# Supplementary Online Content

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**This supplementary material has been provided by the authors to give readers additional information about their work.**

**eAppendix.** Economic Analysis of Home AMD Monitoring

To analyze the potential impact of ForeseeHome in the US population with high risk for CNV, we developed a simulation model to assess the effects of ForeseeHome on health, quality of life, economic and budgetary outcomes. The simulation model allows us to apply the findings of the HOME study to the entire Medicare population at-risk for wet-form AMD, and track the outcomes and effects of AMD including ForeseeHome, other ophthalmologic costs, long-term visual function, costs of low vision, productivity losses and quality adjusted life years, or QALYs.

We include three primary analyses;

1) a cost-effectiveness analysis in which we estimate the incremental costs required to gain a quality adjusted life year (QALY) using a lifetime, societal perspective. This allows the cost per benefit gained of the ForeseeHome system to be directly compared to other interventions that Medicare currently reimburses;

2) a cost-benefit analysis in which the programmatic costs of ForeseeHome are compared to the monetized benefits of averted medical and productivity costs. This analysis estimates the social return on investment of Medicare dollars invested in ForeseeHome; and

3) a CBO-style 10-year budgetary analysis in which we report the expected impact on nominal government spending in each of the initial 10 years of ForeseeHome program implementation.

## Analysis Methods

We used a Markov model simulation approach in which a population representing patients eligible for the ForeseeHome system are assigned to initial AMD states and progress through AMD states with annual risk of CNV in one or both eyes.[1, 2] The model tracks two identical populations, one representing those using standard care, and the other those supplementing standard care with the ForeseeHome system.

In brief, the model generates a population representing the age and disease state characteristics of Medicare beneficiaries who would be medically eligible for the program. Values for patient initial visual acuity and acuity at time of CNV diagnosis are based on the acuity values observed at both points in the HOME study. We assumed all diagnosed CNV was treated with anti-VEGF therapy, with efficacy and drug costs based on the outcomes of the CATT study. Other costs of AMD are based on Medicare claims costs or Medicare fee schedule reimbursement for

procedures that occur at frequencies observed in other published studies or the HOME study. Costs of low vision and productivity losses are based on per-person costs attributable to blindness or visual impairment as reported in the Cost of Vision study. Quality adjusted life years (QALYs) are calculated based on published utility values based on visual acuity in the better-seeing eye, adjusted by age-specific background utility levels.

The model is run probabilistically by independently sampling all parameters from their prior distributions over 1,000 iterations. Credible intervals are expressed as the central 95 percentile of simulation results. All costs and QALYs in the cost-effectiveness and cost-benefit analysis are discounted to the current year by 3% annually based on economic evaluation guidelines.[3] Costs for the government budgetary analysis are expressed in nominal terms. All costs are expressed in 2016 US dollars.

## AMD states and progression

The ForeseeHome system is intended for patients at high risk for CNV, including patients with bilateral risk factors for CNV, or patients who already have CNV in one eye. We use the Age-Related Eye Disease Study (AREDS) simplified severity scale to define and allocate early AMD among states 1-4 based on risk factors for progression to advanced AMD **(eTable 1**).[1, 2, 4] The AREDS simplified severity scale classifies stages 0-4 based on the cumulative number of risk factors in both eyes, including retinal pigment abnormalities and the presence of large (≥125μm) drusen. Zero risk factors in eye refers to Stage 0, indicating the patient does not have AMD. Successive Stages each add one risk factor to either eye, culminating in Stage 4 where both eye have pigment abnormalities and large drusen.

Annual rates of progression through stages were observed in AREDS1, including reverse transitions among early-stage AMD (**eTable 2**).[1] We define CNV1 as having CNV in one eye, with the fellow eye in any prior state from 1-4 or geographic atrophy. CNV1 has a high rate of progression to CNV2, which indicates bilateral CNV. The annual probability of progressing from CNV1 to CNV2 is 0.987 as observed by Sunness et al, 1999.[2]

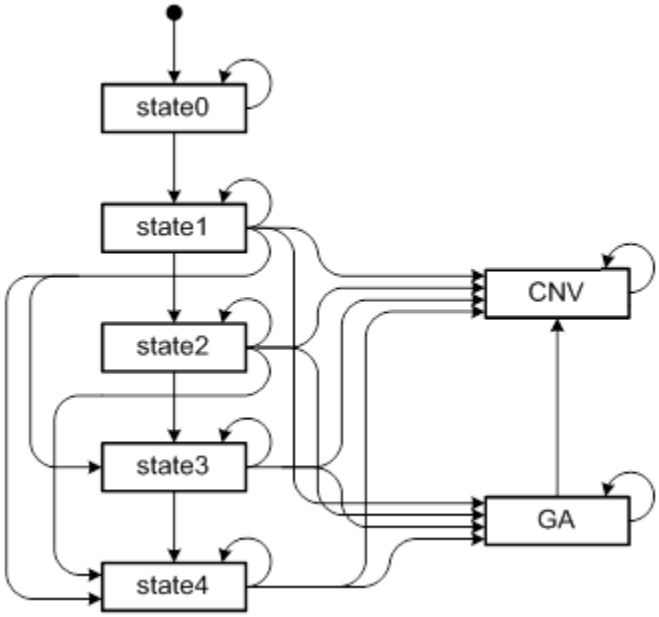
**eFigure** represents the possible stage transitions in the model.

**eTable 1.** Annual Risk of CNV, Calculated From AREDS Report 18

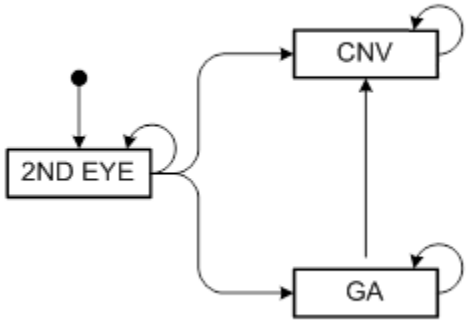
| Severity Stage (# of Risk Factors) | Risk Factors | % of Early AMD | Annual CNV Risk | | |
|---|---|---|---|---|---|
| | | | One Eye | Both Eyes | Per Eye |
| **0** | None | 46% | 0.0007 | 0.0001 | 0.0010 |
| **1** | 1 risk factor in one eye | 20% | 0.0051 | 0.0006 | 0.0064 |
| **2** | 2 risk factors in one eye, OR 1 risk factor in each eye | 14% | 0.0188 | 0.0039 | 0.0266 |
| **3** | 2 risk factors in one eye, AND 1 risk factor in the other eye | 10% | 0.0318 | 0.0093 | 0.0505 |
| **4** | 2 risk factors in each eye | 10% | 0.0337 | 0.0197 | 0.0731 |
| **Total** | | 100% | 0.0103 | 0.0036 | 0.0175 |

**eFigure.** Annual AMD State Transition Diagram (Reverse Transitions Not Shown)

**Leading eye**




**Second eye**



## Study Population

We specified the model to fit the estimated US population aged 65 and older at high risk for CNV because these are the individuals who are anticipated to be eligible and may choose to use the ForeseeHome system. Eligible individuals include those who already have CNV in a single eye (CNV1) and individuals with high bilateral risk of CNV, defined as AREDS simplified severity state 4.[4]

Eligibility also requires visual acuity of 20/60 or better in any monitored eye, and the patient must be able to operate the device and establish baseline measures.[5] We exclude patients with prior central geographic atrophy (GA) because an unknown, but likely high proportion would be ineligible for home monitoring due to acuity worse than 20/60. Based on the findings of the HOME study, we assume 78% of individuals in states 3, 4 and CNV1 who attempt to enroll would meet eligibility criteria and undergo monitoring.[5]

We assume the patient population who attempt to enroll would reflect the age, sex and race make-up of the total US population with AMD in states 3, 4 and CNV1, with actual number of persons who enroll based on program uptake projections provided by Notal Vision. No published prevalence estimates of the population in AREDS stage or with unilateral CNV exist. We therefore estimated the US population eligible for the program using published estimates of the prevalence of AMD as reported by the Eye Disease Prevalence Research Group (EDPRG), which provides separate prevalence estimates by age group for any AMD, large drusen, GA or CNV, applied to 2013 US Census estimates.[6] We then partitioned the AMD population estimates by stage. To estimate the AREDS state 3 and 4 population, we multiplied the estimated “large drusen” population by the proportion of pre-advanced AMD AREDS patients that were in state 3 and 4 at baseline. To estimate the proportion of CNV patients who had unilateral CNV (CNV1), we modeled incidence of CNV in one or both eyes, and progression of CNV from unilateral to bilateral using progression rates calculated from AREDS patient data.[1, 6].[2, 6] We show the proportions allocated by age and AMD state in **eTable 2**.

## eTable 2. Estimated Current Population by AMD Stage

| Age | State 0 | State 1 | State 2 | State 3 | State 4 | GA | CNV1 | CNV2 |
|---|---|---|---|---|---|---|---|---|
| **65** | 194,456 | 84,229 | 61,679 | 43,507 | 42,048 | 4,686 | 13,815 | 4,133 |
| **66** | 205,789 | 89,138 | 65,274 | 46,043 | 44,499 | 5,735 | 16,151 | 5,397 |
| **67** | 213,362 | 92,418 | 67,676 | 47,737 | 46,136 | 6,872 | 18,541 | 6,848 |
| **68** | 217,986 | 94,421 | 69,143 | 48,772 | 47,136 | 8,086 | 20,937 | 8,487 |
| **69** | 221,342 | 95,875 | 70,208 | 49,523 | 47,862 | 9,342 | 23,244 | 10,286 |
| **70** | 247,979 | 107,413 | 78,656 | 55,482 | 53,622 | 10,634 | 25,467 | 12,239 |
| **71** | 270,223 | 117,048 | 85,712 | 60,459 | 58,432 | 11,984 | 27,820 | 14,307 |
| **72** | 286,347 | 124,031 | 90,826 | 64,067 | 61,918 | 13,370 | 30,233 | 16,480 |
| **73** | 298,866 | 129,454 | 94,797 | 66,868 | 64,625 | 14,780 | 32,649 | 18,757 |
| **74** | 307,880 | 133,359 | 97,656 | 68,884 | 66,574 | 16,194 | 35,009 | 21,122 |
| **75** | 313,757 | 135,904 | 99,520 | 70,199 | 67,845 | 17,558 | 37,186 | 23,507 |
| **76** | 315,876 | 136,822 | 100,192 | 70,673 | 68,303 | 18,848 | 39,133 | 25,876 |
| **77** | 315,039 | 136,460 | 99,927 | 70,486 | 68,122 | 20,047 | 40,820 | 28,202 |
| **78** | 311,857 | 135,081 | 98,918 | 69,774 | 67,434 | 21,129 | 42,200 | 30,438 |
| **79** | 305,858 | 132,483 | 97,015 | 68,432 | 66,137 | 22,059 | 43,221 | 32,523 |
| **80** | 301,516 | 130,602 | 95,638 | 67,461 | 65,198 | 22,736 | 43,704 | 34,296 |
| **81** | 295,450 | 127,974 | 93,714 | 66,103 | 63,886 | 23,216 | 43,825 | 35,798 |
| **82** | 286,900 | 124,271 | 91,002 | 64,191 | 62,038 | 23,506 | 43,616 | 37,018 |
| **83** | 275,014 | 119,123 | 87,232 | 61,531 | 59,468 | 23,409 | 42,726 | 37,635 |
| **84** | 263,634 | 114,194 | 83,622 | 58,985 | 57,007 | 23,340 | 41,944 | 38,273 |
| **85** | 250,055 | 108,312 | 79,315 | 55,947 | 54,071 | 23,019 | 40,755 | 38,483 |
| **86** | 234,650 | 101,639 | 74,428 | 52,500 | 50,739 | 22,453 | 39,182 | 38,253 |
| **87** | 217,371 | 94,155 | 68,948 | 48,634 | 47,003 | 21,649 | 37,251 | 37,575 |
| **88** | 198,888 | 86,149 | 63,085 | 44,499 | 43,006 | 20,621 | 34,995 | 36,453 |
| **89** | 179,675 | 77,827 | 56,991 | 40,200 | 38,852 | 19,392 | 32,463 | 34,910 |
| **90** | 159,755 | 69,198 | 50,673 | 35,743 | 34,545 | 17,992 | 29,714 | 32,979 |
| **91** | 139,853 | 60,578 | 44,360 | 31,290 | 30,241 | 16,457 | 26,810 | 30,713 |
| **92** | 120,578 | 52,228 | 38,246 | 26,978 | 26,073 | 14,827 | 23,824 | 28,175 |
| **93** | 102,015 | 44,188 | 32,358 | 22,825 | 22,059 | 13,147 | 20,833 | 25,439 |
| **94** | 84,298 | 36,514 | 26,738 | 18,861 | 18,228 | 11,461 | 17,906 | 22,588 |
| **95** | 68,442 | 29,646 | 21,709 | 15,313 | 14,800 | 9,814 | 15,107 | 19,706 |
| **96** | 54,364 | 23,548 | 17,244 | 12,163 | 11,755 | 8,245 | 12,498 | 16,874 |
| **97** | 42,206 | 18,282 | 13,387 | 9,443 | 9,126 | 6,788 | 10,128 | 14,168 |
| **98** | 32,041 | 13,878 | 10,163 | 7,169 | 6,928 | 5,472 | 8,029 | 11,652 |
| **99+** | 42,119 | 18,244 | 13,360 | 9,424 | 9,108 | 7,700 | 6,220 | 9,376 |
| **Total 65+** | **7,375,443** | **3,194,684** | **2,339,414** | **1,650,167** | **1,594,826** | **536,567** | **1,017,955** | **838,965** |

## Visual Acuity and Visual Function Classification

Because the overall purpose of the ForeseeHome program is to preserve visual acuity, we use acuity as the primary outcome of our analysis. The model tracks acuity in both eyes of patients using the ETRDS letters system. Visual function is classified as normal, mild impairment, moderate impairment or blind based on US acuity measures on the Snellen scale of the better-seeing eye; 20/200 or worse for blind, <20/80 to 20/200 for moderate impairment, 20/40 to <2/80 for mild impairment and 20/20 to <20/40 for normal visual function..

Visual acuity values in the baseline scenario are based directly on those observed in the HOME study, as shown in **eTable 3**. At model initiation, patients are assigned visual acuity in each eye based on the full sample of acuity measures recorded at the baseline of the HOME study, both for eyes undergoing monitoring as well as any eye not monitoring, which we assume was likely due to existing CNV. The HOME study measured acuity at the time of CNV event; the examination at which CNV was first diagnosed in the study. The model assigns acuity at time of event based on the event acuity measures in the ForeseeHome monitoring and control arms of the HOME study.

Visual acuity values at baseline and at the time of CNV diagnosis are sampled directly from observed values of HOME study patients. HOME study patients could be monitored in one or both eyes. Of 1520 patients in the HOME study, 1078 were monitored in both eyes, 372 were monitored only in the better-seeing eye and 70 were monitored only in the worse-seeing eye.

In each of the 1,000 simulation iterations, we assign a randomly selected value from 0 to 1, and use this to select the closest approximate percentile ranked acuity value observed in the HOME study for the baseline and event acuity measures. Thus, simulated visual acuity measures at the baseline and time of event almost exactly match those values observed in the HOME study.

## eTable 3. Visual Acuity Assignment Parameters

| Visual Acuity Values | Baseline | Distribution | Range | Source |
|---|---|---|---|---|
| **Initial acuity** | | | | |
| Monitored eyes | 81.68 | observed values | 67.5-92.0 | HOME study |
| Non-monitored eyes | 54.81 | observed values | 0.0-90.0 | |
| **Acuity at CNV diagnosis – HOME study scenario** | | | | |
| ForeseeHome monitoring | 73.78 | observed values | 33.7-86.4 | HOME study |
| Control | 65.94 | observed values | 0.0-85.0 | |

In the HOME study, both the control and intervention arms exhibited approximately two examinations per year. Also, the short (average of 1.4 (±0.6) years) duration of the study prevented most patients from losing substantial vision, which could occur over longer time periods. Retrospectively collected real-world data shows substantially worse acuity at time of CNV diagnosis than was observed in the HOME study, in many cases with high proportions of patients presenting already blind.[7-11].

### Treatment for CNV

At time of CNV event, we assume all patients will initiate anti-VEGF therapy. Treatment efficacy estimates are based on the 2-year outcomes of the CATT Study monthly ranibizumab arm. The CATT study reports the proportion of patients who fell under 5 different ranges of acuity change. We expressed this outcome as a stepwise function, and then fit a 5-degree polynomial to create a close-fit linear expression of the distribution of acuity outcomes from which to sample in the model.

The SEVEN-UP study is the first to report long-term follow-up of patients undergoing anti-VEGF therapy.[12] Based on pooled outcomes of the ANCHOR, MARINA, and HORIZON study samples, a seven-year follow-up population was reported. The study shows average gains in acuity for two-years following anti-VEGF initiation, followed by a near constant rate of decline for the subsequent 5 years. Based on these results, we reduce acuity beginning 2 years after anti-VEGF therapy begins based on a constant rate of 3.74 ETRDS letters per year. **eTable 4** lists the impact of anti-VEGF treatment in the first two years, and the annual decline in acuity beginning in the third year of treatment.

## eTable 4. Anti-VEGF Treatment Efficacy Parameters

| Anti-VEGF Treatment Efficacy | Baseline letter change | Distribution | 95% CI | Source |
|---|---|---|---|---|
| 2-year change in acuity after initiation of anti-VEGF treatment | | | | |
| Bevacizumab, as needed | 5.0 | polynomial | 27.78-23.57 | Martin et al, 2012<br>Martin et al, 2011 |
| Bevacizumab, monthly | 7.8 | polynomial | 28.14-21.46 | |
| Ranibizumab, as needed | 6.7 | polynomial | 28.06-21.06 | |
| Ranibizumab, monthly | 8.8 | polynomial | 28.20-21.20 | |
| Change in vision after 2 years of anti-VEGF treatment | | | | |
| Annual letter decline | 3.74 | log normal | 2.66-4.79 | Rofagha et al, 2013 |

### Examination rates

The HOME study collected detailed data on examination frequency and reason for exam. In both the monitoring and control arms of the study patients underwent relatively frequent scheduled routine exams; 1.94 and 1.95 per year for the monitoring and control arms, respectively. Patients also reported seeing their doctor due to perceived symptoms, at a rate of 0.04 per year. In the monitoring side, patients also could go to their doctor due to a device alert, which occurred at a frequency of 0.24 visits per year. When the ForeseeHome system detects a change in vision, Notal Vision contacts the patients' physicians who in turn may schedule an exam. These visits resulted in either a CNV diagnosis event (device true positive) or did not result in CNV diagnosis (device false positive). In the HOME study, as in actual deployment of this technology, the device can only signal an indication for scheduling an examination. CNV can only be diagnosed in an ensuing ophthalmic examination. We do not consider the possibility of false positive CNV diagnosis at the eye examination, because this is considered the gold-standard diagnostic and presumably such an eventuality would be captured in the net impact of anti-VEGF therapy from the CATT study. Examination rates used in the model from the HOME study are listed in **eTable 5**.

We included examinations at the rates observed in the HOME study. In the HOME study, the monitoring arm underwent more examinations than the control group, and thus in our analysis the ForeseeHome system results in higher total examination costs.

## eTable 5. Examination Rate Parameters

| Examination rates | Baseline value | Distribution | 95% CI | Source |
|---|---|---|---|---|
| Scheduled visits per year | 1.94 | Normal | 0.97-2.91 | HOME study |
| Scheduled visits per year | 1.94 | Normal | 0.97-2.91 | |
| Symptom visits per year | 0.04 | Normal | 0.02-0.06 | |
| False+ visits per year | 0.24 | Normal | 0.12-0.36 | |

### Program Compliance and Costs

Medicare reimbursement for this monitoring system is $74.23 monthly monitoring fee for patients enrolled in the program. We also include a $30 cost for patients unable to initiate baseline values to initiate monitoring. For the government cost projection analyses, we assume Medicare would pay 80% of all program costs. Program costs are listed in **eTable 6**, and are held constant in the model, but are varied in the univariate sensitivity analysis.

## eTable 6. Program Cost Parameters

| Program Costs | Baseline value | Distribution | Source |
|---|---|---|---|
| Monitoring cost per month | $74.23 | Constant | Notal Vision |
| One-time cost for ineligible patients | $30.00 | Constant | |

**eTable 7** lists program compliance rates used in the analysis. We assume patients will continue monitoring for a maximum of 10 years and that each year 10% of patients will discontinue the program. These rates were also provided by Notal Vision and reflect estimates informed by the HOME study as well as Notal Vision's experience with commercially provided ForeseeHome systems.

## eTable 7. Program Compliance Parameters

| Program Compliance | Baseline value | Distribution | Source |
|---|---|---|---|
| % of Target Population meeting eligibility requirements | 78% | Constant | HOME study |
| Maximum monitoring duration | 10 years | Constant | Notal Vision |
| Annual drop-out rate | 10% | Constant | HOME study |

### Examination and AMD management and treatment costs

Medical costs include ophthalmologic visit costs for dry-form AMD and annual costs of wet-form AMD management and anti-VEGF treatment. The frequency of ophthalmologic visits can be affected by the intervention, and thus this cost is expressed per visit. Wet-form AMD management and anti-VEGF treatment costs are not impacted by the ForeseeHome intervention, and these costs are expresses as annual costs per person. We calculated the average cost of an exam based on Halpern et al (2006) which reports the annual frequency of exams, tests and procedures in Medicare patients with dry-form AMD.[13] We adjusted these results to include OCT tests and assigned costs based on the 2013 Medicare fee schedule.[14] This leads to an annual estimated cost of $334, which coincidentally is the same as the annual Medicare costs for dry-form AMD reported by Schmier et al 2012.[15]

We also included costs of wet-form AMD, including anti-VEGF drug costs and all other costs. The drug costs are based on the injection frequency reported in the Wills Eye Hospital Treat & Extend study. In this study, patients received ranibuzumab, bevacizumab or a combination of both. We multiplied the number of injections received of each type by the cost per injection for the corresponding type of injection as reported in the CATT study. This results in average annual costs of $9,308, $7,940 and $8,519 in years 1, 2 and 3 respectively. We apply an average annual treatment cost of $8,766 for patients diagnosed with CNV.

In addition to anti-VEGF therapy, we included a measure of other wet-form AMD treatment costs based on the findings of Day et al (2011), who reported annual non-anti-VEGF Medicare costs for patients with advanced AMD, and the Cost of Vision report, which estimates AMD-attributable medical costs paid outside of the Medicare program.[16, 17] Medical costs parameters are listed in **eTable 8**.

## eTable 8. Medical Cost Parameters

| Medical Costs | Baseline value | Distribution | 95% CI | Source |
|---|---|---|---|---|
| Cost per ophthalmologic visit | $187.34 | normal | $95.54-$279.13 | Schmier et al, 2012. Halpern et al 2006., Medicare fee schedule |
| **Annual anti-VEGF cost** | | | | |
| Annual anti-VEGF cost, ranibizumab as needed | $12,600 | normal | $6,426-$18,774 | Martin et al, 2012 |
| **Annual other CNV cost** | | | | |
| Government | $2,081.82 | log normal | $1,613-$2,688 | Day et al 2011, Wittenborn, Rein 2013 |
| Societal | $2,557.78 | log normal | $1,981-$3,302 | Wittenborn, Rein 2013 |

| | | | | |
|---|---|---|---|---|
| Annual non-CNV AMD costs | $334 | na | na | Schmier et al, 2012. Halpern et al 2006., Medicare fee schedule |

## Low vision costs

We included the other annual direct and indirect costs of visual impairment ($4,126) and blindness ($18,176) based on the Cost of Vision report.[18, 19] Costs attributable to low vision include medical costs based on 2003-2008 Medical Expenditure Panel Survey (MEPS) data. Using a 2-part general linear model with log-link, we attributed medical costs to diagnosed eye disorders, diagnosed blindness or visual impairment, and self-reported, but non-diagnosed difficulty seeing. Adjusting results to prevent double counting of costs, we attribute the costs of diagnosed impairment or blindness to patients who reach 20/80 or 20/200 in the better-seeing eye, respectively.[20] Other direct costs of blindness include costs of government assistance programs, low vision aids and adaptations and certain vision rehabilitation costs estimated from federal budgets and the published literature. Indirect costs include productivity losses and long term care. We estimated direct productivity losses associated with moderate or severe difficulty seeing, include losses due to lower employment and reduced wages, using data from the Survey of Income and Program Participation (SIPP). We also include productivity losses attributable to the opportunity costs of informal care givers.[21] We estimated the excess probability of nursing home utilization associated with blindness using data from the Baltimore Eye Study and the National Nursing Home Survey, and applied this utilization to national estimates of nursing home payments by payer.[22-24]

All costs are allocated among three payer categories; government, private insurance, and patient out of pocket. All three categories are included in the net societal cost estimate. Only government costs are included in the government budgetary impact analysis. Tax losses and entitlement programs are included as government costs, but are not included in societal costs other than the inclusion of deadweight losses incurred from economic transfers. Productivity

losses are included only in the net-societal cost analysis, and are not included in the cost-effectiveness analysis as productivity impacts are assumed to be implicitly captured in the QALY measures, nor are they included in the government budgetary estimate.

The components of low vision costs for persons blind or with visual impairment are shown in **eTables 9** and **10**, respectively.

## eTable 9. Annual Cost per Person of Blindness, Aged 65 and Older, Cost of Vision Report, $2013

| | Government | Societal |
|---|---|---|
| **Medical Costs** | | |
| Diagnosed blindness | $2,116.33 | $2,899.48 |
| Optometry costs | $196.03 | $538.19 |
| Vision Aids | $295.30 | $2,205.67 |
| **Direct Costs** | | |
| Guide dogs | - | $58.43 |
| Other direct costs | - | $496.21 |
| **Direct Transfers** | | |
| Supplemental security income | $368.94 | |
| Food stamps | $74.85 | |
| National library services | $145.40 | $145.40 |
| Committee for purchase from the blind | $4.33 | $4.33 |
| Tax losses | $10.51 | |
| Social Security Disability Insurance | $1,339.44 | |
| **Indirect Costs** | | |
| Nursing homes | $4,420.13 | $7,581.69 |
| Skilled Nursing Facilities | $3,436.85 | $3,436.85 |
| Informal care blind | - | $797.41 |
| Deadweight loss | - | $810.17 |
| **Total** | $12,408 | $18,176 |

## eTable 10. Annual Cost per Person of Visual Impairment, Aged 65 and Older, Cost of Vision Report, $2013

| | Government | Societal |
|---|---|---|

| | | |
|---|---|---|
| Medical costs of impairment | $352.24 | $491.45 |
| Nursing homes | $2,118.67 | $3,634.09 |
| Informal care | - | $184.02 |
| Total | $2,470.91 | $4,309.55 |

## Productivity Costs

We also include productivity costs of low vision as reported by the Cost of Vision report. Productivity losses include those incurred by the affected individual as well as to their friends and family who provide care for the affected person. Productivity losses incurred by the affected patient include reduced wages as well as reduced labor force participation rates, as measured by the US Census' Survey of Income and Program Participation. Based on the findings of the Cost of Vision report, productivity losses are not statistically significantly different between persons with moderate impairment (20/80 or worse) or blindness. This somewhat surprising result is a function of the fact that among the population aged 65 and older, the blind population is skewed towards the oldest ages, at which individuals are much less likely to be employed and incur productivity losses due to vision loss.

Productivity losses included in our analysis also include the opportunity cost of unpaid care provided to persons affected with low vision, as calculated from the Medical Expenditure Panel Survey.

### eTable 11. Annual Productivity Losses From Low Vision, Aged 65 and Older, Cost of Vision Report

| Annual Productivity Losses | Mean | Distribution | 95% CI |
|---|---|---|---|
| Blindness | $6,684.76 | log normal | $4,794-$8,598 |
| Visual Impairment | $6,052.81 | log normal | $4,341-$7,785 |

## QALY Losses

Quality adjusted life years (QALYs), form the denominator of the cost-effectiveness ratio, and thus are an important measure of the potential benefits of the program. We base the QALY calculations on time tradeoff utility values for patients with ocular disease by visual acuity in the better-seeing eye as reported by Brown et al, 2003.[25] The utility values used for our analysis are listed in **eTable 12**. An important aspect of these utility values is that they are based on the

acuity of the better-seeing eye. This paper also included a utility value for individual with visual impairment in a single eye, equating to a utility decrement of more than 8%. We however include the slightly more conservative utility decrement found in the earlier paper by Brown et al focusing on utility values for persons with unilateral vision loss, equating to a utility decrement of 5.15%.[26] In the sensitivity analysis we vary this utility decrement from zero to twice the baseline value.

Following consensus guidelines, the utility values from vision loss are multiplied by expected background utility values, 0.77 for ages 65-74, and 0.70 for ages 75 and older.[3, 27] This serves to mitigate the impact of vision loss on overall patient utility. The background adjusted utility is assigned to patients with corresponding bilateral or monocular visual acuity for each year of life, yielding QALYs. Future QALYs are discounted to the present year at 3% annually.

**eTable 12.** Utility Values based on Acuity in the Better-Seeing Eye

| Better-eye Acuity | Letters | Utility |
|---|---|---|
| 20/20 | 85.0 | 0.97 |
| 20/25 | 80.2 | 0.87 |
| 20/30 | 76.2 | 0.84 |
| 20/40 | 69.9 | 0.8 |
| 20/50 | 65.1 | 0.77 |
| 20/70 | 57.8 | 0.74 |
| 20/100 | 50.1 | 0.67 |
| 20/200 | 35.0 | 0.66 |
| 20/300 | 26.2 | 0.63 |
| 20/400 | 19.9 | 0.54 |

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