

Health Intelligence Team
NHS Highland

Drive time access to hospital for the population of Lochaber

Health Intelligence Team

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The Health Intelligence Team are part of the Directorate of Public Health of NHS Highland and provide an expert resource of demographic and population health evidence.

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Drive time analysis

Calculating drive time isochrones and estimating population coverage

In this work we used a Geographic Information System (GIS) to identify the Lochaber population resident within 30, 60, 90 and 120 minute drive times of select hospital locations. The GIS creates isochrones or footprint extents that represent the areas covered within drive time limits of locations. We then used a point in polygon technique to select the population weighted centroids of data zone areas within isochrones. Populations of data zones are published as Small Area Population Estimates by the National Records of Scotland. In this work we used the current estimates from 2016.¹

The software used for the generation of the travel isochrones was ArcGIS version 10.3 with the Network Analyst Extension.

Three types of spatial data were used:

- Road network data from the Integrated Transport Network © Ordnance Survey. This incorporates all Motorways, 'A', 'B' and minor roads.
- Population weighted data zone centroids published by the Scottish Government.
- Boundary files for NHS Boards (2014), Scottish Council areas and NHS Highland small area geographies

Data Attributes

To perform the drive time analysis in the GIS, road speeds were applied to the complete road network using two classes (urban and rural). The GIS calculates the isochrones extent using the fastest available route. Speed class assumptions for roads are given in the table following.

• Road types and time travel speeds

Road type	Rural (Speed - mph)	Urban (Speed – mph)
Motorway	52	34
Trunk	48	28
A Road	45	25
B Road	32	20
Unclassified	24	16
Landfill	6	4

Road types and time travel speeds

In undertaking this work we recognise that actual journey times over the same roads may result in very different experience and will be influenced by multiple factors including the behaviour of the individual driver; their vehicle; the volume of traffic and the incidence of road works. Driving conditions and journey times can obviously be affected by the weather.

The travel times estimated by a GIS provide no more than a representation of likely journey times and the distance that it may be possible to travel within a timescale. In attempting to model access to a service this picture is more useful than the range of possible extremes that may be recalled from individual experience. Other studies have shown GIS estimates of travel time to be closely correlated with actual journey times². It is also know that this association is less strong as journey distances increase and the opportunity to take alternative routes expands. A ceiling of 120 minutes was applied to the road network analysis in this work.

¹ [National Records of Scotland mid-2016 Small Area Population Estimates \(SAPE\)](#)

² Haynes, R, Jones A, Sauerzapf V and Zhao H: Validation of travel times to hospital estimated by GIS. International Journal of Health Geographics 2006, 5(40): [<http://www.ij-healthgeographics.com/content/5/1/40>]

Drive time access to hospital for the population of Lochaber

Disparity in the geographic access of populations to hospital services results from the way in which people and facilities are distributed. The extent of inequalities in health care access is further influenced by the availability of services at individual hospitals and by the transport infrastructure. Of particular concern are situations that result in large distances between people and health care facilities. These populations experience greater difficulty of access due to increased travel times, often coupled with poor transportation infrastructure and a lack of public transport options.

Map 1 below illustrates that in a national context the population of Lochaber lives at extreme distance and journey time from hospital services available at Teaching and Large General Hospitals. The majority of the Lochaber area is highlighted as being over two hours distant from the nearest Large General Hospital at Raigmore in Inverness.

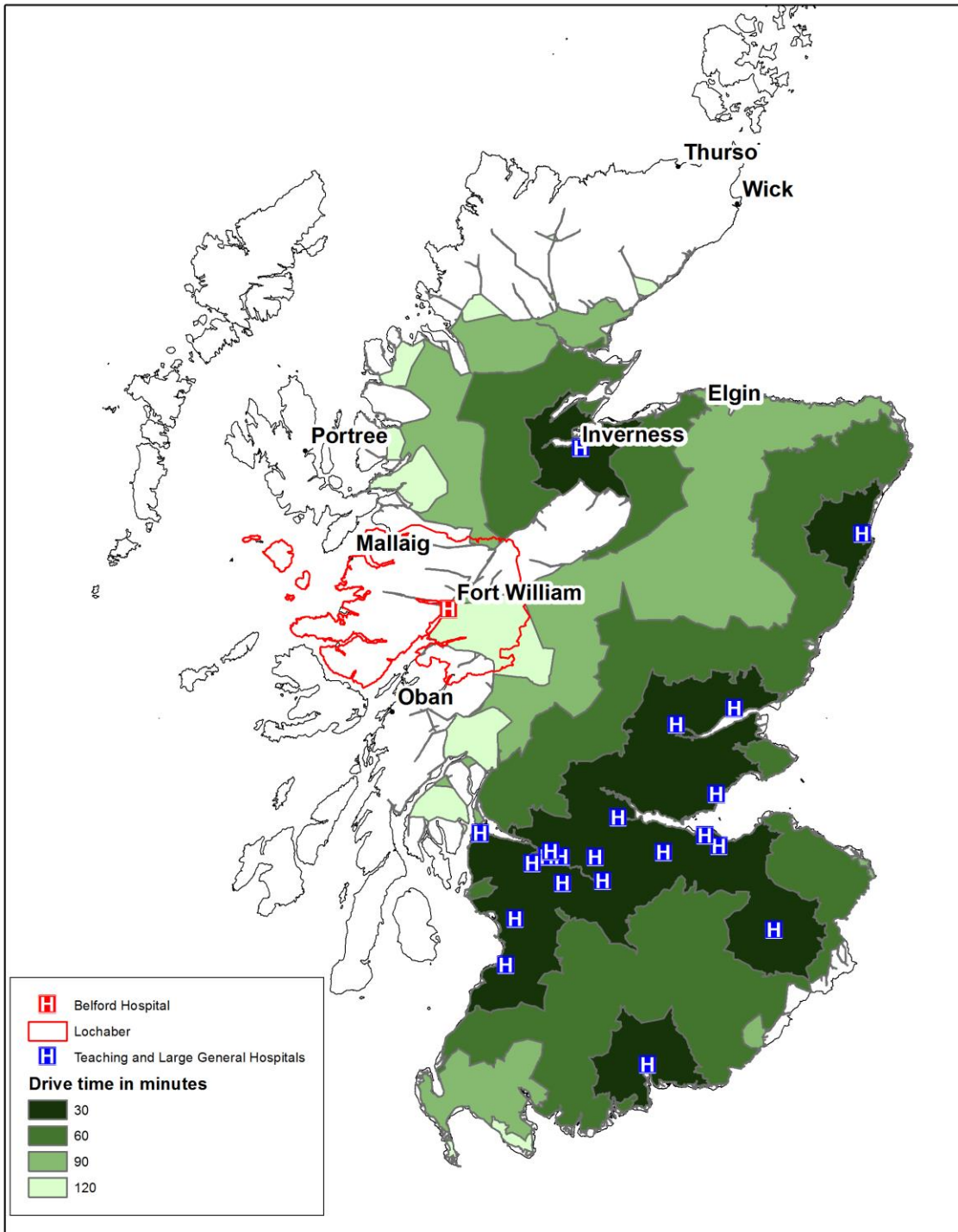
More detailed mapping (map 3) suggests that about three-quarters of the population of the Lochaber area would take between 90 to 120 minutes to reach Raigmore. The remaining 25 percent of the area population live beyond two hours drive time of Inverness. More than two and a half hours driving would be required to reach the nearest Teaching Hospital in Glasgow from Fort William.

The next nearest General Hospital for the majority of the Lochaber population is the Lorn and Islands Hospital located in Oban. This facility is 45 miles from Fort William and a journey time of about 80 minutes. Map 4 and tables 5 and 6 show that only 10 percent of the Lochaber population lives within an hour of the Rural General Hospital in Oban. The resident population of Lochaber is therefore highly dependent on the services run from the Belford Hospital for immediate access to secondary care hospital services.

About three quarters of the population of Lochaber can access the Belford Hospital in 30 minute by driving. At 60 minutes this rises to about 85% of the population (map 2 and tables 1 and 2).

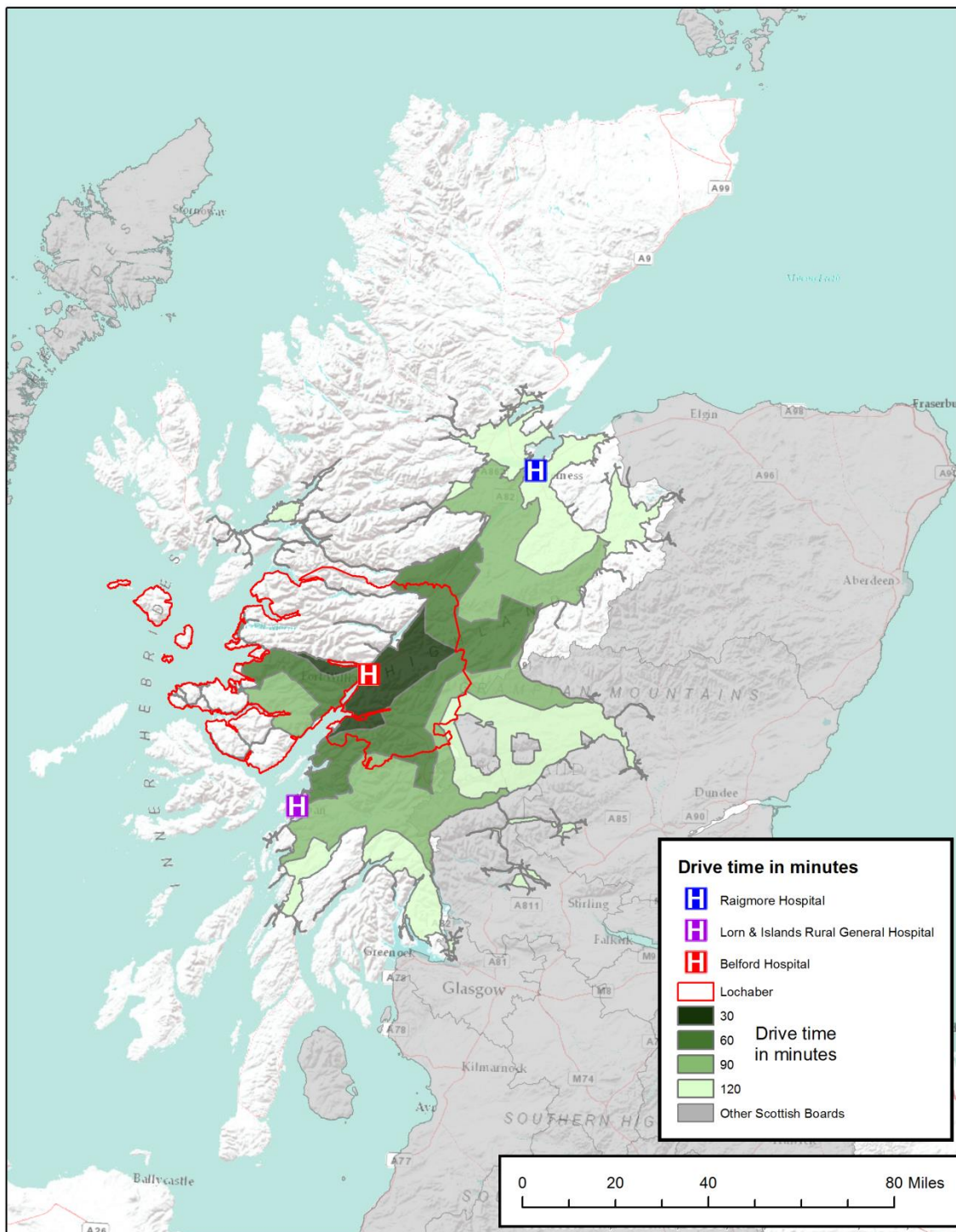
Just over 6,500 people or about thirty percent of people living in the Oban, Lorn and Isles area of Argyll & Bute are in reach of the Belford Hospital within 60 minutes (map 2 and tables 1 and 2). It would be important for estimating service demand to establish if this population routinely uses hospital based services in Lochaber, or if there is an expectation that any of this population are to be served in the future from a site in Fort William.

Map 1: Drive time in minutes to Teaching and Large General Hospitals in Scotland showing Lochaber area



<p>Drive time to Teaching and Large General Hospitals in Scotland</p> <p>This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. © Crown copyright and database right. All rights reserved. 100010825 2017</p>	 <p>Directorate of Public Health Health Intelligence Team Larch House, Inverness</p> <p>Date: Nov 2017</p>
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Map 2: Drive time in minutes from Belford Hospital showing Lochaber area



<p>Drive time in minutes from Belford Hospital</p>	
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Table 1: NHS Highland population within drive times of Belford Hospital

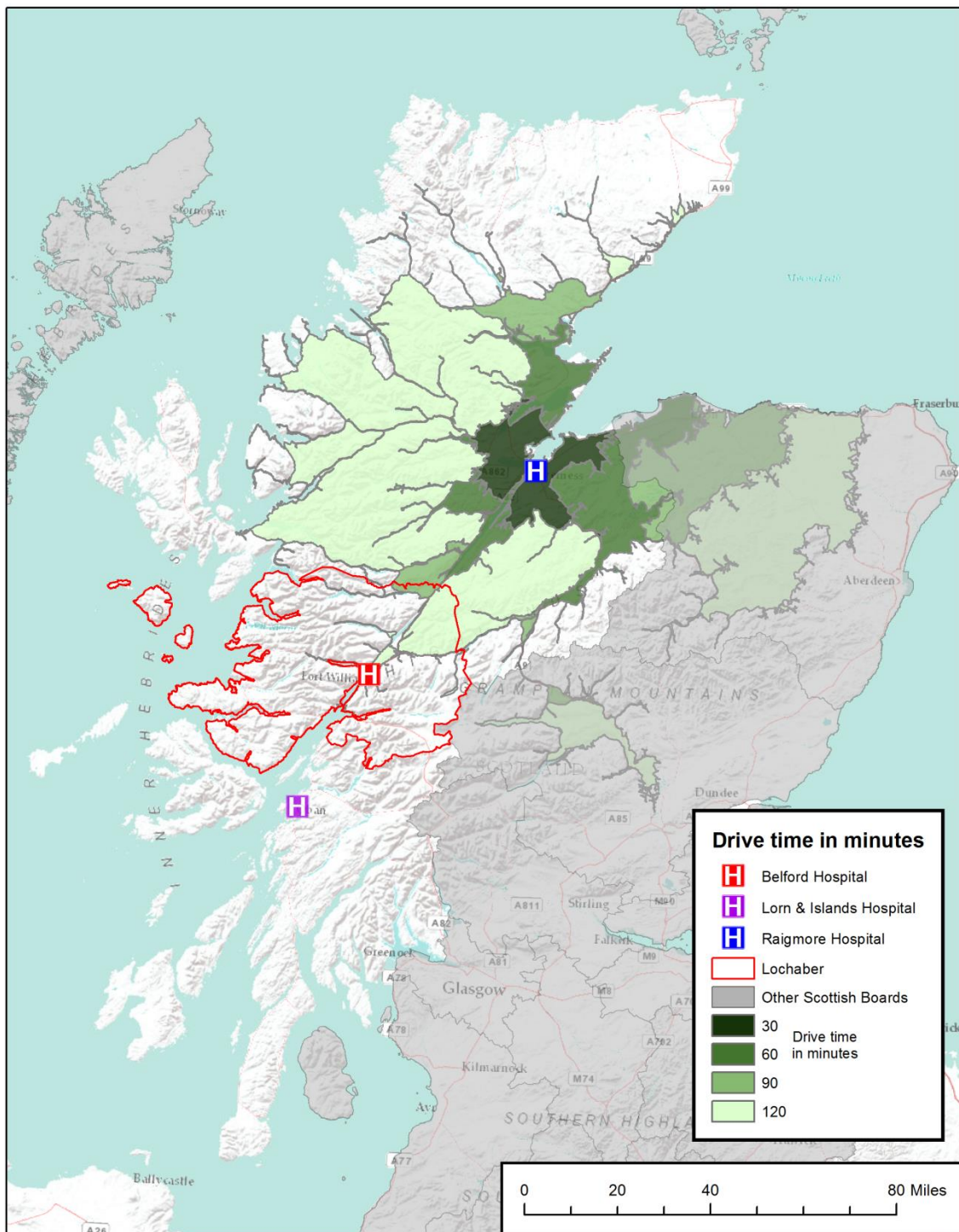
Council area	Area*	Drive time in minutes			
		30	60	90	120
Highland	Lochaber	14,587	2,361	2,299	559
	Inverness		1,106	24,803	54,986
	Badenoch and Strathspey			7,568	6,209
	East Ross				8,104
	Mid Ross				24,916
	Nairn & Nairnshire				11,791
	Skye, Lochalsh and West Ross				5,349
Highland Total		14,587	3,467	34,670	111,914
Argyll & Bute	Helensburgh & Lomond				22,330
	Mid-Argyll, Kintyre & Islay				6,707
	Oban, Lorn & the Isles		6,692	7,206	2,496
Argyll & Bute Total		6,692	7,206	31,533	
NHS Highland		14,587	10,159	41,876	143,447

Table 2: Percentage of the NHS Highland population within drive times of Belford Hospital

Council area	Area*	Drive time in minutes			
		30	60	90	120
Highland	Lochaber	73.6	11.9	11.6	2.7
	Inverness		1.4	30.7	68.0
	Badenoch and Strathspey			54.9	45.1
	East Ross				36.5
	Mid Ross				93.5
	Nairn & Nairnshire				89.3
	Skye, Lochalsh and West Ross				27.6
Highland Total		6.2	1.5	14.8	47.7
Argyll & Bute	Helensburgh & Lomond				84.5
	Mid-Argyll, Kintyre & Islay				33.4
	Oban, Lorn & the Isles		33.1	35.7	12.3
Argyll & Bute Total			7.7	8.3	36.2
NHS Highland		4.5	3.2	13.0	44.6

*Area extents based upon Highland Community Partnerships and Argyll & Bute Localities

Map 3: Drive times in minutes from Raigmore Hospital showing Lochaber area



Drive time in minutes from Raigmore Hospital

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Table 3: NHS Highland population within drive times of Raigmore Hospital

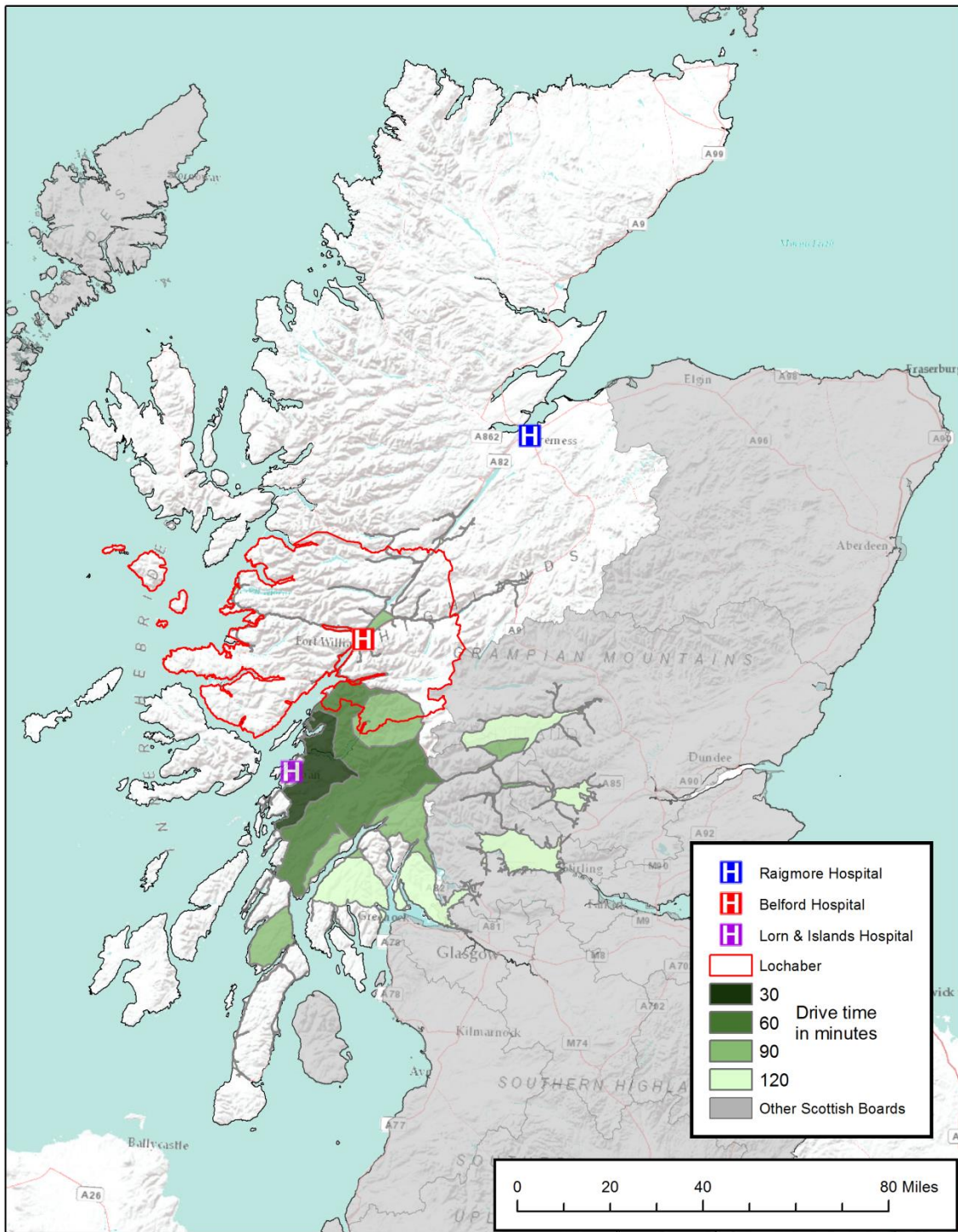
Areas*	Population within drive time in minutes			
	30	60	90	120
Lochaber			1,394	13,855
Inverness	77,019	3,876		
Badenoch and Strathspey		13,777		
Caithness				762
East Ross	1,622	19,320	1,267	
Mid Ross	24,092	1,695		
Nairn & Nairnshire	12,604	605		
Skye, Lochalsh and West Ross			2,966	4,794
Sutherland		1,871	6,980	828
Highland Total	115,337	41,144	12,607	20,239
NHS Highland Total	115,337	41,144	12,607	20,239

Table 4: Percentage of the NHS Highland population within drive times of Raigmore Hospital

Areas*	Percentage of population within drive time in minutes			
	30	60	90	120
Lochaber			7.0	70.0
Inverness	95.2	4.8		
Badenoch and Strathspey		100.0		
Caithness				3.0
East Ross	7.3	87.0	5.7	
Mid Ross	90.4	6.4		
Nairn & Nairnshire	95.4	4.6		
Skye, Lochalsh and West Ross			15.3	24.7
Sutherland		14.4	53.6	6.4
Highland Total	49.1	17.5	5.4	8.6
NHS Highland Total	35.8	12.8	3.9	6.3

*Area extents based upon Highland Community Partnerships and Argyll & Bute Localities

Map 4: Drive times in minutes from Lorn and Islands Rural General Hospital



Drive time in minutes from Lorn & Islands Hospital

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Table 5: NHS Highland population within drive times of Lorn and Islands RGH

		Population within drive time in minutes			
Council area	Area	30	60	90	120
Highland	Lochaber		2,018	10,939	3,991
	Inverness				1,106
Highland Total			2,018	10,939	5,097
Argyll & Bute	Bute & Cowal			747	11,463
	Helensburgh & Lomond			921	25,500
	Mid-Argyll, Kintyre & Islay		5,973	1,861	1,237
	Oban, Lorn & the Isles	12,477	2,100	837	980
Argyll & Bute Total		12,477	8,073	4,366	39,180
NHS Highland		12,477	10,091	15,305	44,277

Table 6: Percentage of the NHS Highland population within drive times of Lorn and Island RGH

		Percentage of the population			
Council area	Area	30	60	90	120
Highland	Lochaber		10.2	55.2	20.2
	Inverness				1.4
Highland Total			0.9	4.7	2.2
Argyll & Bute	Bute & Cowal			3.7	56.2
	Helensburgh & Lomond			3.5	96.5
	Mid-Argyll, Kintyre & Islay		29.7	9.3	6.2
	Oban, Lorn & the Isles	61.7	10.4	4.1	4.8
Argyll & Bute Total		14.3	9.3	5.0	45.0
NHS Highland		3.9	3.1	4.8	13.8