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Evidence base for an intervention to maximise uptake of glaucoma testing: A theory based cross-sectional survey.

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KEYWORDS

Glaucoma; health behaviour; screening behaviour; intention; planned behaviour; behavioural self-regulation

ABSTRACT

Objective. To identify factors associated with intention to attend a hypothetical eye health test, and provide an evidence base for developing an intervention to maximise attendance, for use in studies evaluating glaucoma screening programmes.

Design. Theory based cross-sectional survey, based on an extended Theory of Planned Behaviour (TPB) and the Common Sense Self-Regulation Model (CS-SRM), conducted in June 2010.

Participants. General population including oversampling from low socioeconomic areas.

Setting. Aberdeenshire and the London Boroughs of Lewisham and Southwark; UK.

Results. From 867 questionnaires posted, 327 questionnaires were returned completed (38%). In hierarchical regression analysis the three theoretical predictors in the Theory of Planned Behaviour (Attitude, Subjective norm and Perceived Behavioural Control) accounted for two-thirds of the variance in intention scores (adjusted R^2=0.65). All three predictors

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contributed significantly to prediction. Adding Anticipated regret as a factor in the TPB model resulted in a significant increase in prediction (adjusted R^2=0.74). In the CS-SRM, only illness representations about the personal consequences of glaucoma (*How much do you think glaucoma would affect your life?*) and illness concern (*How concerned are you about getting glaucoma?*) significantly predicted. The final model explained 75% of the variance in intention scores, with ethnicity significantly contributing to prediction.

Conclusions In this population-based sample (including over-representation of lower socioeconomic groupings), the predictors of intention to attend for testing to detect glaucoma were Attitude, Perceived control over attendance, Anticipated regret if did not attend, and black ethnicity. This evidence informs the design of a behavioural intervention with intervention components targeting low intentions and predicted to influence health related behaviours.

ARTICLE SUMMARY

Article focus

- The current UK practice of opportunistic case finding during routine sight tests misses a majority of those with glaucoma. Early detection and treatment of glaucoma reduces the risk of blindness.
- The feasibility and cost-effectiveness of screening programmes is largely determined by uptake by the target population.
- This study identified empirical evidence, based on models of behaviour change, to inform the design of an intervention to maximise uptake, thereby increasing the chance of addressing identified, rather than assumed, barriers to uptake.

Key messages

- Intention to attend an eye health check to detect glaucoma is associated with positive Attitude, perceived control over screening attendance, Anticipated regret if test is not attended, perceived consequences of glaucoma and black ethnicity. These factors can be targeted in an intervention to maximise uptake.

Strengths and limitations of this study

- This study is the largest of its kind and uses a robust methodology based on plausible models of change to identify potential barriers to attendance for eye care.
- The response rate was 38%, which is higher than generally achieved in similar population-based surveys.

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- There was evidence to suggest that this sample was representative of the target population (general population with over-representation of Black ethnicity or of low socio-economic status).

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INTRODUCTION

Glaucoma is a leading cause of avoidable and irreversible blindness worldwide.[1] In the UK, glaucoma is second to macular degeneration as the most common cause of blindness. If glaucoma is identified early, treatment is effective at reducing progressive disease.[2] It is estimated, based on a synthesis of the available evidence, that the current UK practice of opportunistic case finding during routine sight tests misses a majority of those with glaucoma.[3] Identified risk factors for developing the most common form of glaucoma (open angle glaucoma) include: age (> 60 years), family history of glaucoma in a first degree relative, myopia, diabetes and black ethnicity.[3] Late presentation, older age and poor adherence to treatment are important determinants of blindness.[4-6] Late presentation may be due to patient delay in terms of attendance for testing, process delay in terms of missed diagnosis, or system delay leading to delayed access to treatment.[7] There is evidence to suggest that uptake of eye care services may be lower in groups at risk of glaucoma blindness. In the UK, uptake of current eye care services is lower in black ethnic groups (38% of those aged 55 years and over, compared to 80% of the same age group in the general population).[8] In addition, lower socioeconomic groups and/or black and other ethnic minority groups are less likely to attend for health promotion and preventative services more generally.[9,10] Considering the public health importance of glaucoma and that early detection and treatment reduce the risk of blindness, a screening programme could be considered.[11] However, there is insufficient evidence from high quality studies that the benefits of glaucoma screening or enhanced case detection programmes outweigh any potential harms (such as raising anxiety levels).[3] Such evidence would be best gathered in the context of a randomised controlled trial (RCT).[11] For public health programmes, a major determinant of both feasibility and cost-effectiveness is the level of uptake by the target population.[12] Uptake involves intentional behaviour (e.g. intend to go to screening appointment) and is likely to be influenced by the way people think (i.e., their cognitions) about the action (attending an eye test) or the condition (glaucoma). We investigated the factors that predict intention to attend an 'eye health test', based on (1) the Theory of Planned Behaviour (TPB) [13] and (2) the Common Sense Self-

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Regulation Model (CS-SRM).[14] The TPB proposes that intentions are determined by Attitude (beliefs about whether the benefits outweigh the costs), Subjective norm (perceived normative pressures) and Perceived control over the behaviour. There is consistent evidence that adding Anticipated regret as a factor (i.e. beliefs about whether feelings of regret will follow from inaction) to the TPB model increases prediction of intention and behaviour.[15] The model including Anticipated Regret is hereafter referred to as the extended TPB model. The CS-SRM proposes that cognitive representations (a 'mental picture') or emotional representations (worry or concern) about a health threat lead to behaviours that assist in coping with the threat. Ideally, an intervention to maximise uptake of a screening programme would be based on empirical evidence of an association between these cognitive or emotional factors and intention to attend the eye test, to ensure that the intervention is based on identified (rather than assumed) barriers to uptake. Therefore we conducted a study to identify the predictors of intention to attend for eye testing, using the factors proposed by the extended TPB to predict intention and the factors proposed by the CS-SRM to lead to coping behaviours. Specifically, we investigated the associations between intention to attend an eye test and:

1. measures of how people think about attending an 'eye health test' (Intention, Attitude, Subjective norm, Perceived Behavioural Control, Anticipated regret)
2. measures of how people think and feel about glaucoma (illness representations i.e. Consequences, Timeline, Personal control, Treatment control, Identity, Concern, Coherence, Emotional representation)
3. other personal attributes (i.e. socio-demographic variables that are known risk factors for glaucoma and knowledge of glaucoma)

Identified predictors would provide an evidence base for developing a behavioural intervention to maximise uptake of glaucoma screening or enhanced case detection programmes.

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METHODS

Study design and population

We used a cross sectional survey design to identify factors associated with intention to attend an eye health test, among members of the general population on the edited electoral register in two geographic locations: Aberdeenshire and the London Boroughs of Lewisham and Southwark. The initial sample was obtained from a commercial company specialising in the supply of publically available data (names and addresses) for use in research.[16] We requested a sample that was systematically biased towards people over forty years of age, in lower socioeconomic groups and/or of African-Caribbean ethnicity.[3,17] We used the Index of Multiple Deprivation 2007 (IMD) and the Scottish Index of Multiple Deprivation (SIMD) to independently assess the socioeconomic status of the initial sample. These indices provide relative ranking of geographic areas (data zones) within England or Scotland according to levels of deprivation. The IMD is based on 37 different indicators of deprivation, weighted and combined to give a relative ranking for data zones ranging from most deprived (Rank 1) to least deprived (Rank 32482). The SIMD uses different indicators to the IMD, but provides a relative rank for Scottish data zones ranging from most deprived (Rank 1) to least deprived (Rank 6505).

Materials

We used a questionnaire based on the extended TPB and the CS-SRM to identify factors associated with intention to attend an eye health test. Twenty factors were measured: four from the TPB; eight from the CS-SRM and eight medical and demographic factors (see below). We used the phrase ‘new eye health test’ and not ‘glaucoma screening test’ in the questionnaire to minimise anxiety that may be caused if the selected members of the public mistakenly believed that we had approached them after identifying an underlying ‘problem’ with their eyes.

The questionnaire was presented in three sections. Section A contained 18 items based on the components of the extended TPB (Intention, Attitude, Subjective Norm, Perceived

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Behavioural Control and Anticipated regret), with items measured on seven-point response scales with consistent direction (i.e. high scores indicating high intention, PBC and Anticipated regret, positive Attitude and more positive normative pressures). Items designed to assess the same construct were separated and presented in a non-systematic order (in accordance with TPB guidance).[13,18] Examples of Section A items are shown in Table 1. The full questionnaire is available in supplementary file 1. Section B (Table 1) assessed illness representations and emotional representations about glaucoma using items adapted from the Brief Illness Perceptions Questionnaire (Brief IPQ).[19] The Brief IPQ is a validated questionnaire that measures the components of the CS-SRM that are proposed to influence health-related coping behaviour. Rewording of items for specific conditions and for people without a diagnosis are part of the standard use of the questionnaire [20] and items in Section B were adapted to be appropriate to this study. Each item assesses a different domain of illness representations, on a 10-point scale, and each is analysed separately.[19] An item assessing knowledge of the term glaucoma (*Have you heard of the eye condition glaucoma?*) preceded the Brief IPQ items in Section B.

Section C of the questionnaire contained socio-demographic and general health items (gender; general health status; time since last eye test) and items to assess identified risk factors for glaucoma (age; diabetes, myopia; family history of glaucoma; and ethnicity). In addition, unique study identification numbers enabled us to identify the location (London or Aberdeenshire) and socioeconomic status of the invited sample and responders.

We pilot tested the questionnaire with two members of the general population to assess usability and identify any need for clarification of wording. This resulted in changes to the instruction sheet to emphasise our interest in the honest opinions of participants and not socially desirable responses.

Procedure

The questionnaire was mailed to 867 potential participants (421 in London and 446 in Aberdeenshire) in June 2010 together with an information letter (see supplementary file 2) and

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reply paid envelope. One reminder was sent to non-responders two weeks later. The return of a completed questionnaire was considered as consent to take part. Ethical approval for the survey was obtained from the University of Aberdeen College of Life Sciences and Medicine Ethics Review Board (Ref: CERB/2010/4/507). The postal survey reported in this paper formed part of a larger study to assess the feasibility of conducting a RCT of glaucoma screening.[21]

Sample size and statistical analyses

Multiple regression approaches were used to identify factors associated with intention to attend a hypothetical eye health test. The recommended minimum sample is calculated as 50 + 8m, where m is the number of predictor variables.[22] This study design involved a total of 20 potential predictor variables and the minimum sample size required was thus 210.

The internal consistency of each multi-item measure was assessed using Cronbach's alpha (for measures with three or more items) and Pearson's correlation coefficient (for the 2-item measure of Anticipated regret), using an acceptability criterion of $\alpha > 0.65$, and $r > 0.5$ respectively.[23] In addition, measures of central tendency and dispersion were computed for measures in Sections A and B.

The primary analysis addressed the prediction of intention to attend an eye health test. A 4-step hierarchical regression analysis explored the predictive value of (1) the TPB measures; (2) Anticipated regret; (3) the Brief IPQ measures and (4) socio-demographic and general health variables in explaining variance in participants' intention to attend a test. Variables that did not contribute significantly to the model ($p > 0.05$) at their point of entry were excluded in later steps. The TPB constructs were entered at Step 1 as these are proposed by the theory to be the proximal predictors of intention. Anticipated regret was added at Step 2 as this variable represents an extension of the TPB. Step 3 involved the addition of the Brief IPQ items (as they represent cognitions at a more contextual level). At Step 4, demographic and general health variables were added (as they represent the broader personal context in which screening behaviour would be performed). Prior to inclusion in the model, independent-sample

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t-tests were performed to compare intention scores of dichotomised demographic and general health variables. Only those variables for which there was a significant difference in intention scores were added to the regression model at Step 4. There was no imputation of missing data.

RESULTS

Response rates and responder characteristics

Of the 867 questionnaires sent out, 327 completed questionnaires were returned, representing a response rate of 38%. The response rate differed by geographical area with London achieving 24% (101/421) and Aberdeenshire 51% (226/446). Of the 11,445 possible data points in the returned questionnaire, 2.1% of data were missing. The mean (sd) age of respondents was 54 (12) years. The socioeconomic status of respondents, in both locations was representative of those sampled and achieved the desired weighting towards people in lower socioeconomic groups: mean IMD rank of the London sample was 4818 versus 4809 for respondents; mean SIMD of the Aberdeenshire sample was 2818 versus 2914 for respondents. The most commonly reported health status was 'good' (41%). Ten percent of the sample reported Black ethnicity (Table 2) and 81% reported having an eye test within the previous three years.

Table 2 here

Internal consistency of the extended TPB measures was satisfactory with reliabilities (Cronbach's alpha) of the Intention, Attitude, Subjective norm and PBC scales > 0.65 and the Anticipated regret scale > 0.5 (Pearson correlation coefficient). Summary statistics for each variable are shown in Table 3. All variables representing the extended TPB had medians > 6.3 (on a scale of 1 to 7) suggesting potential ceiling effects (generally positive views and intentions). Although intention was generally high (Figure 1), there was still a substantial proportion of respondents (54.7%) who reported a mean intention score < 7, indicating some reservation in their intention to attend. All measures of the CS-SRM variables, apart from

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Treatment control, had medians > 5 (on a scale of 1 to 10), representing generally negative representations about glaucoma (Table 3).

Table 3 here

Figure 1 here

The Pearson correlations between intention to attend an eye health test and the theoretical predictor variables are shown in Table 3. Higher intention to attend was significantly associated with all the predictors as proposed by the theories.

Intention scores for groups defined by demographic and general health variables are shown in Table 4. There was a significant difference in the intention scores for respondents of Black and non-Black ethnicity and for respondents who reported they had heard of glaucoma compared with those who had not. Both variables were therefore included in the regression model at Step 4. The other five variables in Table 4 were excluded. A further risk factor for glaucoma, the continuous variable 'age', was also entered at Step 4 as it was highly correlated with intention to attend an eye health screening test (Spearman's rank correlation coefficient = 0.155, p=0.006).

Table 4 here

The results of the hierarchical regression analysis are presented in Tables 5 and 6. At Step 1, the three theoretical predictors of the TPB (Attitude, Subjective norm and PBC) accounted for two-thirds of the variance in intention scores (adjusted R^2 = 0.65) and all three predictors contributed significantly to prediction. The addition of Anticipated regret at Step 2 resulted in a significant increase in prediction (adjusted R^2 = 0.74). At Step 3, only representations about consequences of the condition (*How much do you think glaucoma would affect your life?*) and illness concern (*How concerned are you about getting glaucoma?*) significantly predicted. The final model (Step 4) explained 75% of the variance in intention scores, with ethnicity significantly contributing to prediction.

Tables 5 and 6 here

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DISCUSSION

This study showed that, in this population-based sample, intention to attend an eye health test was relatively high and was related to Attitude, Subjective norm, Perceived Behavioural Control, Anticipated regret, perceived consequences of having glaucoma and ethnicity. In other words, people who reported that they were *in favour* of attending an eye health test, that other people would *approve* of their attending, that they would be *able* to attend and that they would *regret* not attending were more likely to report strong intention to attend such a test. (The effect size for the association between Subjective norm and intention was small, so Subjective norm will not be considered further). The prediction of intention was higher than is usually reported in studies of the TPB (e.g. commonly, TPB-based studies explain around 40% of the variation in intention).[24] People who reported that glaucoma would negatively affect their life (*consequences of glaucoma*) were also more likely to report strong intention to attend an eye health test, but the effect size was small. People of Black ethnicity, who are known to be at increased risk of developing glaucoma, were less likely than those of other ethnicities to report strong intention to attend such a test. Intention was not uniquely predicted by knowledge or perceptions about glaucoma, nor was it associated with age when analysed with the other predictors. This pattern of findings can be used as an evidence base for developing an intervention to be evaluated in a possible population-based screening trial.

Implications of this evidence base for designing a behavioural component of a complex intervention to improve glaucoma detection

Intention scores were generally high, as were measures of other variables that represented the way people thought about attending a hypothetical eye health test. The data indicate that a large proportion of this sample was highly receptive to the idea of an eye health programme to detect glaucoma. High intention is thus possibly not a barrier to uptake of a screening programme for the majority of this sample. However, there was still a substantial proportion of the sample (54.7%) who reported some uncertainty about their intention. Such individuals may benefit from an intervention to increase their motivation. The distribution of intention scores

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(median of 6.7 on a 7-point scale) also indicated that many in the sample reported that they were highly motivated to re-arrange other priorities in order to attend a screening test. This is not to say that all people who strongly intend to attend would actually do so. We were unable to estimate the likely size of the 'intention-behaviour' gap for attendance at this hypothetical eye health test as a glaucoma screening programme is not current policy. However, the literature suggests that around 50% of people who intend to perform a health-related behaviour actually translate that intention into action.[25] So an intervention that targets "post-intentional" (action) processes would also be likely to increase uptake of a screening or enhanced case detection programme by assisting people to translate their high intentions into actual behaviour. The inclusion of non-modifiable socio-demographic and general health variables in the predictive model enabled us to determine if, in addition to targeting modifiable predictors of intention to attend an eye test, it would be appropriate to develop an intervention that is tailored to different socio-demographic groups (e.g. ethnic groups).

In summary, this evidence suggests that an intervention to increase motivation may be appropriate for nearly half of the population. In addition, tailoring of the intervention to increase motivation in people of Black ethnicity should be considered. An intervention to support the translation of motivation into action (i.e. actual attendance) would also be appropriate. Methods have recently been reported for developing interventions based on the evidence reported here.[26] Hence, it would be feasible to design an intervention to support both (1) motivation and (2) action. Such an intervention would include techniques such as (1) persuasive communication to target people's beliefs about the benefits of screening (i.e. Attitude, Anticipated regret) and factors likely to make it easier to attend the test (i.e. Perceived Behavioural Control) as well as (2) prompts and/or reminders (e.g. letters or phone calls) and contracts (i.e. written and signed agreements to perform a behaviour) that would make actual attendance more likely among those who are motivated to attend.

Strengths and limitations of the study

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This study is the largest of its kind and uses a robust methodology based on plausible models of change to identify potential barriers to attendance for eye care. We avoided the term 'glaucoma screening' in the participant information sheet and questionnaire, instead using the phrase 'new eye health tests'. Our purpose was to minimise potential participant anxiety that they had been specifically targeted in a research study about a serious condition. However, the use of a generic description of the proposed eye test has generated results that are applicable to development of interventions for improving attendance at eye care services more generally.

The response rate was 38%, which is higher than generally achieved in similar population-based surveys.[27,28] There was evidence to suggest that this sample was representative of the target population (general population with over-representation of Black ethnicity or of low socio-economic status). First, the proportion of participants reporting having their eyes tested in the last 3 years (81%) was consistent with findings in the general population.[8] Second, the socioeconomic status and sample characteristics of responders and non-responders suggested that responders were not distinguishable from non-responders on these variables and the desired weighting towards people in lower socio-economic groups was achieved. Furthermore, groups that might be at higher risk of developing glaucoma including hard-to-reach groups were well represented in the sample. For example, 2.0% of the UK population [29] but 10% of our sample are of Black ethnicity. In addition, there was a good spread of general health status in the sample, but the proportion reporting excellent health (5.5%) was lower than the UK average (21.3%).[30]

CONCLUSION

This study identified that, in a population-based sample (including over-representation of lower socioeconomic groupings), the predictors of intention to attend for sight testing to detect glaucoma were Attitude, perceived control over attendance, Anticipated regret if not attended, and black ethnicity. This evidence will inform the design of a behavioural intervention to maximise screening uptake. The intervention components that are the likely 'best bets' for

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targeting these factors can be selected using a tool systematically developed for this purpose.[26] This study illustrates the evidence base that is required to inform the development of interventions to influence health-related behaviours.

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Competing interests: All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that (1) MP, JB, CR, DJ, SC and JF had support for the submitted work through a Medical Research Council funded strategic grant; (2) no authors have relationships that might have an interest in the submitted work in the previous 3 years; (3) their spouses, partners, or children have no financial relationships that may be relevant to the submitted work; and (4) no authors have non-financial interests that may be relevant to the submitted work.

Contributors: At the time of the research all authors were at the University of Aberdeen Health Services Research Unit. JB, JF, CR, MC and AA-B had the original ideas for the study. JF, MP JB, SC, CR developed the questionnaire. MP and SC conducted the data collection. DJ and

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MP performed the statistical analysis. MP drafted the paper. All authors participated in the interpretation of results, revision and approval of the final draft. All authors had full access to all of the data in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis. JF is guarantor.

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Data sharing: No additional data available

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Table 1 Sample questionnaire items designed to assess theoretical predictors.

Section A	Items designed to measure each component	Response options
Dependent variable: Intention (Items: A1, A8, A17)	*If I received a letter inviting me to attend for an eye health test I would attend*	Strongly disagree (1) to Strongly agree (7)
Predictors:		
Attitude (Items A21A-A21F)	*For me, attending an eye health test would be…*	not worthwhile (1) to worthwhile (7) bad use of my time (1) to good use of my time (7)
Subjective Norm (Items A6,A19, A20)	*Most people who are important to me would think that I should attend an eye health test*	Strongly disagree (1) to Strongly agree (7)
Perceived Behavioural Control (Items A5, A14, A15, A22)	*Whether I attend an eye health test would be entirely up to me*	Strongly disagree (1) to Strongly agree (7)
Anticipated Regret (Items: A7, A18)	*If I was invited for an eye health test and I did not attend I would later wish I had.*	Strongly disagree (1) to Strongly agree (7)
Section B (Items B2- B9)		10-point response options
Consequences	*How much do you think glaucoma would affect your life?*	No effect at all (1) to Would severely affect my life (10)
Timeline	*How long do you think glaucoma lasts?*	Very short time (1) to Forever (10)
Personal Control	*Once a person has been diagnosed with glaucoma, how much control do you think they have over the disease?*	Extreme amount of control (1) to Absolutely no control (10)
Treatment Control	*How helpful do you think treatment is for glaucoma?*	Extremely helpful (1) to Not at all (10)
Identity	*How much do you think a person with glaucoma would experience symptoms*	No symptoms at all (1) to Many sever symptoms (10)
Concern	*How concerned are you about getting glaucoma?*	Not at all concerned (1) to Extremely concerned (10)
Coherence	*How well do you feel you understand glaucoma?*	Understand very clearly (1) to Don't understand at all (10)
Emotional Representation	*How much does the possibility of getting glaucoma affect you emotionally?*	Not at all affected emotionally (1) to Extremely emotionally affected (10)

Note: full questionnaire included as a supplementary file

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Table 2 Sample characteristics from both locations

Sample characteristic	n	(%)
Male	143	(43.7)
General Health Status		
Excellent	18	(5.5)
Very Good	79	(24.2)
Good	134	(41.0)
Fair	71	(21.7)
Poor	18	(5.5)
Heard of the term glaucoma	280	(85.6)
Last Eye Test within 3 years	265	(81.0)
Black Ethnicity (Black British, Caribbean, African)	33	(10.1)
Diabetic	37	(11.3)
Short-sighted	144	(44.0)
Family history of glaucoma	53	(16.2)

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Table 3 Summary statistics for theory-based variables in the analysis including correlations with intention scores.

Section & Factor	Mean (sd)	Median (Q1, Q3)	Pearson correlation with intention score
Section A: Attending an eye health test			
Intention	6.3 (1.0)	6.7 (6.0, 7.0)	
Attitude	6.3 (1.0)	6.7 (6.0, 7.0)	0.67**
Subjective Norm	6.0 (1.2)	6.3 (5.3, 7.0)	0.59**
Perceived Behavioural Control	6.3 (0.8)	6.5 (6.0, 7.0)	0.71**
Anticipated Regret	6.0 (1.2)	6.5 (5.5, 7.0)	0.76**
Section B: Illness and emotional representations of glaucoma			
Consequences	8.6 (1.9)	9.5 (8.0, 10.0)	0.44**
Timeline	8.6 (2.0)	10.0 (8.0, 10.0)	0.24**
Personal control	6.2 (2.7)	6.0 (4.0, 8.0)	-0.43
Treatment control	3.2 (2.4)	3.0 (1.0, 5.0)	0.28**
Identity	6.8 (2.4)	7.0 (5.0, 8.5)	0.17**
Illness concern	7.3 (2.8)	8.0 (5.0, 10.0)	0.35**
Coherence	6.6 (2.7)	7.0 (5.0, 9.0)	0.16**
Emotional representation	6.0 (2.8)	6.0 (4.0, 8.0)	0.25**

Note: Scales ranged from: (1) negative intention/belief to (7) positive intention/belief (Section A); (1) positive representation of glaucoma to (10) negative representation of glaucoma (Section B).
**p<0.01

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Table 4 Independent sample t-tests on intention scores.

		N[#]	Mean Intention Score	SD	t	p
Heard of glaucoma	Yes	280	6.33	0.91	2.04	0.047**
	No	44	5.87	1.43		
Gender	Male	143	6.28	0.88	0.17	0.868
	Female	177	6.30	1.05		
Ethnicity	All Black ethnicities	33	5.80	1.51	2.05	0.048**
	All other ethnicities	281	6.35	0.87		
Diabetes	Yes	37	6.41	0.98	0.71	0.476
	No	278	6.29	0.96		
Last eye test	Within the last 3 years	265	6.29	1.00	0.17	0.867
	More than 3 years ago/never	56	6.31	0.86		
Short-sighted	Yes	144	6.30	0.91	0.84	0.402†
	No	107	6.19	1.14		
	Don't know	61	6.44	0.82		
Family history of Glaucoma	Yes	53	6.43	0.69	1.11	0.269†
	No	172	6.27	1.00		
	Don't know	94	6.30	0.99		

Numbers for each variable do not add up to 327 as some participants did not provide the information

† The test was between "yes" and "no" with those answering "don't know" left out. When the t-tests were repeated with the variables coded dichotomously (yes versus 'not yes') the t-tests remained non-significant.

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Table 5 Hierarchical regression model summary for predicting intention to attend and eye test.

Model	R^2	R^2 Change	p-value
1	0.651	0.651	<0.001
2	0.738	0.088	<0.001
3	0.747	0.009	0.006
4	0.752	0.004	0.025

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Table 6 Coefficients of terms in the final model (Model 4) for predicting intention to attend and eye test.

Variable	Coefficient	Standard Error	95% CI	p-value
(Constant)	-0.067	0.248	(-0.556,0.421)	0.786
Attitude	**0.176**	0.039	(0.098,0.253)	**0.000**
Subjective norm	**0.067**	0.030	(0.007,0.126)	**0.028**
PBC	**0.407**	0.046	(0.316,0.499)	**0.000**
Anticipated regret	**0.298**	0.033	(0.232,0.363)	**0.000**
Consequences of glaucoma	**0.045**	0.016	(0.013,0.078)	**0.006**
Illness concern	0.016	0.011	(-0.006,0.037)	0.153
Black ethnicity	**-0.212**	0.094	(-0.396,-0.027)	**0.025**

Figure 1 Frequency distribution of mean intention scores (possible range 1 – 7).

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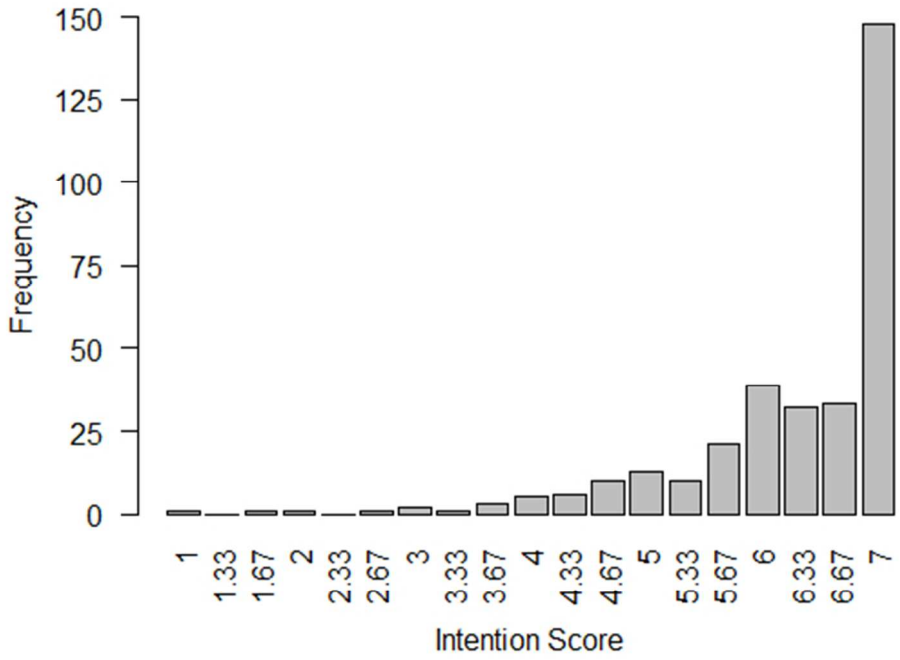

Figure 1 Frequency distribution of mean intention scores
194x158mm (72 x 72 DPI)

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Study No

New Eye Health Tests

Questionnaire

Thank you for taking the time to help us with this study

Confidential

The aim of this study is to find out your views on possible new NHS eye health tests.

These tests would be a separate service to the routine eyesight tests currently offered at High Street Opticians.

Your answers to this questionnaire will help us to identify how best to offer new NHS eye health tests.

Unfortunately, we are not able to invite you to attend an eye health test as part of this study.

We are just asking for your views.

HOW TO FILL IN THIS QUESTIONNAIRE

We are interested in **your own personal views,** not what you think we want to hear.
There are no right or wrong answers.

Most questions can be answered by **ticking** the appropriate box (ONE box only)

For example

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☑	☐	☐	☐	☐	☐	

If you make a mistake, shade out the wrong box and tick the correct one like this

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☑	☐	☑	☐	☐	☐	

All the answers you give are useful to us.

Please try to complete the whole questionnaire.

Section A – YOUR views on eye health tests

Please tell us what **YOU** think about eye health tests.

For each question choose a number between 1 and 7 that best reflects your views (Tick ONE box only)

A1. If I received a letter inviting me for an eye health test I would attend

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A2. If I attend an eye health test it would tell me whether or not I had a problem with my eyes

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A3. If I attended an eye health test and it detected a problem with my eyes I would be anxious

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A4. If I attend an eye health test, any problems would be picked up early

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A5. Whether I attend an eye health test would be entirely up to me

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A6. Most people who are important to me would think that I should attend an eye health test

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A7. If I was invited for an eye health test and I did *not* attend I would feel sorry

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A8. I would make it a high priority to attend an eye health test

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A9. If I attend an eye health test it would find problems before I notice anything is wrong

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A10. If I attended an eye health test and it detected a problem with my eyes, the problem could be treated

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A11. If I attended an eye health test and it detected *no* problems it would give me peace of mind

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A12. If I attended an eye health test it would pick up additional eye problems to a routine/normal eye sight test

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A13. If I attend an eye health test it may show up other health problems (e.g. diabetes, high blood pressure)

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A14. I am confident that I *could* attend an eye health test if it was available

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A15. The decision to attend an eye health test would be within my control

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A16. If I attended an eye health test and it detected a problem with my eyes it could stop me losing my sight

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A17. I would rearrange other things in order to attend an eye health test

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A18. If I was invited for an eye health test and I did not attend I would later wish I had

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A19. My close relatives would want me to attend an eye health test

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A20. My friends would want me to attend an eye health test

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

For each of the following options choose a number between 1 and 7 that best reflects YOUR views (Tick ONE box only)

A21. *For me*, attending an eye health test would be…

	1	2	3	4	5	6	7	
Not worthwhile	☐	☐	☐	☐	☐	☐	☐	Worthwhile
Bad use of my time	☐	☐	☐	☐	☐	☐	☐	Good use of my time
Unimportant	☐	☐	☐	☐	☐	☐	☐	Important
Unpleasant	☐	☐	☐	☐	☐	☐	☐	Pleasant
Uninformative	☐	☐	☐	☐	☐	☐	☐	Informative
Bad for my eye health	☐	☐	☐	☐	☐	☐	☐	Good for my eye health

A22. Attending an eye health test would be…

	1	2	3	4	5	6	7	
Difficult for me	☐	☐	☐	☐	☐	☐	☐	Easy for me

A23. If I was sent an eye health appointment for a specific day and time it would be…

	1	2	3	4	5	6	7	
Difficult for me to attend	☐	☐	☐	☐	☐	☐	☐	Easy for me to attend

A24. If an eye health test was available locally (e.g. within 10 miles) it would be…

	1	2	3	4	5	6	7	
Difficult for me to attend	☐	☐	☐	☐	☐	☐	☐	Easy for me to attend

A25. If an eye health test was only available during working hours it would be…

Difficult for me to attend	1	2	3	4	5	6	7	Easy for me to attend
	☐	☐	☐	☐	☐	☐	☐	

A26. If an eye health test was available during evenings and weekends it would be…

Difficult for me to attend	1	2	3	4	5	6	7	Easy for me to attend
	☐	☐	☐	☐	☐	☐	☐	

A27. If the location for the eye health test was a Community Health Centre (GP surgery) it would be …

Difficult for me to attend	1	2	3	4	5	6	7	Easy for me to attend
	☐	☐	☐	☐	☐	☐	☐	

A28. If the location for the eye health test was a High Street Optician it would be...

Difficult for me to attend	1	2	3	4	5	6	7	Easy for me to attend
	☐	☐	☐	☐	☐	☐	☐	

A29. Showing up other health problems (e.g. diabetes, high blood pressure) in the eye health test is…

Unimportant	1	2	3	4	5	6	7	Important
	☐	☐	☐	☐	☐	☐	☐	

A30. My close relatives' views about me attending an eye health test are important to me

Not at all	1	2	3	4	5	6	7	Very much so
	☐	☐	☐	☐	☐	☐	☐	

A31. My friends' views about me attending an eye health test are important to me

Not at all	1	2	3	4	5	6	7	Very much so
	☐	☐	☐	☐	☐	☐	☐	

Section B - Your views on the eye condition glaucoma

B1. Have you heard of the eye condition glaucoma?

Yes ☐ No ☐

For the following questions choose a number between 0 and 10 that best reflects your views (Tick ONE box only)

B2. How much do you think glaucoma would affect your life?

No effect at all	1	2	3	4	5	6	7	8	9	10	Would severely affect my life
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B3. How long do you think glaucoma lasts?

Very short time	1	2	3	4	5	6	7	8	9	10	Forever
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B4. Once a person has been diagnosed with glaucoma, how much control do you think they have over the disease?

Absolutely no control	1	2	3	4	5	6	7	8	9	10	Extreme amount of control
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B5. How helpful do you think treatment is for glaucoma?

Not at all	1	2	3	4	5	6	7	8	9	10	Extremely helpful
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B6. How much do you think a person with glaucoma would experience symptoms?

No symptoms at all	1	2	3	4	5	6	7	8	9	10	Many severe symptoms
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B7. How concerned are you about getting glaucoma?

Not at all concerned ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 Extremely concerned

B8. How well do you feel you understand glaucoma?

Don't understand at all ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 Understand very clearly

B9. How much does the possibility of getting glaucoma affect you emotionally?

Not at all affected emotionally ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 Extremely affected emotionally

B10. Please list in order of importance the 3 most important factors that you believe cause glaucoma

1. _____
2. _____
3. _____

Section C - Can you tell us a little bit about yourself?

C1. Are you...

Male ☐ Female ☐

C2. What is your age?

☐ years

C3. In general, would you say your health is... (please tick one box only)

Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Poor ☐

C4. Ethnic group

Please tick the box that best describes your ethnic group (please tick ONE box only)

White British ☐

Any other White background ☐

Black or Black British – Black Caribbean ☐

Black or Black British – Black African ☐

Black or Black British (Any other Black background) ☐

Asian or Asian British ☐

Chinese ☐

Mixed – White and Black Caribbean ☐

Mixed – White and Black African ☐

Mixed – White and Asian ☐

Any other mixed background ☐

Any other ☐

Prefer not to answer ☐

C5. Do you have diabetes (Type 1 or 2)?

Yes ☐ No ☐

C6. When did you last have your eyes tested?

Within the last 3 years ☐ More than 10 years ago ☐

Between 3 and 5 years ago ☐ Never ☐

Between 5 and 10 years ago ☐

C7. Are you short-sighted?

Yes ☐ No ☐ Don't know ☐

C8. Is there a history of glaucoma in your family?

Yes ☐ No ☐ Don't know ☐

Section D – Would you attend this eye health appointment?

Please choose a number between 1 and 7 (Tick ONE box only)

D1. Please imagine that you receive a letter inviting you to attend an eye health test. The letter contains the following information:

- a fixed appointment time that you can change if it is not convenient
- the test will be done at your Community Health Centre (GP surgery)
- the test takes about 15 minutes
- appointments are available outside of working hours

How certain are you that you would attend this eye health appointment?

I am certain I would *not* attend	1	2	3	4	5	6	7	I am certain I would attend
	☐	☐	☐	☐	☐	☐	☐	

I am not sure

End of questionnaire

Thank you very much for your time and patience in filling in this questionnaire

The information you have given us will be extremely useful to us

It will be treated with the strictest confidence and kept securely

Please send the questionnaire back to us in Aberdeen in the pre-paid envelope provided

If you would like further information or have any questions about the study, please contact:

The Eye Health Screening Study Co-ordinator – Dr. Maria Prior (Tel: 01224 559800)

This study is taking place across the UK but questionnaires are being processed in Aberdeen at the Health Services Research Unit, University of Aberdeen, Health Sciences Building, Foresterhill, ABERDEEN, AB25 2ZD

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New Eye Health Tests: your views

A Questionnaire Study

Dear <<title name>>

We are writing to ask if you will answer some questions as part of an important new study into eye health. Please note, **we are not asking you to have an eye test, only to fill in a questionnaire**. The study is funded by the Medical Research Council and is part of internationally recognised research looking at whether introducing new NHS eye health tests would be worthwhile.

Why are we doing this study?

Certain eye conditions do not cause obvious symptoms in the early stages. By the time people notice anything is wrong, there may be permanent damage to their vision. We want to find out whether introducing new NHS eye health tests would reduce the number of people who go on to have serious vision problems. These tests would be a separate service to the routine eyesight tests currently offered at High Street Opticians in the UK.

Why have you been chosen?

We want people like you - who might be invited to have a test if it was available – to give us your personal views about a proposed new NHS eye health test programme. Your answers to the questionnaire will help us to decide how best to design this kind of programme.

This letter is being sent to about 500 people, chosen from the electoral register, in your area. **Whether you think you have an eye problem or not, we would like you to complete the questionnaire.**

What do you have to do to take part?

All you will need to do is to complete the enclosed questionnaire and return it in the reply-paid envelope provided. The questionnaire should take about 10 minutes to complete.

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HSRU is supported by the Chief Scientist Office, Scottish Executive Health Department
www.abdn.ac.uk/hsru

Do you have to take part?

Taking part is entirely voluntary. If you decide not to take part, please return your blank questionnaire in the reply-paid envelope. However, if we have not heard from you at all after two weeks we will write to you again. If we do not hear from you after the second letter, we will not contact you again.

Who will know what I say?

The information you provide will be strictly confidential. Your name will not appear on your questionnaire or anywhere else. The answers you give us will be transferred to a secure computer database that is only accessible to researchers involved in this study. All information will be kept securely within the Health Services Research Unit at the University of Aberdeen for ten years, in line with current Research Governance requirements. It will then be destroyed.

Is an NHS eye health test available now?

No. Unfortunately, we are not able to invite you to attend an eye health test as part of this study.

What are the possible benefits of taking part?

Taking part in this study will be of no direct benefit to you. However, it may benefit others in the future. We have interviewed several people as part of this study and they have told us they are pleased to be asked their views about new NHS programmes before they are introduced, as this gives them the chance to influence how the health service is run.

If you would like any further information on this study, or have any questions about the study, or about the questionnaire, please do not hesitate to contact Maria Prior at the address above.

Yours sincerely

Dr Maria Prior
Study Co-ordinator
on behalf of the Eye Health Screening Study Team

This study has been approved by the Ethics Review Board of the College of Life Sciences and Medicine of the University of Aberdeen.

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1✓	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
	✓	(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2✓	Explain the scientific background and rationale for the investigation being reported
Objectives	3✓	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4✓	Present key elements of study design early in the paper
Setting	5✓	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6✓	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7✓	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*✓	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9✓	Describe any efforts to address potential sources of bias
Study size	10✓	Explain how the study size was arrived at
Quantitative variables	11✓	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12✓	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
	✓	(*c*) Explain how missing data were addressed
		(*d*) If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses
Results		
Participants	13*✓	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*✓	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*✓	Report numbers of outcome events or summary measures
Main results	16✓	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

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Discussion		
Key results	18✓	Summarise key results with reference to study objectives
Limitations	19✓	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20✓	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21✓	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22✓	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Evidence base for an intervention to maximise uptake of glaucoma testing: A theory-based cross-sectional survey

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2011-000710.R1
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Date Submitted by the Author:	26-Jan-2012
Complete List of Authors:	Prior, Maria; University of Aberdeen, Health Services Research Unit Burr, Jennifer; University of Aberdeen, Health Services Research Unit Ramsay, Craig; University of Aberdeen, Health Services Research Unit Jenkinson, David; University of Birmingham, School of Health & Population Sciences Campbell, Susan; University of East Anglia, School of Nursing Sciences Francis, Jillian; University of Aberdeen, Health Services Research Unit
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Ophthalmology
Keywords:	Glaucoma < OPHTHALMOLOGY, Health behaviour, Screening behaviour, Intention, Planned behaviour, Behavioural self-regulation

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Evidence base for an intervention to maximise uptake of glaucoma testing: A theory-based cross-sectional survey.

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KEYWORDS

Glaucoma; health behaviour; screening behaviour; intention; planned behaviour; behavioural self-regulation

ABSTRACT

Objective. To identify factors associated with intention to attend a hypothetical eye health test, and provide an evidence base for developing an intervention to maximise attendance, for use in studies evaluating glaucoma screening programmes.

Design. Theory-based cross-sectional survey, based on an extended Theory of Planned Behaviour (TPB) and the Common Sense Self-Regulation Model (CS-SRM), conducted in June 2010.

Participants. General population including oversampling from low socioeconomic areas.

Setting. Aberdeenshire and the London Boroughs of Lewisham and Southwark; UK.

Results. From 867 questionnaires posted, 327 questionnaires were returned completed (38%). In hierarchical regression analysis the three theoretical predictors in the Theory of Planned Behaviour (Attitude, Subjective norm and Perceived Behavioural Control) accounted for two-thirds of the variance in intention scores (adjusted R^2=0.65). All three predictors

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contributed significantly to prediction. Adding Anticipated regret as a factor in the TPB model resulted in a significant increase in prediction (adjusted R^2=0.74). In the CS-SRM, only illness representations about the personal consequences of glaucoma (*How much do you think glaucoma would affect your life?*) and illness concern (*How concerned are you about getting glaucoma?*) significantly predicted. The final model explained 75% of the variance in intention scores, with ethnicity significantly contributing to prediction.

Conclusions In this population-based sample (including over-representation of lower socioeconomic groupings), the predictors of intention to attend a hypothetical eye health test were Attitude, Perceived control over attendance, Anticipated regret if did not attend, and black ethnicity. This evidence informs the design of a behavioural intervention with intervention components targeting low intentions and predicted to influence health related behaviours.

ARTICLE SUMMARY

Article focus

- The current UK practice of opportunistic case finding during routine sight tests misses a majority of those with glaucoma. Early detection and treatment of glaucoma reduces the risk of blindness.
- The feasibility and cost-effectiveness of screening programmes is largely determined by uptake by the target population.
- This study identified empirical evidence, based on models of behaviour change, to inform the design of an intervention to maximise uptake.

Key messages

- Intention to attend an eye health check to detect glaucoma is associated with positive Attitude, perceived control over screening attendance, Anticipated regret if test is not attended, perceived consequences of glaucoma and black ethnicity. These factors can be targeted in an intervention to maximise uptake.

Strengths and limitations of this study

- This study is the largest of its kind and uses a robust methodology based on plausible models of change to identify potential barriers to attendance for eye care.
- The response rate was 38%, which is higher than generally achieved in similar population-based surveys.

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- There was evidence to suggest that this sample was representative of the target population (general population with over-representation of Black ethnicity or of low socio-economic status).

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INTRODUCTION

Glaucoma is a leading cause of avoidable and irreversible blindness worldwide.[1] In the UK, glaucoma is second to macular degeneration as the most common cause of blindness. If glaucoma is identified early, treatment is effective at reducing progressive disease.[2] It is estimated, based on a synthesis of the available evidence, that the current UK practice of opportunistic case finding during routine sight tests misses a majority of those with glaucoma.[3] Identified risk factors for developing the most common form of glaucoma (open angle glaucoma) include: age (> 60 years), family history of glaucoma in a first degree relative, myopia, diabetes and black ethnicity.[3] Late presentation, older age and poor adherence to treatment are important determinants of blindness.[4-6] Late presentation may be due to patient delay in terms of attendance for testing, process delay in terms of missed diagnosis, or system delay leading to delayed access to treatment.[7] There is evidence to suggest that uptake of eye care services may be lower in groups at risk of glaucoma blindness. In the UK, uptake of current eye care services is lower in black ethnic groups (38% of those aged 55 years and over, compared to 80% of the same age group in the general population).[8] In addition, lower socioeconomic groups and/or black and other ethnic minority groups are less likely to attend for health promotion and preventative services more generally.[9,10] Considering the public health importance of glaucoma and that early detection and treatment reduce the risk of blindness, a screening programme could be considered.[11] However, there is insufficient evidence from high quality studies that the benefits of glaucoma screening or enhanced case detection programmes outweigh any potential harm (such as raising anxiety levels).[3] Such evidence would be best gathered in the context of a randomised controlled trial (RCT).[11] For public health programmes, a major determinant of both feasibility and cost-effectiveness is the level of uptake by the target population.[12] Uptake involves intentional behaviour (e.g. intend to go to screening appointment) and is likely to be influenced by the way people think (i.e., their cognitions) about the action (attending an eye test) or the condition (glaucoma). We investigated the factors that predict intention to attend an 'eye health test', based on (1) the Theory of Planned Behaviour (TPB) [13] and (2) the Common Sense Self-

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Regulation Model (CS-SRM).[14] The TPB proposes that intentions are determined by Attitude (beliefs about whether the benefits outweigh the costs), Subjective norm (perceived normative pressures) and Perceived control over the behaviour. There is consistent evidence that adding Anticipated regret as a factor (i.e. beliefs about whether feelings of regret will follow from inaction) to the TPB model increases prediction of intention and behaviour.[15] The model including Anticipated Regret is hereafter referred to as the extended TPB model. The CS-SRM proposes that cognitive representations (a 'mental picture') or emotional representations (worry or concern) about a health threat lead to behaviours that assist in coping with the threat. Ideally, an intervention to maximise uptake of a screening programme would be based on empirical evidence of an association between these cognitive or emotional factors and intention to attend the eye test, to ensure that the intervention is based on identified (rather than assumed) barriers to uptake. Therefore we conducted a study to identify the predictors of intention to attend for eye testing, using the factors proposed by the extended TPB to predict intention and the factors proposed by the CS-SRM to lead to coping behaviours. Specifically, we investigated the associations between intention to attend an eye test and:

1. measures of how people think about attending an 'eye health test' (Intention, Attitude, Subjective norm, Perceived Behavioural Control, Anticipated regret)
2. measures of how people think and feel about glaucoma (illness representations i.e. Consequences, Timeline, Personal control, Treatment control, Identity, Concern, Coherence, Emotional representation)
3. other personal attributes (i.e. socio-demographic variables that are known risk factors for glaucoma and knowledge of glaucoma)

Identified predictors would provide an evidence base for developing a behavioural intervention to maximise uptake of glaucoma screening or enhanced case detection programmes.

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METHODS

Study design and population

We used a cross sectional survey design to identify factors associated with intention to attend an eye health test, among members of the general population on the edited electoral register in two UK locations: Aberdeenshire (to target a mixture of urban and rural Scottish residents) and the London Boroughs of Lewisham and Southwark (areas with a high Black African/Caribbean population). The initial sample was obtained from a commercial company specialising in the supply of publically available data (names and addresses) for use in research.[16] We requested a sample that was systematically biased towards people over forty years of age, in lower socioeconomic groups and/or of African-Caribbean ethnicity.[3,17] We used the Index of Multiple Deprivation 2007 (IMD) and the Scottish Index of Multiple Deprivation (SIMD) to independently assess the socioeconomic status of the initial sample. These indices provide relative ranking of geographic areas (data zones) within England or Scotland according to levels of deprivation. The IMD is based on 37 different indicators of deprivation, weighted and combined to give a relative ranking for data zones ranging from most deprived (Rank 1) to least deprived (Rank 32482). The SIMD uses different indicators to the IMD, but provides a relative rank for Scottish data zones ranging from most deprived (Rank 1) to least deprived (Rank 6505).

Materials

We used a questionnaire based on the extended TPB and the CS-SRM to identify factors associated with intention to attend an eye health test. Twenty factors were measured: four from the TPB; eight from the CS-SRM and eight medical and demographic factors (see below). We used the phrase ‘new eye health test’ and not ‘glaucoma screening test’ in the questionnaire to minimise anxiety that may be caused if the selected members of the public mistakenly believed that we had approached them after identifying an underlying ‘problem’ with their eyes.

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The questionnaire was presented in three sections. Section A contained 18 items based on the components of the extended TPB (Intention, Attitude, Subjective Norm, Perceived Behavioural Control and Anticipated regret), with items measured on seven-point response scales with consistent direction (i.e. high scores indicating high intention, Perceived Behavioural Control and Anticipated regret, positive Attitude and more positive normative pressures). Items designed to assess the same construct were separated and presented in a non-systematic order (in accordance with TPB guidance).[13,18] Examples of Section A items are shown in Table 1. The full questionnaire is available in supplementary file 1. Section B (Table 1) assessed illness representations and emotional representations about glaucoma using items adapted from the Brief Illness Perceptions Questionnaire (Brief IPQ).[19] The Brief IPQ is a validated questionnaire that measures the components of the CS-SRM that are proposed to influence health-related coping behaviour. Rewording of items for specific conditions and for people without a diagnosis are part of the standard use of the questionnaire [20] and items in Section B were adapted to be appropriate to this study. Each item assesses a different domain of illness representations, on a 10-point scale, and each is analysed separately.[19] An item assessing knowledge of the term glaucoma (*Have you heard of the eye condition glaucoma?*) preceded the Brief IPQ items in Section B.

Section C of the questionnaire contained socio-demographic and general health items (gender; general health status; time since last eye test) and items to assess identified risk factors for glaucoma (age; diabetes, myopia; family history of glaucoma; and ethnicity). In addition, unique study identification numbers enabled us to identify the location (London or Aberdeenshire) and socioeconomic status of the invited sample and responders.

We pilot tested the questionnaire with two members of the general population to assess usability and identify any need for clarification of wording. This resulted in changes to the instruction sheet to emphasise our interest in the honest opinions of participants and not socially desirable responses.

Procedure

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The questionnaire was mailed to 867 potential participants (421 in London and 446 in Aberdeenshire) in June 2010 together with an information letter (see supplementary file 2) and reply paid envelope. One reminder was sent to non-responders two weeks later. The return of a completed questionnaire was considered as consent to take part. Ethical approval for the survey was obtained from the University of Aberdeen College of Life Sciences and Medicine Ethics Review Board (Ref: CERB/2010/4/507). The postal survey reported in this paper formed part of a larger study to assess the feasibility of conducting a RCT of glaucoma screening.[21]

Sample size and statistical analyses

Multiple regression approaches were used to identify factors associated with intention to attend a hypothetical eye health test. The recommended minimum sample is calculated as 50 + 8m, where m is the number of predictor variables.[22] This study design involved a total of 20 potential predictor variables and the minimum sample size required was thus 210. The internal consistency of each multi-item measure was assessed using Cronbach's alpha (for measures with three or more items) and Pearson's correlation coefficient (for the 2-item measure of Anticipated regret), using an acceptability criterion of $\alpha > 0.65$, and $r > 0.5$ respectively.[23] In addition, measures of central tendency and dispersion were computed for measures in Sections A and B.

The primary analysis addressed the prediction of intention to attend an eye health test. A 4-step hierarchical regression analysis explored the predictive value of (1) the TPB measures; (2) Anticipated regret; (3) the Brief IPQ measures and (4) socio-demographic and general health variables in explaining variance in participants' intention to attend a test. Variables that did not contribute significantly to the model ($p > 0.05$) at their point of entry were excluded in later steps. The TPB constructs were entered at Step 1 as these are proposed by the theory to be the proximal predictors of intention. Anticipated regret was added at Step 2 as this variable represents an extension of the TPB. Step 3 involved the addition of the Brief IPQ items (as they represent cognitions at a more contextual level). At Step 4, demographic and general health variables were added (as they represent the broader personal context in which

screening behaviour would be performed). Prior to inclusion in the model, independent-sample t-tests were performed to compare intention scores of dichotomised demographic and general health variables. Only those variables for which there was a significant difference in intention scores were added to the regression model at Step 4. There was no imputation of missing data.

RESULTS

Response rates and responder characteristics

Of the 867 questionnaires sent out, 327 completed questionnaires were returned, representing a response rate of 38%. The response rate differed by geographical area with London achieving 24% (101/421) and Aberdeenshire 51% (226/446). However, the areas did not differ on the key variable we were attempting to predict (intention) (p=0.084) so we combined the two samples for the primary analysis. Of the 11,445 possible data points in the returned questionnaire, 2.1% of data were missing. The mean (sd) age of respondents was 54 (12) years. The socioeconomic status of respondents, in both locations was representative of those sampled and achieved the desired weighting towards people in lower socioeconomic groups: mean IMD rank of the London sample was 4818 versus 4809 for respondents; mean SIMD of the Aberdeenshire sample was 2818 versus 2914 for respondents. The most commonly reported health status was 'good' (41%). Ten percent of the sample reported Black ethnicity (Table 2) and 81% reported having an eye test within the previous three years.

Table 2 here

Internal consistency of the extended TPB measures was satisfactory with reliabilities (Cronbach's alpha) of the Intention, Attitude, Subjective norm and Perceived Behavioural Control scales > 0.65 and the Anticipated regret scale > 0.5 (Pearson correlation coefficient). Summary statistics for each variable are shown in Table 3. All variables representing the extended TPB had medians > 6.3 (on a scale of 1 to 7) suggesting potential ceiling effects (generally positive views and intentions). Although intention was generally high (Figure 1),

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there was still a substantial proportion of respondents (54.7%) who reported a mean intention score < 7, indicating some reservation in their intention to attend. All measures of the CS-SRM variables, apart from Treatment control, had medians > 5 (on a scale of 1 to 10), representing generally negative representations about glaucoma (Table 3).

Table 3 here

Figure 1 here

The Pearson correlations between intention to attend an eye health test and the theoretical predictor variables are shown in Table 3. Higher intention to attend was significantly associated with all the predictors as proposed by the theories.

Intention scores for groups defined by demographic and general health variables are shown in Table 4. There was a significant difference in the intention scores for respondents of Black and non-Black ethnicity and for respondents who reported they had heard of glaucoma compared with those who had not. Both variables were therefore included in the regression model at Step 4. The other five variables in Table 4 were excluded. A further risk factor for glaucoma, the continuous variable 'age', was also entered at Step 4 as it was highly correlated with intention to attend an eye health screening test (Spearman's rank correlation coefficient = 0.155, p=0.006).

Table 4 here

The results of the hierarchical regression analysis are presented in Tables 5 and 6. At Step 1, the three theoretical predictors of the TPB (Attitude, Subjective norm and Perceived Behavioural Control) accounted for two-thirds of the variance in intention scores (adjusted R^2 = 0.65) and all three predictors contributed significantly to prediction. The addition of Anticipated regret at Step 2 resulted in a significant increase in prediction (adjusted R^2 = 0.74). At Step 3, only representations about consequences of the condition (*How much do you think glaucoma would affect your life?*) and illness concern (*How concerned are you about getting glaucoma?*)

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significantly predicted. The final model (Step 4) explained 75% of the variance in intention scores, with ethnicity significantly contributing to prediction.

Tables 5 and 6 here

DISCUSSION

This study showed that, in this population-based sample, intention to attend an eye health test was relatively high and was related to Attitude, Subjective norm, Perceived Behavioural Control, Anticipated regret, perceived consequences of having glaucoma and ethnicity. In other words, people who reported that they were *in favour* of attending an eye health test, that other people would *approve* of their attending, that they would be *able* to attend and that they would *regret* not attending were more likely to report strong intention to attend such a test. (The effect size for the association between Subjective norm and intention was small, so Subjective norm will not be considered further). In this sample, in which lower socio-economic status was well represented, the theory did better in predicting intention than is usually reported in the literature (i.e. 65% in this study, 40% frequently reported) demonstrating the theoretical coherence of the data.[24] People who reported that glaucoma would negatively affect their life (*consequences of glaucoma*) were more likely to report strong intention to attend an eye health test, but the effect size was small. Intention was not uniquely predicted by knowledge or perceptions about glaucoma, nor was it associated with age when analysed with the other predictors. However, people of Black ethnicity, known to be at increased risk of developing glaucoma, were less likely than those of other ethnicities to report strong intention to attend such a test. This pattern of findings can be used as an evidence base for developing an intervention to be evaluated in a possible population-based screening trial.

Implications of this evidence base for designing a behavioural component of a complex intervention to improve glaucoma detection

Intention scores were generally high, as were measures of other variables that represented the way people thought about attending a hypothetical eye health test. The data indicate that a

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large proportion of this sample was highly receptive to the idea of an eye health programme to detect glaucoma. Motivation (i.e. high intention [24]) is thus possibly not a barrier to uptake of a screening programme for the majority of this sample. However, there was still a substantial proportion of the sample (54.7%) who reported some uncertainty about their intention (i.e. mean intention score <7) (Figure 1). Thus, an intervention could include components to increase motivation to attend. The distribution of intention scores (median of 6.7 on a 7-point scale) also indicated that many in the sample reported that they were highly motivated to re-arrange other priorities in order to attend a screening test. This is not to say that all people who strongly intend to attend would actually do so. We were unable to estimate the likely size of the 'intention-behaviour' gap for attendance at this hypothetical eye health test as a glaucoma screening programme is not current policy. However, the literature suggests that around 50% of people who intend to perform a health-related behaviour actually translate that intention into action.[25] Thus, intervention components could target "post-intentional" (action) processes to support increased uptake of a screening programme or an enhanced case detection programme by assisting people to translate their high intentions into actual behaviour. The inclusion of non-modifiable socio-demographic and general health variables in the predictive model enabled us to determine that, in addition to targeting modifiable predictors of intention to attend an eye test, it would be appropriate to develop an intervention that is tailored to different ethnic groups. However, there was no evidence to suggest that tailoring to different age groups is warranted.

In summary, an intervention to increase uptake could include components to increase motivation and components to increase action. In addition, tailoring of the intervention to increase motivation in people of Black ethnicity should be considered (e.g., a letter of invitation endorsed by a relevant community leader). Methods have recently been reported for developing interventions based on the evidence reported here.[26] Hence, it would be feasible to design an intervention to support both (1) motivation to attend and (2) action (attendance for testing). An intervention to increase motivation could include techniques such as persuasive communication (e.g., argument in favour of attending, delivered by letter, mass media, or an

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individual matched to the target group) to target people's beliefs about the benefits of screening (Attitude, Anticipated regret) and factors likely to make it easier to attend the test (Perceived Behavioural Control). In addition, prompts and/or reminders (e.g. letters or phone calls) and contracts (i.e. written and signed agreements to attend) could make actual attendance more likely among those who are motivated to attend for screening.

Strengths and limitations of the study

This study is the largest of its kind and uses a robust methodology based on plausible models of change to identify potential barriers to attendance for eye care. We avoided the term 'glaucoma screening' in the participant information sheet and questionnaire, instead using the phrase 'new eye health tests'. Our purpose was to minimise potential participant anxiety that they had been specifically targeted in a research study about a serious condition. However, the use of a generic description of the proposed eye test has generated results that are applicable to development of interventions for improving attendance at eye care services more generally.

The response rate was 38%, which is higher than generally achieved in similar population-based surveys.[27,28] There was evidence to suggest that this sample was representative of the target population (general population with oversampling from low socioeconomic areas). Furthermore the intention to attend an eye health test did not differ significantly between the two locations. The proportion of participants reporting having their eyes tested in the last 3 years (81%) was consistent with findings in the general population.[8] The socioeconomic status and sample characteristics of responders and non-responders suggested that responders were not distinguishable from non-responders on these variables and the desired weighting towards people in lower socio-economic groups was achieved. Furthermore, groups that might be at higher risk of developing glaucoma including hard-to-reach groups were well represented in the sample. For example, 2.0% of the UK population [29] but 10% of our sample are of Black ethnicity. In addition, there was a good spread of general health status in

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the sample, but the proportion reporting excellent health (5.5%) was lower than the UK average (21.3%).[30]

CONCLUSION

This study identified that, in a population-based sample (including over-representation of lower socioeconomic groupings), the predictors of intention to attend for sight testing to detect glaucoma were Attitude, perceived control over attendance, Anticipated regret if not attended, and black ethnicity. This evidence will inform the design of a behavioural intervention to maximise screening uptake. The intervention components that are the likely 'best bets' for targeting these factors can be selected using a tool systematically developed for this purpose.[26] This study illustrates the evidence base that is required to inform the development of interventions to influence health-related behaviours.

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Competing interests: All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that (1) MP, JB, CR, DJ, SC and JF had support for the submitted work through a Medical Research Council funded strategic grant; (2) no authors have relationships that might have an interest in the submitted work in the previous 3 years; (3) their spouses, partners, or children have no financial relationships that may be relevant to the submitted work; and (4) no authors have non-financial interests that may be relevant to the submitted work.

Contributors: At the time of the research all authors were at the University of Aberdeen Health Services Research Unit. JB, JF and CR had the original ideas for the study. JF, MP JB, SC, CR developed the questionnaire. MP and SC conducted the data collection. DJ and MP performed the statistical analysis. MP drafted the paper. All authors participated in the interpretation of results, revision and approval of the final draft. All authors had full access to all of the data in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis. JF is guarantor.

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Data sharing: No additional data available

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Table 1 Sample questionnaire items designed to assess theoretical predictors.

Section A	Items designed to measure each component	Response options
Dependent variable: Intention (Items: A1, A8, A17)	*If I received a letter inviting me to attend for an eye health test I would attend*	Strongly disagree (1) to Strongly agree (7)
Predictors:		
Attitude (Items A21A-A21F)	*For me, attending an eye health test would be…*	not worthwhile (1) to worthwhile (7) bad use of my time (1) to good use of my time (7)
Subjective Norm (Items A6,A19, A20)	*Most people who are important to me would think that I should attend an eye health test*	Strongly disagree (1) to Strongly agree (7)
Perceived Behavioural Control (Items A5, A14, A15, A22)	*Whether I attend an eye health test would be entirely up to me*	Strongly disagree (1) to Strongly agree (7)
Anticipated Regret (Items: A7, A18)	*If I was invited for an eye health test and I did not attend I would later wish I had.*	Strongly disagree (1) to Strongly agree (7)
Section B (Items B2- B9)		10-point response options
Consequences	*How much do you think glaucoma would affect your life?*	No effect at all (1) to Would severely affect my life (10)
Timeline	*How long do you think glaucoma lasts?*	Very short time (1) to Forever (10)
Personal Control	*Once a person has been diagnosed with glaucoma, how much control do you think they have over the disease?*	Extreme amount of control (1) to Absolutely no control (10)
Treatment Control	*How helpful do you think treatment is for glaucoma?*	Extremely helpful (1) to Not at all (10)
Identity	*How much do you think a person with glaucoma would experience symptoms*	No symptoms at all (1) to Many sever symptoms (10)
Concern	*How concerned are you about getting glaucoma?*	Not at all concerned (1) to Extremely concerned (10)
Coherence	*How well do you feel you understand glaucoma?*	Understand very clearly (1) to Don't understand at all (10)
Emotional Representation	*How much does the possibility of getting glaucoma affect you emotionally?*	Not at all affected emotionally (1) to Extremely emotionally affected (10)

Note: full questionnaire included as a supplementary file

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Table 2 Sample characteristics from both locations

Sample characteristic	n	(%)
Male	143	(43.7)
General Health Status		
Excellent	18	(5.5)
Very Good	79	(24.2)
Good	134	(41.0)
Fair	71	(21.7)
Poor	18	(5.5)
Heard of the term glaucoma	280	(85.6)
Last Eye Test within 3 years	265	(81.0)
Black Ethnicity (Black British, Caribbean, African)	33	(10.1)
Diabetic	37	(11.3)
Short-sighted	144	(44.0)
Family history of glaucoma	53	(16.2)

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Table 3 Summary statistics for theory-based variables in the analysis including correlations with intention scores.

Section & Factor	Mean (sd)	Median (Q1, Q3)	Pearson correlation with intention score
Section A: Attending an eye health test			
Intention	6.3 (1.0)	6.7 (6.0, 7.0)	
Attitude	6.3 (1.0)	6.7 (6.0, 7.0)	0.67**
Subjective Norm	6.0 (1.2)	6.3 (5.3, 7.0)	0.59**
Perceived Behavioural Control	6.3 (0.8)	6.5 (6.0, 7.0)	0.71**
Anticipated Regret	6.0 (1.2)	6.5 (5.5, 7.0)	0.76**
Section B: Illness and emotional representations of glaucoma			
Consequences	8.6 (1.9)	9.5 (8.0, 10.0)	0.44**
Timeline	8.6 (2.0)	10.0 (8.0, 10.0)	0.24**
Personal control	6.2 (2.7)	6.0 (4.0, 8.0)	-0.43
Treatment control	3.2 (2.4)	3.0 (1.0, 5.0)	0.28**
Identity	6.8 (2.4)	7.0 (5.0, 8.5)	0.17**
Illness concern	7.3 (2.8)	8.0 (5.0, 10.0)	0.35**
Coherence	6.6 (2.7)	7.0 (5.0, 9.0)	0.16**
Emotional representation	6.0 (2.8)	6.0 (4.0, 8.0)	0.25**

Note: Scales ranged from: (1) negative intention/belief to (7) positive intention/belief (Section A); (1) positive representation of glaucoma to (10) negative representation of glaucoma (Section B).
**p<0.01

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Table 4 Independent sample t-tests on intention scores.

		N[#]	Mean Intention Score	SD	t	p
Heard of glaucoma	Yes	280	6.33	0.91	2.04	0.047**
	No	44	5.87	1.43		
Gender	Male	143	6.28	0.88	0.17	0.868
	Female	177	6.30	1.05		
Ethnicity	All Black ethnicities	33	5.80	1.51	2.05	0.048**
	All other ethnicities	281	6.35	0.87		
Diabetes	Yes	37	6.41	0.98	0.71	0.476
	No	278	6.29	0.96		
Last eye test	Within the last 3 years	265	6.29	1.00	0.17	0.867
	More than 3 years ago/never	56	6.31	0.86		
Short-sighted	Yes	144	6.30	0.91	0.84	0.402†
	No	107	6.19	1.14		
	Don't know	61	6.44	0.82		
Family history of Glaucoma	Yes	53	6.43	0.69	1.11	0.269†
	No	172	6.27	1.00		
	Don't know	94	6.30	0.99		

Numbers for each variable do not add up to 327 as some participants did not provide the information

† The test was between "yes" and "no" with those answering "don't know" left out. When the t-tests were repeated with the variables coded dichotomously (yes versus 'not yes') the t-tests remained non-significant.

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Table 5 Hierarchical regression model summary for predicting intention to attend and eye test.

Model	R^2	R^2 Change	p-value
1	0.651	0.651	<0.001
2	0.738	0.088	<0.001
3	0.747	0.009	0.006
4	0.752	0.004	0.025

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Table 6 Coefficients of terms in the final model (Model 4) for predicting intention to attend and eye test.

Variable	Coefficient	Standard Error	95% CI	p-value
(Constant)	-0.067	0.248	(-0.556,0.421)	0.786
Attitude	**0.176**	0.039	(0.098,0.253)	**0.000**
Subjective norm	**0.067**	0.030	(0.007,0.126)	**0.028**
Perceived Behavioural Control	**0.407**	0.046	(0.316,0.499)	**0.000**
Anticipated regret	**0.298**	0.033	(0.232,0.363)	**0.000**
Consequences of glaucoma	**0.045**	0.016	(0.013,0.078)	**0.006**
Illness concern	0.016	0.011	(-0.006,0.037)	0.153
Black ethnicity	**-0.212**	0.094	(-0.396,-0.027)	**0.025**

Figure 1 Frequency distribution of mean intention scores (possible range 1 – 7).

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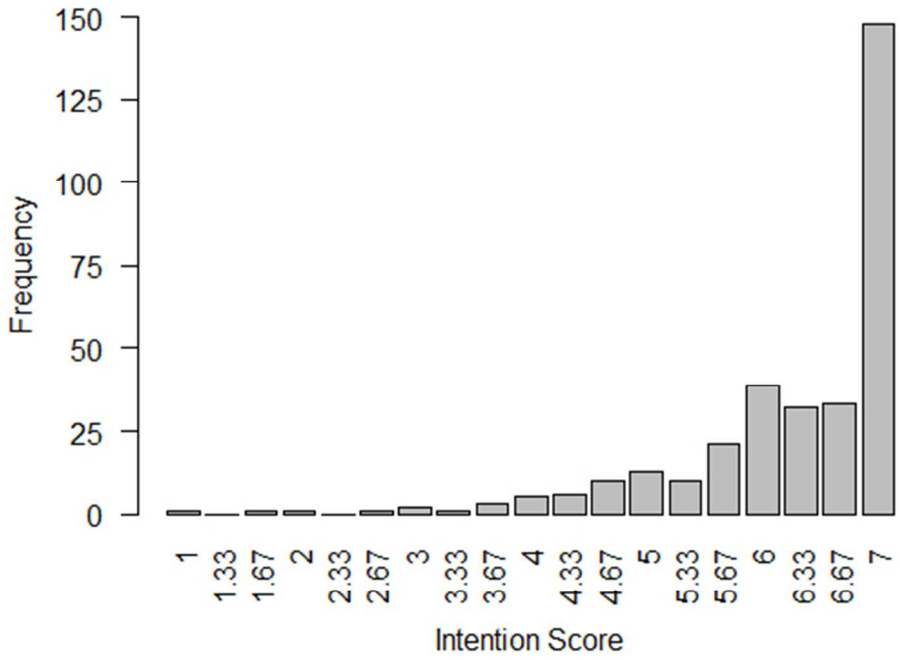

Figure 1 Frequency distribution of mean intention scores
194x158mm (72 x 72 DPI)

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Study No

New Eye Health Tests

Questionnaire

Thank you for taking the time to help us with this study

Confidential

The aim of this study is to find out your views on possible new NHS eye health tests.

These tests would be a separate service to the routine eyesight tests currently offered at High Street Opticians.

Your answers to this questionnaire will help us to identify how best to offer new NHS eye health tests.

Unfortunately, we are not able to invite you to attend an eye health test as part of this study.

We are just asking for your views.

HOW TO FILL IN THIS QUESTIONNAIRE

We are interested in **your own personal views,** not what you think we want to hear.
There are no right or wrong answers.

Most questions can be answered by **ticking** the appropriate box (ONE box only)

For example

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☑	☐	☐	☐	☐	☐	

If you make a mistake, shade out the wrong box and tick the correct one like this

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☑	☐	☑	☐	☐	☐	

All the answers you give are useful to us.

Please try to complete the whole questionnaire.

Section A – YOUR views on eye health tests

Please tell us what **YOU** think about eye health tests.

For each question choose a number between 1 and 7 that best reflects your views (Tick ONE box only)

A1. If I received a letter inviting me for an eye health test I would attend

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A2. If I attend an eye health test it would tell me whether or not I had a problem with my eyes

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A3. If I attended an eye health test and it detected a problem with my eyes I would be anxious

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A4. If I attend an eye health test, any problems would be picked up early

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A5. Whether I attend an eye health test would be entirely up to me

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A6. Most people who are important to me would think that I should attend an eye health test

Strongly disagree	1	2	3	4	5	6	7	Strongly agree
	☐	☐	☐	☐	☐	☐	☐	

A7. If I was invited for an eye health test and I did *not* attend I would feel sorry

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A8. I would make it a high priority to attend an eye health test

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A9. If I attend an eye health test it would find problems before I notice anything is wrong

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A10. If I attended an eye health test and it detected a problem with my eyes, the problem could be treated

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A11. If I attended an eye health test and it detected *no* problems it would give me peace of mind

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A12. If I attended an eye health test it would pick up additional eye problems to a routine/normal eye sight test

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A13. If I attend an eye health test it may show up other health problems (e.g. diabetes, high blood pressure)

Strongly disagree 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Strongly agree

A14. I am confident that I *could* attend an eye health test if it was available

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A15. The decision to attend an eye health test would be within my control

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A16. If I attended an eye health test and it detected a problem with my eyes it could stop me losing my sight

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A17. I would rearrange other things in order to attend an eye health test

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A18. If I was invited for an eye health test and I did not attend I would later wish I had

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A19. My close relatives would want me to attend an eye health test

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

A20. My friends would want me to attend an eye health test

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

For each of the following options choose a number between 1 and 7 that best reflects YOUR views (Tick ONE box only)

A21. *For me*, attending an eye health test would be…

	1	2	3	4	5	6	7	
Not worthwhile	☐	☐	☐	☐	☐	☐	☐	Worthwhile
Bad use of my time	☐	☐	☐	☐	☐	☐	☐	Good use of my time
Unimportant	☐	☐	☐	☐	☐	☐	☐	Important
Unpleasant	☐	☐	☐	☐	☐	☐	☐	Pleasant
Uninformative	☐	☐	☐	☐	☐	☐	☐	Informative
Bad for my eye health	☐	☐	☐	☐	☐	☐	☐	Good for my eye health

A22. Attending an eye health test would be…

	1	2	3	4	5	6	7	
Difficult for me	☐	☐	☐	☐	☐	☐	☐	Easy for me

A23. If I was sent an eye health appointment for a specific day and time it would be…

	1	2	3	4	5	6	7	
Difficult for me to attend	☐	☐	☐	☐	☐	☐	☐	Easy for me to attend

A24. If an eye health test was available locally (e.g. within 10 miles) it would be…

	1	2	3	4	5	6	7	
Difficult for me to attend	☐	☐	☐	☐	☐	☐	☐	Easy for me to attend

A25. If an eye health test was only available during working hours it would be…

Difficult for me to attend	1	2	3	4	5	6	7	Easy for me to attend
	☐	☐	☐	☐	☐	☐	☐	

A26. If an eye health test was available during evenings and weekends it would be…

Difficult for me to attend	1	2	3	4	5	6	7	Easy for me to attend
	☐	☐	☐	☐	☐	☐	☐	

A27. If the location for the eye health test was a Community Health Centre (GP surgery) it would be …

Difficult for me to attend	1	2	3	4	5	6	7	Easy for me to attend
	☐	☐	☐	☐	☐	☐	☐	

A28. If the location for the eye health test was a High Street Optician it would be...

Difficult for me to attend	1	2	3	4	5	6	7	Easy for me to attend
	☐	☐	☐	☐	☐	☐	☐	

A29. Showing up other health problems (e.g. diabetes, high blood pressure) in the eye health test is…

Unimportant	1	2	3	4	5	6	7	Important
	☐	☐	☐	☐	☐	☐	☐	

A30. My close relatives' views about me attending an eye health test are important to me

Not at all	1	2	3	4	5	6	7	Very much so
	☐	☐	☐	☐	☐	☐	☐	

A31. My friends' views about me attending an eye health test are important to me

Not at all	1	2	3	4	5	6	7	Very much so
	☐	☐	☐	☐	☐	☐	☐	

Section B - Your views on the eye condition glaucoma

B1. Have you heard of the eye condition glaucoma?

Yes ☐ No ☐

For the following questions choose a number between 0 and 10 that best reflects your views (Tick ONE box only)

B2. How much do you think glaucoma would affect your life?

No effect at all	1	2	3	4	5	6	7	8	9	10	Would severely affect my life
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B3. How long do you think glaucoma lasts?

Very short time	1	2	3	4	5	6	7	8	9	10	Forever
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B4. Once a person has been diagnosed with glaucoma, how much control do you think they have over the disease?

Absolutely no control	1	2	3	4	5	6	7	8	9	10	Extreme amount of control
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B5. How helpful do you think treatment is for glaucoma?

Not at all	1	2	3	4	5	6	7	8	9	10	Extremely helpful
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B6. How much do you think a person with glaucoma would experience symptoms?

No symptoms at all	1	2	3	4	5	6	7	8	9	10	Many severe symptoms
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

B7. How concerned are you about getting glaucoma?

Not at all concerned ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 Extremely concerned

B8. How well do you feel you understand glaucoma?

Don't understand at all ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 Understand very clearly

B9. How much does the possibility of getting glaucoma affect you emotionally?

Not at all affected emotionally ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 Extremely affected emotionally

B10. Please list in order of importance the 3 most important factors that you believe cause glaucoma

1. _____
2. _____
3. _____

Section C - Can you tell us a little bit about yourself?

C1. Are you...

Male ☐ Female ☐

C2. What is your age?

☐ years

C3. In general, would you say your health is... (please tick one box only)

Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Poor ☐

C4. Ethnic group

Please tick the box that best describes your ethnic group (please tick ONE box only)

White British ☐

Any other White background ☐

Black or Black British – Black Caribbean ☐

Black or Black British – Black African ☐

Black or Black British (Any other Black background) ☐

Asian or Asian British ☐

Chinese ☐

Mixed – White and Black Caribbean ☐

Mixed – White and Black African ☐

Mixed – White and Asian ☐

Any other mixed background ☐

Any other ☐

Prefer not to answer ☐

C5. Do you have diabetes (Type 1 or 2)?

Yes ☐ No ☐

C6. When did you last have your eyes tested?

Within the last 3 years ☐ More than 10 years ago ☐

Between 3 and 5 years ago ☐ Never ☐

Between 5 and 10 years ago ☐

C7. Are you short-sighted?

Yes ☐ No ☐ Don't know ☐

C8. Is there a history of glaucoma in your family?

Yes ☐ No ☐ Don't know ☐

Section D – Would you attend this eye health appointment?

Please choose a number between 1 and 7 (Tick ONE box only)

D1. Please imagine that you receive a letter inviting you to attend an eye health test. The letter contains the following information:

- a fixed appointment time that you can change if it is not convenient
- the test will be done at your Community Health Centre (GP surgery)
- the test takes about 15 minutes
- appointments are available outside of working hours

How certain are you that you would attend this eye health appointment?

I am certain I would *not* attend	1	2	3	4	5	6	7	I am certain I would attend
	☐	☐	☐	☐	☐	☐	☐	

I am not sure

End of questionnaire

Thank you very much for your time and patience in filling in this questionnaire

The information you have given us will be extremely useful to us

It will be treated with the strictest confidence and kept securely

Please send the questionnaire back to us in Aberdeen in the pre-paid envelope provided

If you would like further information or have any questions about the study, please contact:

The Eye Health Screening Study Co-ordinator – Dr. Maria Prior (Tel: 01224 559800)

This study is taking place across the UK but questionnaires are being processed in Aberdeen at the Health Services Research Unit, University of Aberdeen, Health Sciences Building, Foresterhill, ABERDEEN, AB25 2ZD

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New Eye Health Tests: your views

A Questionnaire Study

Dear <<title name>>

We are writing to ask if you will answer some questions as part of an important new study into eye health. Please note, **we are not asking you to have an eye test, only to fill in a questionnaire**. The study is funded by the Medical Research Council and is part of internationally recognised research looking at whether introducing new NHS eye health tests would be worthwhile.

Why are we doing this study?

Certain eye conditions do not cause obvious symptoms in the early stages. By the time people notice anything is wrong, there may be permanent damage to their vision. We want to find out whether introducing new NHS eye health tests would reduce the number of people who go on to have serious vision problems. These tests would be a separate service to the routine eyesight tests currently offered at High Street Opticians in the UK.

Why have you been chosen?

We want people like you - who might be invited to have a test if it was available – to give us your personal views about a proposed new NHS eye health test programme. Your answers to the questionnaire will help us to decide how best to design this kind of programme.

This letter is being sent to about 500 people, chosen from the electoral register, in your area. **Whether you think you have an eye problem or not, we would like you to complete the questionnaire.**

What do you have to do to take part?

All you will need to do is to complete the enclosed questionnaire and return it in the reply-paid envelope provided. The questionnaire should take about 10 minutes to complete.

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HSRU is supported by the Chief Scientist Office, Scottish Executive Health Department
www.abdn.ac.uk/hsru

Do you have to take part?

Taking part is entirely voluntary. If you decide not to take part, please return your blank questionnaire in the reply-paid envelope. However, if we have not heard from you at all after two weeks we will write to you again. If we do not hear from you after the second letter, we will not contact you again.

Who will know what I say?

The information you provide will be strictly confidential. Your name will not appear on your questionnaire or anywhere else. The answers you give us will be transferred to a secure computer database that is only accessible to researchers involved in this study. All information will be kept securely within the Health Services Research Unit at the University of Aberdeen for ten years, in line with current Research Governance requirements. It will then be destroyed.

Is an NHS eye health test available now?

No. Unfortunately, we are not able to invite you to attend an eye health test as part of this study.

What are the possible benefits of taking part?

Taking part in this study will be of no direct benefit to you. However, it may benefit others in the future. We have interviewed several people as part of this study and they have told us they are pleased to be asked their views about new NHS programmes before they are introduced, as this gives them the chance to influence how the health service is run.

If you would like any further information on this study, or have any questions about the study, or about the questionnaire, please do not hesitate to contact Maria Prior at the address above.

Yours sincerely

Dr Maria Prior
Study Co-ordinator
on behalf of the Eye Health Screening Study Team

This study has been approved by the Ethics Review Board of the College of Life Sciences and Medicine of the University of Aberdeen.

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1✓	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
	✓	(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2✓	Explain the scientific background and rationale for the investigation being reported
Objectives	3✓	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4✓	Present key elements of study design early in the paper
Setting	5✓	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6✓	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7✓	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*✓	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9✓	Describe any efforts to address potential sources of bias
Study size	10✓	Explain how the study size was arrived at
Quantitative variables	11✓	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12✓	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
	✓	(*c*) Explain how missing data were addressed
		(*d*) If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses
Results		
Participants	13*✓	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*✓	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*✓	Report numbers of outcome events or summary measures
Main results	16✓	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

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Discussion		
Key results	18✓	Summarise key results with reference to study objectives
Limitations	19✓	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20✓	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21✓	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22✓	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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