PE1646/F
NHS Highland submission of 4 July 2017

I am responding, on behalf of Prof Elaine Mead and NHS Highland, to your letter of 5 June requesting written evidence to the Petitions Committee on PE1646 - Drinking Water Supplies in Scotland.

Our understanding is that this issue arose primarily from concerns raised about the public water supply to the Aviemore/Spey Valley area. The Health Protection Team of our Public Health department have been involved in investigating these concerns and have just finished a report on the matter. I have enclosed a copy of this for the attention of the Committee. It addresses many of the points raised in previous oral evidence, such as the potential health effects of the tap water and in particular any adverse effects on some consumer's skin. I trust it will be helpful to the Committee's deliberations.

Therefore the majority of our submission is contained in the enclosed report however in summary our views on the two broader issues of the petition are as follows:

1. **The role of the Drinking Water Quality Regulator**

   Over the past 20 years, during the time I have been in post as a Consultant in Public Health for NHS Highland, I have witnessed major improvement in water quality and safety in Scotland. There has been significant investment in water treatment and distribution systems throughout the Highlands, as well as elsewhere in the country. My experience of the DWQR since its inception post 2002 is that they have performed their role professionally and well, acting as an important strand of the aforementioned overall improvements.

   The DWQR staff have managed to maintain the balance between collaborative work with key stakeholders including Scottish Water, Local Authorities and the NHS but also working on behalf of consumers (and Government), ensuring enforcement actions are taken by requiring improvements and change where necessary. DWQR governance has been fair, proportionate and effective.

   It is my strong view that concerns about the perceived quality of the water supply in Aviemore do not warrant a change in the role of the DWQR.

2. **Chloramination of Drinking Water**

   Chloramination is a tried and tested water disinfection method. It is widely used worldwide as well as throughout Scotland and has been used in some places for years. There is not any concrete evidence forthcoming about adverse health effects, nor widespread consumer concern in Scotland about the safety of this process or the quality of water which results from its use. On the contrary chloramination enables the amount of free chlorine in water distribution systems to be reduced due to its longer disinfection time and so usually leads to a decrease in taste and odour complaints from consumers as the amount of chlorine and its by- products are reduced.

Chloramination has only very recently been introduced to the Aviemore area and so its effects there cannot be fully assessed until more time has passed. In the meantime there has not been a marked or sudden increase in the numbers of local complaints about the alleged health issues in Aviemore. Indeed the vast majority of these concerns were raised prior to the introduction of chloramination.

There is already published literature on chloramination and this can be accessed by the committee. In my view there is little to be gained by further research in Scotland on the safety of chloramination although it may provide further reassurance of its effectiveness and safety. Whether this would fully alleviate the concerns of those who already have concerns about it is doubtful. It is much easier to prove something does have an effect, than to prove something has no effect i.e. proving something is safe and has no detrimental effect is a significant challenge. This is especially the case when alleged adverse effects are vague or nonspecific such as dry or itchy skin; and also when the alleged cause is an environmental component like water or air quality where there are so many other confounding factors.

I trust the above comments and the **Annex 1** report below is helpful to the Committee.

ANNEX 1

AVIEMORE WATER SUPPLY SUMMARY REPORT

June 2017

This report summarises the investigation undertaken by NHS Highland Health Protection Team into the concerns raised by some of the local community about the Strathspey drinking water supply. The report aims to summarise the situation to date, the investigations undertaken and the conclusions reached.

1. Background

The source of raw water for the public water supply to the Strathspey area was changed in 2012. Prior to that it was from Loch Einich and since then it has been from boreholes beside the River Spey at Kinakyle, south of Aviemore. Subsequent to the change some customers complained about taste and odour issues in the drinking water. These complaints have persisted and now include concerns about skin irritation from bathing and the wider impact of the tap water on health.

The local newspaper the Strathspey and Badenoch Herald "the Strathy" has been covering this issue extensively in recent months and conducted a survey of readers in which some residents reported that the tap water has a harmful effect on their skin such as increased dryness, redness and itch.

Scottish Water changed the method of disinfection from chlorination to chloramination in early April 2017.

2. Investigation Process

NHS Highland Health Protection Team, based in the department of Public Health, have carried out some investigations to explore the above concerns further.

In addition to telephone conversations and email exchanges on this subject, two recent meetings have been held with Scottish Water and officers from the Drinking Water Quality Regulator team at which there was an open and comprehensive exchange of information.

Discussions have taken place with GPs from each of the 3 General Practices based in Grantown on Spey, Kingussie and Aviemore.

Anonymised prescribing data from each of the 3 General Practices was obtained and reviewed for all relevant skin products.

Anonymised referral data from each of the 3 General practices was obtained and reviewed for all patients referred to Dermatology out patients at Raigmore Hospital, Inverness.

Anonymised patient data was requested from the Aviemore GP practice for GP consultations for patients with Dermatitis in the last 10 years.

Discussions have taken place with senior members of the Environmental Public Health Team at Health Protection Scotland.

A visit was made to the new Treatment works at Aviemore.

Key published work on similar issues have been read and reviewed.

3. Normal working practice

There are existing close working arrangements between Scottish Water and NHS Board Health Protection Teams (HPTs) which follow nationally agreed protocols. Regular routine sampling of water quality including microbiological and chemical quality is undertaken by Scottish Water. HPTs are sent email notifications by SW of any microbiological or chemical sample result which is out with agreed standard parameters set by the Scottish Government, the wider water industry and the World Health Organisation. These notifications are usually also accompanied by a telephone call to discuss the "failure" and any potential health impact or further actions. So when any standard level is breached, appropriate actions are discussed that day and agreed remedial action taken immediately by Scottish Water. These actions could include the HPT recommending further samples are taken, or that bottled water is issued to customers for a while, or rarely that a temporary boil notice is issued. Contact between the public health scientific team at SW and NHS Board HPTs about water supplies in their geographical area is therefore a regular occurrence. So dialogue is frequent and a precautionary approach is always adopted and priority is given to protecting the public from any potential harm. The NHS HPT as an independent arbiter for public health can always ensure that is the case.

4. Investigation findings

4.1 Aviemore Treatment Works and sampling data

Since the implementation of the new treatment works there have been no breaches of Water Industry Standards in any regulatory samples taken on this supply. These include both Prescribed Concentration Values and also World Health Organisation Guideline levels. In other words the tap water supplied has been 100% compliant with drinking water quality standards. The works and the sample results have been independently evaluated by experts in water quality.

When the works opened in 2012 the chlorine levels were initially too high but these were gradually reduced. Free chlorine is now around 0.05mg/l.

pH has also been fine-tuned such that it is now consistently within a narrow range around 8.2. (range 7.9 – 8.6).

All samples remain compliant.

During a recent visit to the Aviemore works as well as at various meetings and email exchanges with SW I have been shown the monitoring data and spoken directly to SW scientific staff and several involved in running and maintaining the works. The works is a state of the art membrane plant. The chloramination dosing equipment is newer and even more accurate than other similar processes in the Highland area, including Inverness.

4.2 GP prescribing data

The quantity of several skin products dispensed by the Aviemore GP practice each year between 2010 and 2016 was reviewed. This data was then compared to the other GP practices within the South and Mid Operational unit of NHS Highland (ie the same locality) and with all NHS Highland GP practices for the last 3 years 2014-2016.

For skin emollients and barrier preparations, topical corticosteroids, and preparations for eczema and psoriasis, no rise in the number of prescriptions was noted in the years following the opening of the new treatment works. In fact for steroids and preps for eczema/dermatitis the trend has been downward since 2012/13.

The Quantity prescribed per 1000 patients in 2014, 2015 and 2016 was consistently much lower in Aviemore than the rest of Highland GP practices. (Approximately 20% lower for emollients, 30% lower for topical steroids and more than 30% lower for eczema preps).

(For more detailed data – see Appendix 1

4.3 GP Referral data

The number and rate of referral by the Speyside GP practices to the Dermatology outpatient clinic at Raigmore Hospital Inverness over the past 3 years 2014/15, 15/16 and 16/17 was reviewed. This was then compared to the rate of referral by the other GP practices within the South and Mid Operational Unit and with all NHS Highland GP practices.

The rate of referral by the Aviemore, Grantown and Kingussie practices was consistently lower than other practices in the locality and consistently lower than the average rate in all Highland GP practices during all 3 years examined.

When the number of referrals was standardised to take account of the age and sex profiles of the practice populations ie whether they had more young or older people, then the Speyside practices standardised referral ratio was between 57 and 75, so considerably lower than the average for Highland which is represented by 100 in this type of standardisation.

In the Aviemore practice – over the 3 year period, the actual number of patients referred to dermatology were 144 compared with an expected 216, so 33% less than what was expected if Aviemore referred at the same rate as other Highland practices.

(For more detailed data – see Appendix 1)

4.4 Views from Local General Practices

Advice was taken from one of the Associate Medical Directors and at least one General Practitioner within each practice was contacted to discuss the situation. Each was asked to consult their GP colleagues and collate a consensus view on whether they considered there to be an issue with the water supply affecting patients health, in particular their skin, or not. The following is a summary of the responses received:

Response from Aviemore GPs: (summarized from email responses)

The general consensus was that some people have become aware of a chemical smell from the water since the new water supply came in 2012 and others tell their GPs that their dermatitis/eczema deteriorated at the time the new water supply came in.

Some of these patients say that their skin improves whenever they spend weeks away from Aviemore, for example on holiday, and that it deteriorates again on their return.

Those GPs that have experience both before and after the water supply changed feel that there was a step change increase in frequency of dermatitis/eczema presentations to GPs at the time of the change in water supply.

They appreciate that these perceptions are anecdotal.

There has not been any significant change or deterioration in the last 12 months, nor has it been a topic for discussion between the GPs until asked.

Response from Kingussie GPs: (summarized from email responses)

Their feeling was that they don't see any more dermatitis than previously but there are some patients who notice their eczema clears when they are away from the area and therefore blame the water.

Response from Grantown GPs: (summarized from email responses)

They agreed with Kingussie that they hadn't seen a significant rise in skin complaints.

4.5 Aviemore Practice data from READ codes

Further to this the Aviemore practice were asked if they had any data within the practice itself or evidence to demonstrate that more patients with dermatitis/eczema were being seen in the practice since the new treatment works opened. They generated data from their own computer system and reported the following:

In the 4 years prior to the change in water supply, 496 consultations for dermatitis were Read-coded. In the 4 years after the change, 501 dermatitis consultations are Read-coded.

In other words there had been almost no change in the numbers seen with dermatitis since the new works in 2012.

The GPs concluded: (quote from email response)

"Finally, we accepted that your data (on referrals and prescriptions) *and the bit extra we add (*consultations for dermatitis*) does not support the premise that the water supply has made a difference; that is the hard objective data. However, my colleagues are clear that they wish me to re-iterate again that they feel that anecdotally there has been an impact."*

4.6 Work published elsewhere

A wide-ranging review of the evidence for a possible link between skin irritation and sensitisation and tap water quality/usage and any related health effects, perceived or otherwise was carried out by the Water Research Council (WRc) on behalf of the UK DWI, and published in 2011. The main findings of this are discussed below.

5 Discussion

5.1 Skin disease and tap water

Skin diseases affect around 23% to 33% of the UK population at any one time, and are the most common reason for people to consult their general practitioner with a new problem. In childhood, eczema is the most common non-infectious skin condition. Risk factors for the more common skin diseases, such as eczema include genetic predisposition and a range of environmental factors, including exposure to irritants and allergens.

Atopic dermatitis is a chronic, relapsing, inflammatory disease of the skin with high prevalence, affecting 15–30% of children and 2– 10% of adults. This large sub-population is likely to be most susceptible to the potential irritant effects of domestic tap water.

DWI in 2011 identified 158 chemicals and parameters of drinking water that have the potential to cause skin irritation, with effects ranging from mild to corrosive.

Water has been associated with mild skin irritation and dryness under conditions of soaking (Galzote et al., 2007; Hiscock, 2006; Tsai and Maibach, 1999). Irritation may result from an increased permeability of excessively hydrated skin and the concomitant elevation of protease activity under these conditions (Tsai and Maibach, 1999). In addition, the loss of natural moisturising factor (NMF) under conditions of soaking has been suggested to cause drying of the skin (Robinson et al., 2010).

It is also recognised in the published literature that some people have skin which is more sensitive than others and therefore it is possible that for a few of those with existing skin conditions such as dermatitis or eczema, tap water may exacerbate their symptoms. However, the published information available on skin & gastric irritation and tap water is not conclusive. There are a few studies available which have concentrated on pH and water hardness and changes in disinfection processes, mainly chloramination. Dermatologists have suggested that alkalinity may affect the skin which is naturally of lower pH while other studies suggested that hard water might also increase atopic dermatitis. However, further studies which include several in the UK have not confirmed these conclusions. There is no firm evidence of irritation problems at water pH 6.5-9.5, the UK parameter.

Before the new treatment works, the water used to be taken from Loch Einich and was more prone to microbiological failures than the new water source and system. The previous water supply was also more acidic. So the fact that Loch Einich was more acidic and the new water is more alkaline is one potential reason that a few people have noted a change in their skin condition, or that they notice that their skin changes when they leave the area on holiday. This does not mean the water is now unsafe or unhealthy although we recognise that this change may have had an impact on some people's skin.

5.2 Chloramination

Chloramination is a tried and tested method of water disinfection. It is widely used throughout the world and more than 25% of all supplies in Scotland use this treatment method. It has been used for several years in other parts of the country without evidence of any adverse health effects in the populations served. Within the Highland area water treatment works to Inverness, Fort William and Wick all use chloramination. None of these areas have experienced similar levels of complaints about taste, smell or concerns about effects on the skin.

Since the change of disinfection at Aviemore from chlorination to chloramination in early April to the time of writing (mid-June), there have been 16 complaints to SW although some are from repeat callers. Four of these complaints have mentioned skin effects but most have been about taste and smell. Concerns have also been raised about disinfection by products but the extremely low level of organic material

in the raw water means the levels of total Trihalomethanes (THMs) are very low – an average of 3.2 micrograms per litre and these have always been within acceptable limits. Many other Highland water supplies have THM levels in excess of this.

5.3 Potential impact of ongoing adverse publicity about water safety

This report would be incomplete without raising the potential adverse impact on the population's health and wellbeing of continually thinking, or being told, their tap water is unsafe, or is having a negative impact on their health, or on the local economy and tourism, etc. Confidence in drinking water is something that is taken as a given in the UK and the negative effect of wondering whether you are doing yourself harm each time you drink or bathe, even if there is no evidence of actual harm, cannot be helpful to long term mental or physical wellbeing.

6 Key findings

There is no sampling data to support the presence, or elevated levels, of any chemical or parameter which could be considered as an on-going cause of skin irritation in consumers.

At any one time, it is suggested that at least 20% (probably more) of the population may be suffering from a skin condition of some kind. Many different exposures and factors may play a role in these conditions. It is not possible to demonstrate an association, or cause and effect, between a skin condition and any one single factor in Aviemore.

The DWI review in 2011 indicated that perceptions of the general public following knowledge of a change in chemicals present in the water supply may impact on reporting of adverse health effects.

The quantity of skin products prescribed per 1000 patients in 2014, 2015 and 2016 was consistently much lower in Aviemore than the rest of Highland GP practices. (Approximately 20% lower for emollients, 30% lower for topical steroids and more than 30% lower for eczema preps).

The rate of referral by the Aviemore, Grantown and Kingussie practices to the Dermatology outpatient clinic at Raigmore was consistently lower than other practices in the locality and consistently lower than the average rate in all Highland GP practices during all 3 years examined. (33% less than expected in Aviemore)

There was no change in the numbers seen with dermatitis in the Aviemore GP practice in the 5 years before and after the new water treatment works was opened in 2012.

Despite this data, and the lack of evidence of any increased prevalence of skin conditions in the Spey valley, a few of the local general practitioners still perceive

that the new water treatment works has had an impact on some people's skin but these GPs recognise that this is anecdotal opinion in the absence of firm data.

Chloramination is a tried and tested method of water disinfection. It is widely used throughout the world and more than 25% of all supplies in Scotland use this treatment method. It has been used for years in other parts of the country and the Highlands without evidence of any adverse health effects or significant levels of complaints about skin problems among the populations served.

7 Conclusions

There have been no breaches of regulatory standards which have caused significant concern for human health in the past few years. The tap water being supplied to the Spey Valley is technically of higher quality than it was historically.

In any population there are a proportion of people who have skin problems such as dermatitis and eczema. Therefore within the 10,000 or so people served by the Aviemore treatment works, it is quite normal to have a significant number with skin conditions. For some people these can be extremely disabling and disruptive to daily life. For a small proportion of these their skin sensitivity may be affected by contact with tap water. Therefore a few of these people may be more sensitive to changes in the acidity/alkalinity (pH) of the water and some may also be more sensitive to one or more of the chemicals within the water. This appears to be the case for some individuals in the Strathspey area and also occurs in other areas of the country. This does not mean the tap water is the "cause" of their problems, or that the water is unsafe. Nor does it mean the water is the underlying cause of this condition, as so many other allergies and environmental factors may be playing a part. However the overwhelming majority of the population will be unaffected by tap water which does not breach regulatory standards.

Scottish Water have in early April changed the disinfection method in Aviemore from chlorination to chloramination. This means that considerably less free chlorine is required in the disinfection process – something in the order of 90% less. Consumers will therefore notice much less of a smell and taste of chlorine in their water. This change could also be expected to improve any irritation of existing dermatitis and eczema caused by the previous levels of free chlorine. However for a few with extremely sensitive skin they may unfortunately not notice any improvement.

From the evidence seen, reviewed and discussed there is no scientific data which suggests that the water supply to Aviemore and the surrounding area is in any way unsafe to drink, or to bathe in. Indeed the opposite is true – that the water is of a high quality and over the past 5 years has consistently met the strict standards laid down for the water industry in the UK and Scotland.

The public water supply from the Aviemore Water treatment works is of high quality and the drinking water from this works to Aviemore, and the rest of the Spey Valley area, is safe to drink.

For a very small proportion of the people who have skin conditions it may be that they do need to take some additional measures to minimise the impact of bathing water on their skin. Every effort should be made to help them treat and control their condition in a way which minimises discomfort and any negative impacts on their everyday life.

However, for the overwhelming majority of local people the detrimental effect of worrying about their water quality unnecessarily, far outweighs any possibility that the water may actually cause them any harm.

Further efforts should now be made by all parties to reassure the population of the Strathspey area and dispel any lingering doubts about water safety which may be having an adverse impact on overall wellbeing amongst local people.

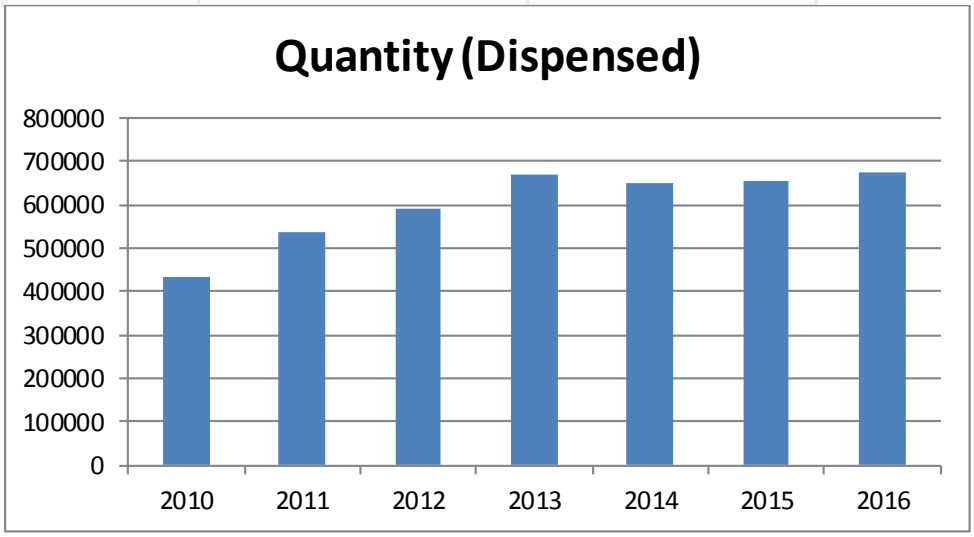
Appendix 1

AVIEMORE PRACTICE DATA

Prescribing Data

1. EMOLLIENT & BARRIER PREPARATIONS

Calendar Year	No of Items (Dispensed)	Quantity (Dispensed)
2010	1111	434048
2011	1301	537459
2012	1452	593512
2013	1660	671630
2014	1573	649465
2015	1551	657140
2016	1590	677465

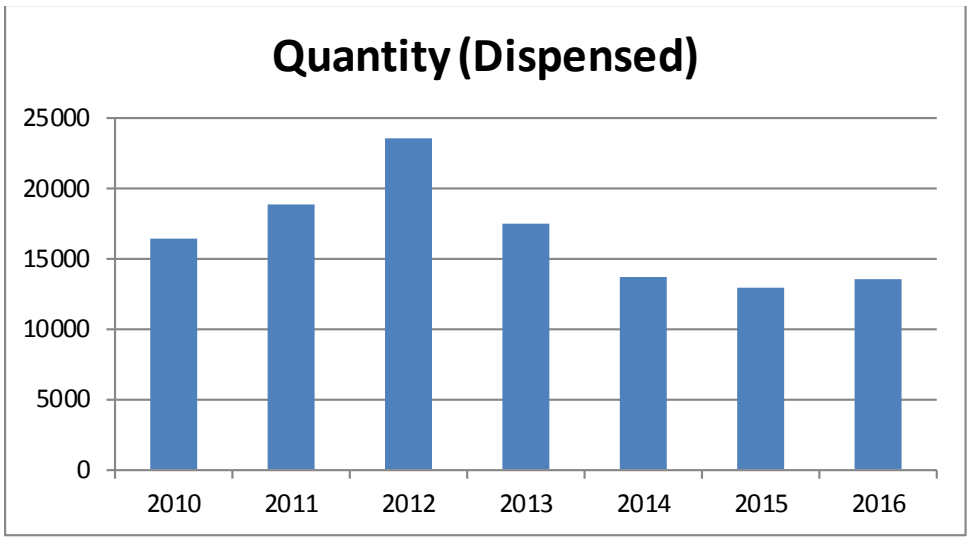


Quantity / 1000 Patients			
Calendar Year	55911 Aviemore	South & Mid Op Unit	NHS Highland
2014	130,752	167,292	164,830
2015	129,576	171,906	165,311
2016	132,119	177,605	168,006

2.PREPARATIONS FOR ECZEMA AND PSORIASIS

Calendar Year	No of Items (Dispensed)	Quantity (Dispensed)
2010	154	16360
2011	180	18920
2012	201	23615
2013	164	17450
2014	132	13770
2015	141	13010
2016	133	13525

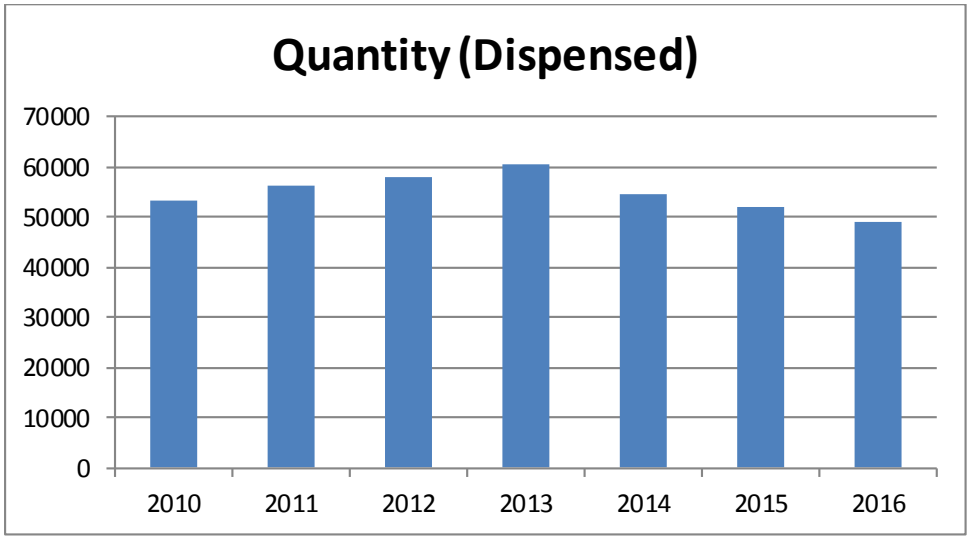
Note – Number of items = numbers of prescriptions. Quantity = number of tablets (eg antihistamines), grams of cream (eg emollients) - etc.



Quantity / 1000 Patients			
Calendar Year	55911 Aviemore	South & Mid Op Unit	NHS Highland
2014	2,771	3,631	4,122
2015	2,564	3,687	4,094
2016	2,638	3,598	4,024

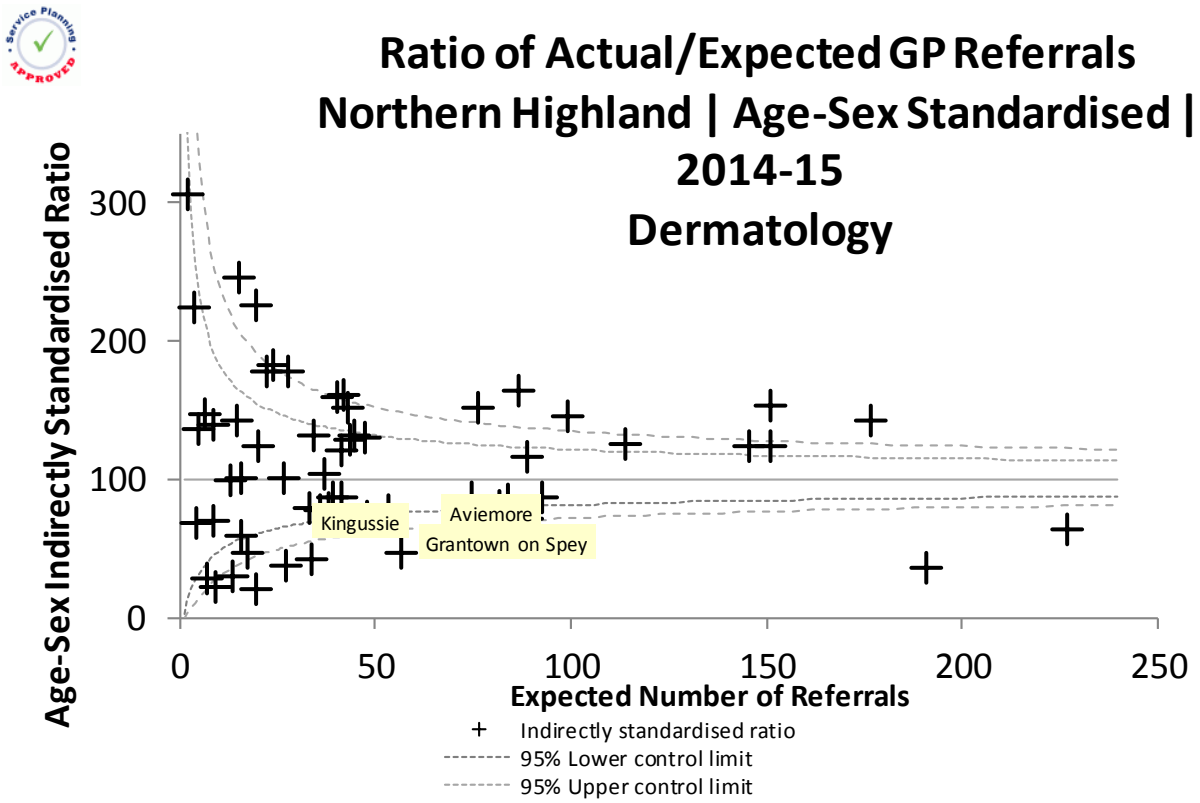
3. TOPICAL CORTICOSTEROIDS

Calendar Year	No of Items (Dispensed)	Quantity (Dispensed)
2010	1081	53266
2011	1243	56150
2012	1218	57917
2013	1214	60502
2014	1220	54683
2015	1115	52032
2016	1036	48991



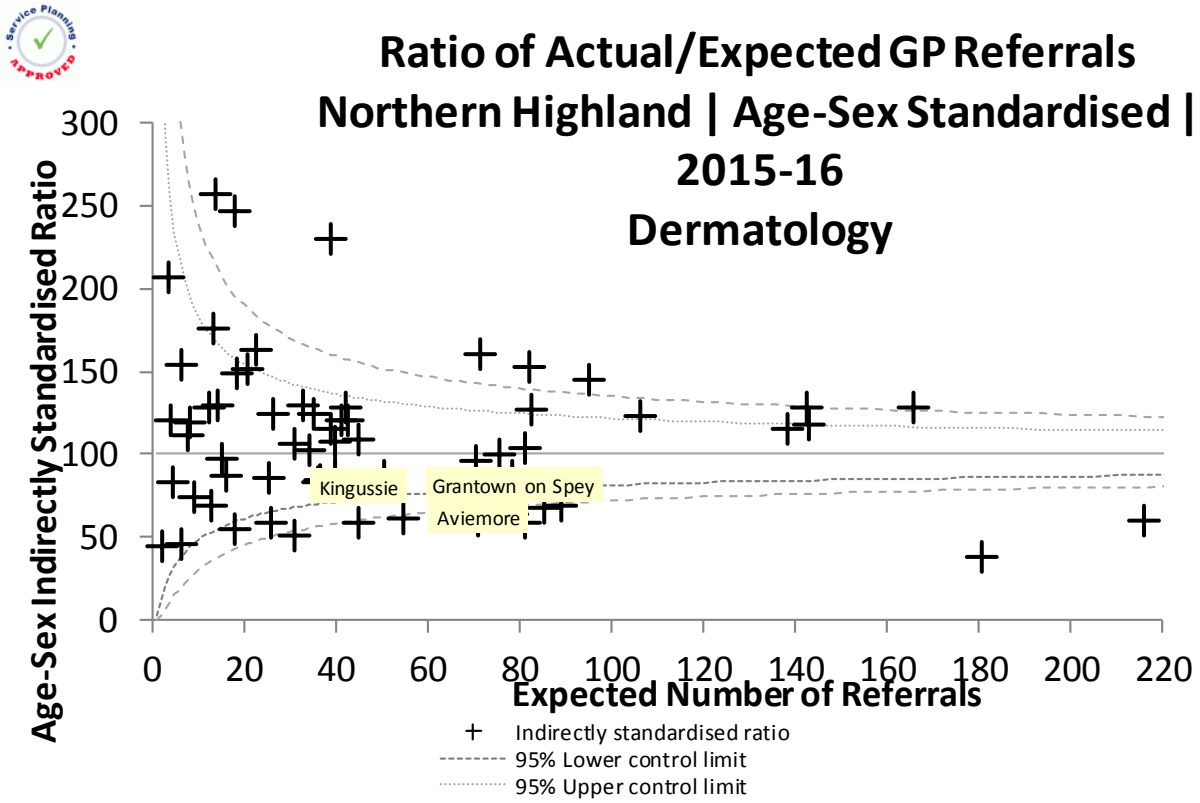
Quantity / 1000 Patients			
Calendar Year	55911 Aviemore	South & Mid Op Unit	NHS Highland
2014	11,008	14,472	15,038
2015	10,257	14,181	14,807
2016	9,556	14,495	14,514

Highland GP Practices Referrals to Dermatology OPD at Raigmore Hospital Inverness



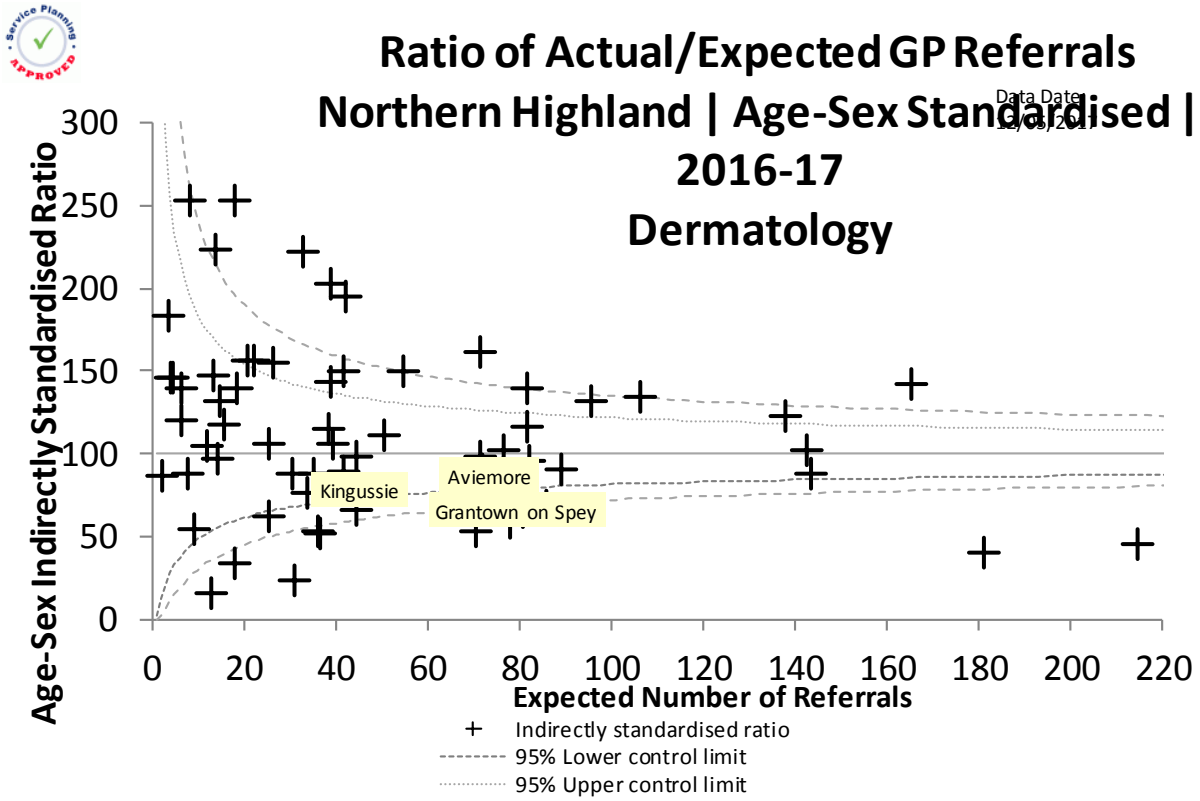
2014 - 15

Practice name	Referrals per 1000 prac pop	Indirectly standardised ratio	Expected events (referrals)	Actual Events (referrals)
Aviemore	9.6	65.1	73.8	48
Grantown on Spey	10.4	65.6	83.8	55
Kingussie	11.8	72.8	48.1	35
All Highland	15.3	100		



2015-16

Practice name	Referrals per 1,000 prac pop	Indirectly standardised ratio	Expected events (referrals)	Actual Events (referrals)
Aviemore	8.2	59.1	71.1	42
Grantown on Spey	9.6	63.3	79.0	50
Kingussie	8.8	57.7	45.1	26
All Highland	14.4	100		



2016-17

Practice name	Referrals per 1,000 prac pop	Indirectly standardised ratio	Expected events (referrals)	Actual Events (referrals)
Aviemore	10.6	75.3	72	54
Grantown on Spey	8.6	57.4	78	45
Kingussie	9.9	65.0	45	29
All Highland	14.4	100		