St Andrews is frequently perceived as hard to reach.

We show that by combining representations in terms of mileage, journey duration and fare we can create an index that reflects the difficulty of geographical access to the University of St Andrews from these Scottish communities. This index is not dependent on the local authority in which the institutions are located, nor on the Scottish Index of Multiple Deprivation associated with each institution datazone, nor on the percentage rate of progression to higher education from these secondary schools. It is dependent on how distance may be perceived in terms of geographical access, monetary costs and transportation. This index represents an alternative way of measuring remoteness. It could be easily (1) extended to many higher education institutions and (2) integrated into a contextualised admissions system in which applicants from Scottish remote communities would be signalled.

1. Introduction

The purpose of this paper is to propose a methodology capturing the perception of distance between secondary state schools in some Scottish remote communities and a hard to reach university located in a small town on the north-east coast of rural Fife, i.e. the University of St Andrews. The location of St Andrews and the absence of a railway station mean that it is often interpreted as being geographically isolated. As a result, the University of St Andrews is perceived as hard to reach by public transport means. The university is also more often perceived as hard to reach for students from state schools. Indeed, students from independent schools are disproportionately represented among young full-time first degree UK domiciled entrants (see Lasselle et al. 2014; Sutton Trust 2011).

In Scotland or elsewhere, participation rates in higher education (HE) are usually studied through socio-economic factors. Students from less affluent backgrounds and whose parents or family did not go to university are less likely to study at university (Gorard 2007; Croxford and Raffe 2013; Riddell 2014; Weedon et al. 2014; Raffe and Croxford 2015). More recent research has revealed that lower participation rates in HE may be explained by geographical barriers because of multi-faceted costs involved in attending a university far from 'home'. Frenette (2004) identifies three factors that may explain variation in university participation by distance to school: financial costs, emotional costs and neighbourhood educational attainment effect.

Financial costs are multiple and linked to moving away from home. They comprise direct costs, such as the need to rent a room or the travel expenses between home and the university location, and indirect costs, such as the foregone economies of scale associated with the family being divided. Emotional costs are considerable for some. Moving to a new place means leaving family, friends and community. Finally, pupils living far away from a university may not see the benefits resulting from a

university education since fewer people hold a degree. For instance, in Canada, *“18% of students living within 40km from a university have at least one parent with a university degree, compared to only 11% of students living beyond 80 km”* Frenette (2004, 53).

Several studies have analysed the links between geographical access and participation in HE, including Walsh et al. (2015) for Ireland and Gibbons and Vignoles (2012) for England and Wales. As Scotland has many rural communities where access may not be straightforward (Skerratt et al. 2012), measuring distance between some of these communities and a HE institution ought to be fully explored.

Geographical access to HE in Scotland is diverse. The Open University in Scotland is open to all. As a distance learning university, no need for transport is required. As many universities are located in Edinburgh and Glasgow or their vicinity, accessibility is not a real issue. The University of St Andrews is often perceived to be hard to reach because of the lack of transport connections. St Andrews, situated on the north-east coast of rural Fife, has no railway station and no airport. The bus station is situated near the town centre. It links the town to all of Fife and Dundee, Edinburgh and Glasgow. The closest railway station is in Leuchars, five miles away from St Andrews, and is on the main line between Edinburgh and Aberdeen. The location of St Andrews and the absence of a railway station often mean that it is seen as being geographically isolated. This paper aims to explore geographical access between these hard to reach communities and a hard to reach university.

In the Scottish context, geographical aspects are always taken into account in the debate about access to HE. When Nicola Sturgeon became First Minister in November 2014, she set out *“clear ambition that a child born today in one of our most deprived communities should, by the time he or she leaves school, have the same chance of going to university as a child born in one of our least*

deprived communities. (...) Not just a better chance than they have today. But the same chance as anyone else. In other words, where you are born and brought up and your parents' circumstances must not be the driver of how likely you are to go to university" (Scottish Government 2014). As the recent CREID seminar announcement indicates, the Scottish Government has set up a Widening Access Commission to report in 2016, in order to identify the action needed to ensure that 20% of university students are drawn from the most socially disadvantaged neighbourhoods (CREID 2015). This action places a heavy emphasis on the Scottish Index of Multiple Deprivation (SIMD). The SIMD divides Scotland into datazones and measures in each zone the level of deprivation, aggregating the zones by quintile from the 20% most deprived zones to the 20% least deprived zones (see Scottish Government (2012) for more information). The domicile of the entrant can then indicate the quintile in which the entrant is located. The SIMD is well known to capture deprivation in urban areas more effectively than in rural areas (Skerratt et al. 2014, 79). More recently, the interim report of the Commission on Widening Access (2015: 78) pointed out that although "the SIMD is the most robust national measure of deprivation available" it has its limitations. It remarks that a "wider basket of measures may be more suitable to provide a fuller picture of deprivation". This is exactly the area to which our paper seeks to contribute. We propose one measure that could be included in the basket. Our measure indicates rural deprivation in terms of geographical access from some remote Scottish areas to a highly selective but hard to reach university.

In what follows, we focus on five local authorities which are mostly in remote rural areas: Argyll & Bute, Eilean Siar, Highland, the Orkney Islands and the Shetland Islands, i.e. the ARC¹ region. These local authorities are providing 47 secondary state schools, i.e. the ARC schools. In what follows, we will explore the perception of geographical access between these hard to reach communities and a

¹ Access for Rural Communities. This is the name of a pioneering project aiming to increase the participation in HE from pupils living in these five local authority areas. The project was co-funded by the Scottish Government, the Scottish Funding Council and the University of St Andrews.

hard to reach university. This geographical access is measured from the ARC schools to the University of St Andrews according to three units: miles, minutes and £. Due to its size, its location and its traditional portfolio of degree programmes and subjects taught, few Scottish students domiciled in the ARC region prior to studying a full-time course at university favour St Andrews as their preferred destination (see for instance Lasselle et al. 2009 or Lasselle et al. 2015). The majority attend universities in Glasgow or Edinburgh or the University of the Highlands and Islands.

The paper is organised as follows. Section 2 provides some contextual information about the 47 secondary state schools we consider. Section 3 presents our data and methodology. Our visual representations and their discussion are presented in Sections 4 and 5. Section 6 draws together our main conclusions.

2. Background context: ARC schools

Our study focuses on the perception of distance between the University of St Andrews and 47 ARC schools in five local authorities mostly in remote rural areas in Scotland. 10 ARC schools are in Argyll & Bute, four in Eilean Siar, 29 in Highland, two in the Orkney Islands and two in the Shetland Islands.

2.1. ARC schools and SIMD

Only 10 ARC schools out of 47 (about a fifth) are located in the 40% most deprived areas of Scotland, compared with 19 (about 40%) in the least deprived areas. There are large discrepancies between local authorities. For instance, no ARC Schools in Eilean Siar are in the 40% least deprived areas in Scotland. Although all four ARC schools located in the 20% least deprived areas in Scotland are located in Highland, 70% of the ARC schools in the 40% most deprived areas in Scotland are also in Highland (for more information see Lasselle et al. (2015) and Table 1 in Appendix). The low number

of ARC schools in the 40% most deprived areas of Scotland is not surprising as the SIMD is not the most suitable index for capturing deprivation in Scottish rural communities. Hence, in Argyll & Bute, there are only 33 SIMD20 and SIMD40 out of 123 zones; in Eilean Siar, 14 out of 36; in Highland, 81 out of 292; in the Orkney Islands, five out of 27; in the Shetland Islands, one out of 30.

2.2. ARC schools and progression to HE

Taking the 47 ARC schools all together, the three-year average progression rate to HE is 34%, below the national rate of 36%. However, there are discrepancies between the local authorities in the ARC region and between schools within each local authority. In two local authorities of the ARC region, the percentage is above the national rate. It is 37% in Eilean Siar and 38% in the Orkney Islands. In the remaining three local authorities, the percentage is equal to or less than the national rate. It is 36% in Argyll & Bute, 34% in Highland and 28% in the Shetland Islands.

At school level the discrepancy also exists. 17 ARC schools, i.e. 36% of the 47 ARC schools, have a higher than average progression rate to HE. 28 schools across the ARC region have a lower than average rate and two schools have attained exactly the average rate of 36%. All percentages are collected in Table 1 provided in the Appendix.

3. Data and research methods

This paper explores the perception of geographical access from hard to reach communities located in the ARC region to a hard to reach university, i.e. the University of St Andrews. In particular, it seeks to aggregate different measures of distance into one. These different measures capture the three usual notions of distance: mileage, duration and cost. Let us consider three locations: A, B and C. Individuals will perceive the distance between A and C as being greater than that between A and B when either the road mileage between A and B is lower than the road mileage between A and C, or

the journey duration between A and B is shorter than the journey duration between A and C, or the journey cost between A and B is lower than the journey cost between A and C.

Data are provided by National Records of Scotland (NRS) data © Crown copyright and database right 2014, Ordnance Survey data © Crown copyright and database right 2014, ViaMichelin Maps and route planner (2014), Traveline Scotland (2014).

The Euclidean distance (or straight line) was calculated in ESRI ArcMap software after identifying the OS coordinates of the main ARC school buildings and College Gate of the University of St Andrews, College Gate being the contact address of the University.

The road mileage distance was computed from the ARC school postcode to the St Andrews bus station. The journey origin can be misleading as the school catchment area can be very large. The journey destination is less problematic. St Andrews bus station represents a location most evenly accessible to the University halls of residence and place of registration.

The road mileage and costs by private transport were evaluated by using ViaMichelin. The following conditions were applied: 'quickest route', 'type of car: hatchback', 'currency: GBP', 'fuel type: petrol', 'fuel cost per litre: 130p'. Ferry miles, traffic and ferry timetables were excluded.

Journey durations and costs by public transport were calculated for journeys in September and October 2014 using Traveline Scotland. At the beginning of the academic session students have to arrive in St Andrews for the official registration process in Orientation Week. To meet this condition in September 2014, they had to depart from their ARC school after 5pm on Friday 5th September or after 7am on Saturday 6th September.

The October journey rationale is simple. After a few weeks, students may wish to go home for a weekend. Their means of transport is public transport. Students had to depart after 5pm on Friday 24th October or after 7am on Saturday 25th October and return to St Andrews before 9am on Monday 27th October. The additional following conditions were applied:

- the travel time that gives the longest duration at the ARC school was always chosen;
- in the event that multiple results were given, the route with the fewest changes was always selected.

The difference between private and public transport costs needs to be interpreted with caution. In this analysis, priority in public transport choice was given to duration over distance and cost. This difference may be less extreme if greater priority had been given to the cost than to the duration of the journeys.

4. Visual representations of distance between the 47 ARC schools and the University of St Andrews

4.1. A first visual representation depending on cost, mileage and duration

4.1.1. Methodology

Briefly speaking, when people think about distance or travel, they take various factors and their means of transport into account. The three most commonly used factors are the road mileage, the cost of the journey and the journey duration. When making the decision about travelling by private transport or by public transport, people will most likely weigh up the cost and duration of the former against those of the latter.

Map 1 proposes the visual representation of the possibility of making the return journey between the University of St Andrews and one of the 47 ARC schools by public transport in a weekend in October 2014. It shows whether the journey is possible, whether it costs more than £100, the length of time at home and whether the transport duration is greater than that of the stay at home.

4.1.2. Results

It transpires that (1) it is impossible to travel by public transport from St Andrews to 17 ARC schools for a weekend; (2) for 15 ARC schools, the duration of the weekend at home is more than 36 hours and (3) for three ARC schools, the duration of the journey is longer than the length of time at home. At a first glance we note that all local authorities comprising the ARC region allow the journey in geographical terms. However, not all secondary schools in the ARC region are accessible.

For more than a third of the ARC schools it is impossible to do this journey. These are crossed in Map 1. This can be due to two reasons. For eight ARC schools, the return journey takes more hours than the number of hours in the weekend. For nine ARC schools, even if it is possible to do the outward journey by public transport, it is impossible to get back to St Andrews for the 9am lecture/tutorial/seminar or laboratory.

Therefore, out of 47 schools, only 30 allow a short break. For three ARC schools, the stay at home is shorter than the length of the journey. These schools are on the west coast of Scotland and necessitate the use of several means of public transport in order to be reached. Those are highlighted in red in Map 1. For the ARC schools highlighted in orange, the stay at home is between 18 hours and 24 hours, i.e. the difference between the stay at home and the travel journey is less than 12 hours.

For some ARC schools, the stay at home can be more than 24 hours and less than 28 hours. These are highlighted in yellow in Map 1. In these cases, the difference between the stay at home and the travel journey is between 12 and 24 hours. Finally, for the ARC schools either in the Inverness area or close to Glasgow, the stay can be even more than 36 hours, i.e. the difference between the stay at home and the travel journey is more than 24 hours. In most cases, a railway station is close by.

If we now consider the cost of travel by public transport from the University of St Andrews to an ARC school at that time of the year, the journey cost can span from £49 to £162. In other words, the most expensive journey costs 3.3 times as much as the cheapest journey for a weekend in October.

This exercise shows that a) it can be complex to make an analysis in terms of distance between the ARC schools and the University of St Andrews and b) the fact that multiple factors need to be taken into account makes the analysis cumbersome. In the remaining part of this paper, we propose another representation capturing the perception of geographical and transportation distance.

Map 1 around here.

4.2. A second visual representation depending on mileage and duration

4.2.1. Methodology

As indicated earlier, the perception of distance can be measured according to three elements: journey mileage, journey duration or journey cost. We drop the journey cost due to the previously noted limitations of such data. Let us now combine the two remaining elements.

4.2.1.1. Journey mileage

The perception of distance depends on the journey mileage. We consider that individuals compare the straight line distance with the road mileage. The straight line distance could be deduced from a blind map, i.e. a map with no indication of roads or geographical features such as hills or rivers.

Individuals would simply draw a line between two locations. The road mileage distance is calculated by using a website such as ViaMichelin in our case. We measure the perception of distance from the mileage ratio, defined as the ratio between the road mileage and the straight line mileage. From Table 1 available in the Appendix, the mileage ratio for Kinlochleven High School (#37) is 1.51. In other words, the road mileage is 1.51 times as high as the straight line mileage, i.e. 50% further than

the straight line would indicate. All ratios are greater than one as the straight line mileage is always lower than the road mileage. A high ratio can mean that the perception of distance from an ARC school to the University of St Andrews is rather high.

4.2.1.2. Journey duration

The perception of distance depends on the journey duration. We consider that individuals compare the duration of the journey by private transport with that by public transport. In our case, the duration of the journey by private transport is given by ViaMichelin, that by public transport is given by Traveline Scotland. We measure the perception of distance from the duration ratio, defined as the ratio between the journey duration by public transport and that by private transport. From Table 1 available in the Appendix, the duration ratio for Kinlochleven High School (#37) is 2.03. In other words, the journey duration by public transport is 2.03 times as high as that by private transport, i.e. it takes twice as long to travel by public transport from the school to St Andrews as by private transport. We could say that the journey by public transport would allow the return trip by private transport. All ratios are greater than one as the journey duration by public transport always takes longer than the journey by private means. Again, a high ratio can mean that the perception of distance from an ARC school to the University of St Andrews is rather high.

4.2.2. Results

The mileage ratio and the duration ratio for each ARC school are available in Table 1 in the Appendix. The mileage ratio varies from 1.19 to 1.88. No ARC school is twice as far from the University of St Andrews by road as in a straight line. Eight (11%) ARC schools are more than 1.7 times further by road than in a straight line. 34 (72%) are more than 1.5 times further by road than in a straight line.

The duration ratio varies from 1.08 to 2.03. One ARC school is twice as far from the University of St Andrews by public transport as by private transport. 11 (23%) ARC schools are more than 1.5 times as far by public transport as by private transport.

A school is considered to be “further than people think” when the duration ratio is greater than the mileage ratio. A school is considered to be “not as far as people think” when the mileage ratio is greater than the duration ratio. When both ratios have equivalent values, schools are grouped in the category “equivalent”.

Map 2 illustrates the suggested index and Table 1 in the Appendix clearly indicates the category with which each school is associated. From this second representation, we first note that only within the Orkney Islands and the Shetland Islands do all the schools belong to the same category, i.e. ‘not as far’. Second, regardless of the costs, the schools that might be perceived by people to be further than they think are those broadly in line with St Andrews, with the exception of Farr High School (#6). These schools are located in the north part of Argyll & Bute, in the south-west part of the Highland region and the bottom half of Eilean Siar. Travelling west-east by public transport is never straightforward in Scotland.

Map 2 around here.

5. Discussion: what are the visual representations for?

The above visual representations allow us to capture the complex notion of geographical access from some hard to reach communities to a hard to reach university in Scotland. Our first representation is purely visual. The second representation is both a visual representation and a metric. Neither is dependent on the local authority, the SIMD quintile or the percentage rate of progression to HE.

We have no doubt that many Scottish students at the University of St Andrews use the various factors we explored above when making a travel decision: cost, duration, mileage and time of year. The time of year might be crucial in making the decision to take private transport. The use of private transport is most likely to occur at the start and the end of the academic session. Students are more likely to be driven by a relative or a friend. The volume of luggage might also make the car option preferable. At other times of the year the use of public transport is more likely. It is then perhaps that the remoteness of St Andrews might be most keenly felt. As we highlighted in Section 4, going back home for a weekend in October was not a possibility for many students coming from areas in the vicinity of an ARC school. This might influence their decision whether to apply to the University of St Andrews. This is the reason why the first representation of the perception of geographical access is essential. It allows us to visualise the concept of geographical access.

The second representation seems perhaps more complex than the first representation but this apparent complexity should not lead us to disregard it, for three reasons. First, it depends not on costs but only on objective factors such as mileage and journey duration. The latter two are very unlikely to change. Second, our ratios are easy to compute and could be easily adapted to other HE institutions. One needs only to calculate them for each ARC school relative to the location of one of the 18 other Scottish HE institutions. Finally and more importantly, it is a tool that can be integrated in contextualised admissions. As we emphasised in the introduction, the SIMD quintile is not the

best indicator to capture rural deprivation. If urban applicants from the 40% most deprived areas in Scotland can be signalled by the use of SIMD quintiles, rural applicants experiencing deprivation are less likely to be flagged. Our index of geographical access based on three scales, i.e. not as far as people think, equivalent and further than people think, could allow this signalling.

6. Conclusion

The notion of geographical access is not straightforward. The duration of a journey, the means of transport and the cost of a journey are all essential factors that a person takes into account when making a decision about a journey from A to B. This paper has pointed out that these factors lead to different notions of geographical access.

The paper proposed two visual representations of the notion of distance. The first representation depends on the time of year. The second representation depends on objective factors, namely mileage and journey duration. Both were independent of the SIMD, the progression rate to HE and the local authority.

This research will continue in two directions.

First, it seems essential to expand these visual representations to other places than St Andrews. The visual representation of the notion of geographical access will then be available to HE institutions located in these places. They could then integrate this concept into their own contextualised admissions.

Second, the point of origin needs to be revisited. Indeed, school catchment areas would be more suitable to be considered as the point of origin than the school postcode. The distance between school and the home address may be significant. This is particularly true for schools on the west coast of Scotland, and in some cases results in the pupils staying in dormitories during term time.

Appendix: Table 1 – ARC schools distance data.

Map #	ARC school name	LA	% Pg to HE	SIMD quintile	Mileage ratio	Duration ratio	Perception of distance
1	Brae High School	SI	22	4	1.54	1.16	not as far
2	Anderson High School	SI	33	3	1.55	1.22	not as far
3	Kirkwall Grammar School	OI	36	3	1.66	1.35	not as far
4	Stromness Academy	OI	39	4	1.58	1.34	not as far
5	Thurso High School	H	34	2	1.63	1.15	not as far
6	Farr High School	H	35	3	1.50	1.82	further
7	Kinlochbervie High School	H	34	3	1.43	1.35	equivalent
8	Wick High School	H	34	2	1.72	1.12	not as far
9	The Nicolson Institute	ES	35	2	1.37	1.42	equivalent
10	Sir E Scott School	ES	45	3	1.47	1.55	equivalent
11	Golspie High School	H	26	3	1.63	1.19	not as far
12	Ullapool High School	H	43	4	1.46	1.25	not as far
13	Dornoch Academy	H	47	4	1.63	1.20	not as far
14	Tain Royal Academy	H	24	2	1.62	1.26	not as far
15	Gairloch High School	H	34	3	1.49	1.33	not as far
16	Alness Academy	H	12	2	1.56	1.23	not as far
17	Invergordon Academy	H	23	3	1.61	1.26	not as far
18	Dingwall Academy	H	38	3	1.52	1.38	not as far
19	Fortrose Academy	H	51	5	1.62	1.24	not as far
20	Nairn Academy	H	31	3	1.70	1.27	not as far
21	Sgoil Lionacleit	ES	35	3	1.58	1.74	further
22	Culloden Academy	H	37	5	1.59	1.23	not as far
23	Millburn Academy	H	43	3	1.57	1.17	not as far
24	Inverness High School	H	14	4	1.58	1.09	not as far
25	Charleston Academy	H	36	2	1.59	1.17	not as far
26	Portree High School	H	29	2	1.54	1.31	not as far
27	Inverness Royal Academy	H	41	5	1.60	1.29	not as far
28	Plockton High School	H	42	4	1.53	1.33	not as far
29	Glen Urquhart High School	H	49	4	1.78	1.23	not as far
30	Grantown Grammar School	H	28	4	1.79	1.34	not as far
31	Kilchuimen Academy	H	43	4	1.68	1.42	not as far

Map #	ARC school name	LA	% Pg to HE	SIMD quintile	Mileage ratio	Duration ratio	Perception of distance
32	Kingussie High School	H	24	5	1.56	1.08	not as far
33	Castlebay Community School	ES	32	3	1.19	1.42	further
34	Mallaig High School	H	31	4	1.43	1.82	further
35	Lochaber High School	H	29	4	1.47	1.82	further
36	Ardnamurchan High School	H	43	4	1.35	1.72	further
37	Kinlochleven High School	H	24	2	1.51	2.03	further
38	Tobermory High School	A & B	49	4	1.27	1.88	further
39	Tiree High School	A & B	27	3	1.24	1.95	further
40	Oban High School	A & B	31	2	1.27	1.58	further
41	Lochgilphead High School	A & B	44	3	1.63	1.30	not as far
42	Hermitage Academy	A & B	41	4	1.41	1.47	equivalent
43	Dunoon Grammar School	A & B	35	3	1.88	1.23	not as far
44	Tarbert Academy	A & B	35	4	1.72	1.26	not as far
45	Rothesay Academy	A & B	41	2	1.86	1.19	not as far
46	Islay High School	A & B	24	3	1.62	1.57	equivalent
47	Campbeltown Grammar School	A & B	34	3	1.75	1.32	not as far

#: Number. ARC schools are numbered by latitude.

LA: Local authority. A & B: Argyll & Bute, ES: Eilean Siar, H: Highland, OI: Orkney Islands, SI: Shetland Islands.

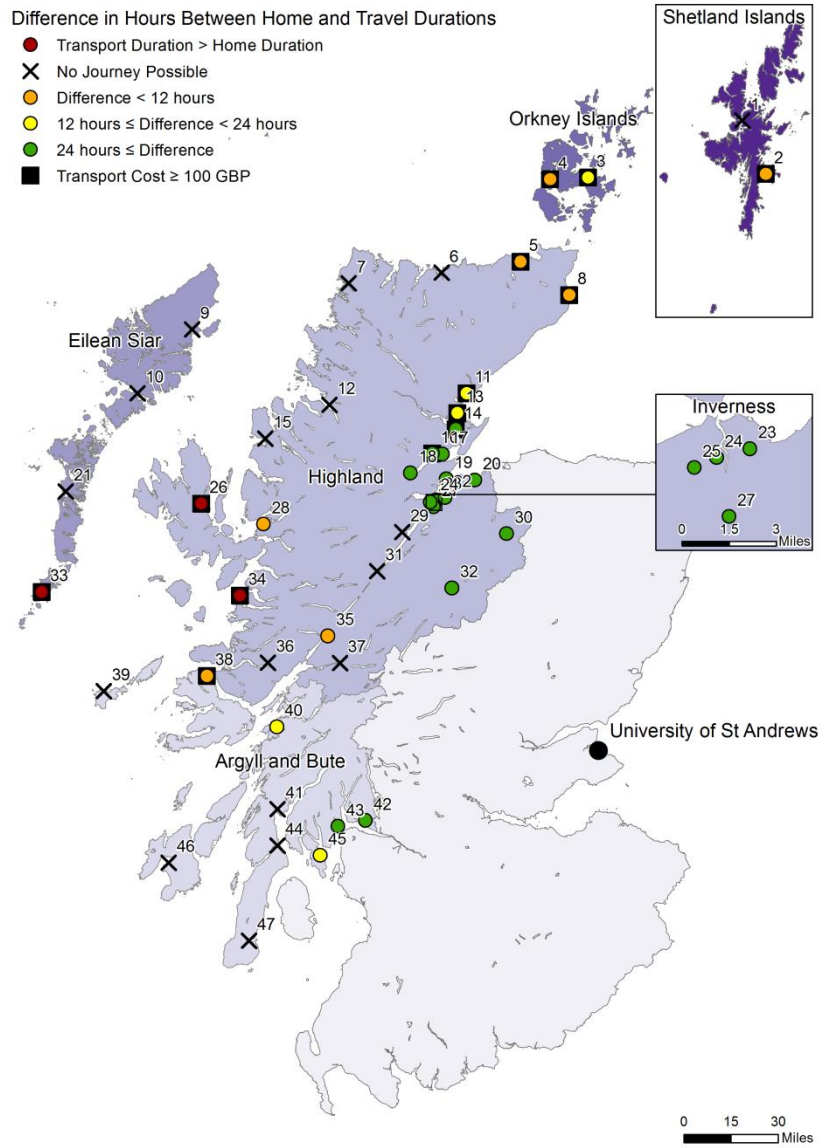
% Pg to HE: three-year average progression rate to HE (2010-11 / 2012/13).

In the SIMD quintile column: 1: 20% most deprived areas in Scotland; 5: 20% least deprived areas in Scotland.

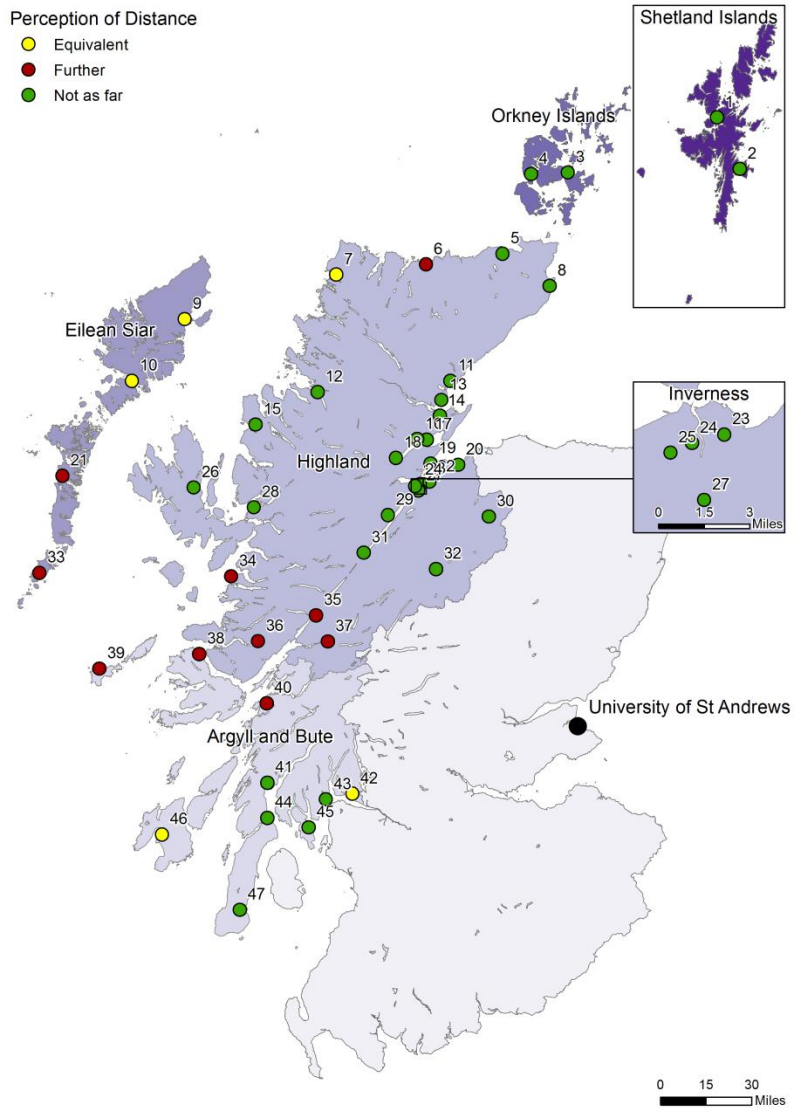
Mileage ratio: the ratio between the road mileage and the straight line distance.

Duration ratio: the ratio between the journey duration by public transport and the journey duration by private transport.

Maps



Map 1: Difference in hours between the travel duration from the University of St Andrews to one of the ARC Schools by public transport and the stay at home for a weekend in October 2014.



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