VISUAL IMPAIRMENT, VISUAL FUNCTIONING, AND QUALITY OF LIFE ASSESSMENTS IN PATIENTS WITH GLAUCOMA

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PURPOSE

Background/Purpose: To determine the relation between visual impairment, visual functioning, and the global quality of life in patients with glaucoma.

Methods: Visual impairment, defined with the American Medical Association Guides to the Evaluation of Permanent Impairment; visual functioning, measured with the VF-14 and the Field Test Version of the National Eye Institute - Visual Functioning Quenstionnaire (NEI-VFQ); and the global quality of life, assessed with the Medical Outcomes Study 36 - Item Short Form Health Survey (SF-36), were determined in 147 consecutive patients with glaucoma.

Results: None of the SF-36 domains demonstrated more than a weak correlation with visual impairment. The VF-14 scores were moderately correlated with visual impairment. Of the twelve NEI-VFQ scales, distance activities and vision specific dependency were moderately correlated with visual impairment. Of the twelve NEI-VFQ scales, distance activities and vision specific dependency were moderately correlated with visual field impairment; vision specific social functioning, near activities, vision specific role difficulties, general vision, vision specific mental health, color vision, and driving were modestly correlated; visual pain was weakly correlated; and two were not significantly correlated. Correcting for visual actuity weakened the strength of the correlation coefficients.

Conclusions: The SF-36 is unlikely to be useful in determining visual impairment in patients with glaucoma. Based on the moderate correlation between visual field impairment and the VF-14 score, this questionnaire may be generalizable to patients with glaucoma. Several of the NEI-VFQ scales correlate with visual field impairment scores in patients with a wide range of glaucomatous damage.

INTRODUCTION

QUALITY OF LIFE HISTORICAL PERSPECTIVE

Traditionally, the success or failure of medical therapy has been judged by meeting an objective criterion. A consensus has evolved that preferential-

ly values the perception of the patient as the central determinant in monitoring the outcomes of medical intervention.[1-3] This grows from a recognition that patients themselves are not interested in improvements in a biomedical indicator, but rather in how treatment affects their quality of life. Meeting an objective treatment goal, such as lowering of total serum cholesterol levels, remains an important therapeutic concept, but how treatments that achieve this goal effect the perception of well-being and the ability to function effectively as an independent "whole person" are also being considered.[4-9] Although physicians have considered themselves genuinely interested in the well-being of patients in ways that extend beyond the assessment of objective data, the instruments, such as questionnaires or interview techniques, that permit valid, reliable, responsive, easily analyzed, and generalizable determinations of general health status have only recently been developed.[1]

The World Health Organization defined quality of life as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, and their relationship to salient features of their environment."[10] The term "quality of life," or the subjective perception of well-being and wholeness, was initially applied by behavioral researchers who attempted to evaluate the effects of social programs.[11-13] This concept of quality of life was later utilized in the assessment of chronically ill patients, including those with mental illness,[14] cancer,[15-17] and cardiovascular disease,[18] and in the elderly.[19-20] Quality of life issues have been addressed in various other medical groups, and several disease-specific quality of life instruments have been developed for use: Functional Assessment of Cancer Therapy—Lung (FACT-L),[21] Cancer Rehabilitation Evaluation System (CARES),[22] Memorial Symptom Assessment Scale (MSAS),[23] The European Organization for Research and Treatment of Cancer QLQ-C30 (EORTC QLQ-C30),[24] Cancer Rehabilitation Evaluation System—short form (CARES-SF),[25] Life Ingredient Profile (LIP),[26] neuromuscular disorders,[27] Bristol-Myers Anorexia/Cachexia Recovery Instrument (BACRI),[28] Gastrointestinal Quality of Life Index (GIQLI),[29] Kidney Disease Quality of Life (KDQOL),[30] Respiratory Disease Questionnaire (RDQ),[31] inflammatory bowel disease questionnaire (IBDQ),[32] Asthma Quality-of-Life Questionnaire (AQLQ),[33-34] adults with growth hormone deficiency,[35] head and neck radiotherapy questionnaire (HNRQ),[36] and Epilepsy Surgery Inventory (ESI-55).[37]

Patients with glaucoma, specifically primary open-angle glaucoma,

infrequently present with visual or systemic symptoms. The failure of primary open-angle glaucoma to produce visual symptoms until either visual field loss or diminished central acuity, or both, have occurred has thwarted efforts at early diagnosis. In a recent survey of outpatient visits in the United States in 1991 and 1992, an estimated 17.5 million visits were made to nonfederally employed, office-based physicians with the principal, or first-listed diagnosis of "glaucoma."[38] An additional 3.2 million visits occurred over this same period, which included glaucoma as the second- or third-listed diagnosis. Glaucoma ranked second only to cataract as the principal diagnosis at office visits and accounted for 15.3% of the visits. Of the 8,742,000 average annual visits, the principal reason for the visit was the disease module "glaucoma" itself. Only 825,000 (9.4%) of the total visits were related to symptoms, and of those only 536,00 (6.1%) were due to visual symptoms.[38] After glaucoma has been diagnosed, the perception of the quality of life of the patient may be altered not only by the disease process that results in progressive axonal injury and attendant visual field and acuity loss, but also by the anxiety elicited by diagnosis itself. The term "glaucoma" may induce implicit fears of blindness and immediately alter perceptions of well-being and future health problems.[39]

Quality of life assessments are further confounded by the effect of medical and surgical treatments of glaucoma.[39] Associated local side effects of medical therapy, such as miosis and ocular irritation, may produce symptoms in an otherwise asymptomatic patient. Although the objective assessment of progressive glaucomatous damage based on measurement of visual field loss and optic nerve injury is widely accepted, quality of life assessments are considerably more complex when the side effects of therapy are superimposed on frequently both visually and systemically asymptomatic patients early in the course of their disease. Because both glaucoma and its medical and surgical treatment may affect the global quality of life, as well as visually related quality of life, assessment of general health status and visual system health status is relevant. Lichter summarizes the associations as follows: "The ophthalmologist must consider the ways in which glaucoma can affect a patient's life and recognize that these effects begin when the disease is diagnosed and carry forth from treatment effects to other physical and social effects."[39]

GENERIC QUALITY OF LIFE INSTRUMENTS

Although the importance of quality of life as a medical outcome variable is becoming increasingly accepted, agreement on how it should be measured is only beginning.[4] There is a growing appreciation that instruments based on subjective data from patients provide important information that may

not be evident from physiologic measurements and may be just as reliable as many clinical, biomedical, or physiologic indexes on which doctors have traditionally relied. Generic instruments are designed to assess broad concepts of health and well-being that are applicable across a range of different types of diseases, medical interventions, and demographic and cultural subgroups. In the context of visually impaired patients, these instruments are constructed to gain information beyond the immediate impact of a particular visual disorder and to identify and quantitate the impact on wider aspects of daily living, such as self-care, mobility, and dependency. Several generic measures of health status have been used to measure quality of life in patients with visual disorders.

Medical Outcomes Study Short Form-36 (SF-36)

The Medical Outcomes Study–derived Short Form-20 (SF-20), and more recently the Medical Outcomes Study Short Form-36 (SF-36) have been widely studied and accepted as measures of global health status.[40-42] Worldwide, 15 investigators have developed and evaluated translations of the SF-36 for the International Quality of Life Assessment (IQOLA) Project.[43,44] The goal of the IQOLA Project was to culturally adapt, translate, validate, and normalize the SF-36 for use in Argentina, Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, the United Kingdom, and the United States, including the Mexican-American version.

The SF-36 includes one multi-item scale that assess 8 health concepts: (1) limitations in physical activities because of health problems, 10 items with 21 levels; (2) limitations in social activities because of physical or emotional problems, 4 items with 5 levels; (3) limitations in usual role activities because of physical health problems, 2 items with 9 levels; (4) bodily pain, 2 items with 11 levels; (5) general mental health (psychological distress and well-being, 5 items with 26 levels; (6) limitations in usual role activities because of emotional problems, 3 items with 4 levels; (7) vitality (energy and fatigue), 4 items with 21 levels; and (8) general health perceptions, 5 items with 21 levels. The questions have been intensively studied and normative values have been established to assist in the interpretation of the SF-36 response.[42] This instrument has been used to define generic health status in specific disease entities, such as human immunodeficiency virus infection,[45,46] and several chronic conditions, such as headaches[47,48] and hypertension.[49] The SF-36 is being used as a measure of general health–related quality of life in the Ocular Hypertension Treatment Study (OHTS)(National Institutes of Health, Bethesda, Md) in which patients with ocular hypertension are randomized either to receive

initial medical treatment or to be closely observed.[50] The SF-36 was also chosen to evaluate the global health related effects of treatment of patients with keratoconus in the Collaborative Longitudinal Evaluation of Keratoconus study (CLEK) (National Institutes of Health, Bethesda, Md). Both investigations are ongoing and the results have not been published.

Sickness Impact Profile and Vision-Specified Sickness Impact Profile

The Sickness Impact Profile (SIP)[51] and the modified vision-specific Sickness Impact Profile (SIPV)[52] have been used to study quality of life in patients with visual disorders, specifically those with retinal vascular disease[52] and cataracts.[53-55] The validity and reliability of the SIP have been demonstrated repeatedly[56-61] and comparative data are available for several populations of healthy adults,[62-64] as well as for specific disease conditions, such as rheumatoid arthritis,[65] angina,[66] back pain,[67,68] cancer,[69] end-stage renal disease,[70] myocardial infarction,[71] and chronic obstructive pulmonary disease.[72,73]

The SIP profiles general health status in 12 subscales: SR, sleep and rest; E, eating; W, work; HM, home management; RP, recreation and pastimes; A, ambulation; M, mobility; BCM, body care and movement; SI, social interaction; AB, alertness behavior; EB, emotional behavior; and C, communication. None of the specific subscales are directly a measure of visual function or visual impairment. In the vision-specific SIP, the respondent is asked to indicate if the limitation on activity occurred as a direct result of decreased visual function.

The SIP specified for the effects of glaucoma and glaucoma treatment has been included as one of several questionnaires that are being used to assess the quality of life in the Collaborative Initial Glaucoma Treatment Study (CIGTS), a clinical trial sponsored by the National Eye Institute, Bethesda, Md. In this study, the risks and benefits of initial treatment with medical therapy versus surgical intervention are compared prospectively.

Community Disability Scale (CDS) and General Health Questionnaire

The Community Disability Schedule (CDS)[74] has been used to assess the functional status of patients with retinal vascular disease.[52] The subscales of activities of daily living, instrumental activities of daily living, and mobility have been demonstrated to be valid and reliable in several patient groups.[75] The General Health Questionnaire (GHQ)[76] was used to assess emotional well-being in patients with retinal vascular disorders, as well as in a variety of settings.[77-83] The 4 subscales (A-D) survey somatic symptoms (A), anxiety and insomnia (B), social dysfunction (C), and severe depression (D). The scores of the vision-specific Sickness Impact Profile and the

Community Disability Scale were independently associated with visual acuity in a group of patients with retinal vascular disorders; however, the SIP and GHQ were of no additional discriminant value.[52]

VISION-SPECIFIC QUALITY OF LIFE OR VISUAL FUNCTION INSTRUMENTS

The VF-14

This recently developed visual system–related instrument was developed to identify a broad spectrum of vision-dependent activities performed in everyday life that can be affected by cataract.[53-55,84] The following functional activities were included in the 18 questions from which the VF-14 was derived.[53]

1. Reading small print, such as labels on medicine bottles, a telephone, book or food labels
2. Reading a newspaper or book
3. Reading a large-print book or newspaper or the numbers on a telephone
4. Recognizing people when they are close to you
5. Seeing steps, stairs, or curbs
6. Reading traffic, street, or store signs
7. Doing fine handwork such as sewing, knitting, crocheting, or carpentry
8. Writing checks or filling out forms
9. Playing games such as bingo, dominoes, card games, or mahjong
10. Taking part in sports such as bowling, handball, tennis, or golf
11. Cooking
12. Watching television
13. Daytime driving
14. Nighttime driving

The VF-14 has been demonstrated to be a predictor of patient outcome or patient satisfaction after cataract extraction independent of age, comorbidity, or cataract symptom.[84] When tested in an observational longitudinal study in the same group of patients who had undergone previous cataract surgery who were tested at 4 and 12 months postoperatively, the VF-14 was highly reproducible.[55] The VF-14 was about 3 times more responsive to a change in vision than the SIP in patients with cataracts.

Activities of Daily Vision Scale

Mangione and coworkers[85] reported the usefulness of a scale, the Activities of Daily Vision Scale (ADVS), that was studied to evaluate visual function in patients with cataracts. Twenty visual activities were identified and categorized into 5 subscales (distance vision, near vision, glare disability, night

driving, and daytime driving). The investigators concluded that substantial visual disability was not captured by routine visual testing and that the ADVS was a reliable and valid measure of a the perception of visual functional impairment.[86] Twenty-eight percent of the variance in measured binocular vision loss was explained by the ADVS subscales. The test of correlational validity between the ADVS and the SF-36 10-item physical functioning scale was significant but less than expected by the investigators.[86] Because physical functioning is dependent not only on visual function but also on neuromuscular and cognitive function, elderly patients in the group studied may have had physical disabilities that affected their ability to perform generic physical functioning activities.

Visual Activities Questionnaire

Sloane and coworkers[87] recently developed an instrument, the Visual Activities Questionnaire, (VAQ), to assess 10 target areas in older adults: vision under low illumination, peripheral vision, visual processing speed, visual search, acuity (both near and distance tasks), color vision and contrast sensitivity, disability glare, light and dark adaptation, depth perception, and motion/dynamic sensitivity. Based on the 10 target areas, 10 statements were developed to test each area, for a total of 100 items. Subjects were asked to respond to the statement based on a 5-point scale by indicating "never, rarely, sometimes, often, and always." Factor analysis was used to determine 8 factors that were valid and were grouped together on the basis of the responses: peripheral vision, acuity, visual search, depth, color, adaption, glare, and processing speed. Thirty-three items were selected for the shortened VAQ on the basis of high internal consistency demonstrated with Cronbach alpha coefficients that exceeded 0.80. The investigators concluded that the VAQ had good reliability, had reasonable validity given the complexity of self-report judgments about health and behavior problems, and was brief to administer. The VAQ has been included as part of a panel of questions that is being used to study visual functioning in the Collaborative Initial Glaucoma Treatment Study (CIGTS).

The National Eye Institute Visual Functioning Questionnaire (NEI-VFQ)

The Test Version of the National Eye Institute Visual Functioning Questionnaire (NEI-VFQ), a targeted multidimensional survey, was designed to represent the perspective of the patient with respect to visual disabilities and their impact on daily functioning. The Field Test Version of the NEI-VFQ consists of a generic core of items that are relevant to the majority of visually impaired adults, irrespective of the cause of the visual

disability. The NEI-VFQ employs 12 different scales including: (1) general health, 2 items; (2) general vision, 2 items; (3) visual pain, 2 items; (4) near activities, 7 items; (5) distance activities, 7 items; (6) vision-specific social functioning, 4 items; (7) mental health, 8 items; (8) expectations, 3 items; (9) role difficulties, 5 items; (10) dependency, 5 items; (11) driving, 4 items; and (12) color vision, 1 item. A single question regarding peripheral vision that is not part of a scale is included. Since there is no published reference containing the exact questions in the NEI-VFQ, the questionnaire and the standard Spanish translation version are included for reference (see Appendix).

Other Glaucoma Visual Functional Tests

Several other vision specific scales, proposed by Haase and Bryant,[88] Bernth-Petersen,[89] Colenbrander,[90] Applegate,[91] Brenner,[92] Golden,[93] Javitt,[94] Kosnik,[95] have been developed to measure functional distance vision loss; however, none have been universally accepted for the assessment of patients with glaucoma. Additional questionnaires have been suggested to define the level of functional loss in patients with glaucoma.[96,97] Ross and coworkers[96] generated a questionnaire for the purpose of judging disability of visually dependent daily activities, and assessed the relationship of the disability to the visual defect determined by several objective tests. Perceived visual disability was quantified using a fully piloted questionnaire of 84 questions about the effect of vision on everyday activities. Five life areas were studied: self-care, domestic tasks, navigation, travel, and leisure. Responses were recorded on a 5-point unipolar rating scale from "no disability" to "severe disability." The previously published paraphrased version of questions used in their factor analysis included the following:

Difficulty with dressing, seeing food on plate
Time taken to eat food
Difficulty cooking
Difficulty with housework
Confidence in street
Care crossing street
Seeing moving vehicles
Care on uneven pavement
Difficulty on outside steps
Moving in unfamiliar places
Difficulty in walking in dark
Reading instructions on packets etc
Enjoyment of television

Recognizing faces

Effect of eyesight on leisure activities

Near visual acuity, visual field, and contrast sensitivity were the best predictors of the difficulty experienced by patients in performing visually dependent daily activities. Distance visual acuity, one of the main criteria for defining partial sight and blindness registration in the United Kingdom, was not highly correlated with the disability (factor) scores. Eleven patients with visual acuity of 20/40 or better and a negative factor score suffered only mild field loss.

Mills and Drance[97] devised a visual field disability questionnaire specifically for determining visual symptoms that were related to peripheral visual field loss and not to central acuity loss. The following questions were developed to determine disability in patients with advanced glaucoma.

1. Do you have any problems with your vision?
2. Are these problems mostly corrected with glasses?
3. Is your trouble mostly in focusing or in getting around?
4. Do you trip on things?
5. Do you bump into things?
6. Do you have trouble locating things?
7. Do you have trouble following a line of print or finding the next line?
8. Are moving things easier to see than things that are standing still?
9. At the cinema, do you sit at the back or the front?
10. Do you see better on grey days or sunny days?
11. Do objects ever suddenly appear when you should have noticed them before?
12. Do you have trouble finding your own clothing in closets or on coat racks?
13. Do you notice any variation in color richness from time to time?
14. Have you had trouble doing certain things because of your vision?
15. Have you had to give up any activities because of your vision?

Of this group of questions, only 4 were correlated with or predictive of visual field disability scores when measured with the binocular visual field with an automated perimeter: "Do you have trouble following a line of print or finding the next line?", "Do you bump into things?", "Have you had to give up any activities because of your vision?", and "Do you notice any variation in color richness from time to time?"[97]

STANDARDIZED MEASUREMENT OF VISUAL IMPAIRMENT

American Medical Association Guides to the Evaluation of Permanent

Impairment

The process of visual disability determination has continually evolved. The American Medical Association (AMA) Guides to the Evaluation of Permanent Impairment, the nationally accepted standard for determining not only visual but whole-person disability, is in its fourth edition.[98] The stated purpose in chapter 8, The Visual System, is "to provide criteria and a method for evaluating permanent impairments of the visual system and relating them to permanent impairment of the whole person." Furthermore, the Guides state, "Visual impairment occurs in the presence of a deviation from normal in one or more of the functions of the eye, which include (1) corrected visual acuity for near and far objects, (2) visual field perceptions, and (3) ocular motility with diplopia." Impairment of usual vision-related daily activities is implied in the definition of the Guides; however, no specific functional definition of visual disability based on either patient report or objectively measured performance is provided, nor are any general or vision-specific quality of life instruments suggested as possible instruments to measure the disability.

Central Visual Acuity

For many purposes it has been assumed that judgments of visual disability can be made on the basis of an acuity measure.[96] For example, the United Kingdom Blindness and Partial Sight registration employs acuity as the primary criterion of disability.[96] Most prospective clinical trials, such as the Diabetic Retinopathy Study Research Group,[99] the Macular Photocoagulation Study Group,[100] and the Early Treatment of Diabetic Retinopathy Study[101] used visual acuity as the primary outcome variable. Visual acuity is easily measured, and determination involves no inconvenience or discomfort to the patient. Distant Snellen acuity scores can be converted to a scale that is easily subjected to statistical analysis.[102,103] In the AMA Guides, table 2 is used for the conversion of distant acuities, tested at either 6 m (20 ft) or at no less than 4 m (13 ft 1 in), and near acuities, measured at 35 cm (14 in) with the Revised Jaeger Standard optotypes, into corresponding percentages of loss of central vision for each eye individually. A separate table (table 3) provides a rating of loss in percent of central vision in a single eye, which is calculated by weighting both central and near acuities. The AMA Guides dictate that central vision be reduced by 50% if 1 eye is aphakic or pseudophakic.

Peripheral Visual Field Measurement

In the AMA Guides visual fields are evaluated as the ability to see a standard stimulus, either in terms of the peripheral-most extent along 8 merid-

ians at which the stimulus is seen (method 1) or in terms of the proportion of a predefined region in which the standard stimulus is or is not visible (method 2).[98] The traditional standard stimulus is the 111-4e kinetic stimulus of the Goldmann Bowl perimeter. The IV-4e stimulus is used in aphakic patients without a lens implant or contact lens. In method 1, the peripheral-most extent over which the static stimulus is seen is noted in each of the 8 principal meridians. The normal extent of the meridians is as follows: temporal, 85°; down temporally, 85°; direct down, 65°; down nasally, 50°; nasally, 60°; up nasally, 55°; direct up, 45°; up temporally, 55°; and totals, 500°. The percentage of retained vision is calculated by adding the extent of the visual field along each of the 8 meridians and then dividing by 5. To calculate the percentage of visual field lost, the visual field remaining is subtracted from 100 and assigned a percentage value.

Monocular Functional Visual Field Testing

In 1967 Esterman[104] proposed a scoring system that considers central as well as peripheral field, and provided additional weight for areas of the field that are functionally more important. This system recognized the greater functional importance of certain areas of the visual field, specifically, the central, the inferior, and the portion astride the horizontal meridian. The Esterman 100-unit monocular grid is used to calculate the remaining visual field. A count of the number of dots seen within the field among the 100 dots that are in the grid gives the percentage of retained vision. The total number of dots not seen equals the percentage lost. The grid has been developed for scoring the visual field measured with the tangent screen[104] and the Perimeter.[105] The Esterman grid is made available through the American Academy of Ophthalmology, San Francisco.

Simultaneous Binocular Visual Field Testing

In 1982 Esterman[106] devised a schema for binocular perimetry and a new binocular grid that bypassed the 2 separate monocular tests and the complex, faulty formulas for combining them. This testing strategy evolved to plot the field exactly as the patient uses his or her eyes, as a whole binocular unit, without occlusion. In this new binocular scale the monocular grid was expanded to binocular (120) units by overlapping the right and left grids, as the 2 normal fields are fused in the act of seeing. In this testing algorithm, both eyes are fixed on a target, and the outline of the field is recorded on the special binocular chart, whose broken line represents the standard, full (100%) isopter tested with the III 4-e isopter. The 100% isopter is the 4-mm^2 target with no filter (maximum luminance) and with low background luminance. The Esterman grid is used to determine the

extent of the visual field in method 2 for the AMA Guides to Permanent Impairment.[98] Software for Esterman testing has been developed for automated visual field testing with the Cooper Vision Diagnostics Dicon AP2000 (Perimeter)[97,107] and the Humphrey Field Analyzer.[108]

Objective Measurements of Functional Visual Impairment: Assessment in Patients With Cataract

Several attempts have been made to use standard objective tests to quantitatively define functional visual impairment due to cataracts with various instruments and techniques, such as the VCTS contrast sensitivity plates,[108] the Miller Nadler glare tester,[109-111] the Baylor visual function tester,[108] the StereoOptical glare tester, 108 contrast sensitivity at low and intermediate spatial frequencies with the Pelli-Robson letter chart,[112] the Mentor Brightness Acuity Tester (BAT) used in conjunction with the LogMAR visual acuity chart and the Pelli-Robson chart,[112,113] Berkeley Glare Test,[114] the measurement of glare susceptibility using low-contrast letter charts,[113,115] the van den Berg Straylightmeter direct measurement of wide-angle forward light scatter,[113] and the Vistech MCT8000.[113] Glare test scores have been shown to correlate more closely with glare symptoms in cataract patients than central visual acuity.[109] Glare testing scores have also correlated well with Snellen central acuity as measured outdoors,[116,117] which has been used as an assessment of functional vision in patients with cataracts.[116-119] The Princeton-Nadler Glare tester has been used to quantitate symptoms of glare due to cataract both before and after cataract surgery[120,121] and neodymium:YAG laser posterior capsulotomy.[122] Claesson and associates[123] studied the benefits of Nd:Yag laser capsulotomy on visual performance after extracapsular cataract extraction.

Complaints of decreased visual acuity in conditions of bright illumination, such as in direct sunlight or when in the path of oncoming headlights, may limit driving ability even when central visual acuity meets legal standards of driving. Although decreased functioning has been implied by the degree of glare measured, no functional correlate has been reproducibly described. Several investigations have demonstrated little correlation between Snellen acuity and glare testing scores in patients with cataracts.[112-114,116,119,124,125]

Despite the proliferation of testing instruments, few studies have addressed the correlation of a visual disability score and the effect on the activities related to daily living. Elliott and coworkers,[126] using a 20-item questionnaire to assess subjective visual disability, correlated visual acuity, contrast sensitivity, and glare disability with the perceived visual disability. This instrument included 3 qualitative questions, such as "Please list any

hobbies you find difficult because of your eyesight," and 17 other questions that were quantified with a 10-cm Rosser line rating scale. In 13 questions the patients were asked to describe the effect of vision on everyday activities by marking the Rosser line between limits of "no problem" and "extreme difficulty" and in 3 questions patients were instructed to describe their sight using their right, left, and both eyes by marking the Rosser line somewhere between limits of "normal" and "severely reduced." One question asked whether the patients ever felt in any danger because of their eyesight. The following have been published as paraphrased versions of questions used in the statistical analysis:

1. Vision in right eye
2. Vision in left eye
3. Vision using both eyes
4. Walking outside
5. Crossing road
6. Driving
7. Bright sunlight
8. Recognizing your friends
9. Reading bus numbers
10. Watching TV
11. Telling the time
12. Reading normal-print books
13. Reading a newspaper
14. Danger

The Ferris-Bailey LogMAR chart was used to measure central visual acuity and the Pelli-Robson letter chart was used to determine contrast sensitivity. Glare disability was measured with the Mentor Brightness Acuity Tester in conjunction with both the LogMAR and Pelli-Robson charts. Subjective visual disability correlated poorly with monocular or binocular visual acuity measurements. Binocular measurements of contrast sensitivity were the most highly correlated with the patient's perceived visual disability and were superior to the conventional measurement of Snellen acuity.[126]

In 1994, Rubin and coworkers[127] studied whether components of vision impairment other than reduced central acuity contributed to reduced functional independence. Distance acuity, letter contrast sensitivity, glare disability, and stereoacuity were measured in patients 65 years of age and older. A physical function questionnaire assessed self-reported difficulties with activities of daily living (ADL),[128] instrumental activities of daily living (IADL),[129] and mobility activities. In the ADL patients were asked, "Do you have any difficulty . . . with the following activities: getting

out of bed or chair, dressing yourself, bathing or showering, using the toilet, and feeding yourself?" The IADL similarly queried if difficulty was experienced any with the following: doing light housework, doing heavy housework, shopping for personal items, preparing own meals, managing money, using the telephone, giving yourself medication. Physical domain questions relating to mobility asked, "Do you have any difficulty . . . with the following: walking one-half mile, walking 150 ft, walking around your home, walking up 10 steps, and walking down 10 steps?" Twenty questions about general vision and driving questions were divided into 4 groups to reflect "resolution" questions, "distance" questions, "adaption" questions, and "night driving" questions. The following questions, classified as resolution questions, were presented as, "Do you have trouble . . . reading small print, reading in dim light, if lights off to the side are shining into your face, reading signs or identifying faces while walking, locating a sign among signs?" Distance questions determined if the subject had trouble with the following: seeing the edges of steps or curbs, bumping into people or things off to the side, and judging distance of foot to curb or stair, judging distance of objects. Adaption questions included determination if patients had trouble with the following: seeing things because they appear hazy or washed-out, adjusting to bright lights, and adjusting to dim lighting. Night driving questions examined if the patient had trouble with vehicles coming unexpectedly into peripheral vision, other vehicles appearing to go too fast, driving at night, seeing with oncoming headlights, seeing tail lights at night, seeing distant objects at night, and reading instrument panel at night. The investigators reported that reduced acuity and reduced contrast sensitivity were independently associated with an overall vision disability score. Acuity was associated with difficulty in tasks that required good resolution and adaption to changing light conditions, and contrast sensitivity was associated with difficulty in tasks that required distance judgments, night driving, and mobility. Glare and stereoacuity were not associated with self-reported disability.[127]

The following describes the AMA's position on various visual functional tests:

> There are no universally accepted standards for contrast and glare sensitivity testing and glare disability testing. Thus, the results of such testing are not incorporated in visual tests of central acuity. However, such testing, if it is done with generally accepted methods, may be the basis for an additional impairment of visual function of the involved eye as high as 10%.[98]

INVESTIGATIONAL STRATEGY

In view of the inability of any one physiological test or group of measurements to directly and objectively assess visual system functioning and to

predict accurately the perceived disability of the patient, this study was undertaken to assess subjective general and visual functioning in patients with glaucoma. The objective measurement of visual acuity and visual field in a standardized manner forms the basis for correlations with visual function and generic quality of life subjective assessments.

MATERIAL AND METHODS

QUALITY OF LIFE INSTRUMENTS

Plans for this investigation, including both the English and a standard Spanish translation versions of the informed consent form, VF-14, the Field Test Version of the National Eye Institute Visual Functioning Questionnaire (NEI-VFQ), and the Medical Outcomes Short Form-36 (SF-36), were approved by the local Institutional Review Board, the Medical Sciences Subcommittee for the Protection of Human Subjects in Research, prior to patient recruitment. Permission to use the VF-14 in this study was granted to the author by Johns Hopkins University, Baltimore, holder of the copyright. A standard Spanish translation version of the VF-14, also copywritten by Johns Hopkins University, is included in Appendix. Permission to use the Medical Outcomes Short Form-36 in both the English and standard Spanish forms was granted from The Medical Outcomes Trust, Boston. Spanish language versions of the NEI-VFQ and the VF-14 were validated by independent translations from the Spanish back into English by professional medical linguists without prior knowledge of the original English text.

PATIENTS

Inclusion Criteria

The 147 consecutive participants were solicited from the private practices of 7 ophthalmologists whose patient base was largely limited to the consultative management glaucoma located within a 3-county area. Any patient with a diagnosis of glaucoma, irrespective of type, who had been seen within a 3-month period was considered eligible for inclusion if none of the exclusion criteria were met. No specific visual field or central visual acuity levels were used to define eligibility. All patients had received either medical therapy, laser surgery, or standard incisional surgery, or any combination thereof. Except for 1, all patients were recruited from the practice of the author. Of the 151 patients who were offered participation in the study, 4 declined enrollment.

Exclusion Criteria

Exclusion criteria included the following: a history of either laser surgery or standard incisional eye surgery 3 months prior to recruitment, or antic-

ipated laser or standard incisional surgical intervention 3 months after recruitment. Patients who refused to participate (either to answer the questionnaires or to undergo Esterman binocular visual field testing) were not eligible. Patients of any age were invited to participate.

Administration of Questionnaires

Patients were invited to participate in person by either the author or by 1 of 2 clinical assistants who explained the rationale of the study. After questions regarding the investigation were answered, the patient was enrolled and written informed consent was obtained. If the visual acuity of the subject was not sufficient to read the consent form, either a family member or a clinical assistant read the consent form. Patients unable to see the printed questions were assisted by a family member or a clinical assistant, who read aloud the questions and answers and marked the form at the instruction of the patient. Patients who could read were instructed to seek assistance and clarification if they did not understand any of the questions or choices. Sixteen of 147 participants (11%) required assistance in reading and completing the questionnaire.

Mental Status

No formal determination of mental status was made prior to testing. If a patient appeared confused or unable to understand what was being said, he or she would have been excluded from the study. All patients who could read the questionnaires without difficulty were also capable of marking the forms with their response. Subjects were asked if they preferred to respond to questionnaires in English or Spanish.

VISUAL ACUITY MEASUREMENTS

Central distance visual acuity was measured at 20 ft in identical examining lanes equipped with 1 plano mirror, a projector, and an AO ProjectoChart slide with nonserif block letters. Each letter subtended a visual angle of 5 minutes and a stroke width of 1 minute. Distance central acuity was measured with the habitual refraction of the patient and no attempt was made to further refine the distance correction. This was necessary so that the visual field could be tested binocularly. With the patient wearing the usual corrective spectacle for reading, near vision was measured with a Rosenbaum pocket vision screener (J. G. Rosenbaum, MD, Cleveland, Ohio) which employed the Revised Jaeger Standard print for use at 35 cm (14 in). Determination of distance central visual acuity was made with a test chart illumination of approximately 6 foot-candles.

VISUAL FIELD TESTING

Binocular simultaneous visual field testing was performed with a Humphrey automated perimeter (Humphrey Visual Field Analyzer, Humphrey Instruments, San Leandro, Calif), which was equipped with the Esterman Program. Permission to use the Esterman program in this investigation was granted by the American Academy of Ophthalmology, San Francisco. Prior to visual field testing, patients were instructed to wear their usual optical correction for distance viewing. If no corrective lenses were usually worn by the patient, the Esterman test was performed without any optical correction. If several types of contact lenses or corrective spectacles, or both, were worn, patients were instructed to perform the test wearing the usual combination of contact lenses or glasses that would be used in performing daily activities. With the chin rest in the central position and both eyes open with the usual distance correction in place, the patient was asked to respond to the 120 stimulus presentations by pressing the buzzer. Each stimulus duration was 400 milliseconds with a Goldmann stimulus of 1114e (10dB) or 10,000 apostilbs with a background of 31.5 apostilbs. If a point was not seen, it was retested, and if missed a second time, it was recorded as not seen. Fixation was monitored with an infrared light to assess the pupillary reflex, and 5% of stimuli were retested to determine the rate of fixation losses. False-positive and false-negative errors were recorded, and 3% of stimuli were rechecked to calculate both the false-negative and false-positive rates. The total number of correct responses was recorded and then divided by 120 to determine the Esterman efficiency score. This number was subtracted from 100 to calculate the binocular percentage loss of visual field or visual field impairment score.

STANDARD DETERMINATION OF VISUAL DISABILITY

Determination of visual disability was calculated with the 3-step method described in the Guides of Evaluation of Permanent Impairment, fourth ed.[98] After distance visual acuity and near vision were determined separately in each eye, the percentage loss of central vision for each eye was calculated separately in a fashion that combined both near and distance vision with Tables 2 and 3. Second, the percentage loss of visual field of both eyes together was determined by subtracting the Esterman efficiency score from 100. Third, any percentage loss of ocular motility was assessed. No patient in this investigation had a measurable loss of motility or was diplopic. When the visual field was tested binocularly, the impairment due to loss of central vision of both eyes was determined with Table 7, which was based on the following formula:

$$\frac{3 \times (\text{impairment value of the better eye}) + \text{impairment value of the worse eye}}{4} =$$

With the Combined Values Chart, the impairment due to loss of central vision was combined with the impairment due to binocular field loss to yield the overall impairment of the visual system. The Combined Values Chart was derived from the formula:

A + B (1-A) = combined value of A and B, where A and B are the decimal equivalents of the impairment ratings.

The following is an example of how 3 objective measurements of visual impairment, specifically central visual acuity impairment, visual field impairment, and overall visual system impairment (central visual impairment combined with visual field impairment), are calculated in a study patient using the Guides to the Evaluation of Permanent Impairment:

An 81-year-old man had a Snellen rating of 20/20 for distance vision of the right eye; the rating for near vision of the same eye was J1+. The native lens was present. Table 3 indicates that the loss of central vision of the eye was 0%. In the left eye the Snellen rating for distance vision was 20/25 and the rating for near of the same eye was J1+ . Table 3 indicates that the loss of central vision of the left eye was 3%. After determining the level of impairment of each eye, Table 7 is used to ascertain the impairment of the visual system due to the loss of central vision in both eyes, and in this case it equals 1%.

Binocular visual field testing (Esterman) was performed and is shown in Fig 1A. For interest, previously obtained Humphrey visual fields 24-2 are shown in Fig 1B and Fig 1C. The dense nasal step of the right eye is not detected on the Esterman test. The overlapping portion of the normal nasal visual field of the left masks the defect of the right eye. A total of 102 of the 120 stimuli were seen, and the calculated efficiency Esterman score was 85. The degree of binocular visual field impairment is calculated by subtracting the Esterman Score from 100 and equals 15.

The overall impairment of the visual system that combines the impairment due to the loss of central vision with the impairment due to binocular visual field loss is calculated with the Combined Values Chart and equals 16%.

CLINICAL INFORMATION AND DEMOGRAPHIC INFORMATION

Medical records were reviewed to determine the type of glaucoma, date of diagnosis of glaucoma based on the first eye, type of medical therapy for glaucoma, dates and types of all intraocular procedures involving a conjunctival incision, and dates and types of all laser treatments. Patients also

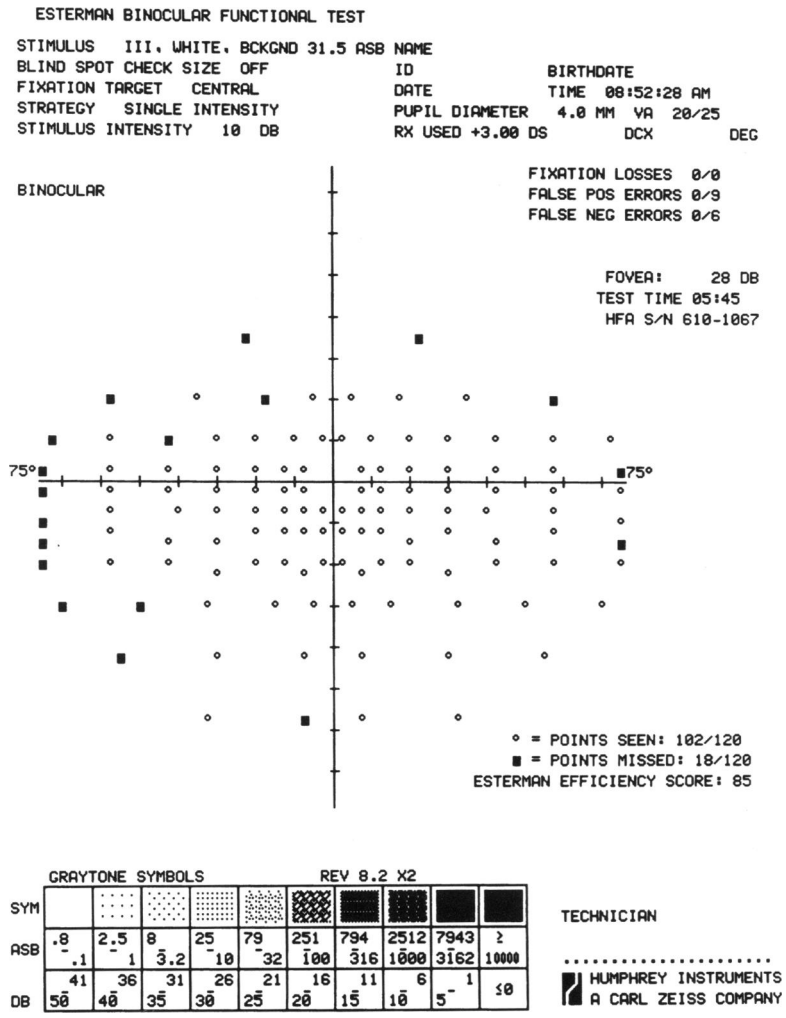

FIGURE 1A

Esterman binocular visual field, Humphrey, efficiency score 85, visual field impairment 15%.

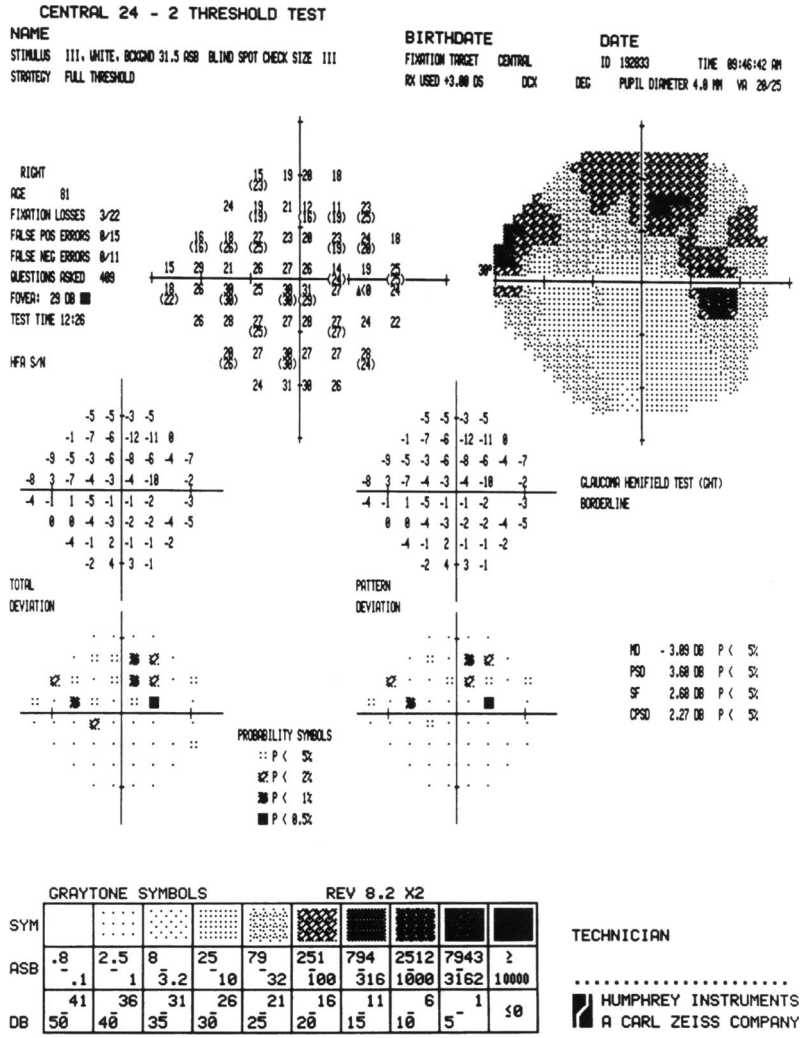

FIGURE 1B
Visual field, Humphrey 24-2 right eye, 81-year-old man, 20/20, J1+.

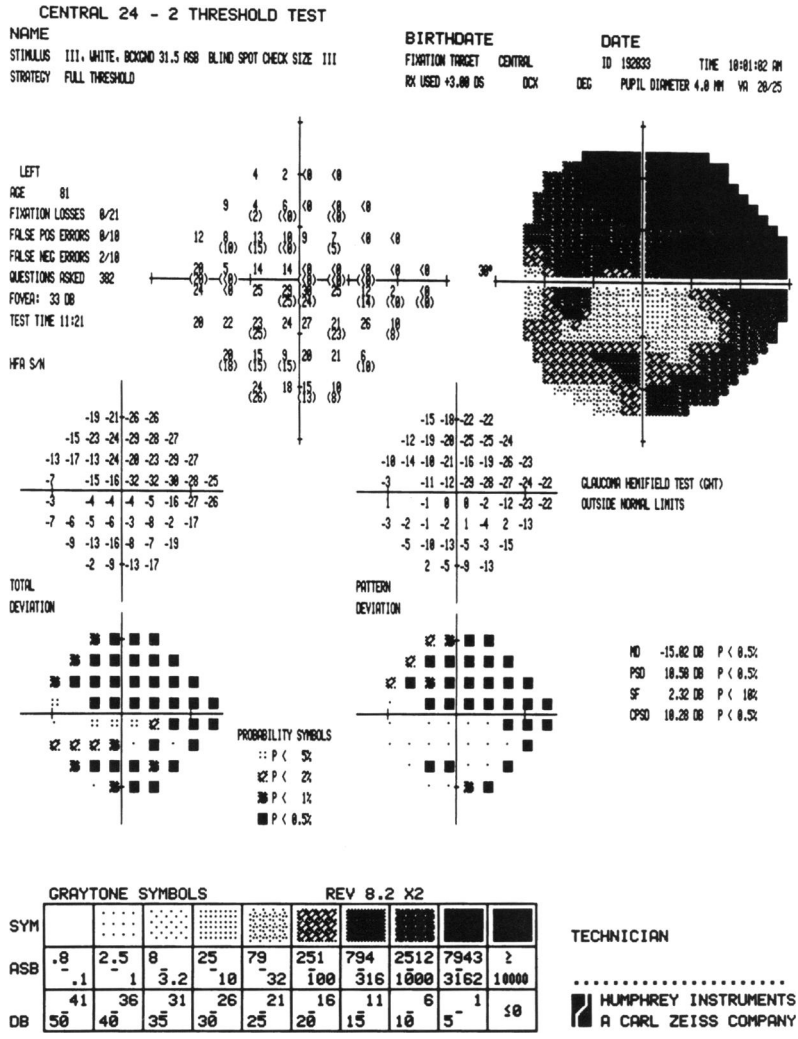

FIGURE 1C
Visual field, Humphrey 24-2 left eye, 81-year-old man, 20/25, J1+.

answered questions abstracted from the Living With Glaucoma questionnaire (Glaucoma Research Foundation, San Francisco) regarding race, social living status, education, and annual income.

SCORING OF QUESTIONNAIRES

VF-14

The VF-14 responses were scored in a manner previously described in detail.[53] A score of 4, 3, 2, 1, or 0 was assigned to each response depending on whether a patient reported having "no difficulty" with the activity being questioned (4), "a little difficulty" (3), "a moderate amount of difficulty" (2), or ""a great deal" of difficulty (1). If the patient could not perform the activity because of visual difficulty, a score of 0 was assigned. If patients did not perform an activity for a reason other than their vision, then the question was not included in the scoring. The scores of all activities that patients either could or could not perform because of their vision were averaged and multiplied by 25. A person scoring 100 would have no visual impairment with respect to the activities questioned and a score of 0 would indicate total impairment of any ability to perform the activity related to visual disability.

Field Test Version of the National Eye Institute Visual Functioning Questionnaire (NEI-VFQ)

This instrument, as well as the preliminary scoring algorithm, were provided by Carol M. Mangione, MD, MPH, and Jennifer S. Pitts, MA from the UCLA School of Medicine, Los Angeles. The 2-step scoring system was developed on the basis of evaluation of pilot test data and is currently undergoing further refinement. In the first step, 51 questions were scored so that a higher score defines a more favorable quality of life or visual functioning than a lower score. The highest possible score equals 100 and lowest is 0. Raw scores then represent the percentage of the total possible score for each item. In the second step, items in the same scale were averaged to generate 12 scale scores: general health, general vision, visual pain, near activities, vision-specific social functioning, mental health, expectations, role difficulties, dependency, driving, and colour vision. Questions that were not answered were not used to calculate scale scores. Only subscales in which at least one half of the questions were completed could be scored.

Medical Outcomes Short Form-36 (SF-36)

Responses for the SF-36 were scored according to recommendations of the SF-36 Health Survey Manual and Interpretation Guide contained in Chapter 6, Scoring the SF-36.[42] The items and scales were scored so that

a higher score indicated a better health state. For example, functioning scales were scored so that a high score indicated better functioning, and the pain scale was scored so that a high score indicated freedom from pain. These steps were followed in scoring the items and scales after data entry: recoding of out-of-range item values as missing, reversing score or recalibrating scores for 10 items, recoding missing item responses with mean substitution where warranted, computing raw scale scores, transforming of raw scale scores to the 0-100 score, and performing scoring checks. For 34 of the 36 items, a linear relationship between the item scores and the underlying health concept defined their scales. Two items, General Health (GH) and the Bodily Pain (BP) scales, required recalibration to establish a linear scaling assumption. Of the 8 scales the following sum final item values are listed with the lowest and highest possible raw score and the possible raw score range:

Physical functioning: 10, 30 (range, 20)
Role-physical: 4, 8 (range, 4)
Bodily pain: 2, 12 (range, 10)
General health: 5, 25 (range, 20)
Vitality: 4, 24 (range, 20)
Social functioning: 2, 10 (range, 8)
Role-emotional: 3, 6 (range, 3)
Mental health: 5, 30 (range, 25)

The following formula was used for transformation of raw scale scores:

$$\text{Transformed scale} = \frac{[(\text{Actual raw score} - \text{lowest possible raw score})]}{\text{Possible raw score range}} \times 100$$

Associated Systemic Comorbidities

To assess the possible effects of comorbid systemic conditions, subjects were asked in the NEI-VFQ if they had any of 15 common health conditions. The NEI-VFQ was modified by the author to determine how the comorbid condition affected activities of the patient. A comorbidity score was assigned to each response: 1, no effect; 2, a little effect; and 3, a great deal of effect. This approach to specifying the effect of various comorbidities had been employed in a previous report by Scott.[52] Although normative values are available for the different domains of the SF-36 for several health conditions, such values have not been established for the NEI-VFQ.

STATISTICAL METHODS

Dependent variables measuring quality of life in this study consisted of the scores on the VF-14, each of the 8 subscales of the SF-36, and each of the

12 subscales of the National Eye Institute Visual Functioning Questionnaire (NEI-VFQ), plus an additional question from the NEI-VFQ that assessed peripheral vision and was not incorporated into a subscale. Objective measures of visual function in this study included the Esterman binocular visual field test, expressed as percent reduction from a completely normal visual field; the AMA index of percent disability for combined near and distance central acuity; and the AMA index combining central acuity and field disabilities.[98] Continuous independent variables were age, comorbidity score, months elapsed since the date of first treatment (medical or surgical) for glaucoma, number of prior procedures involving conjunctival incisions, number of prior surgical procedures for glaucoma, and months elapsed since the most recent procedure involving incision. Ordinal independent variables were educational status (grade 11 or less, high school diploma, some college, college degree, graduate degree), severity of glaucoma surgery (none, laser, filtration or drainage implant, or cyclodestructive), yearly income in thousands of dollars (0-25, 26-35, 36-50, 51-75, >75). Categorical independent variables were sex, unilateral or bilateral disease, only primary open-angle glaucoma involved, ethnic group (self-identification as white, Hispanic, black, or other), and marital status (single, married or living with significant other, divorced, widowed). The distribution of all variables in the study population was examined with frequency tables and summary statistics

Bivariate relationships among the dependent variables (objective visual function measures and each of the quality of life scales), and between the dependent variables and the continuous independent variables, were studied with scatterplots and quantified with, r, the Pearson correlation coefficient,[130] which ranges from -1, a perfect linear inverse relationship, to 1, a perfect linear relationship. Spearman nonparametric correlation coefficient[131] did not uncover or appreciably strengthen the estimates of any bivariate relationships.

Means and standard deviations of each of the quality of life measures were obtained for each level of all ordinals, such as severity of glaucoma surgery and income, and categorical risk factors, such as sex and ethnic group, and their statistical significance was evaluated with analysis of variance. Owing to the large number of variables (22 quality of life domains and subscales and 8 ordinal or categorical risk factors), for ease of presentation ordinal variables were treated as continuous in these models[132] and dichotomous variables were coded as dummy variables.[133] The strength of the relationships between each of the quality of life scales and visual field disability after adjusting for central acuity disability and the risk factors was assessed with partial correlation coefficients.[134]

In a study of this size, even very weak correlations attain statistical significance, so the *P*-value does not constitute a useful measure of the importance of a relationship. The square of the Pearson correlation coefficient can be interpreted as the fraction of variance in 1 variable explained by another. In this study, correlations were classified into ranges of importance: not significant; significant but weak, $r<.32$ ($r^2 < 10\%$); modest, r from .32 to .55 (r^2 from 10% to 20%); and moderate, $r>.55$ ($r^2 > 20\%$). In the case of a dichotomous, or 2-group, variable, such as sex correlated with a continuous variable (any of the quality of life measures), the following approximate equivalence holds between the Pearson correlation coefficient, r, and the difference in mean values between the 2 groups, assuming equal numbers and homogeneity of variance in both groups:

$$\frac{r}{\sqrt{1-r^2}} = \frac{Mean1 - Mean2}{2s}$$

where s indicates the within-group standard deviation. Therefore, an r of 0.32 corresponds to a ratio of the difference between means to the pooled sample standard deviation of about 0.68, or roughly two thirds. This corresponds to a medium effect size for the comparison of 2 means in the terminology of Cohen.[135] In these analyses, the 2 polychotomous variables, ethnic group and marital status, were made into dichotomous variables. Ethnic group was treated as Hispanic versus white, since there were very few blacks or "others" in the study. Marital status was regrouped to married or living with significant other versus single, divorced, widowed.

In the tables, the following abbreviations have been used respectively for the domains of the SF-36: SF36PF (physical functioning), SF36RP (role-physical), SF36BP (bodily pain), SF36GH (general health), SF36V (vitality), SF36SF (social functioning), SF36RE (role-emotional), SF36MH (mental health); and the subscales of the NEIVFQ: NEIGH (general health), NEIGV (general vision), NEIVP (visual pain), NEINA (near activities), NEIDA (distance activities), NEIVSSF (vision-specific social functioning), NEIVSMH (vision-specific mental health), NEIVSE (vision-specific expectations), NEIVSRD (vision-specific (role-difficulties), NEIVSD (vision-specific dependency), NEID (driving), NEICV (color vision). The NEI-VFQ question on peripheral vision is abbreviated NEIPV.

RESULTS

BASELINE CHARACTERISTICS

Demographic characteristics of the 147 participants assessed as continuous variables are listed in Table I. Characteristics that were determined as

TABLE I: DEMOGRAPHIC CHARACTERISTICS (CONTINUOUS VARIABLES)

VARIABLE	MEAN±SD	MEDIAN	RANGE
Age (yr)	70 ± 14	73	15 - 92
Systemic comorbidity score	5.0 ± 4.8	4.0	0 - 23
Elapsed time since diagnosis of glaucoma (mo)	146 ± 109	120	9 - 568
No. of glaucoma operations	2.0 ± 1.6	2	0 - 7
Elapsed time since last glaucoma operation (mo)	43 ± 39	30.4	3 - 235
No. of glaucoma medications (both eyes)	2.1 ± 1.5	2	0 - 6
Total no. of surgeries involving a conjunctival incision	3.0 ± 2.1	3	0 - 9

categorical variables are described in Table II.

Continuous Variables

Age Distribution. Ages ranged from 15 to 92 years, with a mean of 70 years and a standard deviation of 14 years. Thirteen (9%) of patients were less than 50 years old, 32 (22%) were between 50 and 65 years old, and 102 (69%) were older than 66 years.

Systemic Comorbidity Scores. Systemic comorbidity scores for the specific 15 health conditions of the NEI-VFQ ranged from 0 to 23, with a mean of 5 and a standard deviation of 4.8. Twenty-seven patients (18%)

TABLE II: DEMOGRAPHIC VARIABLES (CATEGORICAL VARIABLES)

VARIABLE	CATEGORIES	NO. (%)
Sex	Male	75 (51)
	Female	72 (49)
Race (ethnic group)	White non-hispanic	68 (46)
	Black	11 (8)
	Hispanic	62 (42)
	Other	6 (4)
Social or living status	Single	13 (10)
	Married/living with significant other	80 (63)
	Divorced	12 (9)
	Widowed	22 (17)
	Non-respondents	20
Education	Grade 11 or less	30 (25)
	High school degree	31 (25)
	Some college	24 (20)
	College degree	23 (19)
	Graduate degree	14 (12)
	Nonrespondents	25
Annual income (thousands of dollars)	0 - 25	49 (47)
	26 - 35	26 (25)
	36 - 50	14 (13)
	51 - 75	7 (7%)
	> 75	9 (9)
	Nonrespondents	42
Type of glaucoma	Primary open angle	90 (61)
	Primary angle closure	8 (5)
	Pseudo exfoliation	9 (6)
	Other, mixed mechanism	40 (27)
Ocular involvement	Uniocular	10 (7)
	Binocular	137 (93)
Severity of procedures for glaucoma	Medical therapy	29 (20)
	Laser trabeculoplasty or peripheral iridectomy	20 (14)
	Filter/drainage implant	94 (64)
	Cyclodestructive procedure	4 (3)

had a systemic comorbidity score of 0 that indicated no subjective impact of systemic disease.

Elapsed Time Since Diagnosis of Glaucoma. The time since the diagnosis of glaucoma ranged from 9 to 568 months (47 years and 4 months). The mean time was 146 months (12 years and 1 month) with a standard deviation of 120 months (10 years), and a median duration of 109 months (10 years).

Total Number of Glaucoma Operations. Twenty-nine patients (20%) had not undergone any surgical intervention in either eye for glaucoma management, 28 (19%) had undergone 1 operation, 37 (25%) 2 operations, 27 (18%) 3 operations, 19 (13%) 4 operations, 2 (1%) 5 operations, 4 (3%) 6 operations, and 1 (1%) 7 operations.

Elapsed Time Since Last Glaucoma Operation. The duration of time since the last operation for glaucoma ranged from 3 months to 235 months (19 years and 7 months). The mean duration was 43 months, with a median of 30 months and a standard deviation of 39 months.

Number of Glaucoma Medications (Both Eyes). The total number of glaucoma medications in both eyes ranged from none in 23 (16%) participants to 6 medications in 3 (2%) patients. Twenty-eight patients (19%) required 1 medication, 48 (33%) 2 medications, 18 (12%) 3 medications, 12 (11%) 4 medications, and 11 (7%) 5 medications.

Categorical Variables

Sex.- Seventy-five (51%) of the enrollees were men and 72 (49%) were women.

Race. Racial identification, as defined by self-report, included 68 whites (46%), 62 Hispanics (42%), 11 blacks (8%), and 6 other (4%), such as Asian and Native American.

Social Living Status. Of the 127 patients who responded, 80 (63%) were either married or were living with a significant other, 13 (10%) were single and living alone, 22 (17%) were widowed, and 12 (9%) were divorced.

Education. The self-reported highest level of education defined 30 (25%) without a high school diploma, 31 (25%) with a high school diploma, 24 (20%) with some college education, 23 (19%) with a college degree, 14 (12%) with a graduate degree, and 25 who did not respond.

Income. Forty-nine (47%) of the responding participants had a self-reported income of $25,000 or less, 26 (25%) were between $26,000 and $35,000, 14 (13%) were between $36,000 and $50,000, 7 (7%) were between $51,000 and $75,000, 9 (6%) were greater than $75,000, and 42 failed to report any income designation.

Type of Glaucoma. Ninety patients (61%) had primary open angle glaucoma and 57 (38%) had glaucoma other than primary open-angle glaucoma. Ten (7%) were diagnosed as having uniocular glaucoma and 137 (93%) had bilateral disease.

Severity of Glaucoma. Twenty-nine (20%) received only medical therapy for glaucoma as treatment, 20 (14%) received either laser trabeculoplasty or laser peripheral iridectomy, 94 (64%) underwent either filtering surgery or implantation of a drainage implant, and 4 (3%) received cyclodestructive treatment.

QUALITY OF LIFE: VISUAL ACUITY AND BINOCULAR VISUAL FIELD IMPAIRMENT

Study Population Visual Impairment and Quality of Life: Summary Statistics

Central visual acuity impairment, binocular visual field impairment, and overall visual impairment of the study population are shown in Table III. The mean visual acuity impairment was 20.68 with a standard deviation of 21.74 and a range of from 0 to 99%. The mean visual field impairment was 24.52 with a standard deviation of 24.24 and a range of from 0 to 100%. The distribution of visual field impairment scores is shown in histogram form in Fig 2. This figure demonstrates that more than 75% of the patients had less than 50% loss of binocular visual field. The overall visual impairment was 36.76 with a standard deviation of 27.36 and a range of from 0 to 100%. For these objective visual function measures, the lowest possible score, 0, represents the highest level of functioning or the minimal impair-

TABLE III: SUMMARY STATISTIC ON OBJECTIVE VISUAL FUNCTION MEASURES

VISUAL FUNCTION MEASURE	MEAN IMPAIRMENT	SD OF IMPAIRMENT	MAXIMUM IMPAIRMENT	MINIMUM IMPAIRMENT	N
Visual acuity	20.68	21.74	99	0	147
Visual field	24.52	24.24	100	0	147
Visual acuity combined with visual field (overall)	36.76	27.36	100	0	147

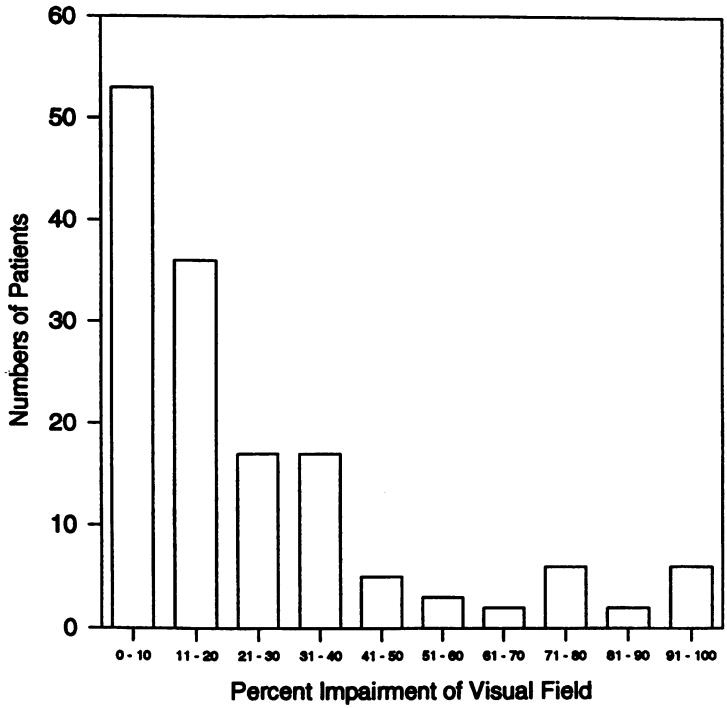

FIGURE 2
Histogram of number of patients by percent impairment of visual field.

ment. Mean values for the VF-14, the 8 scales of the SF-36, and the 12 scales of the NEI-VFQ are listed in Table IV. For all quality of life scales, the highest possible score, 100, represents the highest level of functioning or the minimal subjective impairment.

Visual Impairment and Binocular Visual Field Impairmen: Correlations
The relationship between visual acuity impairment and visual field impairment, corrected for uniocular pseudophakia or aphakia is demonstrated in Fig 3 (r^2 is indicated by rsq in the figures). The correlation $r^2 = 0.25$ (r=.50). Corrected visual acuity impairment is plotted against uncorrected visual acuity impairment in Fig 4. Points that appear above the 45° line represent the 26 patients with either monocular aphakia or pseudophakia. The AMA Guides dictate a 50% reduction of central vision if 1 eye has been rendered pseudophakic or aphakic.[98]

TABLE IV: SUMMARY STATISTICS FOR QUALITY OF LIFE INSTRUMENTS

QUALITY OF LIFE INSTRUMENT	MEAN IMPAIRMENT	SD OF IMPAIRMENT	MAXIMUM IMPAIRMENT	MINIMUM IMPAIRMENT	N
VF-147	9.1	21.8	0	100	147
SF36PF	70.6	28.6	0	100	147
SF36RP	66.4	40.3	0	100	147
SF36BP	72.7	25.4	12	100	147
SF36GH	69.7	21.4	5	100	147
SF36V	57.8	18.4	0	100	147
SF36SF	80.9	23.4	0	100	147
SF36RE	69.8	39.9	0	100	147
SF36MH	72.9	19.7	4	100	147
NEIGV	64.4	19.0	0	100	146
NEIVP	77.8	19.3	12.5	100	147
NEINA	72.8	25.5	0	100	147
NEIDA	72.8	23.3	7.1	100	146
NEIVSSF	84.6	23.3	0	100	146
NEIVSMH	68.2	24.2	6.3	100	147
NEIVSE	48.4	19.9	0	100	145
NEIVSRD	75.1	26.4	0	100	141
NEIVSD	82.1	27.5	0	100	145
NEID	71.3	24.8	0	100	91
NEICV	87.8	22.0	0	100	147
NEIPV	69.5	30.8	0	100	142

VF-14

The scatterplot of VF-14 scores versus the binocular visual acuity impairment is demonstrated in Fig 5, $r^2 = 0.34$ and $r = -.59$, $P<.001$. Visual field impairment versus VF-14 scores are shown in Fig 6, $r^2 = 0.34$ and $r = -.58$, $P<.001$. The correlation of the VF-14 and the overall visual impairment score was $r^2 = .40$, $r = -.63$, $P<.001$. After correcting for visual acuity, the correlation between VF-14 and the visual field impairment was $r^2 = .14$, $r = -.38$, $P<.001$.

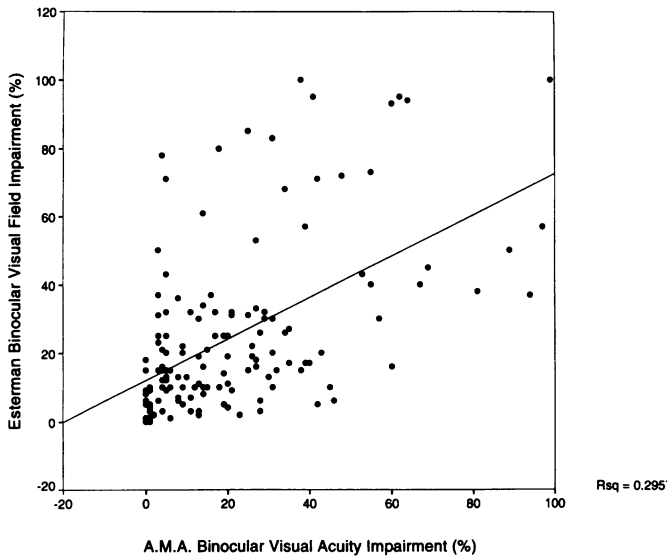

FIGURE 3

Scatterplot of AMA binocular visual acuity impairment by Esterman binocular visual field impairment.

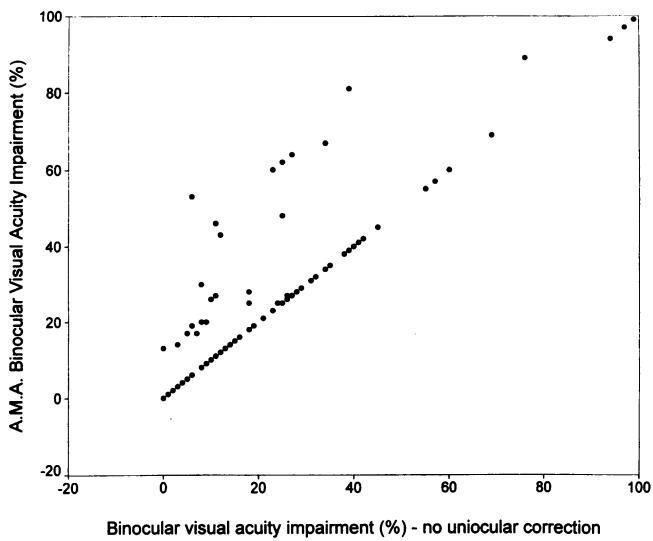

FIGURE 4

Scatterplot of binocular visual acuity impairment, without uniocular correction, by AMA binocular visual acuity impairment.

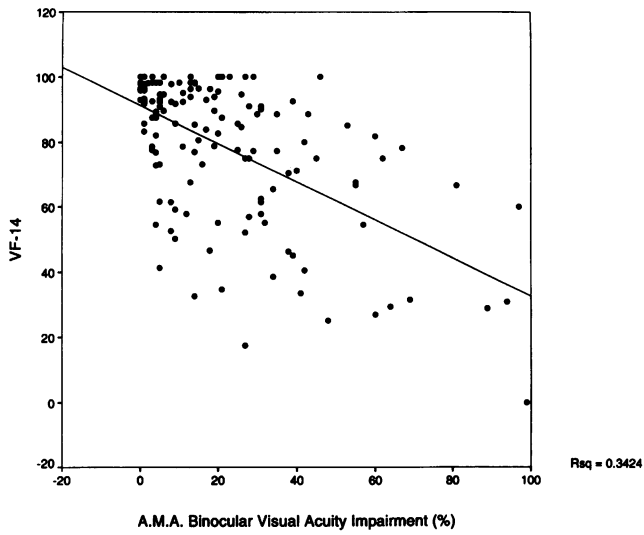

FIGURE 5
Scatterplot of AMA binocular visual acuity impairment by VF-14 score.

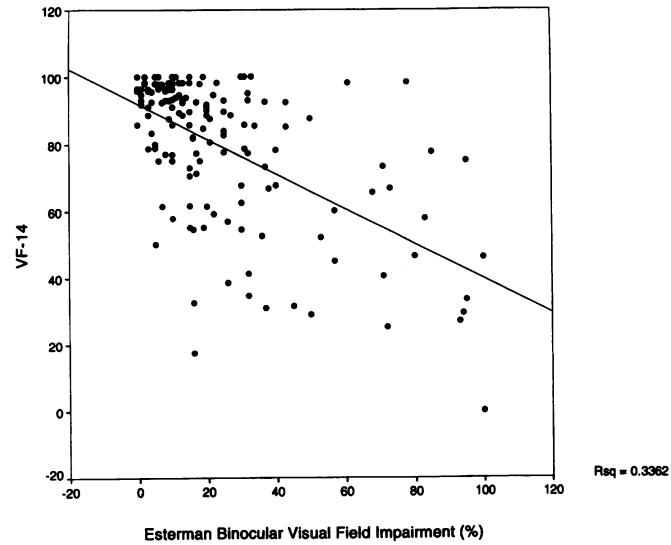

FIGURE 6
Scatterplot of Esterman binocular visual field impairment by VF-14 score.

Medical Outcomes Short Form-36

None of the 8 domains—limitations in physical activities because of health problems, limitations in social activities because of physical or emotional problems, limitations in usual role activities because of physical health problems, bodily pain, general mental health, limitations in usual role activities because of emotional problems, vitality, or general health—demonstrated more than a weak correlation with visual field impairment, visual acuity impairment, or overall visual impairment. Correction for visual acuity did not change the relation of the correlation. Correlation coefficients for the 8 domains are listed in Table V. Scatterplots for scores of each of the 8 domains of SF36 versus visual acuity impairment and visual

TABLE V: CORRELATIONS BETWEEN VISION MEASURES AND SF-36 DOMAINS

	PEARSON CORRELATION COEFFICIENT AND ASSOCIATED P-VALUE		
SF-36 DOMAIN	AMA BINOCULAR VISUAL IMPAIRMENT %	ESTERMAN BINOCULAR VISUAL FIELD IMPAIRMENT %	AMA OVERALL VISUAL IMPAIRMENT %
Physical Functioning	-0.25	-0.25	-0.29
	0.002	0.002	<.001
Role, physical	-0.24	-0.26	-0.28
	0.003	0.002	0.001
Bodily pain	-0.10	-0.06	-0.09
	0.2	0.4	0.3
General health	-0.08	0.02	-0.02
	0.4	0.8	0.8
Vitality	0.03	-0.03	0.02
	0.7	0.7	0.8
Social functioning	-0.13	-0.17	-0.15
	0.12	0.035	0.065
Role, emotional	-0.26	-0.21	-0.27
	0.002	0.009	0.001
Mental health	-0.10	-0.02	-0.05
	0.2	0.8	0.6

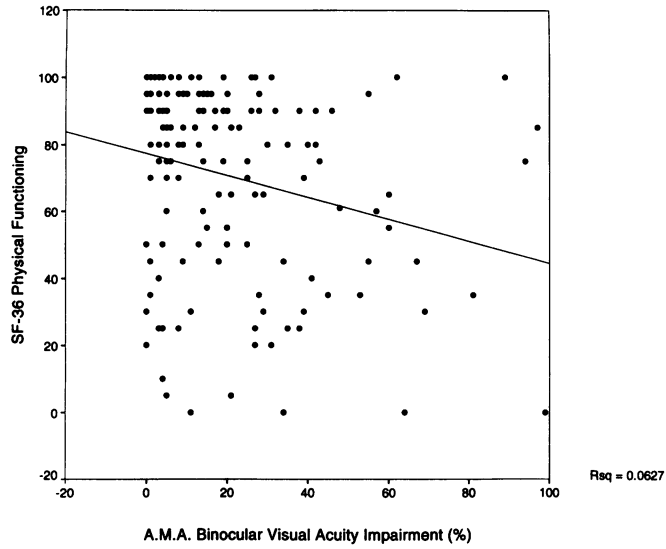

FIGURE 7
Scatterplot of AMA binocular acuity impairment by SF-36 physical functioning.

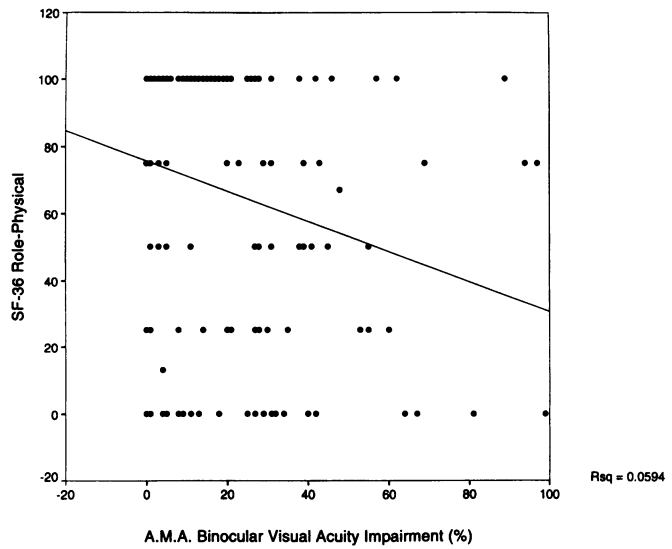

FIGURE 8
Scatterplot of AMA binocular acuity impairment by SF-36 role-physical.

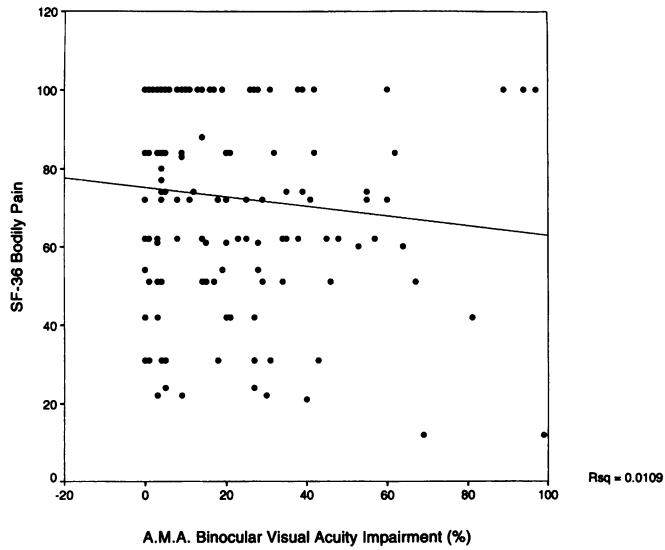

FIGURE 9
Scatterplot of AMA binocular acuity impairment by SF-36 bodily pain.

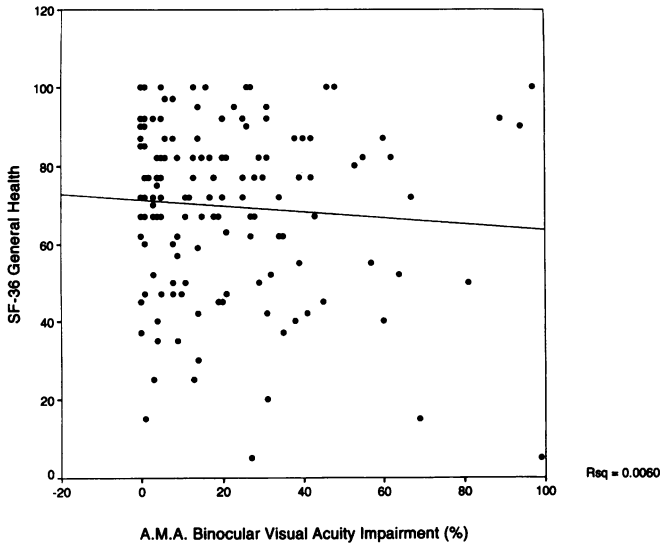

FIGURE 10
Scatterplot of AMA binocular acuity impairment by SF-36 general health.

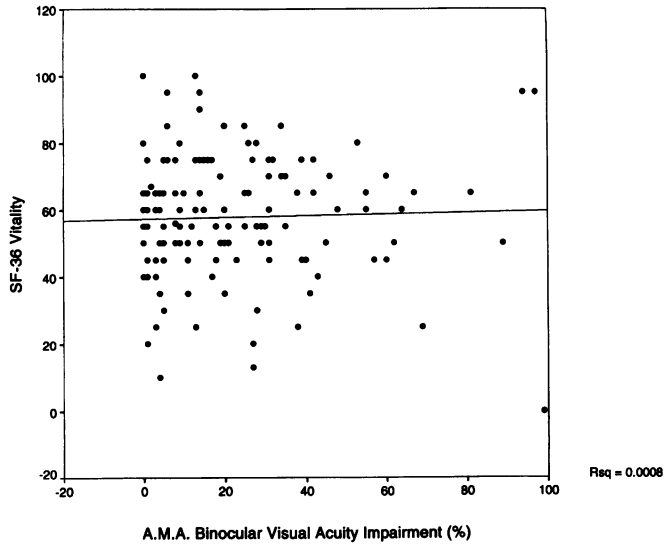

FIGURE 11
Scatterplot of AMA binocular acuity impairment by SF-36 vitality.

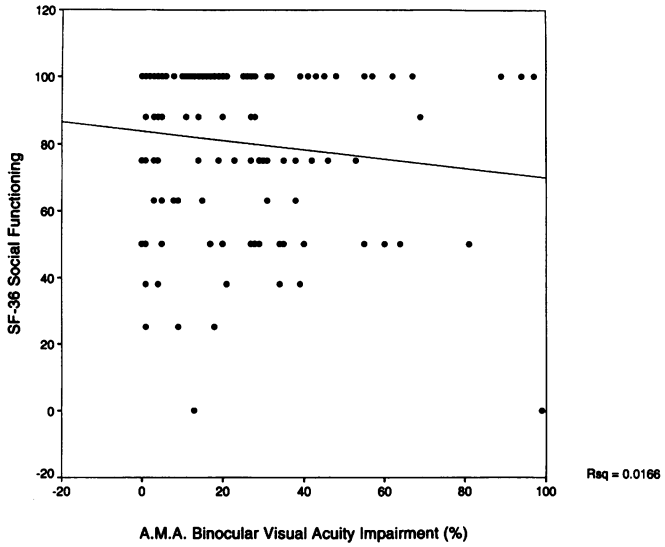

FIGURE 12
Scatterplot of AMA binocular acuity impairment by SF-36 social functioning.

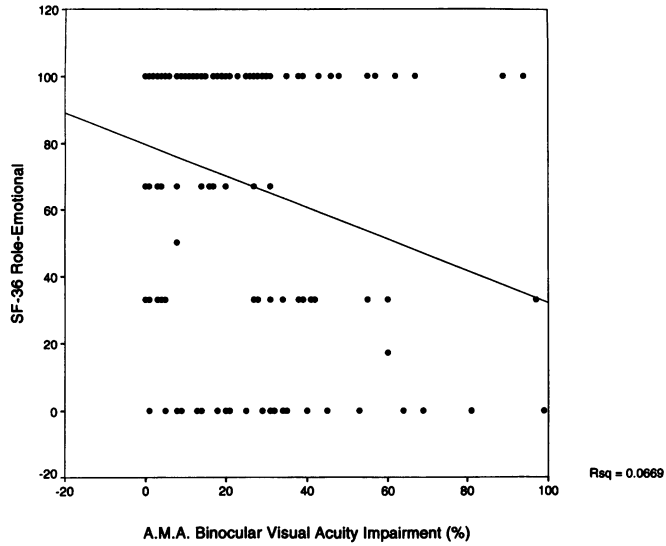

FIGURE 13
Scatterplot of AMA binocular acuity impairment by SF-36 role-emotional.

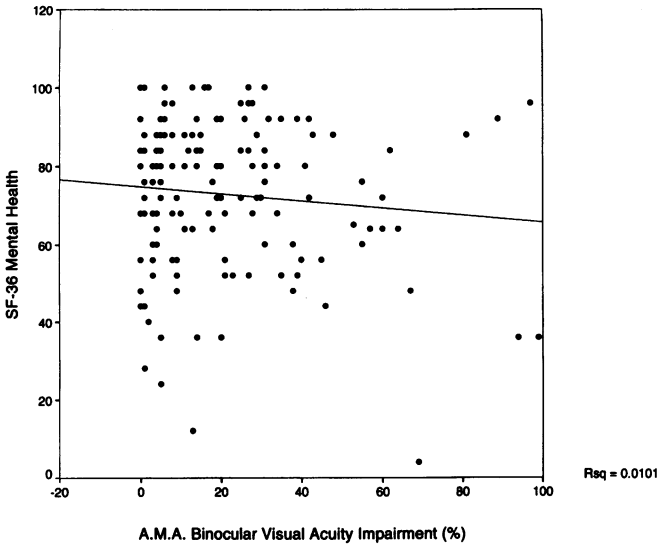

FIGURE 14
Scatterplot of AMA binocular acuity impairment by SF-36 mental health.

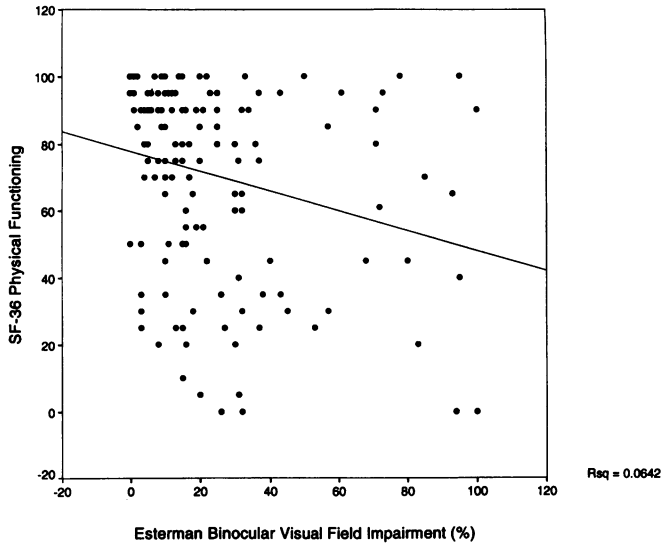

FIGURE 15
Scatterplot of Esterman binocular visual field impairment by SF-36 physical functioning.

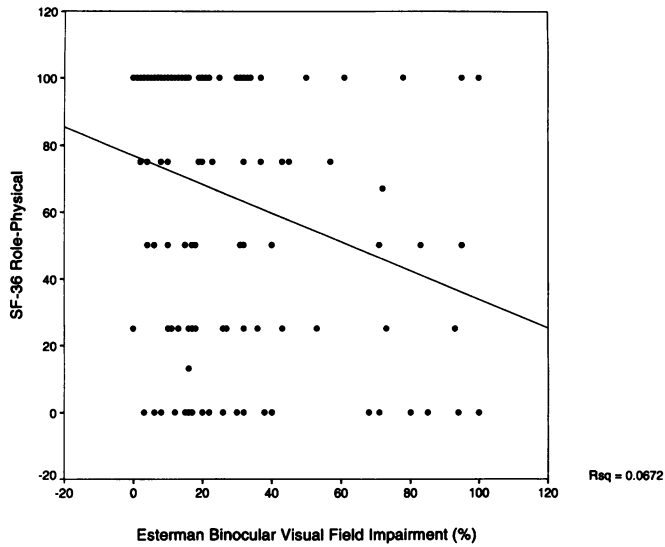

FIGURE 16
Scatterplot of Esterman binocular visual field impairment by SF-36 role-physical.

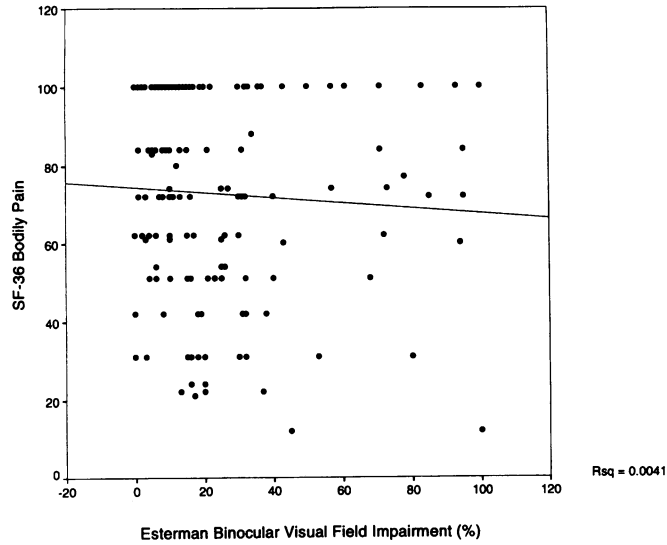

FIGURE 17
Scatterplot of Esterman binocular visual field impairment by SF-36 bodily pain.

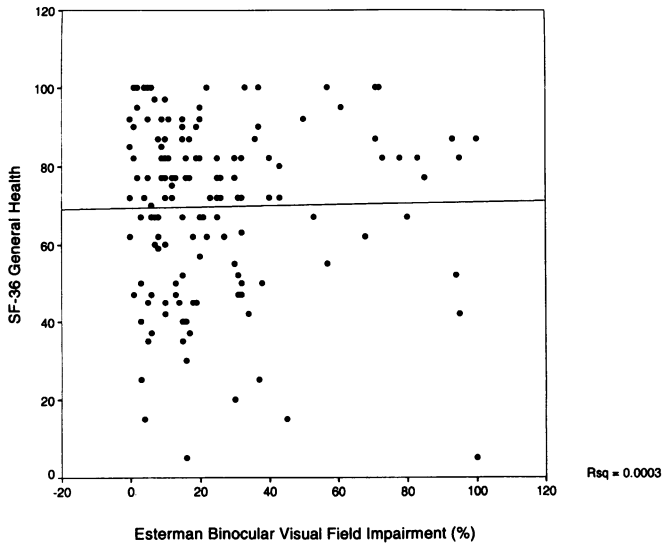

FIGURE 18
Scatterplot of Esterman binocular visual field impairment by SF-36 general health.

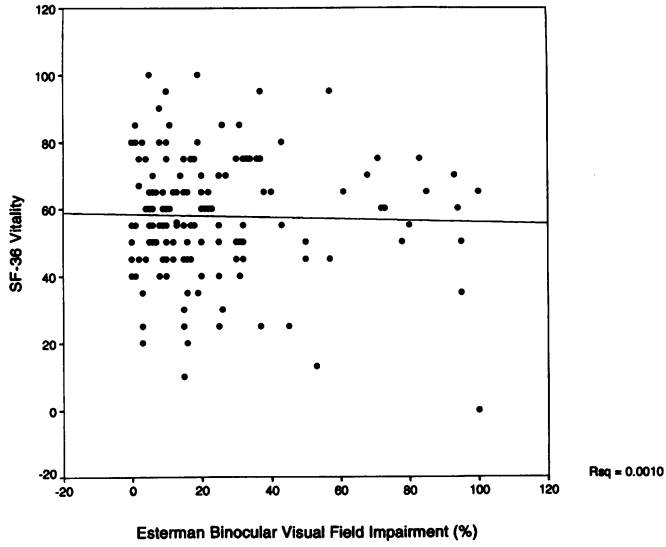

FIGURE 19
Scatterplot of Esterman binocular visual field impairment by SF-36 vitality.

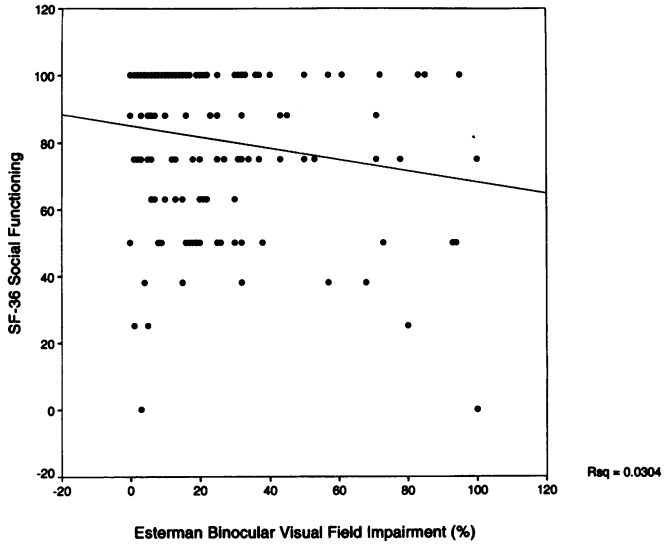

FIGURE 20
Scatterplot of Esterman binocular visual field impairment by SF-36 social functioning.

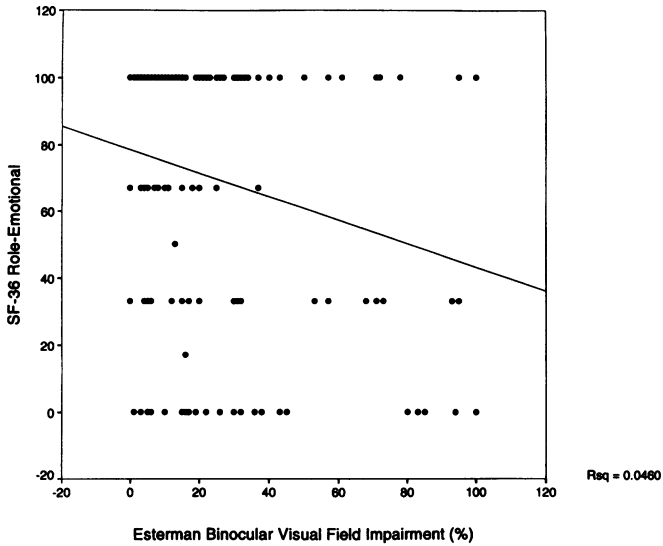

FIGURE 21
Scatterplot of Esterman binocular visual field impairment by SF-36 role-emotional.

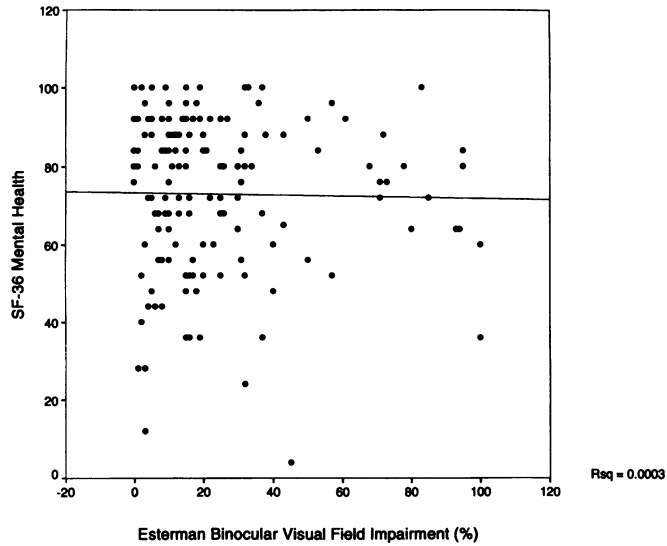

FIGURE 22
Scatterplot of Esterman binocular visual field impairment by SF-36 mental health.

field impairment are shown in Figs 7 through 22 with corresponding r^2 values.

National Eye Institute Visual Functioning Questionnaire

Scatterplots for the 12 scales: general health, general vision, visual pain, near activities, distance activities, vision-specific social functioning, vision-specific mental health, vision-specific expectations, vision-specific role difficulties, vision-specific dependency, driving, and color vision, and the single question relating to peripheral vision versus visual field impairment and corresponding r^2 values are described in Figs 23 through 35. Scatterplots are shown for the scales versus binocular visual field impairment in Figs 36 through 48. Correlation coefficients for each scale with visual acuity impairment, visual field impairment, and overall visual impairment are listed in Table VI. General health and vision-specific expectations were not correlated with either visual acuity impairment or visual field impairment. The statistically significant correlations between the scales and visual field impairment were, in descending order, peripheral vision (r = -.60), distance activities (r = -.56), vision-specific dependency (r = -.56), vision-specific social functioning (r = -.53), near activities (r = -.52), vision-specific role difficulties (r = -.50), general vision (r = -.47), vision-specific mental health (r = -.47), color vision (r = -.42), driving (r = -.36), and visual pain (r = -.19). When corrected for visual acuity the

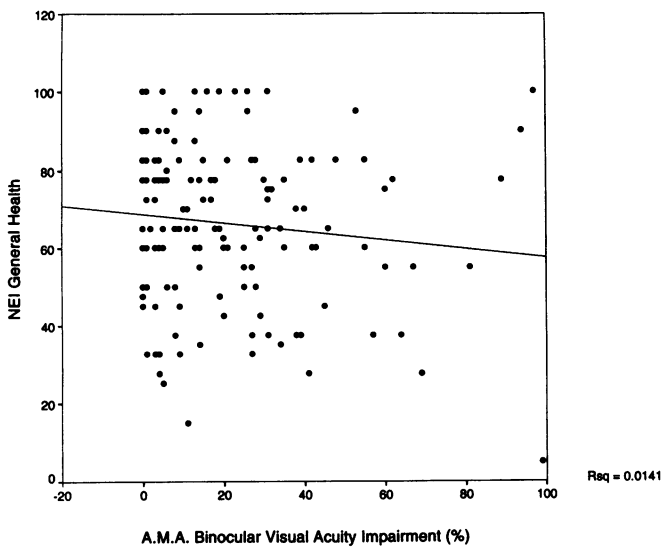

FIGURE 23

Scatterplot of AMA binocular acuity impairment by NEI general health.

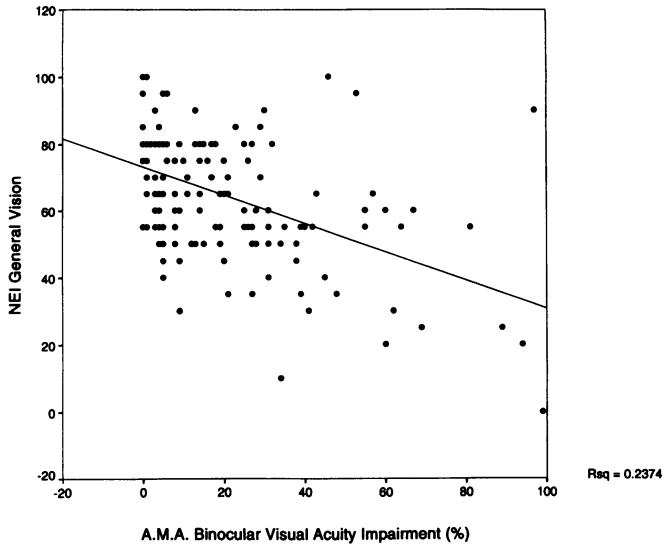

FIGURE 24

Scatterplot of AMA binocular acuity impairment by NEI general vision.

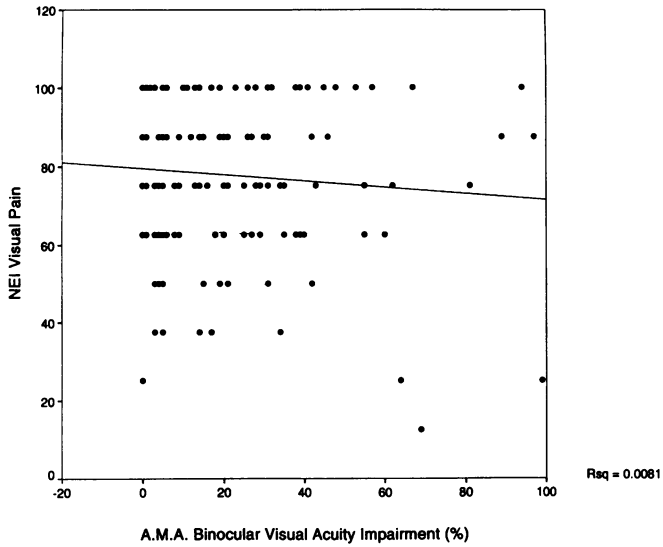

FIGURE 25

Scatterplot of AMA binocular acuity impairment by NEI visual pain.

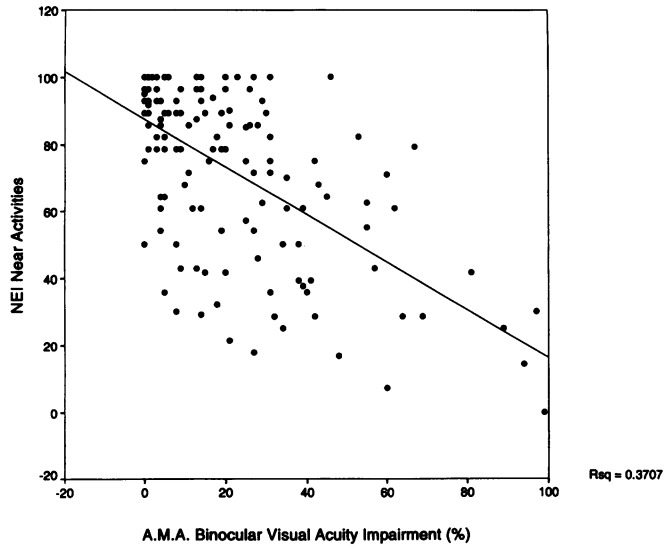

FIGURE 26
Scatterplot of AMA binocular acuity impairment by NEI near activities.

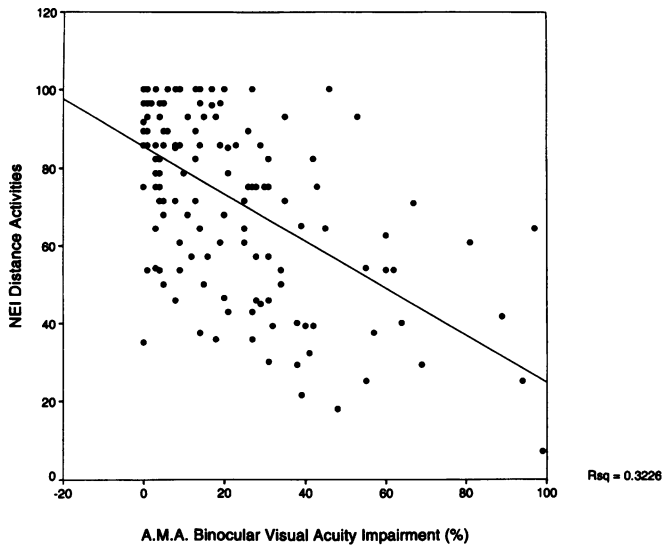

FIGURE 27
Scatterplot of AMA binocular acuity impairment by NEI distance activities.

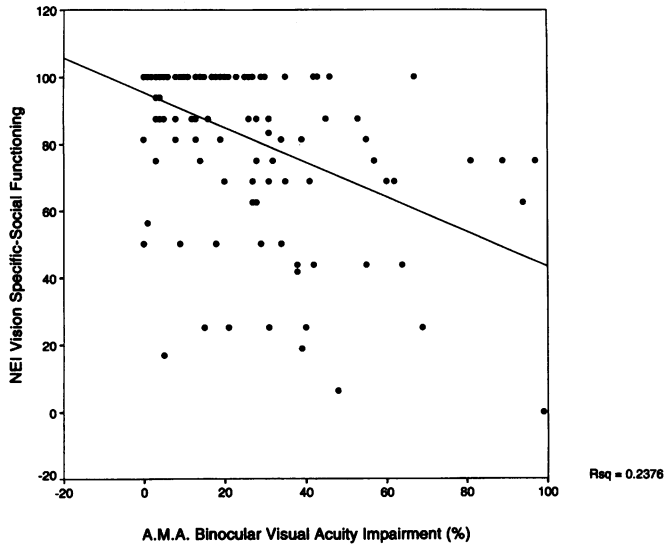

FIGURE 28
Scatterplot of AMA binocular acuity impairment by NEI vision-specific social functioning.

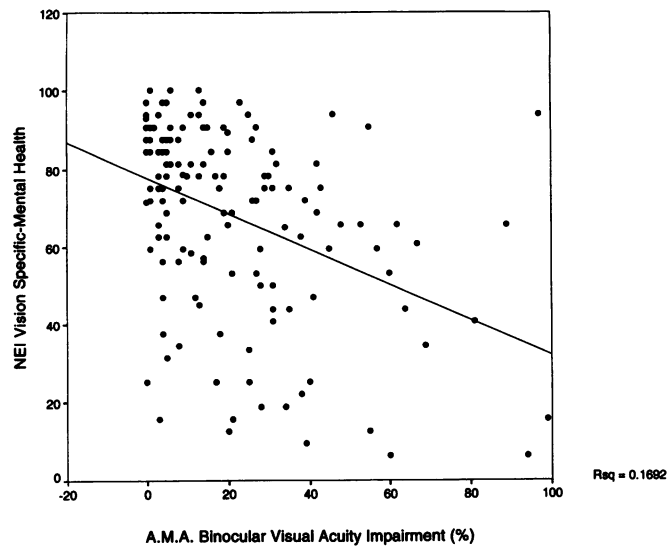

FIGURE 29
Scatterplot of AMA binocular acuity impairment by NEI vision-specific mental health.

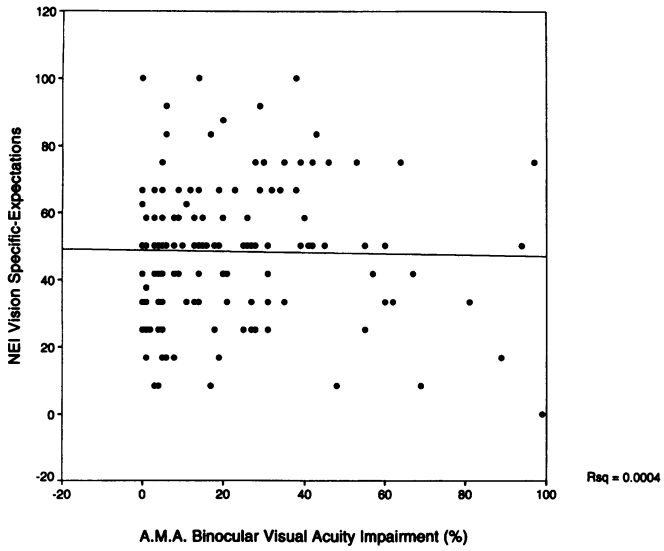

FIGURE 30
Scatterplot of AMA binocular acuity impairment by NEI vision-specific expectations.

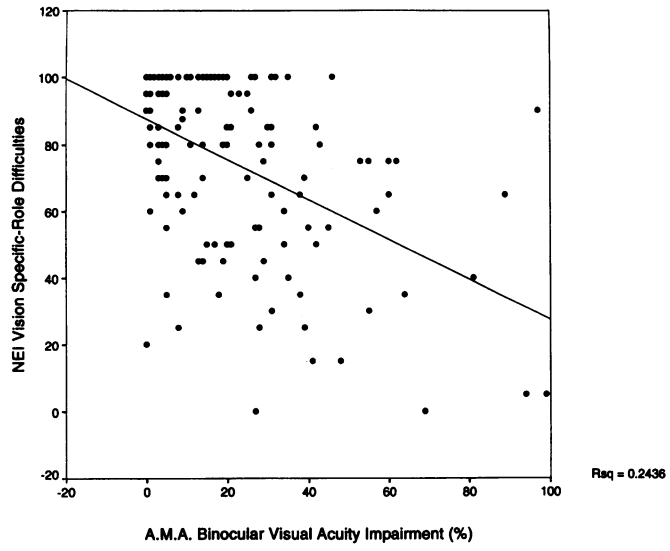

FIGURE 31
Scatterplot of AMA binocular acuity impairment by NEI vision-specific role difficulties.

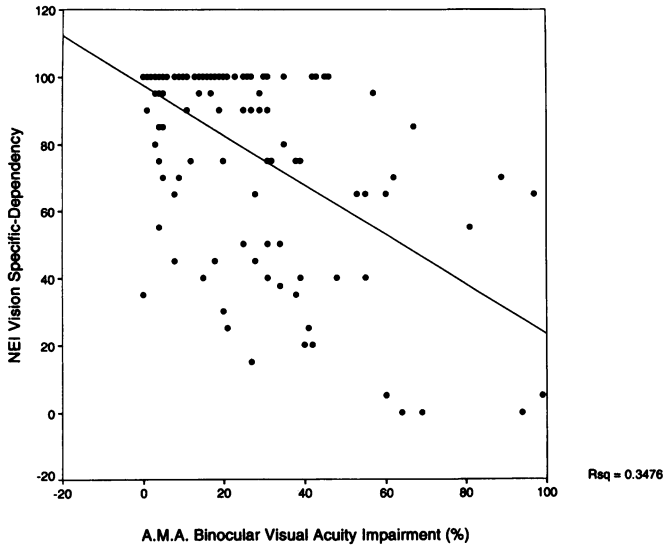

FIGURE 32
Scatterplot of AMA binocular acuity impairment by NEI vision-specific dependency.

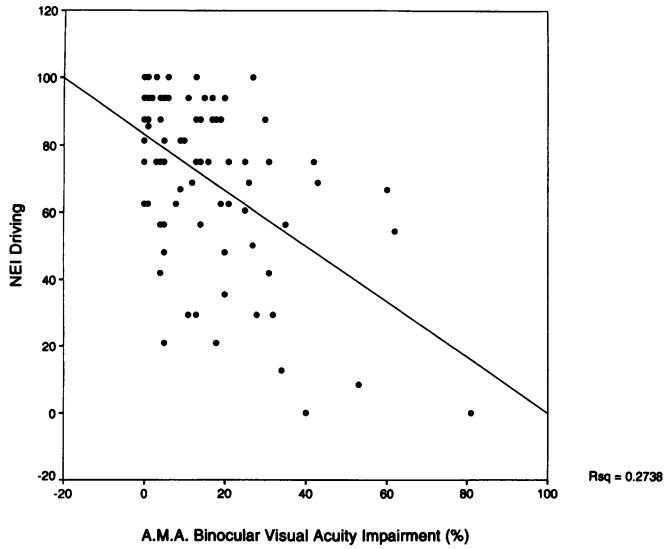

FIGURE 33
Scatterplot of AMA binocular acuity impairment by NEI driving.

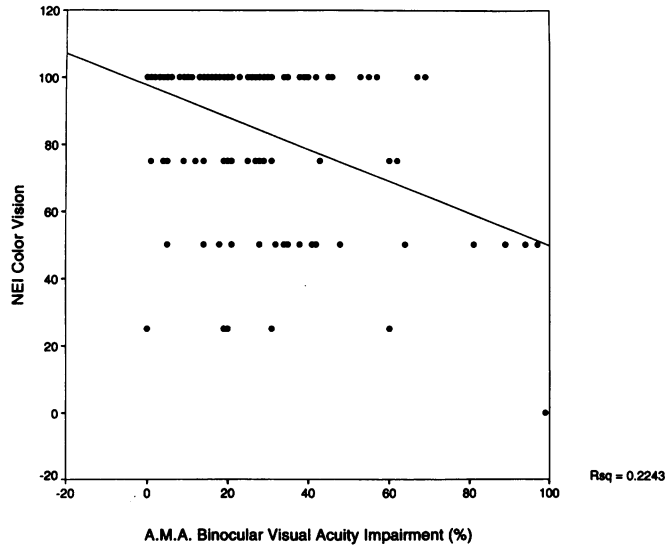

FIGURE 34
Scatterplot of AMA binocular acuity impairment by NEI color vision.

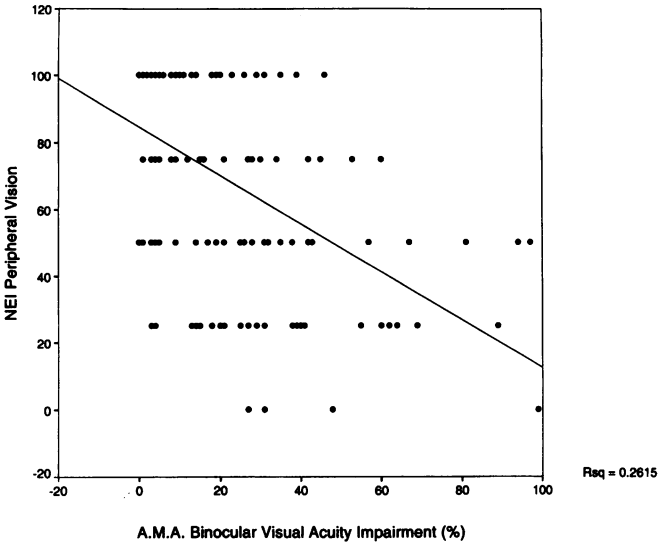

FIGURE 35
Scatterplot of AMA binocular acuity impairment by NEI peripheral vision.

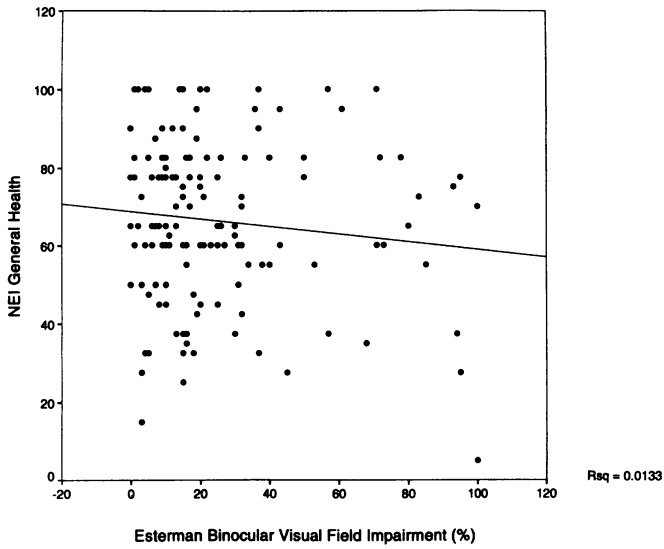

FIGURE 36
Scatterplot of Esterman visual field impairment by NEI general health.

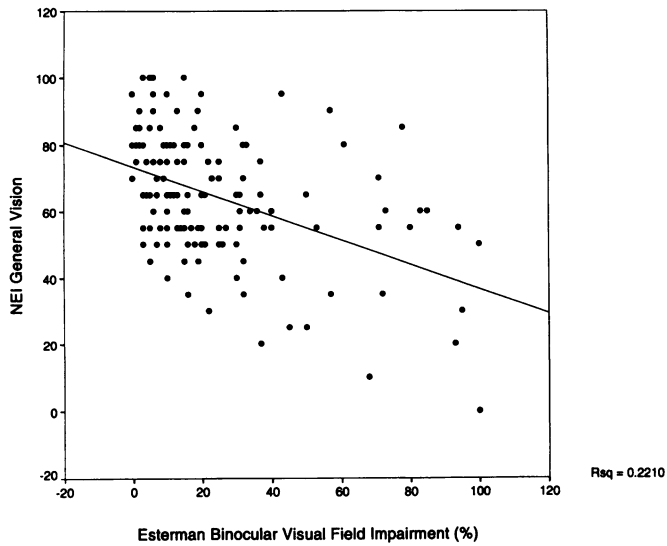

FIGURE 37
Scatterplot of Esterman visual field impairment by NEI general vision.

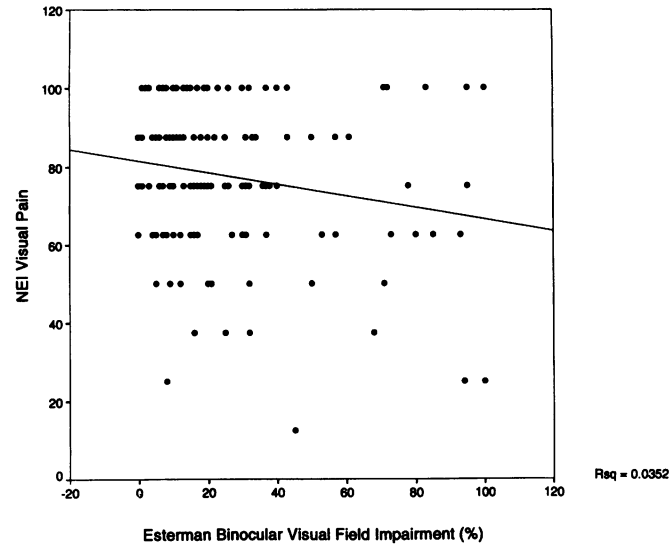

FIGURE 38
Scatterplot of Esterman visual field impairment by NEI visual pain.

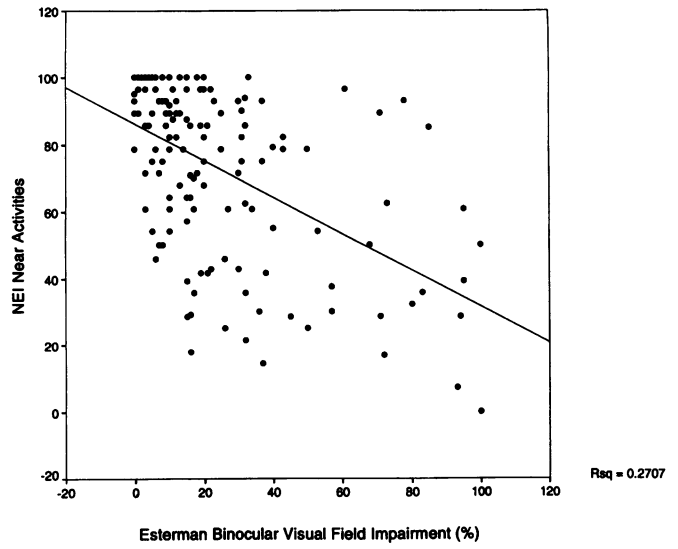

FIGURE 39
Scatterplot of Esterman visual field impairment by NEI near activities.

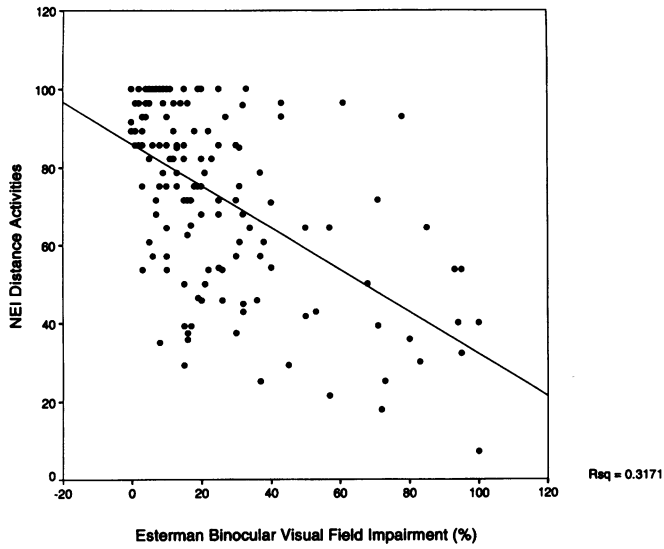

FIGURE 40
Scatterplot of Esterman visual field impairment by NEI distance activities.

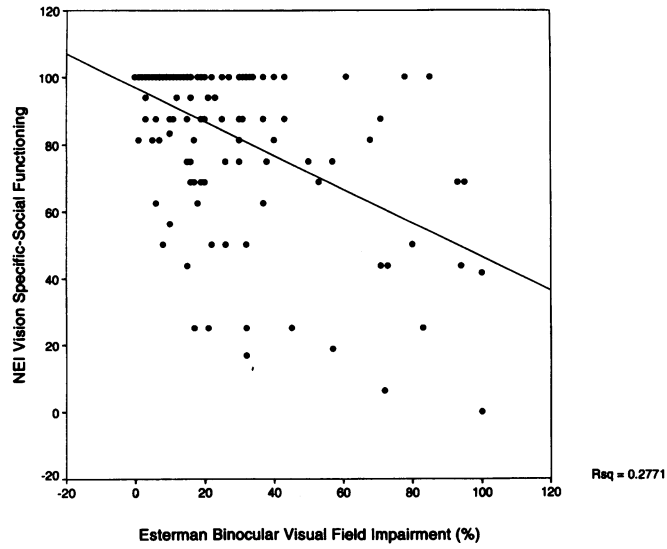

FIGURE 41
Scatterplot of Esterman visual field impairment by NEI vision-specific social functioning.

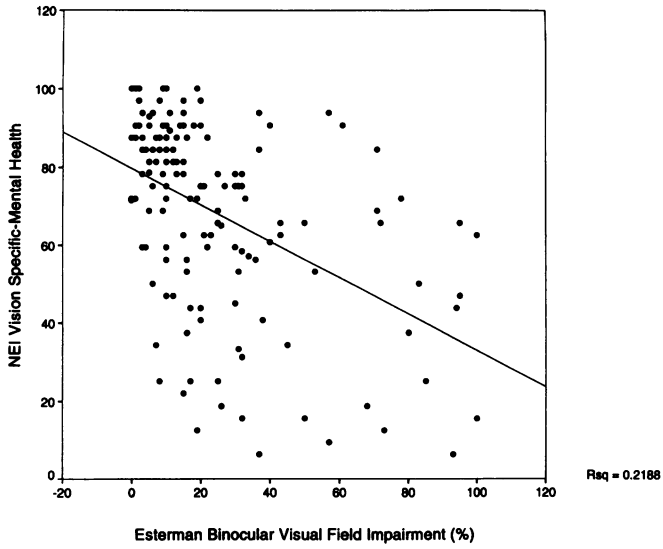

FIGURE 42
Scatterplot of Esterman visual field impairment by NEI vision-specific mental health.

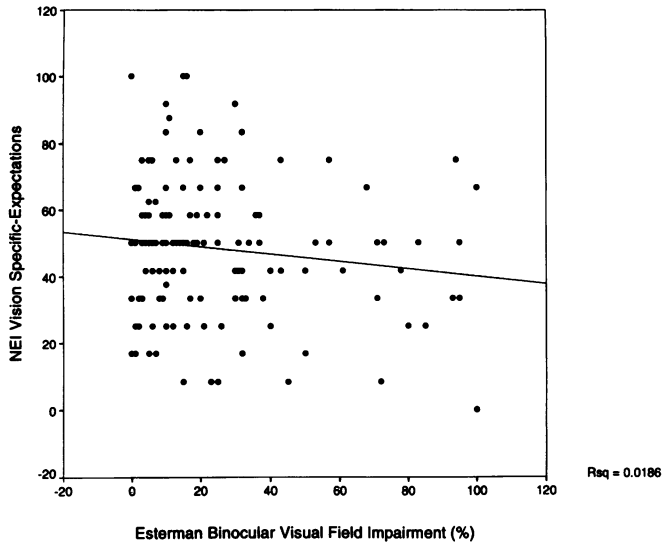

FIGURE 43
Scatterplot of Esterman visual field impairment by NEI vision-specific expectations.

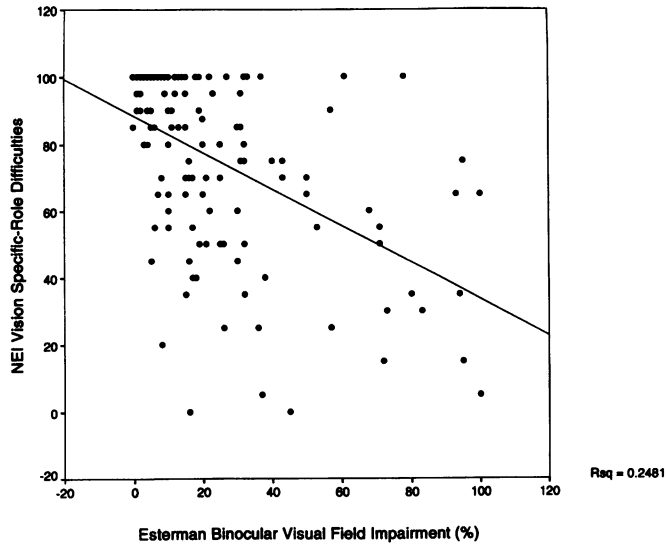

FIGURE 44
Scatterplot of Esterman visual field impairment by NEI vision-specific role difficulties.

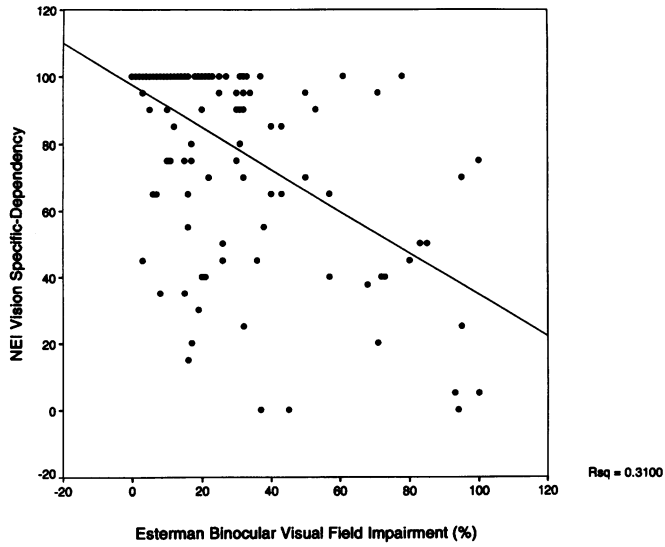

FIGURE 45
Scatterplot of Esterman visual field impairment by NEI vision-specific dependency.

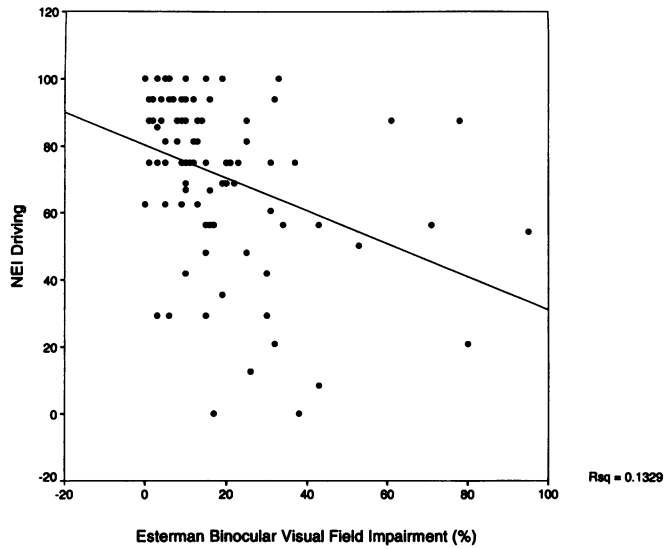

FIGURE 46
Scatterplot of Esterman visual field impairment by NEI driving.

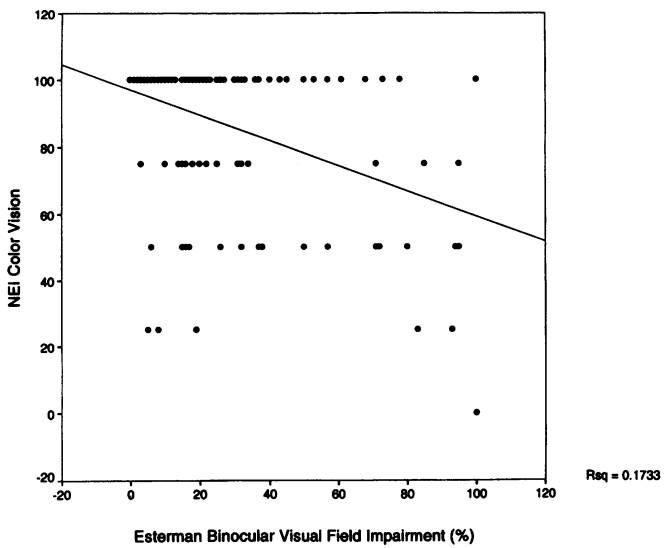

FIGURE 47
Scatterplot of Esterman visual field impairment by NEI color vision.

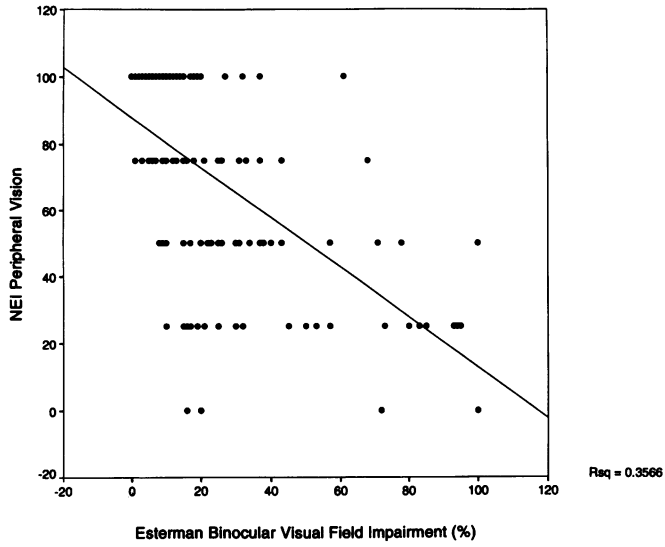

FIGURE 48
Scatterplot of Esterman visual field impairment by NEI peripheral vision.

correlation coefficient between visual field impairment and general vision (r = -.28), near activities (r = -.28), vision-specific mental health (r =-.31), vision-specific role difficulties (r = -.31), color vision (r = -.21) and driving (r = -.11) decreased from the range of 10% to 20% to less than 10%, and general health remained not correlated.

Interaction of Risk Factors and Quality of Life Assessments

Substantive and statistically significant correlations between risk factors and quality of life instruments are demonstrated in Table VII. The ranges of the strength of the Pearson correlations between visual field impairment and the quality of life without adjusting for central acuity are listed in Table VIII. The effect of adjusting for central acuity on quality of life measures is demonstrated in Table IX.

None of the continuous variables, including age, comorbidity score, elapsed time from diagnosis, number of glaucoma operations, or total number of ocular procedures involving conjunctival incisions, were more highly correlated with any of the vision-related quality of life measurement than was binocular visual acuity impairment itself.

Age. Age was correlated in the 10% to 20% range with the physical functioning domain of the SF-36.

Comorbidity Score. Comorbidity score correlated with general health, bodily pain, vitality, and physical functioning domains in the SF36, and

TABLE VI: CORRELATIONS BETWEEN VISUAL FUNCTION MEASUREMENTS AND NATIONAL EYE INSTITUTE VISUAL FUNCTIONING QUESTIONNAIRE (NEI-VFQ)

NEI-VFQ SUBSCALE	AMA BINOCULAR VISUAL IMPAIRMENT %	ESTERMAN BINOCULAR VISUAL FIELD IMPAIRMENT %	AMA OVERALL VISUAL IMPAIRMENT %
General health	-0.12	-0.12	-0.12
n = 146*	0.15	0.17	0.14
General vision	-0.49	-0.47	-0.54
n = 146	<0.001	<0.001	<0.001
Visual pain	-0.09	-0.19	-0.14
n = 147	0.3	0.023	0.099
Near activities	-0.61	-0.52	-0.63
n = 147	<0.001	<0.001	<0.001
Distance activities	-0.57	-0.56	-0.64
n = 146	<0.001	<0.001	<0.001
Vision-specific	-0.49	-0.53	-0.56
Social functioning			
n = 146	<0.001	<0.001	<0.001
Vision	-0.41	-0.47	-0.52
Specific mental health			
n = 147	<0.001	<0.001	<0.001
Vision specific expectations	-0.02	-0.14	-0.06
n = 145	0.8	0.1	0.4

with general health scale of the NEI-VFQ.

Number of Procedures With Conjunctival Incisions. The number of procedures with conjunctival incisions correlated with the VF-14 score. The correlation was also significant for the vision-specific dependency, distance activities, vision-specific mental health, driving scales and peripheral vision question of the NEI-VFQ. No significant correlation could be demonstrated with any of the domains of the SF-36 and the number of previous procedures with conjunctival incisions.

Other Risk Factors. The number of glaucoma medications, elapsed time since the last operation, sex, bilaterality, type of glaucoma (primary open-

TABLE VI: (CONTINUED)

Vision specific role difficulties	-0.49	-0.50	-0.56
n = 141	<0.001	<0.001	<0.001
Vision-specific dependency	-0.59	-0.56	-0.63
n = 145	<0.001	<0.001	<0.001
Driving	-0.52	-0.36	-0.53
n = 91	<0.001	<0.001	<0.001
Color vision	-0.47	-0.42	-0.45
	<0.001	<0.001	<0.001
Peripheral vision	-0.51	-0.60	-0.64
n = 142	<0.001	<0.001	<0.001

*If less than half of the questions associated with a subscale were not answered, then that entire scale is treated as missing.

angle), income, and educational grouping had no measurable effect on the nature of the relation between the quality of life assessment and visual acuity or visual field impairment. The severity of the glaucoma surgery (laser versus filtering surgery and drainage implant versus cyclodestructive procedure) was correlated with the vision-specific dependency and the peripheral vision.

DISCUSSION

An objective measurement of visual acuity or visual field or both may not accurately reflect the actual or perceived ability of the patient to function visually. Several suggestions have been made that visual acuity alone may be inadequate as an indicator of the degree of visual impairment. Genensky[136] argued that visual acuity measurement does not give much information about what a patient has accomplished or what he can be expected to accomplish with his residual vision. He stated, "The definition of legal blindness in this country, based so heavily on distance visual acuity, has done more harm to partially sighted people than any other definition used by our federal and state governments." Cullinan[137] concluded in a survey of 193 visually disabled people in England and Wales that the level of visual acuity provided no accurate guide to what could be achieved

TABLE VII: SUBSTANTIVE AND STATISTICALLY SIGNIFICANT CORRELATIONS BETWEEN RISK FACTORS AND QUALITY OF LIFE INSTRUMENTS

	Quality of Life Instrument																				
Risk factor	VF14	SF36PF	SF36RP	SF36BP	SF36GH	SF36V	SF36SF	SF36RE	SF36MH	NEIGH	NEIGV	NEIVP	NEINA	NEIDA	NEIVSSF	NEIVSMH	NEIVSSE	NEIVSRD	NEIVSD	NEID	NEICV	NEIPV
Age		-																				
Comorbidity score		-		-	-	-				-												
Months since first glaucoma treatment																						
No. of conjunctival cutting surgeries	-													-		-		-	-			-
No. of glaucoma surgeries																		-	-	-		
Months since last glaucoma surgery																						
No. of meds (both eyes)																						
Sex																						
Ocular involvement																						
Primary open-angle glaucoma																						
Educational status																						
Income			+																			
Severity of glaucoma surgery																			-		-	
Hispanic ethnicity						+																
Living status																						

+ indicates a positive and statistically significant Pearson correlations >0.31.
- indicates a negative and statistically significant Pearson correlations <-0.31.

Hispanic ethnicity was coded Hispanic = 1 and white = 0; therefore a positive correlation indicates that Hispanics enjoyed a higher SF-36 Vitality than non-Hispanic whites.

TABLE VIII: STRENGTH RANGES OF PEARSON CORRELATIONS BETWEEN VISUAL FIELD AND QUALITY OF LIFE INSTRUMENTS WITHOUT ADJUSTING FOR CENTRAL ACUITY

Strength of correlation with visual field	Quality of Life Instrument																				
	VF14	SF36PF	SF36RP	SF36BP	SF36GH	SF36V	SF36SF	SF36RE	SF36MH	NEIGV	NEIVP	NEINA	NEIDA	NEIVSSF	NEIVSMH	NEIVSSE	NEIVSRD	NEIVSSD	NEID	NEICV	NEIPV
No significant correlation				°	°	°			°	°						°					
Weak, r<.32		°	°				°	°			°										
Modest, .32≤ r ≤ .55										°		°		°	°		°		°	°	
Moderate, r> .55	°												°					°			°

° Indicates a negative correlation between visual impairment and quality of life instrument.

TABLE IX: STRENGTH RANGES OF PEARSON CORRELATIONS BETWEEN VISUAL FIELD AND QUALITY OF LIFE INSTRUMENTS AFTER ADJUSTING FOR CENTRAL ACUITY

Strength of correlation with visual field	Quality of Life Instrument																				
	VF14	SF36PF	SF36RP	SF36BP	SF36GH	SF36V	SF36SF	SF36RE	SF36MH	NEIGV	NEIVP	NEINA	NEIDA	NEIVSSF	NEIVSMH	NEIVSSE	NEIVSRD	NEIVSSD	NEID	NEICV	NEIPV
No significant correlation		°	°	°	°	°	°	°	°							°		°			
Weak, r<.32										°	°	°			°		°			°	
Modest, .32≤ r ≤ .55	°												°	°				°			°
Moderate, r> .55																					

° Indicates a negative correlation between visual impairment and quality of life instrument.

visually or to the extent of the handicap experienced.

Determination of visual impairment based on testing of the visual fields monocularly, the technique by which both the diagnosis and treatment effects of glaucoma are judged, has not been standardized or universally accepted in clinical practice. Classification of monocular visual field defects has usually been based on 2 criteria: the overall extent of the damage and the proximity to fixation of the damage. The implication is that, for example, the effect of a small and dense central defect is more important than a somewhat larger but just as dense peripheral defect. Hodapp and coworkers[138] proposed a schema for the classification of defects into the categories of early, moderate, and severe based on the mean deviation index (MD), the percentage of points on the pattern deviation plot that are depressed below the 5% and 1% levels, and the sensitivity of points in the central 5°. When the author of this study and an associate, who both have 20/15 and Jaeger 1 + acuity in each eye and normal Humphrey 30-2 visual fields, underwent Esterman testing after monocular occlusion to mimic the effects of monocular blindness, the percent binocular visual field impairments were 11% and 9%, respectively, with the right eye occluded, and 6% and 8% with the left eye occluded. In this hypothetical case of monocular blindness in 2 individuals with normal fellow eyes, the visual acuity impairment is calculated to be 25% with the AMA Guides.[98] The overall visual impairment when calculated with the AMA combined values chart, based on the formula A + B(1-A), is 33%. The intuitive overall impairment of monocular blindness predicted to be 50% is greater than the calculated value of 33%, and demonstrates the value of having a normal visual field in 1 eye. Although arbitrary categorization of visual fields may be of value in planning the treatment of glaucoma, no functional disability score can be calculated or derived from classifications alone. The implication that patients with severe monocular visual field defects experience greater difficulties than those with milder monocular defects may seem obvious, but this relationship has yet to be established.

LIMITATIONS OF THE STUDY

Patient Selection

Although consecutive participants were recruited, most patients had been under observation of a glaucoma specialist for several years. By the referral nature of the practice, the patients were likely to have had more severe glaucoma associated with surgical interventions than most glaucoma patients. This bias toward patients with more severe glaucomatous damage may limit the generalizability of the conclusions to those with less

advanced disease. However, despite the referral bias and the long-standing nature of the disease in many individuals, the mean visual field impairment was 24.5%, and few patients had visual field impairment scores greater than 90%.

Self-administered Questionnaires

The quality of life and visual function instruments used in this study consisted of self-administered questionnaires. For patients with poor near acuity or blindness, a companion or clinical assistant read aloud the questions and recorded the responses as instructed by the patient. It is possible that the family member or assistant could have introduced an intentional or unintentional bias that affected the response of the patient. In a previous study, Mills and Drance[97] explored for this possibility by administering disability questionnaires separately to both the patients and their companions. In no instance did the response to the questionnaire of the companion disagree with the answer of the patient. Based on the uniformity of the responses of their patients who also had advanced glaucoma and their companions, the likelihood that the companions of our patients introduced a substantial bias seems small.

Associated Systemic Comorbidities

Visual impairment is only one of many determinants of general health. Global quality of life is also affected by systemic diseases, such as arthritis, chronic pulmonary problems, and hypertension. To determine if the participants in this study had systemic comorbidities comparable to the published normative values, the mean scores of the eight SF-36 domains of patients in this study were compared with age-adjusted[139] mean normative values.[42] For each domain the scores of the study patients and those of the age-adjusted values were within 10%. To ascertain if the patients in this study were less impaired than patients with a severe comorbid condition, scores were compared with published values for patients with congestive heart failure, a severely debilitating medical problem. Published values for physical functioning, role-physical, and general health scales of patients with congestive heart failure were at least 20% more impaired than the scores of the patients in this study.[42] To compare the study participants with those having a comorbid condition that is usually not associated with severe systemic symptoms, hypertensive patients previously studied with the SF-36 were chosen. Values for all scales of patients with hypertension were comparable to those of patients in this study. Scales for physical functioning, role-physical, bodily pain, vitality, and mental health were within 5% of the values for patients in this study.[42] On the basis of these compar-

isons, it seems that the effects of associated comorbidities of patients chosen to participate in this study were comparable to those of previously studied patients without severe medical problems.

EXPLANATION OF CORRELATION COEFFICIENTS

V-F 14

Although the VF-14 was developed as an instrument to measure the visual functioning of patients with cataracts, the VF 14 scores of glaucoma patients in this study were modestly correlated with visual field impairment scores, after correcting for visual acuity. Because a sufficiently large visual field may be necessary to perform many of the visually related tasks described in the VF-14, patients with substantially reduced visual fields may not have been able to perform them. The correlation between visual field impairment and visual acuity impairment was r=0.54 in this study; some patients with excellent visual acuity had high degrees of visual field impairment, and others with poor visual acuity had relatively less impaired visual field scores. The VF-14 scores of patients in this study were moderately correlated with visual acuity impairment scores. This provides further support for the use of the VF-14 as an instrument to assess visual functioning in glaucoma, an ocular condition other than the indication for which it was originally intended.

SF-36

The 8 domains SF-36 scores were not highly correlated with visual acuity impairment, visual field impairment, or overall visual impairment. This is not surprising, considering that the SF-36 was developed as a global quality of life instrument, rather than a disease or organ system–specific measurement. Although the SF-36 scores were not correlated with visual impairment, the comparable values of patients in this study to age-adjusted values suggests that the general health of the participants was similar to that of previously studied subjects and that the visual impairment of glaucoma did not contribute additional effect.[42] In a previous report, a test of correlation validity between another visual functioning scale, the Activities of Daily Vision Scale, and the SF-36 10-item physical functioning scale was statistically significant, although only modestly, at a level of r = 0.31 (P<.001).[85] The elderly population in that study (average age, 75 years, with a standard deviation of 9 years) may have had physical disabilities that affected their ability to perform generic physical functioning activities.

NEI-VFQ

The question regarding peripheral vision and the subscales for distance activities, vision-specific dependency, vision-specific social functioning,

near activities, vision-specific role difficulties, general vision, vision-specific mental health, color vision, and driving were moderately associated with visual field impairment. When corrected for visual acuity, the correlation coefficients between visual field impairment and general vision, near activities, and color vision decreased from the range of 10% to 20% (r^2) to less than 10% and general health remained not correlated. The finding that multiple scales are correlated, at least moderately with visual field and overall visual impairment, supports the continued investigation of this instrument in glaucoma patients.

EFFECTS OF RISK FACTORS

None of the continuous variables, including age, number of glaucoma medications, comorbidity score, elapsed time from diagnosis, number of glaucoma operations, or total number of ocular procedures involving conjunctival incisions, were more highly correlated with any of the vision-related quality of life measurements than was binocular visual acuity impairment itself. The age of patients in this study was correlated in the 10% to 20% range with the physical functioning domain of the SF-36. This finding is consistent with the published normative values that document decreased scores in the physical functioning domain with advancing age. Mean values for men and women decrease from 94.14 and 90.18, with standard deviations of 16.30 and 20.04, in the 18- to 24-year-old age-group to 65.79 and 61.86 with standard deviations of 28.31 and 28.95 in the group aged 65 years and older.[42]

Comorbidity scores were correlated with bodily pain, vitality, and physical functioning domains in the SF-36, and with the general health scale of the NEI-VFQ. These findings support the continued use of questionnaires that include a self-reported effect of comorbid conditions on general functioning. In the current study, a 3-point scale was used and consisted of either "no effect," "a little effect," or a "great deal of effect." Further resolution of the comorbid effects may have been possible if a 5-point scale had been used, similar to that employed in the Collaborative Initial Glaucoma Treatment Study (CIGTS). In the CIGTS, patients are asked by a skilled interviewer, "How much does (problem) keep you from or interfere with your daily activities? 1 = a lot, 2 = a moderate amount, 3 = some, 4 = a little, and 5 = not at all."

The categorical variable, self-reported Hispanic ethnicity, interacted significantly with the SF-36 Vitality scale. The author speculates that the tightly knit social structure of the American Hispanic family that tends to maintain elderly health-impaired members within the supportive nuclear unit, rather than to custodial care outside the home, may explain this finding in part.

EFFECTS OF DIAGNOSIS AND TREATMENT

Although the initial effects of making a diagnosis of glaucoma on quality of life have been described by Lichter,[39] it was not possible to determine that effect in this study as structured. No significant interaction between the length of time after diagnosis of glaucoma and the quality of life measurements could be demonstrated in the study participants. It seems plausible, however, to predict some long-term effect of diagnosis on the basis of reports in other health areas, particularly in hypertensive patients. In a previous study, patients who were mislabeled as having arterial hypertension reported having more depressive symptoms, lower current health, and a worsening of their health over 5 years compared with a total normotensive sample.[140] When compared with a control group matched for gender, age, ethnicity, education, and marital status, the mislabeled patients reported even more depressive symptoms and lower current health.[140] The mislabeled hypertensive patients did not receive antihypertensive medical therapy, and the worsening of the general quality of life was believed to have been related to the diagnosis, or more correctly, the misdiagnosis itself, rather than to any pathophysiologic effect of a condition or treatment that did not exist. Unless routine quality of life testing were performed on all patients at the time of the initial eye examination, the likelihood of having meaningful baseline values against which to make comparisons after diagnosis seems small. Quality of life testing could be performed immediately after the diagnosis is made and the results could be compared with normative values of patients without eye disease, but to date these age- and comorbid-adjusted values do not exist.

Similarly, the effects of medical therapy could not be isolated from the effects of the glaucoma in this study. No interaction could be defined between the number of glaucoma medications and any of the quality of life measurements. On the basis of other reports, it seems likely that these different treatment effects exist and will probably be found if sought in a systematic prospective fashion. Croog and coworkers[141] reported 3 antihypertensive medications that achieved comparable arterial blood pressure control despite differing notably in their effects on well-being. This may be comparable to the effects of different medical treatments for intraocular pressure control in patients with glaucoma. Although achieving a target pressure may be possible with several individual medications or combinations of medications, the effects on the quality of life may be very different. To determine the effects of each medication, it would be necessary to initiate therapy with 1 drug and to assess quality of life both before and after changing the therapy. This approach to determine the effects of the condition, ocular hypertension, and its medical treatment has been taken

by the Ocular Hypertension Treatment Study.[50] A similar methodology has been elected to measure the effect of medical treatment and surgical intervention in patients with glaucoma in the Collaborative Initial Glaucoma Treatment Study.

FUTURE DIRECTIONS

The finding that over a broad range of severity of glaucoma, an instrument designed to measure generic quality of life, the SF-36, is not correlated with visual impairment is not unexpected. The question of whether the SF-36 would be sensitive to effects of advanced visual field impairment, for example, greater than 80%, cannot be answered on the basis of this study, as the sample size of patients with this degree of visual field impairment is too small. The failure to have a higher proportion of patients with very severe impairment is somewhat surprising given the referral nature of the patients and the fact that a high proportion of patients had already undergone either glaucoma laser or incisional surgery.

The NEI-VFQ, a vision-specific quality of life instrument, was only moderately correlated with the visual acuity impairment scores and the visual field impairment in some scales in the study participants. Because the average visual field loss of study participants was only 24.5%, it was not possible to determine the effects of very severe visual field loss on the NEI-VFQ scales. However, among the few highly impaired patients in this study, the plots reveal a range of quality of life from poor to high.

Since glaucoma early in the course of the disease usually does not produce symptoms, it is not surprising that the instruments chosen did not detect impairment either visually or systemically. To determine if these 3 instruments discriminate the effects of advanced visual field loss, a fundamental question, it will be necessary to study these particular patients in detail. If only some of the scales of the different instruments are proven to be valuable in defining quality of life in patients with advanced visual field loss, then a composite questionnaire of the most discriminating questions could be constructed and used to retest those with milder disease.

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APPENDIX 1

National Eye Institute Visual Functioning Questionnaire (NEI-VFQ)

TEST VERSION
(SELF-ADMINISTERED FORMAT)
April 1995

INSTRUCTIONS

1. In general, we would like to have people try to complete these forms on

their own. If you find that you need assistance, please feel free to ask the project staff and they will assist you.
2. Please answer every question (unless you are asked to skip questions because they don't apply to you).
3. Answer the questions by circling the appropriate number 1 or 2, or filling in the number as requested.
4. If you are unsure of how to answer a question, please give the best answer you can and make a comment in the left margin.
5. Try to estimate the closest exact number, instead of providing ranges. For example, you might estimate 25 years instead of writing a range of 20 to 30 years.
6. Please complete the questionnaire before leaving the center and give it to a member of the project staff. Do not take it home.
7. If you have any questions, please feel free to ask a member of the project staff, and they will be glad to help you.

STATEMENT OF CONFIDENTIALITY

All information that would permit identification of any person who completed this questionnaire will be regarded as strictly confidential. Such information will be used only for the purposes of this study and will not be disclosed or released for any other purposes without prior consent, except as required by law.

Visual Functioning Questionnaire *

SITE ID CODE #
PATIENT ID #
START TIME
DATE

PART 1: DEMOGRAPHIC INFORMATION
1. Are you male or female? (Circle One)
Male 1
Female 2

2. What was your age at your last birthday?
AGE_____

* For scaling and scoring rules, see "Measuring Visual Functioning: Test Version of the NEI-VFQ," NEI-VFQ Phase I Development Team, Santa Monica Calif: RAND MR-6O9-NEI/MES, 1995.

3. Is your *main* racial or ethnic group: (Circle one)

White or Caucasian, but not Hispanic 1
African-American or Black, but not Hispanic 2
Hispanic or Latino 3
Asian or Pacific Islander 4
Native American or Alaskan native 5
Other main race or ethnicity 6
Please specify _____
Mixed—no main race 7
Please specify _____

4. Which vision condition(s) do you have?

(Circle all conditions that apply for each eye.)

	RIGHT	LEFT
a. Glaucoma	1	1
b. Diabetic retinopathy	1	1
c. Cataract	1	1
d. Macular degeneration	1	1
e. CMV retinitis	1	1
f. Other	1	1

Please specify:_____

Has a doctor ever told you that you have any of the following conditions or problems? (If Yes, How much does this interfere with your activities—not at all, a little [some], or a great deal?)

	Yes	No	Not	Not At All	A Little	A Great Deal
a. Arthritis or rheumatism?	1	2	3	1	2	3
b. Cancer, other than skin cancer?	1	2	3	1	2	3
c. Major paralysis or neurologic problems, such as stroke, epilepsy, multiple sclerosis, muscular dystrophy?	1	2	3	1	2	3
d. Cardiac pacemaker?	1	2	3	1	2	3
e. Amputation of an arm or leg?	1	2	3	1	2	3
f. Heart failure or enlarged heart?	1	2	3	1	2	3
9. Heart attack or angina (chest pain)?	1	2	3	1	2	3
h. Asthma or other serious lung problems, such as chronic bronchitis						

or emphysema?	1	2	3	1	2	3
i. Back problems (including disk or spine)?	1	2	3	1	2	3
j. Ulcer (duodenal, stomach, or peptic)?	1	2	3	1	2	3
k. Chronic inflamed bowel, enteritis, colitis?	1	2	3	1	2	3
1. Kidney or liver disease?	1	2	3	1	2	3
m. Diabetes?	1	2	3	1	2	3
n. High blood pressure or hypertension?	1	2	3	1	2	3
o. Deafness or trouble hearing?	1	2	3	1	2	3
p. Other major health problem?	1	2	3	1	2	3

Please specify:_____

PART 2: GENERAL HEALTH AND VISION

1. *In general*, would you say your overall *health* is:
(Circle one)

Excellent 1
Very Good 2
Good 3
Fair 4
Poor 5

2. How would you rate your *overall health*, on a scale where zero is *worst* possible health and 10 is *best* possible health? Circle the number that comes closest to how you rate *your* overall health.
(Circle one)

0	1	2	4	5	6	7	8	9	10
Worst									Best

3. At the present time, would you say your eyesight (with glasses or contact lenses, if you wear them) is *excellent, good, fair, poor*, or *very poor*, or are you *completely blind*?
(Circle one)

Excellent 1
Very Good 2
Good 3
Fair 4
Poor 5
Completely blind 6

4. Over the *next year,* do you think your eyesight will be:
(Circle one)

Much better 1
Somewhat better 2
About the same 3
Somewhat worse 4
Much worse? 5

5. How much of the time do you *worry* about your eyesight?
(Circle one)

None of the time 1
A little of the time 2
Some of the time 3
Most of the time 4
All of the time 5

6. How much does pain or discomfort *in and around your eyes,* for example, burning, itching, or aching, keep you from doing what you'd like to be doing? Would you say:
(Circle one)

None of the time 1
A little of the time 2
Some of the time 3
Most of the time 4
All of the time 5

7. How much of the time do you *think* about your eyesight?
(Circle one)

None of the time 1
A little of the time 2
Some of the time 3
Most of the time 4
All of the time? 5

For each of the statements below, please circle the number to indicate whether for you the statement is *definitely true, mostly true, mostly false, definitely false,* or you *don't know*:
(Circle one on each line)

	Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
8. I expect my eyesight to get *worse than it is now*	1	2	3	4	5
9. I *expect to be completely blind* at some time in the future	1	2	3	4	5
10. In the future, I expect my eyesight will be *better than it is now.*	1	2	3	4	5
11. I worry about *doing things that will embarrass myself or others,* because of my eyesight	1	2	3	4	5

12. How much *pain or discomfort* have you had *in and around your eyes* (for example, burning, itching, or aching)? Would you say it is:
(Circle one)

None 1
Mild 2
Moderate 3
Severe 4
Very severe 5

13. How much of the time do you feel *frustrated* because of your eyesight? Is it:
(Circle one)

All of the time 1
Most of the time 2
Some of the time 3
A little of the time 4
None of the time 5

14. How would your rate your eyesight now, on a scale of 0 to 10, where zero means the worst possible eyesight, as bad as or worse than being blind, and 10 means the best possible eyesight? Circle the number that comes closest to how your rate *your* eyesight.
(Circle one)

0	1	2	3	4	5	6	7	8	9	10
Worst										Best

PART 3: DIFFICULTY WITH ACTIVITIES
The next questions are about how much difficulty, if any, you have doing certain activities wearing your glasses or contact lenses if you use them.

15. How much difficulty do you have *reading ordinary print in newspapers*? Would you say you have:
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

16. Wearing glasses, how much difficulty do you have *reading the small print in a telephone book, on a medicine bottle, or on legal forms*? Would you say:
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

17. How much difficulty do you have doing work or hobbies that require you to *see well up close*, such as cooking, sewing, fixing things around the

house, or using hand tools? Would you say:
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

18. Because of your eyesight, how much difficulty do you have *playing cards or games like bingo or Monopoly*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

19. Because of your eyesight, how much difficulty do you have *finding something on a crowded shelf*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

20. How much difficulty do you have *reading street signs or the names of stores*?
(Circle one)

No difficulty at all 1
A little difficulty 2

Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

21. Because of your eyesight, how much difficulty do you have *going down steps, stairs, or curbs in the daytime*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

22. Because of your eyesight, how much difficulty do you have *going down steps, stairs, or curbs in dim light or at night*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

23. Because of your eyesight, how much difficulty do you have *noticing objects off to the side while you are walking along*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

24. Because of your eyesight, how much difficulty do you have *recognizing people you know from across a room*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

25. Because of your eyesight, how much difficulty do you have *seeing how people react to things* you say?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

26. Because of your eyesight, how much difficulty do you have *figuring out whether bills you receive are accurate*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

27. Because of your eyesight, how much difficulty do you have *picking out and matching your own clothes*?
(Circle one)

No difficulty at all 1

A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

28. Because of your eyesight, how much difficulty do you have doing things like *shaving, styling your hair, or putting on makeup*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

29. Because of your eyesight, how much difficulty do you have in doing your *normal social activities* with family, friend, neighbors, or groups (including church activities)?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

30. Because of your eyesight, how much difficulty do you have *entertaining friends and family in your home*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not

interested in doing this 6

31. Because of your eyesight, how much difficulty do you have *visiting with people you don't know well in their homes, at parties, or in restaurants*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

32. Because of your eyesight, how much difficulty do you have *seeing and enjoying programs on TV*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty .....
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

33. Because of your eyesight, how much difficulty do you have *taking part in active sports or other outdoor activities that you enjoy* (like golf, bowling, jogging, or walking)?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

34. Because of your eyesight, how much difficulty do you have *going out to see movies, plays, or sports events*?
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

35. Are you *currently driving*, at least once in a while?
(Circle one)

Yes .....1 SKIP TO Q 35c
No .....2 CONTINUE

35a. If NO: Have you *never* driven a car or have you *given up driving*?
(Circle one)

Never drove .....1 SKIP TO Q 39
Gave up .....2 CONTINUE

35b. IF GAVE UP DRIVING: Was that *mainly because of your eyesight, mainly for some other reason*, or because of *both your eyesight and other reasons*?
(Circle one)

Mainly eyesight .....1 SKIP TO Q 39
Mainly other reasons .....2 SKIP TO Q 39
Both eyesight and other reasons .....3 SKIP TO Q 39

35c. IF CURRENTLY DRIVING: How much difficulty do you have *driving during the daytime in familiar places*? Would you say you have:
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3

Extreme difficulty 4

36. How much difficulty do you have *driving during the daytime in unfamiliar places*? Would you say you have:
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

37. How much difficulty do you have *driving at night*? Would you say you have:
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

38. How much difficulty do you have *driving in difficult conditions, such as in bad weather, during rush hour, on the freeway, or in city traffic*? Would you say you have:
(Circle one)

No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of my eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

39. The next questions are about things you may do because of your vision as part of work at a job or your other daily activities, such as housework, child care, or school or community activities. For each one, I'd like you to

tell me if this is true for you *all, most, some, a little, or none of the time.* (Circle one on each line)

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
DO YOU					
a. *Accomplish less* than you would have liked?	1	2	3	4	5
b. *Have more help* from others?	1	2	3	4	5
c. *Act irritable* toward other people?	1	2	3	4	5
d. *Let other people do more* of the work?	1	2	3	4	5
e. Be *limited* in the kinds of things you could do?	1	2	3	4	5
f. Be *limited* in how long you could work or do other activities?	1	2	3	4	5

PART 4: RESPONSES TO VISION PROBLEMS

The next questions are about how you deal with your vision. For each statement, please tell me if it is *definitely true, mostly true, mostly false, definitely false, or you don't know.*
(Circle one on each line)

	Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
40. I am often *irritable* because of my eyesight	1	2	3	4	5
41. I *stay home most of the time* because of my eyesight	1	2	3	4	5
42. I feel *frustrated* a lot of the time because of my eyesight	1	2	3	4	5
43. I have *much less control* over what I do, because					

of my eyesight	1	2	3	4	5
44. Because of my eyesight, other *people know too much about my personal business*	1	2	3	4	5
45. I *don't go out of my home alone*, because of my eyesight	1	2	3	4	5
46. Because of my eyesight, I have to *rely too much on what other people tell me*	1	2	3	4	5
47. I *need a lot of help* from others because of my eyesight	1	2	3	4	5

That's the end of the interview. Thank you very much for your time and your help.

END TIME:

DATE COMPLETED: /_____/_____
Month Day Year

TOTAL TIME (MINUTES):

APPENDIX 2

National Eye Institute
CUESTIONARIO SOBRE EL FUNCIONAMIENTO VISUAL
(Spanish-American version, Visual Functioning Questionnaire = NEI-VFQ)

July 1995

Translation into Spanish from the original version developed at RAND under the sponsorship of the National Eye Institute, "NEI-VFQ Test Version–April 1995."

INSTRUCCIONES:

1. Es preferible que las personas respondan este cuestionario por si mismas. Sin embargo, si usted necesita alguna ayuda, no deje de pedirsela a algún miembro de nuestro personal.
2. Por favor, responda a todas las preguntas (a menos que se le pida que salte algunas porque no tienen relación con su caso).
3. Responda las preguntas haciendo un circulo alrededor del número correcto.
4. Si usted tiene dudas acerca de su respuesta, marque la más cercana a su condición y haga un comentario en el borde izquierdo del papel.
5. Si no sabe la fecha o número exacto, calcúlelo aproximadamente. Por ejemplo, calcule *25 ao s* en vez de escribir *entre 20 o 30 abir.*
6. Por favor, complete el cuestionario antes de irse y entréguelo a un miembro de nuestro personal. *NO* SE LO LLEVE para completarlo en su casa.
7. Si usted tiene alguna pregunta que hacer, cualquier miembro de nuestro personal la contestará gustosamente.

DECLARACION DE CONFIDENCIALIDAD:

Toda información que permita la identificación de cualquier persona que responda este cuestionario será considerada estrictamente confidencial. Esta información será usada solamente para los fines de este estudio, y no será revelada o cedida para ningún otro fin sin la previa autorización del interesado, excepto cuando lo requiera la ley.

CUESTIONARIO SOBRE EL FUNCTIONAMIENTO VISUAL *

SITE ID CODE #
PATIENT ID#
START TIME
DATE

PARTE 1: INFORMACION DEMOGRAFICA
1. ¿Pertenece usted al sexo masculino o femenino? (Haga un circulo alrededor de uno de los números.)

Masculino _____1
Femenino _____2

2. ¿Cuántos años cumplió en su último cumpleaños?
_____EDAD

3. ¿Cuál es su grupo étnico o raza principal? (Haga un circulo alrededor de uno de los números.)

Blanco o Caucásico, pero *no* Hispano 1
Norteamericano-Africano, pero *no* Hispano 2
Hispano o Latino 3
Asiatico o de las islas del Pacifico 4
Indio de EEUU o nativo de Alaska 5
Otro grupo étnico o raza principal 6
Por favor, especifique:
Grupos mezclados - ninguna raza principal 7
Por favor, especifique:_____

* For scaling and scoring rules, see "Measuring Visual Functioning: Test Version of the NEI-VFQ," NEI-VFQ Phase 1 Development Team, Santa Monica, Calif: RAND MR-609- NEI/MES, 1995.

4. ¿Que problema o problemas tiene usted en la vista? (Haga un circulo alrededor de cada número que corresponda con sus problemas en cada ojo.)

	OJO DERECHO	OJO IZQUIERDO
a. Glaucoma	1	1
b. Retinopatia diabética	1	1
c. Catarata	1	1
d. Degeneración de la mácula	1	1
e. CMV retinitis	1	1
f. Otro	1	1

Por favor, especifique_____

5. ¿Un médico le ha dicho alguna vez que tiene usted alguno de estos problemas? (Si la respuesta es *Si*, diga cuánto ésto dificulta sus actividades normales, ¿nada?, ¿un poco? o ¿mucho?)

	SI	NO	NO ESTOY SEGURO	NADA	UN POCO	MUCHO
a. Artritis o reumatismo	1	2	3	1	2	3
b. Cáncer, excepto de la piel	1	2	3	1	2	3
c. Parálisis mayor o problemas neurológicos tales como apoplejia (stroke) eplepsia, distrofia muscular o esclerosis múltiple	1	2	3	1	2	3
d. Marcapasos cardiaco	1	2	3	1	2	3
e. Amputación de brazo o pierna	1	2	3	1	2	3
f. Fallo o agrandamiento del corazón	1	2	3	1	2	3
g. Ataque del corazón o angina (dolor de pecho)	1	2	3	1	2	3
h. Asma u otros serios problemas pulmonares como bronquitis crónica o enfisema.	1	2	3	1	2	3
i. Problemas de espalda (incluyendo disco o columna)	1	2	3	1	2	3
j. Ulcera duodenal, estomacal o						

	digestiva	1	2	3	1	2	3
k.	Inflamación cronica de los intestinos enteritis colitis	1	2	3	1	2	3
l.	Enfermedad de riñón o higado	1	2	3	1	2	3
m.	Diabetes	1	2	3	1	2	3
n.	Alta presión arterial o hipertensión	1	2	3	1	2	3
o.	Sordera o problemas auditivos	1	2	3	1	2	3
p.	Algún otro problema mayor de salud	1	2	3	1	2	3

Por favor, especifique:_____

PARTE 2: ESTADO GENERAL DE SALUD Y VISION

1. En términos generales, usted diria que su salud es:
(Haga un circulo alrededor de uno de los números.)

Excelente 1
Muy buena 2
Buena 3
Regular 4
Mala 5

2. ¿Cómo usted calificaria su estado general de salud en una escala donde cero es la peor salud posible y 10 es la mejor posible? Marque el número que más se acerca a la opinón que usted tiene de su propia salud.
(Haga un circulo alrededor de un número en cada linea.)

0	1	2	3	4	5	6	7	8	9	10
La peor salud										La mejor salud

3. ¿Cómo calificaria su vista en la actualidad (usando espejuelos o lentes de contacto, si es que usted los usa)?
(Haga un círculo alrededor de uno de los números.)

Excelente 1
Buena 2
Regular 3
Mala 4
Muymala 5
Completa ceguera 6

4. En el curso del año próximo, a partir de ahora, usted piensa que su visión estará:
(Haga un círculo alrededor de uno de los números.)

Mucho mejor 1
Un poco mejor 2
Más o menos igual 3
Un poco peor 4
Mucho. pear 5

5. ¿Qué parte del tiempo usted se *preocupa acerca de su vista*?
(Haga un círculo alrededor de uno de los números.)

En ningún momento 1
Una pequeña parte del tiempo 1
Parte del tiempo 3
La mayor parte del tiempo 4
Todo el tiempo 5

6. ¿Qué parte del tiempo usted no puede hacer lo que quisiera a causa del dolor o malestar en sus ojos o alrededor de ellos (por ejemplo, ardor, picazón, irritación, inflamación, molestia, dolor)?
(Haga un circulo alrededor de uno de los números.)

En ningún momento 1
Una pequeña parte del tiempo 1
Parte del tiempo 3
La mayor parte del tiempo 4
Todo el tiempo 5

7. ¿Qué parte del tiempo usted *piensa* en su vista?
(Haga un círculo alrededor de uno de los números.)

En ningun momento 1
Una pequeña parte del tiempo 1
Parte del tiempo 3
La mayor parte del tiempo 4
Todo el tiempo 5

¿En qué medida es cierta o falsa, en su caso, cada una de las siguientes frases?

(Haga un círculo alrededor de un número en cada linea.)

	Definiti-vamente cierta	Mayor-mente cierta	No estoy seguro	Mayor-mente falsa	Definiti vamente falsa
8. Yo creo que mi visio falsa empeoraren el futuro	1	2	3	4	5
9. Yo creo que me voy a quedar completamente ciego o ciega en el futuro	1	2	3	4	5
10. Yo creo que mi visituro a mejorar en el futuro	1	2	3	4	5
11. Yo me preocupo de que, a causa de mi vista, pueda hacer cosas que me avergüencen a mi o a otras personas.	1	2	3	4	5

12. ¿Cuánto dolor o malestar usted diría que ha sentido en sus ojos o alrededor de ellos? Por ejemplo, ardor, picazón, irritación, inflamación, molestia, dolor.
(Haga un círculo alrededor de uno de los números.)

Ninguno 1
Un poco 2
Moderado 3
Severo 4
Muy severo 5

13. ¿Qué parte del tiempo usted se siente frustrado a causa de su vista?
(Haga un círculo alrededor de uno de los números.)

Todo el tiempo 1
La mayor parte del tiempo 2
Parte del tiempo 3
Una pequeña parte del tiempo 4
En ningún momento 5

14. ¿Cómo usted calificaria su vista ahora, en una escala donde cero es la peor visión posible, tan mala o peor que la ceguera, y 10 es la mejor vista posible? Marque la respuesta que más se acerca a la opinión que usted

tiene de su propia visión.
(Haga un círculo alrededor de un número en cada línea.)

0	1	2	3	4	5	6	7	8	9	10
La peor visión										La mejor visión

PARTE 3: DIFICULTAD CON ACTIVIDADES
Las siguientes preguntas son acerca de la dificultad que usted pueda tener para realizar ciertas actividades (usando sus espejuelos o lentes de contacto, si es que los usa).

15. ¿Cuánta dificultad tiene usted para leer la letra regular de los periódicos? Usted diria que tiene:
(Haga un círculo alrededor de uno de los numeros.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

16. Usando espejuelos, ¿cuánta dificultad tiene usted para leer la letra pequeña de la guia de teléfonos, un pomo de medicina, o papeles legales? Diria usted que tiene:
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

17. ¿Cuánta dificultad tiene para hacer trabajos que requieran que usted vea bien de cerca, como cocinar, coser, arreglar cosas en la casa, o usar herramientas? Usted diría que tiene:
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

18. A causa de su vista, ¿cuánta dificultad tiene usted para jugar al dominó, barajas, u otros juegos como Bingo o Monopolio?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

19. A causa de su vista, ¿cuánta dificultad tiene usted para encontrar algo que está en un estante lleno de cosas?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

20. ¿Cuánta dificultad tiene usted para leer los nombres de las calles o de las tiendas?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5

Dejé de hacerlo por otras razones
o porque no me interesaba 6

21. A causa de su vista, ¿cuánta dificultad tiene usted bajando escalones, escaleras, o el borde de la acera a la luz del dia?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

22. A causa de su vista, ¿cuánta dificultad tiene usted para bajar escalones, escaleras, o el borde de la acera cuando hay poca luz o es de noche?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

23. A causa de su vista, ¿cuánta dificultad tiene usted para notar objetos laterales cuándo está caminando de frente?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

24. A causa de su vista, ¿cuánta dificultad tiene usted para reconocer personas conocidas que están al otro lado de una habitación?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

25. A causa de su vista, ¿cuánta dificultad tiene usted para notar cómo reacciona la gente cuando usted dice algo?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

26. A causa de su vista, ¿cuánta dificultad tiene usted para saber si las cuentas que recibe estan correctas?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

27. A causa de su vista, ¿cuánta dificultad tiene usted para escoger y coordinar su propia ropa?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

28. A causa de su vista, ¿cuánta dificultad tiene usted para hacer cosas como afeitarse, arreglarse el pelo, o maquillarse?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

29. A causa de su vista, ¿cuánta dificultad tiene usted para realizar sus actividades sociales regulares con familiares, amigos, vecinos, o grupos (incluyendo actividades de la iglesia)?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista 5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

30. A causa de su vista, ¿cuánta dificultad tiene usted para convidar amigos o familiares a su casa?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3

Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

31. A causa de su vista, ¿cuánta dificultad tiene usted para reunirse con personas con las que no tiene mucha intimidad en la casa de ellos, o en fiestas, o en restaurantes?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

32. A causa de su vista, ¿cuánta dificultad tiene usted para ver y disfrutar programas de televisión
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

33. A causa de su vista, ¿cuánta dificultad tiene usted para participar en deportes activos o en otras actividades al aire libre que le gusten (por ejemplo bolear, jugar al golf, correr, caminar)?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5

Dejé de hacerlo por otras razones
o porque no me interesaba 6

34. A causa de su vista, ¿cuánta dificultad tiene usted para salir al cine, al teatro, o a ver eventos deportivos?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

35. ¿Conduce usted un vehículo en la actualidad, al menos de vez en cuando?
(Haga un circulo alrededor de uno de los números.)

Si .....1 (Si marcó el 1, *salte* a la pregunta 35c)
No .....2 (Si marcó el 2, *siga* contestando todas *las preguntas*)

35a. Si usted respondió *No* a la pregunta anterior, ¿es porque nunca condujo un vehículo, o porque ha renunciado a conducir?
(Haga un círculo alrededor de uno de los números.)

Nunca conduje..... 1 (Si marcó el 1, *salte* a la pregunta 39)
Renuncié a conducir.....2 (Si marcó el 2, *siga* contestando *todas las preguntas*)

35b. Si usted renunció a conducir un vehículo, ¿lo hizo a causa de su vista principalmente, por otras razones principalmente, o por la combinación de su vista y otras razones?
(Haga un círculo alrededor de uno de los números.)

Principalmente la vista.....1 (*Salte* a la pregunta 39)
Principalmente otras razones .....2 (*Salte* a la pregunta 39)
La vista y otras razones .....3 (*Salte* a la pregunta 39)

35c. Si conduce actualmente un vehículo, ¿cuánta dificultad tiene usted para conducir durante el día a través de lugares conocidos?
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4

36. ¿Cuánta dificultad tiene usted para conducir durante el día a través de lugares desconocidos o poco conocidos? Usted diria que tiene:
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

37. ¿Cuánta dificultad tiene usted para conducir de noche? Usted diria que tiene:
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3
Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

38. ¿Cuánta dificultad tiene usted para conducir en condiciones difíciles, tales como mal tiempo, mucho tráfico, en autopistas o en el centro de la ciudad? Usted diría que tiene:
(Haga un círculo alrededor de uno de los números.)

Ninguna dificultad 1
Una pequeña dificultad 2
Moderada dificultad 3

Extremada dificultad 4
Dejé de hacerlo a causa de mi vista.....5
Dejé de hacerlo por otras razones
o porque no me interesaba 6

39. Las siguientes preguntas son acerca de cosas que podrían sucederle *a causa de su vista* mientras trabaja o realiza sus otras actividades diarias (como quehaceres domésticos, cuidado de niños, escuela, o actividades comunitarias). Por cada pregunta, diga qué parte del tiempo a usted le sucede esto.
(Haga un círculo alrededor de un número en cada línea.)

	Todo el tiempo	La mayor parte del tiempo	Parte del tiempo	Una pequeña parte del tiempo	En ningun momento
a. ¿Ha realizado usted menos trabajo del que le hubiese gustado hacer?	1	2	3	4	5
b. ¿Ha recibido mayor ayuda de otras personas?	1	2	3	4	5
c. ¿Ha estado irritable con otras personas?	1	2	3	4	5
d. ¿Ha dejado que otros hagan la mayor parte del trabajo?	1	2	3	4	5
e. ¿Ha tenido que limitar el tipo de trabajo que usted puede hacer?	1	2	3	4	5
f. ¿Ha tenido que limitar la cantidad de tiempo que usted le dedica a su trabajo u otras actividades?	1	2	3	4	5

PARTE 4: RESPUESTAS SOBRE PROBLEMAS CAUSADOS POR SU VISTA

Las siguientes preguntas son acerca de cómo usted se siente por sus problemas visuales. ¿En qué medida es *cierta o falsa,* en su caso, cada una de las siguientes frases?

(Haga un circulo alrededor de un número en cada linea.)

	Definitivamente cierta	Mayormente cierta	No estoy seguro	Mayormente falsa	Definitivamente falsa
40. Estoy a menudo irritable a causa de mi vista.	1	2	3	4	5
41. Me quedo en casa la mayor parte del tiempo a causa de mi vista.	1	2	3	4	5
42. Me siento frustrado gran parte del tiempo a causa de mi vista.	1	2	3	4	5
43. Tengo mucho menos control sobre lo que yo hago, a causa de mi vista.	1	2	3	4	5
44. A causa de mi vista, otras personas saben demasiado acerca de mis asuntospersonales.	1	2	3	4	5
45. Yo no salgo de mi casa sin un acompañante, a causa de mi vista.	1	2	3	4	5
46. A causa de mi vista, yo tengo que depender demasiado de lo que la gente me dice.	1	2	3	4	5
47. Yo necesito mucha ayuda de otras personas, a causa de mi vista.	1	2	3	4	5

Este es el final de este cuestionario. Si ha terminado, por favor entreguéselo a un miembro de nuestro personal. Muchas gracias por su ayuda y por el tiempo que nos ha dedicado.

END TIME: _____

DATE COMPLETED: _____/_____/_____
Month Day Year

TOTAL TIME (MINUTES):_____

APPENDIX 3

VF-14
TRANSLATION FROM ENGLISH INTO SPANISH

1. ¿Tiene usted alguna dificultad, aun usando lentes, para leer la letra pequeña impresa, como las instrucciones en un pomo de medicina, los nombres y números en el directorio telefónico, o las etiquetas en los envases de alimentos?

_____Si _____No _____No se aplica la pregunta
Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

2. ¿Tiene usted alguna dificultad, aun usando lentes, para leer un periódico o un libro?

_____Si _____No _____No se aplica la pregunta
Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

3. ¿Tiene usted alguna dificultad, aun usando lentes, para leer periódicos o libros impresos en letra grande, o para distinguir los números en un telefono?

_____Si _____No _____No se aplica la pregunta
Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

4. ¿Tiene usted alguna dificultad, aun usando lentes, para reconocer a personas cuando están cerca de usted?

_____Si _____No _____No se aplica la pregunta

Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

5. ¿Tiene usted alguna dificultad, aun usando lentes, para ver los escalones o peldaños de las escaleras, o los bordes de la acera?

_____Si _____No _____No se aplica la pregunta

Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

6. ¿Tiene usted alguna dificultad, aun usando lentes, para leer las señales de tránsito, los nombres de las calles o las señales de las tiendas?

_____Si _____No _____No se aplica la pregunta

Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

7. ¿Tiene usted alguna dificultad, aun usando lentes, para realizar actividades manuales, como coser, tejer, hacer labores de punto o de carpintería?

_____Si _____No _____No se aplica la pregunta

Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.

3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

8. ¿Tiene usted alguna dificultad, aun usando lentes, para extender un cheque o para llenar planillas o formularios?

_____Si _____No _____No se aplica la pregunta
Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

9. ¿Tiene usted alguna dificultad, aun usando lentes, para jugar bingo, domino, cartas, mah jong u otros juegos similares?

_____Si _____No _____No se aplica la pregunta
Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

10. ¿Tiene usted alguna dificultad, aun usando lentes, para participar en deportes como tenis, golf, "hand ball," o pa ra bolear?

_____Si _____No _____No se aplica la pregunta
Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

11. ¿Tiene usted alguna dificultad, aun usando lentes, para cocinar?

_____Si _____No _____No se aplica la pregunta
Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

12. ¿Tiene usted alguna dificultad, aun usando lentes, para ver la television?

_____Si _____No _____No se aplica la pregunta
Si contestó que sí, ¿cuánta dificultad tiene usted actualmente?

1. Un poquito de dificultad.
2. Una dificultad moderada.
3. Mucha dificultad.
4. ¿Le resulta imposible hacerlo?

13. ¿Conduce usted actualmente algún vehículo?
_____Sí (pase a la pregunta #14)
_____No (pase a la pregunta #16)

14. ¿Cuánta dificultad tiene used, debido a su vista, para conducir en horas del dia?

1. Ninguna dificultad.
2. Un poquito de dificultad.
3. Una dificultad moderada.
4. Mucha dificultad.

15. ¿Cuánta dificultad tiene used, debido a su vista, para conducir en horas de noche?

1. Ninguna dificultad.
2. Un poquito de dificultad.
3. Una dificultad moderada.
4. Mucha dificultad.

16. ¿Ha usted conducido un vehículo alguna vez?
    _____Sí (pase a la pregunta #17)
    _____No

17. ¿Cuándo dejó usted de conducir?
    _____Hace menos de 6 meses
    _____Hace entre 6 y 12 meses
    _____Hace más de un a2 m

18. ¿Por qúe dejó usted de conducir?
    _____Por la vista
    _____Por alguna otra enfermedad
    _____Por alguna otra razerm