**Abstract**

**Purpose:** To examine how the introduction of free eye examinations in Scotland affected people’s use of eye care services. Particularly, to assess if more people are now having their eyes examined regularly, and whether there are differences in the way people responded to the policy across socio-economic groups.

# Methods: Using the British Household Panel Survey, eye test uptake and frequency in Scotland is compared to the rest of the UK pre and post policy. Propensity to have eye tests and responsiveness to the policy is compared across socio-economic groups. In addition, using data available from a chain of private ophthalmic opticians, clinical characteristics of eye examination patients are compared pre- and post-policy.

**Results:** There is evidence that suggests that people responded positively to the policy. In particular, a higher percentage of people in Scotland have their eyes tested after the free eye care policy was introduced. Interestingly, the response to the policy varies between the different socio-economic groups. For the highest earners and most educated groups, the proportion of people having an eye test increased more than for those groups with lower income or lower education.

**Conclusions:** Although the policy succeeded in getting more people to have their eyes tested, the socio-economic differences observed suggest that the policy has not reached the more vulnerable segments in society to the same extent, in particular, those with low education and low income. As a result, eye care services utilisation inequalities have widened in Scotland after the free eye care policy was introduced.

**Keywords:** Eye tests; Health care markets; Health economics; Optometry

**Utilisation of eye-care services: The effect of Scotland’s free eye examination policy**

**Introduction**

Blindness and low vision are public health problems exacerbated by current demographic trends, which combine population growth and increased longevity. It is predicted that, *ceteris paribus*, the global number of blind individuals will increase from 44 million in the year 2000 to 76 million in 2020, with most of them having lost their sight due to diseases that are treatable or preventable (Frick and Foster, 2003). Global efforts towards improving access highlight the importance of eye care services. In 1999, the World Health Organisation (WHO) and the International Agency for the Prevention of Blindness (IAPB) launched VISION 2020 – Right to Sight, a global initiative to eliminate avoidable blindness by 2020 and to “ensure the best possible vision for all people and thereby improve quality of life”. If successful, VISION 2020 initiatives are expected to reduce blind person-years by 429 million and save at least $102 billion in the cost of unaccomodated blindness between 2003 to 2020 (Frick and Foster, 2003).

VISION 2020 recommended that all countries develop a national plan of action in collaboration with non-governmental organisations and the private sector by 2005, and that this commenced by 2007 (VISION 2020, 2007). These plans should reflect specific national realities in terms of priority diseases, human resources and infrastructures needs. In more developed countries the world’s leading causes of avoidable visual impairment[[1]](#footnote-2) have been controlled, and diabetic retinopathy, glaucoma and low vision are among the targeted conditions (Pizzarello *et al*., 2004). However, avoidable vision loss still accounts for a sizeable portion of health care costs: vision disorders rank seventh in terms of health costs in Australia (Taylor *et al*, 2006) and the financial burden of major visual disorders among American adults was $35.4 billion in 2004 (Rein *et al*, 2006). There is still a need for improved access and greater utilisation of existing eye care services (Keeffe *et al*, 2002) and well-designed public health programs that might reduce the economic burden of visual disorders in the future (Rein *et al*, 2006).

Within the framework of VISION 2020, in 2004, the Scottish government reviewed community eye care services in Scotland, with the aim of developing an integrated eye care service to deliver a good quality, efficient service in a convenient setting without undue wait (Scottish Executive, 2006). At the time, the provision of eye care services was broadly the same across all four countries in the United Kingdom (England, Northern Ireland, Scotland and Wales), although health care provision is a matter devolved to the Scottish Government, the National Assembly for Wales and the Northern Ireland Assembly. The first point of contact for patients who had an eye condition was their General Practitioner (GP). Those with complex eye conditions were then referred to hospital eye departments where diagnosis and management of ophthalmic conditions was undertaken by ophthalmologists. The review of eye care services in Scotland acknowledged that some patients attending hospital eye departments could be dealt with in the community. The private optometrists’ role was limited to offering sight tests and corrective spectacles. Most people who required or wanted a sight test would pay for this out of pocket at a private optometrist. Some individuals are/were exempt from paying for their sight test. Exemptions are/were based on age, income, employment, and/or risk factors[[2]](#footnote-3).

A redesign of eye care services in Scotland was introduced on 1st April 2006. The main change was the introduction of free eye examinations for all individuals living in Scotland. As a direct result of the policy, individuals living in Scotland can now walk into any high street optometry practice and get a ‘free’ eye examination funded under the NHS[[3]](#footnote-4). The eye examination is more extensive than a sight test and allows for the early detection of sight problems. Furthermore, GPs can refer patients with common eye conditions to optometrists and only refer the most complex conditions to secondary care ophthalmologists. This makes better use of optometrists to deliver care in settings more appropriate and convenient to the patient (Scottish Executive, 2005). The changes were also expected to bring a range of benefits for patients and the removal of the eye test charge was expected to encourage more people to have their eyes tested. In contrast, in the rest of the UK individuals still have to pay for a sight test out-of-pocket at private ophthalmic optician practices.

This paper investigates the impact of the introduction of free eye care in Scotland. To the best of our knowledge, no other country has implemented a policy the same or similar to the Scottish policy. The effectiveness of the policy depends on its impact across different groups within society. Research evidence suggests that differences in health care utilisation normally exist across gender (Bertakis *et al*. 2000; Gerritsen and Deville, 2009; Mustard *et al*. 1998), age (Keene and Li, 2005; Noro *et al*. 1999) and across levels of educational attainment (Bertakis *et al*. 2000, Fletcher and Frisvold 2009; Gerritsen and Deville 2009; Grossman and Kaestner, 1997). It is preferable to increase eye care utilisation in socio-economic groups with low incidences of eye tests. We focus on two research questions. First, does the policy increase the number of eye tests? Second, does the policy have a different effect across socioeconomic groups? We investigate whether more people have their eyes tested after April 2006, and whether these were people not previously having eye examinations. We investigate differences in eye tests across characteristics such as gender, education, income and health.

**2. Materials and Methods**

The study uses two datasets to investigate the effect of free eye tests on peoples’ utilisation of eye care services in Scotland: the British Household Panel Survey (BHPS) and a private ophthalmic optician company’s business records.

The BHPS is a nationally representative annual survey of adults, covering over 5000 households in the UK. The BHPS collects a range of respondent characteristics and data about health care utilisation. All members of respondent households are usually interviewed and individuals are followed when they move between different households and as they form new households. The BHPS sample increases by births and new household members, and reduces in size by deaths and refusals. We focus on the period from 1999-2008 (the latest year for which data are available). In 1999 the Scottish BHPS sample was boosted from approximately 500 to 2,000 households (Laurie and Wright, 2000). The potential impact of attrition in the BHPS data has been explored in a number of studies. According to Contoyannis *et al*. (2004) although there is evidence of health-related attrition in BHPS, with those in very poor initial health more likely to drop out, this does not distort the estimates of the effect of socioeconomic status on health outcomes. Similar findings have been reported concerning the negligible influence of attrition bias in models of income dynamics and various labour market outcomes (see e.g. Lillard and Panis, 1998; Zabel, 1998; Ziliak and Kniesner, 1998). The introduction of the free eye examination only affects individuals who previously paid for an eye test. Thus, we exclude two groups from our analysis: 1. For the years before the policy, individuals who were exempt from paying for an eye test; 2. For the years after the policy, individuals who would be exempt from paying under the old rules.

The private ophthalmic optician company’s business records (hereafter SHOP data) are for the period 2004-2008. The company is one of the largest operating in the North East of Scotland and has a chain of 22 branches. We use data from the 14 branches that were open for at least one year before the policy was introduced. The data include information about the number of appointments booked, testing days, and sight tests. The data also includes the outcome of the eye examinations: whether individuals required a prescription for corrective spectacles. From the data set, we can identify whether patients required a prescription, and if so whether this was a new prescription or a stable prescription compared to their previous eye examination.

*Impact of the policy on the number of eye tests*

The BHPS survey asks respondents whether they had any eye tests in the previous 12 months prior to the interview. We calculate, for each year, the proportion of the sample that had an eye test in the previous 12 months, we refer to this as utilisation. We hypothesise that utilisation will increase after the policy’s introduction in 2006. We compare this with the utilisation for the rest of the UK. We hypothesise that any increase in utilisation would be greater in Scotland than the rest of the UK. We compare the differences in utilisation before and after the policy and across the UK countries using a Student’s t-test. We test the null hypothesis (H0) that there are no statistically significant differences in eye tests between groups, against the maintained hypothesis (H1) that there are. We reject the null hypothesis at a 5% or 1% level of significance and report both the test statistics and the corresponding probabilities.

However, for a successful implementation of the eye care policy we would ideally wish to observe an increase in the number of people having their eyes tested who were not regularly getting tested prior to the policy change. We hypothesise that people who were not previously having their eyes tested may start to have their eyes tested when the out of pocket payment is removed. We calculate the proportion of people who never had their eyes tested since 1999, and compare this for the years 2004 to 2008 across UK countries.

If more people are having their eyes tested more regularly, one would expect private ophthalmic practices to be busier. We investigate this using three variables from the SHOP data that are measured on a weekly basis. The number of sight tests provided, the number of appointments that are booked for the period of the coming thirty days, and the number of testing days[[4]](#footnote-5). In each case, we would expect to see an increase after the policy was introduced in April 2006.

*Impact of the policy on the outcome and type of eye test*

While the out-of-pocket cost is a barrier to uptake of an eye test, many people may also have felt that they had no reason to have an eye test, either because they had no problems with their vision or because their eye sight had not changed. Using the SHOP data we observe the outcome of patients’ eye tests. In particular, we observe the number of stable prescriptions (the patients eye sight is unchanged) and the number of no prescriptions (patients’ have no sight problems). Following the introduction of the free eye examination, we expect that the number of stable prescriptions and no prescriptions would increase, since people who normally would not have their eyes tested regularly, would start having eye examinations.

*Socio-economic differences in the impact of free eye tests*

The effectiveness of the eye care policy in Scotland will depend on its impact on different socio-economic groups within the population. It is preferable to observe an increase in utilisation amongst those socio-economic groups that have a relatively low incidence of eye tests. Across subgroups stratified by socioeconomic characteristics, we compare utilisation before the policy (2005) with utilisation after the policy (2008) and compare the magnitude of the change in utilisation between 2005 and 2008 using student t-tests.

We compare subgroups based on 5 socioeconomic characteristics: gender, education, health, income, and age. Our a-priori hypotheses are as follows: based on the frequently reported result that a higher proportion of women utilise health services compared to men, we compare men and women, and we expect higher eye care utilisation among women than men but have no expectation about the change in utilisation as a result of the policy (Bertakis *et al*. 2000; Gerritsen and Deville, 2009). The educated are also found to be better informed about health and health care (Fletcher and Frisvold, 2009). We compare three education groups: those with no educational qualification, with school level qualification and with further or higher educational qualifications. We expect the change in utilisation to be larger in more educated subgroups. We compare individuals stratified by their self-assessed health. We have no *a priori* expectations about the effect of self-assessed health on utilisation. Prior to policy, an individual’s income may have affected the affordability of regular eye tests. We stratify individuals using per capita annual household income: those at the bottom 25%, those at the top 25% and those in the middle of the income distribution. We expect utilisation to be increasing with income, and we expect the change in utilisation to be larger for the bottom 25% of the income distribution. To examine whether eye care attendance differs with age, we define four age groups: 19-29 years; 30-39 years; 40-49 years; and 50-59 years. We have no *a priori* expectation about the effect of age on utilisation.

**Results**

*Impact on the number of eye tests*

Table 1 Panel A reports eye care utilisation in the previous 12 months in Scotland, England, Northern Ireland and Wales for the period from 1999-2008. In the Scottish sample, 32.1% of respondents had an eye test in 2005, rising to 37.7% in 2006. This represents an increase of 5.6 percentage points (pp) in utilisation in the year immediately after the policy was introduced, which is a statistically significant increase in utilisation after 2006 compared to before 2006 (t = 2.096, P = 0.03). For England, Wales, and Northern Ireland, the changes in utilisation in the previous 12 months between 2005 and 2006 are 1.1pp, 1.4pp and 0.4pp respectively. In 2005 Scotland had the lowest utilisation compared to England, Wales and Northern Ireland (t = 68.86, P = 0.000; t = 140.00, P = 0.000; t = 62.16, P = 0.00 respectively); this reversed by 2006 with Scotland having the highest. However, by 2008 Scotland once again had the lowest utilisation, but the relative difference between Scotland and the other regions had diminished. Table 1 Panel B reports the proportion of the sample having an eye test for the first time since 1999. We find no evidence of an increase in this proportion after the introduction of the policy (t = 0.967, P = 0.33).

Figure 1 reports the number of sight tests (panel A), number of appointments booked (panel B) and number of testing days (panel C) per week for the period 1st April 2000 to 31st March 2008 across all branches. All three series show evidence of seasonality. Furthermore, there appears to be an increase in activity after the policy was introduced in 2006. This is most striking for the number of appointments booked (Panel B). In particular, the number of sight tests increased by 6.8% over the year 2006-07 and 10.4% between 2006 and 2008. The number of appointments booked saw a 27.7% increase between 1st April 2006 and 1st April 2007 and 21.3% between 1st April 2006 and 1st April 2008, while the number of testing days rose by 7.1% and 7.8% respectively for the same two time periods (indicating a rise in the number of days that optometrists are carrying out sight tests), reflecting the increased demand for community optometry services.

*Outcome and type of eye test*

Figure 2 presents the number of eye tests where patients either required no prescription (Panel A) or had a stable prescription (Panel B). The number of no prescriptions increased by 11.2% over the year 2006-07, and by 35.6% between 2006 and 2008. Similarly, there were rises of 11.7% and 30.1% respectively over the same time periods for the number of stable prescriptions.

*Socio-economic differences in the impact of free eye tests*

As expected, a larger proportion of women have their eyes tested compared to men (t = 9.96, P = 0.00); this is true both before and after the policy change (Figure 3 Panel A). Moreover, the utilisation difference widened after the policy change (t = 79.36, P = 0.00). This is because women experienced the bigger increase in utilisation after the policy change. We find a significant increase in female utilisation after the policy introduction (t = 2.701, P = 0.007). In contrast, we find no evidence of a change in male utilisation since the policy introduction (t = 0.077, P = 0.938).

We find that eye care utilisation increases with education (Figure 3 Panel B). Those with no educational qualifications have the lowest utilisation; compared to those with school level qualifications (t = 3.07, P = 0.002) and university qualifications (t = 8.88, P = 0.000). Similarly, utilisation is lower among individuals with school level qualifications compared to those with university qualifications (t = 8.422, P = 0.000); this is true before and after the policy change. Moreover, the utilisation differences between individuals (i) with university qualifications and school qualification, (ii) university qualifications and no qualifications, and (iii) school qualifications and no qualifications all widened after the policy change (t = 12.94, P = 0.000; t = 56.71, P = 0.000; T = 69.21, P = 0.000 respectively).

Utilisation is higher in the poor health group compared to those in the very good health, good health, and fair health groups (t = 3.43, P = 0.000; t = 3.84, P = 0.000; t = 2.82, P = 0.004 respectively - Figure 3 Panel C). This is true before the policy change, but after the introduction of the policy we find no evidence of a difference in utilisation across the very good, good, and poor health groups, but utilisation is higher in the poor health group compared to the fair health group (t = 1.78, P = 0.074). We observe this because of a significant increase in utilisation in the two top health groups, compared to no evidence of a change for those in the fair and poor health group. For the category reporting ‘very poor health’ the raw figures for the period in the BHPS are variable and should therefore be treated with caution, consequently we do not compare this group to the other health status groups.

We find eye care utilisation increases with income level; utilisation is lower in the bottom 25% of the distribution compared to the middle (t = 2.82, P = 0.004), and the top 25% of the distribution (t = 11.05, P = 0.000) (Figure 3 Panel D). Furthermore, utilisation is lower for those in the middle compared to those in the top 25% of the distribution (t = 10.69, P = 0.000); this is true before and after the policy change. After the policy, the utilisation differences between (i) the bottom and the middle of the distribution, (ii) the middle and the top of the distribution, and (iii) the bottom and the top of the distribution all increased (t = 68.15, P = 0.000; t = 21.57, P = 0.000; t = 66.94, P = 0.000 respectively).

Eye care utilisation is higher for individuals aged 50-59 years compared to those aged 40-49 years (t = 4.03, P = 0.000), 30-39 years (t = 12.97, P = 0.000), and 19-29 years (t = 9.84, P = 0.000) (Figure 3 Panel E). Similarly, utilisation is higher for individuals aged 40-49 years compared to those aged 30-39 years (t = 9.57, P = 0.000), and 19-29 years (t = 6.35, P = 0.000). In contrast, utilisation is higher for individuals aged 19-29 years compared to those aged 30-39 years (t = 2.81, P = 0.005). This is true before and after the policy except that after the policy we find no evidence of a significant difference in utilisation between those aged 19-29 years and 30-39 years. The utilisation increase is largest in the 30-39 years age group.

**Discussion and conclusion**

One of primary aims of the Scottish government’s changes to eye care policy was to encouragemore of the Scottish population to have their eyes tested. All evidence, using different indicators, suggests that people in Scotland responded positively to the policy. Our analysis explicitly focuses on the impact of the removal of fees for eye examinations among people who previously had to pay for an eye test. As this is the first study of its kind to evaluate the effect of policy change on utilisation of eye care services in Scotland, there is no comparable published paper to put our results in perspective. However, our results mirror other research evidence, mostly in developing countries, showing that the removal or reduction of price, for example through the abolition of user fees, has a positive effect on health care utilisation more generally (Ridde and Morestin 2011; Wilkinson *et al*. 2001).

We compare eye care utilisation in the previous 12 months in Scotland, England, Wales, and Northern Ireland from 1999 to 2008. Prior to the policy Scotland had the lowest utilisation, in 2008 the proportion of the Scottish population having an eye test is still lower than in the other countries but the difference has reduced. From the SHOP data we observe the outcome of patients’ eye tests. We find an increase in both the number of patients who require no prescription and the number of patients who have a stable prescription from their last eye test. This indicates that the policy has encouraged those individuals who previously thought there was no reason to have an eye test to attend the ophthalmologist more regularly.

We explore differences in utilisation across socio-economic groups. Although the policy encouraged more people to have eye tests, or have more regular eye tests, there are notable differences across socio-economic groups. We find that although utilisation increases in socio-economic groups normally associated with lower health care utilisation this increase is smaller than for other groups. Importantly, our results suggests people with poorer health, low education and those from poorer households, compared to highly educated people and people from wealthier and healthier households, respectively, not only have overall lower levels of eye examinations, but they had a weaker response to the policy as well. As a result inequality in eye care utilisation has actually risen.

There are some limitations of our analysis. The BHPS data are based on reported rather than actual utilisation of eye tests. There is a possibility that those who regularly had their eyes tested were more likely to report having eye tests, as we have not separately analysed repeat respondents to check for any differences. In 2005 utilisation in Scotland declines, this may be in anticipation of the policy’s introduction in April 2006. Anecdotal evidence, however, suggests that outside the academic/policy making fields the general population were unaware of the forthcoming policy. In July 2007, research by a chain of ophthalmic opticians found that 66% of the population were unaware that the eye examinations were free for everyone (Frost’s Scottish Anatomy, 2012).

We find that removing user charges increases the utilisation of eye care services. However, this has widened inequalities in utilisation. This may reflect differences in how well informed different groups are about health care and health care provision in general. This indicates that policy makers should focus on encouraging utilisation among the more vulnerable segments of society. This is in line with the findings that more than half of the population were unaware of the policy. The policy was announced on the same day as the much acclaimed smoking ban, which took priority, in terms of public attention. This might explain why the policy appears to affect existing users of the eye care services. A plausible explanation for why the people at the bottom of the income distribution did not respond so strongly to the policy, despite lifting the cost of the eye examination, could be the perceived pressure they may feel to buy spectacles once a prescription is given by the optometrist. If this is indeed true, then there are various policies that could potentially be explored.

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1. Cataract, trachoma, onchocerciasis, childhood blindness and refractive error. [↑](#footnote-ref-2)
2. Exemptions include: under 16 or over 60 years old; full-time students aged 16-18; claiming income support or income-based job seekers allowance; entitled to an NHS Tax Credit Exemption Certificate, pension credit guarantee credit; registered as blind or partially sighted; diagnosed with glaucoma; at risk of glaucoma; with diagnosed diabetes, and those with an HC2 or HC3 Certificate. In addition some patients were entitled to help with the cost of optical appliances. Although the BHPS data does not specifically identify those exempted from paying for sight tests, it does provide information on specific issues related to exemptions such as age, maternity status, income levels and whether individuals receive income support such as disability, pension and job seekers allowances. We are therefore able to identify those who would normally be exempt, while recognising that we may not be able to identify all exemptions. In addition, entitlement to exemption is a necessary but not sufficient condition to be completely free of charges, as, in most cases, those who are entitled still have to obtain exemption certificates to be completely exempt. [↑](#footnote-ref-3)
3. Patients under 16 years, or aged 60 years or over, individuals with glaucoma, or those aged 40 years or over with a close family history of glaucoma, patients with ocular hypertension or with diabetes are entitled to a free eye examination every year. For patients aged between 16 years and 59 years the prescribed frequency of an eye examination is every two years. [↑](#footnote-ref-4)
4. The testing days measure the number of days that optometrists are carrying out sight tests. [↑](#footnote-ref-5)