

Assessing the effect of Independent Prescribing (IP) for community optometrists on the Hospital Eye Services in Scotland – a ten-year review of IP Optometrist distribution and referral rates

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24 **Abstract**

25 **Introduction**

26 General Ophthalmic Services legislation and Independent Prescribing (IP) enables optometrists to
27 manage primary eye conditions since 2009. No studies quantify the true impact of IP. We wished to
28 determine distribution of IP optometrists across Scotland and identify impact on hospital referrals.

29 **Methods**

30 A FOI request (General Optical Council and NHS Education Scotland) identified all IP optometrists in
31 Scotland and their registered postcode. Data regarding community eye examinations and referrals to
32 HES was gathered via Information Services Division of NHS Scotland.

33 **Results**

34 As of March 2019, there were 278 IP-qualified optometrists in Scotland (23.4%). 218 IP optometrists
35 work in 293 practises across 11 of Scotland's 14 health boards. There was a strong correlation
36 ($r=+0.96$) between population density and number of IP optometrists. 56% of IP optometrists
37 practice in the two most deprived SIMD quintiles. In 10 years, community optometry visits
38 increased by 30.3%, with marked increase in anterior segment supplementary visits (290%), which
39 may reflect an IP effect. Optometry referrals to GPs reduced by 10.5% but referrals to HES increased
40 by 118% to 96,315. There was no correlation that quantity of IP optometrists reduced referral rate
41 to HES ($r=-0.05$, $p<0.001$).

42 **Conclusion**

43 This is the first analysis of IP optometrists assessing impact on referral rates in Scotland over 10
44 years. Despite good geographical distribution and increased supplementary attendances, optometric
45 referrals to HES have doubled and continue to rise. We propose a ratio of primary, supplementary,
46 non-referral and referral rates to discern the true impact of IP versus non-IP community optometric
47 behaviour.

48 **Word Count: 250**

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49 Introduction

50 Consistent with an expanding and ageing population, demand on the hospital eye services (HES)
51 continues to significantly increase. In light of this, the Scottish Government implemented the
52 extended General Ophthalmic Services (GOS) legislation in 2010, with the aim of reducing the
53 burden on GPs and HES. This shifted the contact point for primary eye care towards community
54 optometrists, who became the designated first port of call for primary and unplanned eye care
55 provision.^{1 2}

56 Eye examinations carried out by community optometrists are divided into primary and
57 supplementary examinations, attracting separate reimbursement charges. Primary examinations are
58 regular standard testing, performed at established intervals depending on patient age and known
59 ocular diagnoses, whereas supplementary examinations are performed outside and in addition to
60 these established intervals. This type of activity is separate from the 5 categories for routine primary
61 eye care examinations. Supplementary examinations can involve an initial ocular assessment or be a
62 review of disease progress or management. As providing ongoing management of primary eye
63 conditions was a change in established optometric behaviour, new supplementary codes were
64 introduced in conjunction with the new legislation in 2010.³ In September 2018, enhanced
65 supplementary codes were introduced to reflect the additional time required for clinical
66 assessments such as those requiring pupil dilation. [See Supplementary Table 1 online]

67 To provide appropriate oversight to this sea-change in traditional optometric activity, the General
68 Optical Council (GOC) introduced a specialist register for Independent Prescribing (IP) optometrists
69 who have completed accredited theoretical training, a hospital placement under the supervision of
70 an ophthalmologist and a final exam.^{4 5} As a result of achieving this qualification, IP optometrists
71 can now prescribe appropriate medications and manage patients with ophthalmic conditions in the
72 primary care setting within their sphere of confidence. This development was intended to
73 potentially reduce avoidable hospital-based ophthalmology appointments.⁶ The IP handbook
74 produced by the GOC expects that practitioners who hold the IP qualification will work in fields such
75 as primary care and glaucoma.⁶

76 With financial support from NHS Education Scotland (NES), an ever-increasing cohort of optometrists
77 in Scotland have become IP qualified and been added to the GOC IP register. Despite IP being
78 introduced 10 years ago, there is no published literature about its true impact. A 2008 survey found
79 that up to 96% of IP optometrists managed blepharitis and dry eye presentations comfortably,
80 whereas only 14% supplied topical antibiotics.⁷ Another survey in 2011 looking at the attitudes and
81 behaviours in a small cohort of 39 IP optometrists in 2011 described 51% reported that they were

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82 referring less patients to secondary care, while 41% reported no noticeable difference in their
83 referring behaviour.⁸

84 The purpose of this study was to identify and evaluate the distribution of IP optometrists across
85 Scotland by health board, population and deprivation score. We wished to objectively assess the
86 effect of IP on the HES over 10 years and identify any measurable metrics. To investigate this from
87 currently available information, changes in supplementary eye examinations and referrals to HES
88 from community optometrists were analysed.

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91 **Methods**

92 Following the introduction of the Scottish Eyecare Integration Project in 2012, electronic referrals
93 allow easily accessible national statistics for ophthalmic professionals and policy makers regarding
94 community eyecare in Scotland.⁹ Data pertaining to community optometry visits and outpatient
95 hospital attendances was obtained from the Information Services Division (ISD), an online statistics
96 warehouse which forms part of NHS Scotland.¹⁰

97 Through freedom of information (FOI) requests to the GOC and NES in March 2019, a list of all the IP
98 optometrists in Scotland with their respective registered addresses was obtained. This was divided
99 into Scotland's 14 health boards, then correlated with the population served by each board to
100 determine the distribution nationally and locally.

101 To define the distribution of IP optometrists based on deprivation, each address was entered into
102 the Scottish Index of Multiple Deprivation (SIMD 2016) map to convert the post code into a
103 deprivation score. This online tool divides Scotland into 6976 data zones which are ranked (1 = most
104 deprived to 6976 = least deprived) based on income, employment, education, health, access to
105 services, crime, and housing. The deprivation scores assigned to each address was divided into
106 quintiles (1 = most deprived quintile and 5 = least deprived quintile), similar to the 2017 Legge *et al*
107 study which had identified the distribution of all community optometrists in Scotland.¹¹

108 The percentage share of IP optometrists was calculated by dividing the number of IP optometrists in
109 one health board by the total number of IP optometrists in Scotland.⁷ Similarly, population share
110 was calculated by dividing the number of SIMD data zones in a health board by the total number of
111 data zones in Scotland.

112 To assess any "bias" in the distribution of IP optometrists, the skew was calculated for the
113 distribution of IP optometrists in each health board. A negative skew indicated a preponderance of
114 IP optometrists in the least deprived quintiles, whereas a positive skew indicated more IP
115 optometrists in more deprived quintiles. A skew between -0.5 and +0.5 would suggest a symmetrical
116 distribution of IP optometrists in both extremes of deprivation. A value above +1 or below -1 would
117 indicate a highly skewed distribution.

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120 **Results**

121 Distribution of IP Optometrists in Scotland

122 As of March 2019, there were 1189 community optometrists in Scotland, with 278 holding the IP
123 qualification (23.4%). According to the GOC register, a total of 218 IP optometrists registered 293
124 working addresses in Scotland. Sixty IP optometrists provided either a hospital address or did not
125 provide a community address and so were excluded from geographical analysis.

126 There was a small over-representation of IP optometrists in population-rich health boards (NHS
127 Grampian, NHS Lanarkshire, NHS Lothian and NHS GG&C) and an under-representation in the
128 smaller ones (NHS Borders, NHS Fife, NHS Forth Valley and NHS Tayside). Across Scotland, the
129 distribution of IP optometrists showed a significant correlation with population share (correlation
130 coefficient $r = +0.96$, $p < 0.01$). For this analysis, three of Scotland's fourteen health boards (NHS
131 Orkney, NHS Shetlands and NHS Western Isles) were excluded as they did not to have a registered IP
132 optometrist according to the data gathered. IP optometrists were slightly over-represented in the
133 two most deprived quintiles in Scotland, with NHS A&A, NHS GG&C and NHS Lanarkshire all
134 appearing to have a greater percentage share of IP optometrists in the most deprived quintile.
135 Looking at the skew, NHS A&A, NHS Borders, NHS Fife and NHS Highland had the highest positive
136 skew values, indicating a preponderance of IP optometrists in more deprived areas. By contrast, IP
137 optometrists in NHS Lothian and NHS Grampian were more frequently found in the least deprived
138 quintiles, as supported by their skew values. [See Figure 1]

139 Supplementary Eye Examinations

140 There has been a 18% increase (from 1,497,764 to 1,763,659) in the number of primary optometric
141 examinations in the past 10 years. Over the same period, supplementary exams have increased
142 markedly by 93.2% (from 300,196 to 579,945). Overall, there has been a 30.3% increase in the total
143 number of eye examinations performed by community optometrists in Scotland since 2010 (from
144 1,797,960 to 2,343,604). The greatest increases in supplementary eye examinations involved
145 anterior segment presentations (from 47,294 to 184,678; percentage change +290%) and visual /
146 neurological symptoms (from 114, 590 to 184,333; percentage change +86.5%). Together these
147 make up 68.7% of all supplementary visits in 2018/19 (total number of supplementary exams
148 579,945). [See Figure 2]

149 Referrals to the Hospital Eye Service

150 According to the ISD statistics, the average referral rate from community optometry to HES was
151 shown to have increased from 2.5% to 4.1% from 2010/11 to 2018/19 throughout Scotland. [See

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152 Supplementary Figure 1 online] The greatest increase was seen in NHS GG&C (from 8,597 to 23,666;
153 percentage change +113%) and the lowest increase was seen in NHS Fife (from 4,635 to 6,699;
154 percentage increase +17.8%). [See Figure 3] When the referral rate in each health board was plotted
155 against the percentage of optometrists who held the IP qualification in 2019, there was no
156 discernible correlation between quantity of IP optometrists influencing the referral rate to HES
157 (Correlation co-efficient $r = -0.05$, $p < 0.001$). [See Figure 4] In terms of absolute numbers, referrals
158 from optometrists to HES increased from 44,174 referrals in 2010/11 to 96,315 in 2018/19. This
159 increased demand was not matched by increased capacity in the HES, as available “New Patient”
160 appointments have only increased by 14.7% in this time period (from 122,538 to 140,5997). This
161 mismatch was further illustrated by the finding that there was a 14.8% annual rise in optometry
162 referrals to HES, but only a 1.8% annual rise in new patient attendances in HES. [See Figure 5]

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164 Discussion

165 Displacing primary eye care services from the hospital into community optometry has been vaunted
166 as an attractive solution to address the existing capacity and demand issues within ophthalmology.
167 Community optometry benefits from ease of access for patients, potential for accessible diagnostic
168 technology and a more detailed referral to HES when required. IP was intended to further develop
169 this pathway, through providing prescribing capabilities and local management to avoid unnecessary
170 HES attendance.⁵

171 Our paper identified a 23.4% uptake of IP within optometrists in Scotland. In addition to Northern
172 Ireland and London, Scotland already benefits from larger numbers of optometrists compared to the
173 rest of the UK. ¹² Similar to Legge *et al* who investigated the distribution share of all optometrists in
174 Scotland, our study also found a strongly positive correlation between the location of IP
175 optometrists and the population served in each health board. NHS GG&C has the largest population
176 density of all the health boards in Scotland, so it is unsurprising that it has the largest number of IP
177 optometrists. This may in part be due to the location of Glasgow Caledonian University, which
178 provides the optometric training for undergraduate and IP level qualifications. A similar pattern has
179 been observed across the UK with recruited students and qualified optometrists clustering around
180 the locations of undergraduate training providers.¹²

181 According to the SIMD scores, the most deprived areas in Scotland are centred around Glasgow City,
182 and the three health boards with the greatest deprivation indices are NHS GG&C, NHS A&A and NHS
183 Lanarkshire.¹³ All of these areas showed a comparative over-representation of IP optometrists
184 compared to elsewhere in Scotland. What the data does not show is the underlying distribution of
185 quintiles in each health board. If those have an underlying skew (i.e., more post codes in the lower
186 compared to higher quintiles in NHS GG&C) then this will also have an impact on the distribution of
187 IP optometrists.

188 It should be noted that our analysis only describes how IP optometrists are distributed across
189 Scottish health boards. It does not make any judgment or suggestion with regards to what may be an
190 appropriate number of IP optometrists per population. This type of analysis and associated cost
191 effectiveness of IP (set up costs vs ongoing saving) should be the subject of further work now we
192 have identified the number and distribution of IP optometrists.

193 The demand for community eye care is rising due to population demographics, chronic eye
194 conditions, ongoing patient education, occupational requirements and follow-up of patients
195 discharged from HES and shared care schemes. ³ GOS legislation focused on managing eye patients

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196 in the community and improving the quality of HES referrals, an anticipated streamlining and
197 reduction of referrals.^{14 15} It follows that one would expect an increase in supplementary
198 examinations to reflect the combination of community optometrists adopting the role of primary
199 care providers, and IP allowing optometrists to initiate treatment and generate additional
200 supplementary visits to follow up treatment responses. Our study identified a significant increase in
201 supplementary visits coded as anterior segment (290%) and new visual/neurological symptoms
202 (86.5%), which made up 68.7% of all such (presumed acute) visits. The yearly increase in
203 supplementary visits was significantly higher for anterior segment presentations (32.2% per year)
204 compared to visual / neurological symptoms (8.7% per year). One possible explanation for this is
205 that visual / neurological symptoms are likely to generate a direct referral onto HES, whereas a
206 proportion of anterior segment complaints could be managed by an IP optometrist. This will
207 generate further supplementary visits to monitor treatment response. Undoubtedly, there will be
208 some variability in the number of supplementary visits generated depending on optometrists'
209 experience. As this paper is purely descriptive of optometric behaviour, we cannot make any
210 comments as to the reasons or justification for the quantity of supplementary visits being
211 undertaken in this time period.

212 It is unclear from these figures if the increased optometry visits are limiting a similar rise in new
213 patient HES attendances (which would suggest that community optometry can negate the need for
214 HES referral). The comparatively small increase in new HES visits may more reflect the lack of
215 resources and capacity in the HES, as outpatient waiting times in ophthalmology continue to rise.¹⁶
216 During the same 10 year time period, outpatient attendances have increased by 38% in England,
217 compared to only 9.8% in Scotland.¹⁷ It is uncertain how much IP behaviour in Scotland contributes
218 to this, as HES referrals continue to rise in Scotland despite the advent of IP. For example, one may
219 hypothesise that having more IP optometrists should be associated with a lower referral rate to the
220 HES. This was not seen to be the case, as illustrated in Figure 4, demonstrating that the quantity of
221 IP-qualified optometrists had no significant impact on referrals to HES.

222 There are multiple factors to consider when assessing the reasons for, the quality and quantity of
223 referrals from optometry to HES, which are beyond the scope of this article. It has been reported
224 that concordance is high (76%) between optometry referrals and diagnoses by ophthalmologists in
225 the UK.^{18 19} A more recent study analysed the level of agreement between IP optometrists and
226 consultant ophthalmologists in the acute hospital ophthalmic services, and found concordant
227 prescribing and decision making whenever IP optometrists were experienced and appropriately
228 trained.²⁰ Where safe and appropriate, it is these acute cases that can be managed in the
229 community. But it is important to acknowledge that diagnostic uncertainty generates HES referrals

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230 too, which may indicate that further training is required to help minimise unnecessary referrals. Lack
231 of feedback for optometrist referrals has been reported as a barrier to education and referral
232 improvement.²¹ In 2005, Evans *et al* highlighted that despite a written request for feedback, only
233 13% of ophthalmologists provided this.²² An accessible electronic patient record system may address
234 this in the future. The Royal College of Ophthalmologists published the joint Ophthalmic Services
235 Guideline with the College of Optometrists stating that there needs to be robust communication
236 between community optometrists and the HES to deliver high quality care.²³

237 A major contributing factor to increasing HES referrals could simply be that the rising demand in the
238 older demographic of patients. 46% of all community eye examinations are for patients over the age
239 of 60.¹⁰ As age related eye conditions are more prevalent, it is not surprising that these patients will
240 require referral to HES and therefore this will have an impact on the referral rate.

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242 Limitations

243 As this is the first analysis of the impact of IP in Scotland, there are acknowledged limitations. There
244 were 60 IP optometrists in Scotland that have been excluded from this analysis, as it is not
245 mandatory to provide a working address for the GOC register. Similar to Legge *et al*, we have also
246 assumed that patients reside in the same data zone as the optometrists' address. It could be that
247 these optometric services are more likely to be based in central or high street locations. Our analysis
248 did not map the locations of community premises where IP optometrists are based like Low *et al* did
249 in NHS Tayside. ²⁴ Variability in deprivation in a defined area can mean that the distribution of IP
250 optometrists does not necessarily reflect the true SIMD demographic of all the patients utilising that
251 service.

252 The data is limited as to the non-specific nature of the referrals, which are not separated in terms of
253 clinical urgency (i.e. destined for acute referral clinics, urgent appointments or routine outpatient
254 clinics).

255 This study does not evaluate the prescribing habits or behaviour of IP optometrists, nor does it
256 include a cost-benefit analysis following the introduction of IP. It only analyses the quantity rather
257 than the quality of referrals. As demand continues to rise, further work is advised to assess these
258 factors, as well as the patient perspective, as this data will be required for future planning. From our
259 limited and specific analysis, we are unable to make any comment or recommendations as to the
260 indications or requirements for repeat supplementary examinations, and if or how they are justified.

261 Proposal for future work

262 In light of our findings, and the discussed complexity of identifying reasons for referral or treatment
263 behaviour, we question if it is possible to identify the effectiveness of IP within the restrictions of
264 currently obtainable metrics. We suggest that to truly identify the impact of changes in optometric
265 referrals by IP, it is necessary to identify what a normal scope of practice for the average reasonable
266 optometrist would be over a calendar year, and then compare and contrast that baseline data with
267 the enhanced scope of practice behaviour for an average reasonable IP optometrist. To this end, we
268 propose a ratio of primary, supplementary, non-referral and referral rates as a better method to
269 further determine the true impact of IP in community optometric behaviour. In our present study, a
270 high supplementary to primary examination ratio, and a low referral to non-referral ratio was
271 observed, but that was in the context of the entire community optometry service in Scotland. If
272 these metrics were available for different cohorts of optometrists this breakdown would enable
273 better categorisation of the normal optometric practice, and allow analysis of the impact of changing

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274 trends, such as education and training, referral refinement and the potential collateral work
275 generated from new guidelines, such as the SIGN guidelines for glaucoma referral and safe
276 discharge.²⁵ As IP becomes more widespread within community optometry, this proposed ratio
277 could be used to discern more accurately the true impact of IP in Scotland.

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279 **Conclusion**

280 This is the first study of IP optometrists assessing the impact on referral rates in Scotland over the
281 past 10 years. There are 1189 community optometrists in Scotland, with 278 holding the IP
282 qualification (23.4%). Despite good optometric geographical distribution and increased
283 supplementary attendances, referrals to HES continue to rise (currently 4.1%). The current metrics
284 available will not permit a thorough evaluation of the impact of IP. We propose a ratio of non-
285 referral, supplementary and referral rates to discern the true impact of IP on community optometric
286 behaviour. Further work is required to determine the impact of IP optometrists in terms of
287 prescribing patterns, patient perspectives and cost-benefit analysis of the corresponding demands
288 on the stretched hospital eye services.

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292 **What was known before:**

- 293 1. General Ophthalmic Services legislation and Independent Prescribing (IP) for optometrists
294 was introduced to refine and reduce referrals to Hospital Eye Services through optometrists
295 providing initial management.
- 296 2. No studies exist to quantify the true impact of IP over the past 10 years in Scotland – either
297 by assessing distribution across population or referral rates.

298 **What this study adds:**

- 299 1. This is the first analysis of IP optometrists assessing the impact on referral rates in Scotland
300 over the past 10 years. As of March 2019, there were 278 IP-qualified optometrists in
301 Scotland (23.4%).
- 302 2. Despite good geographical distribution and increased supplementary attendances (290% in
303 anterior segment supplementary visits), optometric referrals to HES have doubled and
304 continue to rise.
- 305 3. There was no correlation that quantity of IP optometrists reduced the referral rate to HES (r
306 $= -0.05$, $p < 0.001$).
- 307 4. We propose a ratio of primary, supplementary, non-referral and referral rates to evaluate
308 the true impact of IP versus non-IP community optometric behaviour.

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310 Legend

311 **Figure 1:** Graph and skew table detailing the percentage share of IP Optometrists in each quintile of
312 deprivation in each health board, excluding NHS Orkney, NHS Shetland and NHS Western Isles.
313 Within each health board, a positive skew of $>+0.5$ or less than <-0.5 suggests an asymmetrical
314 distribution of IP optometrists in terms of social deprivation.

315 **Figure 2:** Graph documenting the increases in the four commonest recorded reasons for
316 supplementary visits across Scotland. Anterior segment presentations (2.5) and sudden visual loss /
317 flashes & floaters / neurological symptoms (2.8) represent 68.7% of all supplementary examinations
318 in 2018/19. The percentage change over the last 8 years is recorded on the left. Other recorded
319 reasons for supplementary visits have been excluded as they each make up less than 20,000 visits
320 per year.

321 **Figure 3:** Graph illustrating the changing referral rate from community optometry to HES in each
322 health board. The total referral rate for the whole of Scotland has increased from 2.5% to 4.1% over
323 10 years. The greatest increase was seen in NHS GG&C and the lowest increase was seen in NHS Fife.

324 **Figure 4:** Graph showing the correlation between referral rate to HES and the percentage of
325 optometrists who hold the IP qualification in each health board in 2018/19. There was no correlation
326 between the percentage of optometrists who hold the IP qualification and a reduction in the referral
327 rate in each health board (Correlation co-efficient $r = -0.05$, $p < 0.001$).

328 **Figure 5:** Graph showing absolute numbers of community optometry referrals to HES and the
329 number of new patient attendances in HES. The annual increase in referrals (14.8%) was not
330 mirrored by a similar increase in new patient HES attendances (1.8%), demonstrating a lack of
331 capacity / resources in HES.

332 **Supplementary Table 1 online:** Table documenting reasons for Primary and Supplementary Eye
333 Examinations performed by Community Optometrists in Scotland – in use from 2010 to September
334 2018.

335 **Supplementary Figure 1 online:** Graph showing the Number of Primary and Supplementary Eye
336 Examinations performed by Community Optometrists in Scotland. There has been a 18.0% increase
337 in Primary visits and a 93.2% increase in Supplementary visits since the new GOS legislation was
338 introduced in 2010. In total, there has been a 30.3% increase in visits to community optometry. Of
339 note, the IP qualification was introduced in 2008 and the register launched in 2009.

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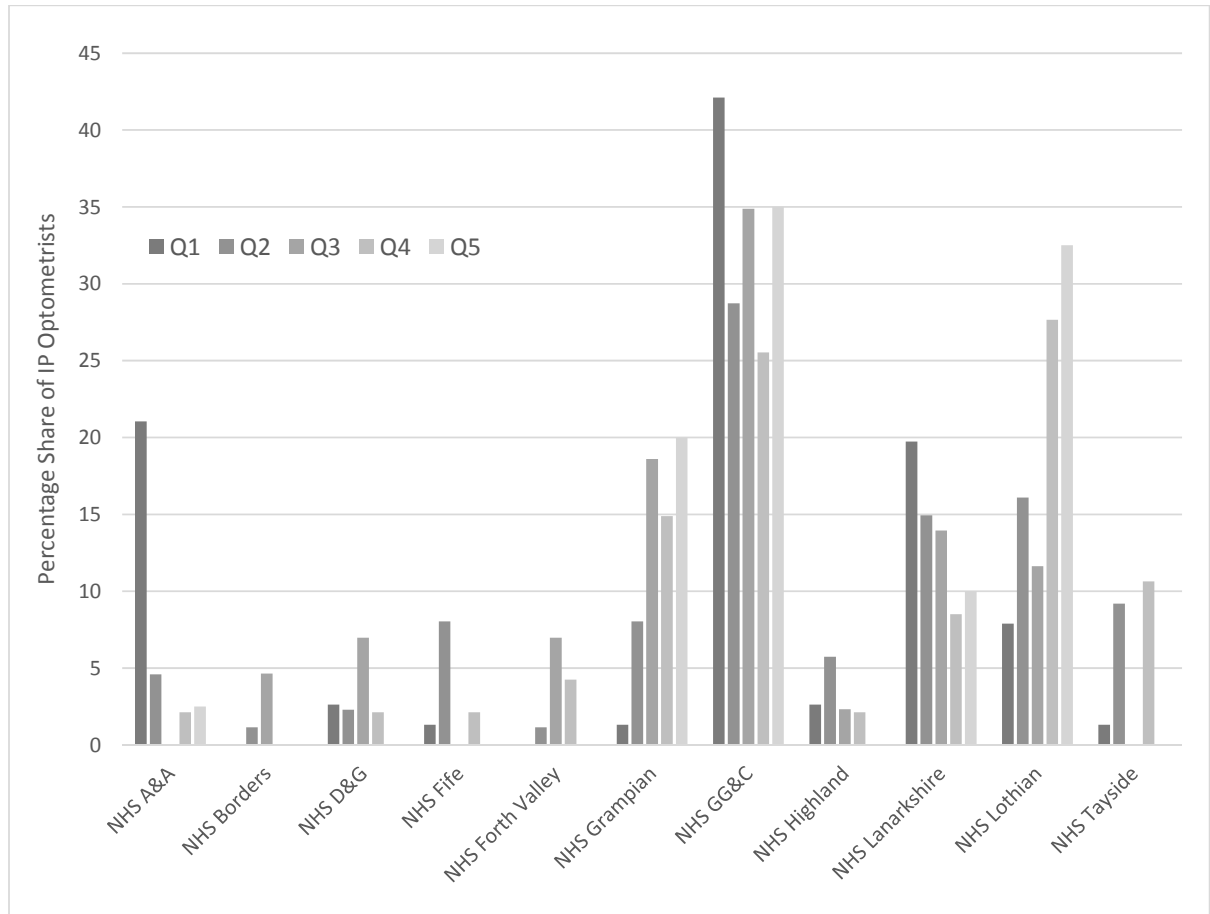
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Figure 1: Graph and skew table detailing the percentage share of IP Optometrists in each quintile of deprivation in each health board, excluding NHS Orkney, NHS Shetland and NHS Western Isles. Within each health board, a positive skew of $>+0.5$ or less than <-0.5 suggests an asymmetrical distribution of IP optometrists in terms of social deprivation.



Skew	+1.97	+1.26	-0.40	+2.07	+0.54	-2.08	+0.90	+1.52	+0.59	-0.60	+0.93
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Figure 2: Graph documenting the increases in the four commonest recorded reasons for supplementary visits across Scotland. Anterior segment presentations (2.5) and sudden visual loss / flashes & floaters / neurological symptoms (2.8) represent 68.7% of all supplementary examinations in 2018/19. The percentage change over the last 8 years is recorded on the left. Other recorded reasons for supplementary visits have been excluded as they each make up less than 20,000 visits per year.

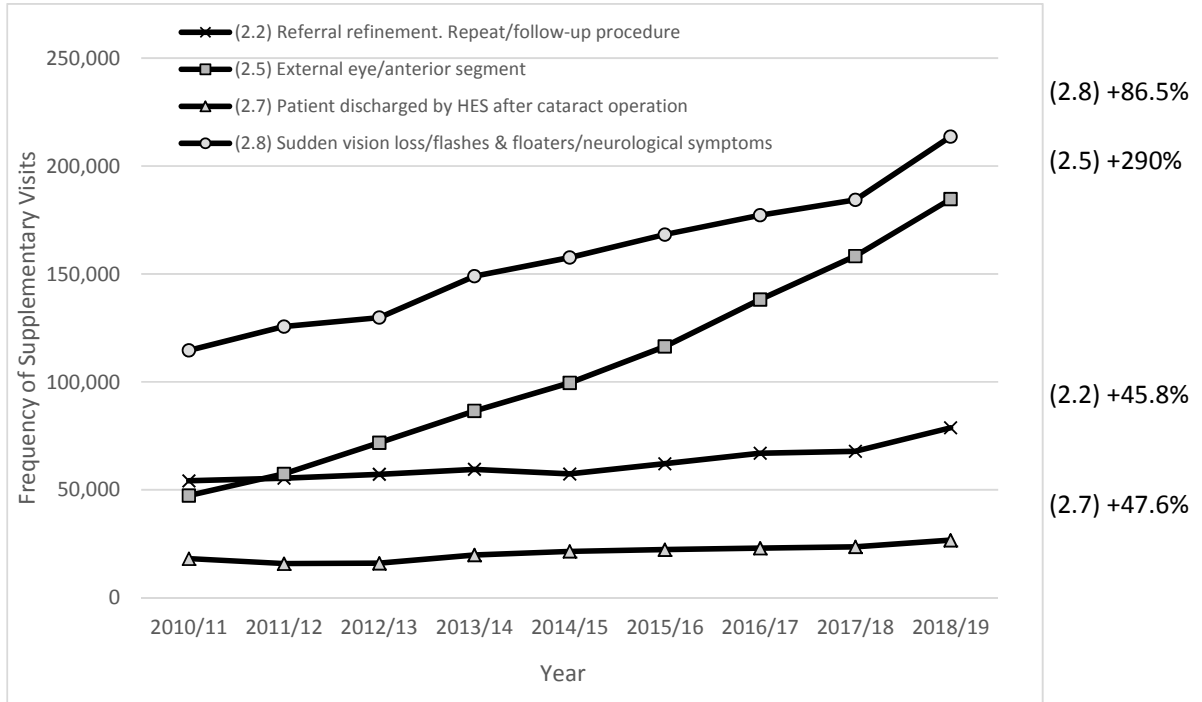


Figure 3: Graph illustrating the changing referral rate from community optometry to HES in each health board. The total referral rate for the whole of Scotland has increased from 2.5% to 4.1% over 10 years. The greatest increase was seen in NHS GG&C and the lowest increase was seen in NHS Fife.

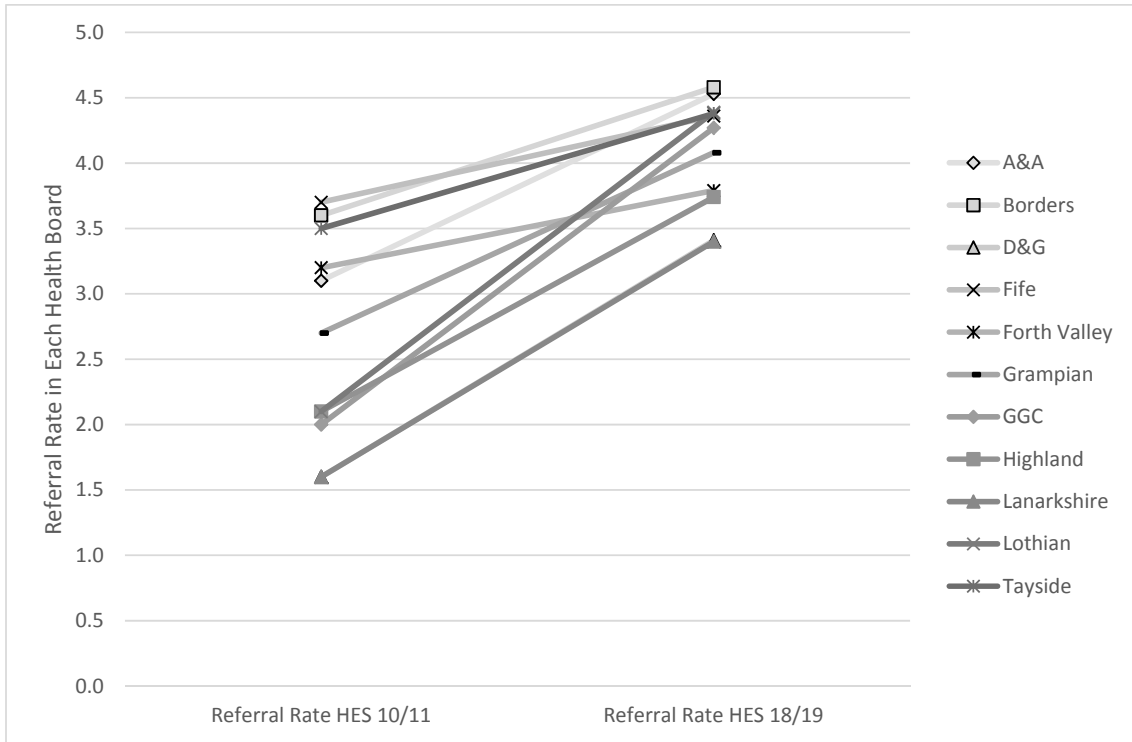


Figure 4: Graph showing the correlation between referral rate to HES and the percentage of optometrists who hold the IP qualification in each health board in 2018/19. There appears to be no correlation between the percentage of optometrists who hold the IP qualification and the referral rate in each health board (Correlation co-efficient $r = -0.05$, $p < 0.001$).

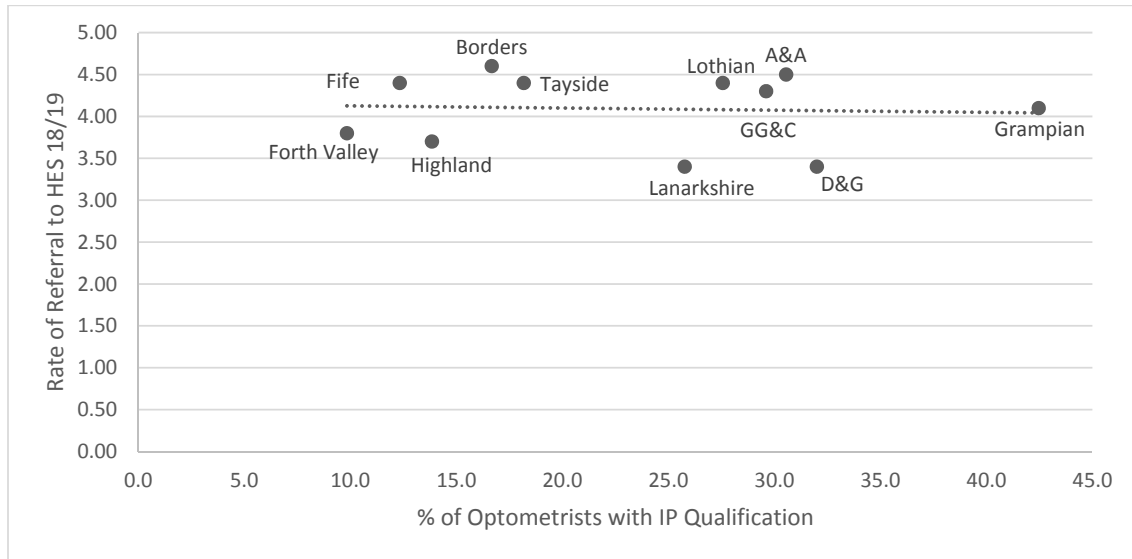


Figure 5: Graph showing absolute numbers of community optometry referrals to HES and the number of new patient attendances in HES. The annual increase in referrals (14.8%) is not mirrored by a similar increase in new patient HES attendances (1.8%), demonstrating a lack of capacity / resources in HES.

