A Multicenter Prospective Cohort Study of Quality of Life and Economic Outcomes after Cataract Surgery in Vietnam : The VISIONARY Study

Article *in* Ophthalmology · November 2014

DOI: 10.1016/j.ophtha.2014.05.014

8 authors, including:

Qiang Li
The George Institute for Global Health
56 PUBLICATIONS **1,600** CITATIONS
SEE PROFILE

Maree L Hackett
The George Institute for Global Health
141 PUBLICATIONS **3,195** CITATIONS
SEE PROFILE

Lisa Keay
The George Institute for Global Health
129 PUBLICATIONS **1,894** CITATIONS
SEE PROFILE

Stephen Jan
University of Sydney
257 PUBLICATIONS **2,796** CITATIONS
SEE PROFILE

American Academy of Ophthalmology
The Eye M.D. Association

A Multicenter Prospective Cohort Study of Quality of Life and Economic Outcomes after Cataract Surgery in Vietnam

The VISIONARY Study

*Beverley M. Essue, PhD,[1] Qiang Li, MBiostat, BPH, AStat,[2] Maree L. Hackett, PhD,[2] Lisa Keay, PhD,[2] Beatrice Iezzi,[3] Khanh Duong Tran, BSc,[4] Huynh Tan Phuc, MD,[4] Stephen Jan, PhD,[2] on behalf of the VISIONARY study team**

Purpose: To measure the change in quality of life and economic circumstances after cataract surgery and identify the predictors of an improvement in these outcomes.

Design: A multicenter, prospective, longitudinal cohort study.

Participants: Participants aged ≥18 years were recruited to the study if the clinical assessment of their best-uncorrected vision was ≥6/18 in the better eye because of cataract.

Methods: Cataract surgery.

Main Outcome Measures: Data were collected on quality of life and a multidimensional assessment of household economic circumstances (work status, income, asset ownership, household economic hardship, and catastrophic health expenditure).

Results: At 12 months follow-up, 381 of 480 participants were re-interviewed, and all had undergone surgery. There was a significant improvement in quality of life. Household economic circumstances also improved (mean change paid work participation/month: 44.5 hours, $P < 0.0001$; mean change unpaid work participation/month: 89.5 hours, $P < 0.0001$; change in proportion with hardship: −17%, $P < 0.0001$; and change in proportion with catastrophic health expenditure: −7%, $P = 0.02$). Improvements were most likely in near-poor households and were related to the type of surgery and complications after surgery.

Conclusions: This research showed that cataract surgery is associated with meaningful improvements in quality of life and household economic circumstances that are indicative of positive transitions out of poverty. Given the unmet need for cataract surgery in low- and middle-income countries where cataract impairment is substantial, this research demonstrates the potential of a relatively simple, low-cost health intervention to greatly improve household economic circumstances. *Ophthalmology 2014;121:2138-2146 © 2014 by the American Academy of Ophthalmology.*

*Supplemental material is available at www.aaojournal.org.

The empirical evidence on the outcomes of cataract surgery in low resourced settings has mainly focused on quality and surgical outcomes[1–3] and on the impact of improved vision on health and social outcomes, such as quality of life,[4,5] the avoidance of injuries,[6] and enhanced social engagement.[7] Indeed, evidence on the association between low vision, regardless of the cause, and impaired quality of life and functional capacity has helped to support the case for the expansion of services in low- and middle-income countries,[8] as has evidence on the cost-effectiveness of surgery in these settings.[9,10] Despite this, access to and availability and affordability of cataract procedures still remain limited in these settings, and many individuals continue to live with avoidable blindness.[11]

The impact of low vision can have profound economic effects for individuals and their households.[12,13] This is explained partly by the vicious cycle of illness-induced poverty, where impaired vision and related illness can reduce opportunities for productive employment, leading to poor economic circumstances and further impoverishment from the costs associated with treatment. Breaking this cycle of poverty and blindness is a priority for the elimination of avoidable blindness globally[14] and is vital for progressing economic development in low- and middle-income settings.

In the few studies that have examined the relationship between surgery and poverty alleviation, cataract surgery was shown to increase per capita expenditure and time in productive work.[15,16] However, longer follow-up, which is

http://dx.doi.org/10.1016/j.ophtha.2014.05.014
ISSN 0161-6420/14

often costly and not feasible in these settings,[17] is needed to determine the impact of surgery on poverty and whether the effect is sustained. This raises 2 issues for research on this topic. First, in the absence of longitudinal data, a multidimensional approach to measuring economic well-being, using interim economic and social outcomes, will provide evidence of positive transitions out of poverty. Second, incorporating a broader range of outcomes, such as quality of life, work status, income, economic hardship, and the affordability of cataract surgery, acknowledges the social determinants of low vision and provides a comprehensive picture of the impact of surgery on household economic circumstances and ultimately on its relationship to the alleviation of poverty.[18]

The economic impact of vision impairment due to cataracts can be particularly catastrophic in Vietnam given poor access to necessary, timely, and affordable health care, the absence of social security safety nets, and the existence of a complex health insurance system that still relies heavily on out-of-pocket costs to fund medical care. Data on the individual economic outcomes and quality of life associated with cataract surgery are needed to inform priority-setting, health care planning, and further investment in eye-health services.

The inVestIgating the pSychologIcal and ecONomic impAct of cataRact surgerY (VISIONARY) study in Vietnam was a multicenter prospective longitudinal cohort study that aimed to measure the change in quality of life and economic circumstances associated with cataract surgery and to identify the predictors of an improvement in these outcomes in a cohort of participants in Vietnam.

Methods

Ethical approval was obtained from the University of Sydney (13407), and all study participants provided written informed consent using certified translations of approved participant information and consent forms.

The methods have been published.[19] VISIONARY was a multicenter prospective longitudinal cohort study conducted in 4 provinces of Vietnam: Hue, Binh Dinh, Vinh Long, and Thai Binh. Health centers in each Province provide eye health services and coordinate regular eye health outreach, screening, and referral services in regional and rural areas. Individuals also can present directly to a health center for referral for surgery. Cataract surgery is free of charge, partially covered by health insurance, or paid in full by individuals (i.e., out-of-pocket costs), depending on the insurance status of the patient (Supplementary Background, available at www.aaojournal.org).

Consecutive participants were recruited between April and November 2011 by ophthalmic staff from vision outreach programs and the health facility in each region. Uncorrected vision (i.e., without spectacles) was measured in full daylight using a Landolt tumbling "C" eye chart on one side and measured at a 5-m distance. Vision <3/60 was assessed using the detection of counting fingers, hand motion, light perception, and no light perception from a 1- or 3-m distance. At the health facilities, uncorrected vision was measured using a Landolt or Snellon tumbling "E" chart, hung on the wall and read from a 5-m distance, with or without electric lamp backlighting. In Vietnam, it is standard practice for vision to be tested without correction. Vision in the better-seeing eye was used to characterize the level of vision impairment.

Participants aged ≥18 years were recruited to the study if the clinical assessment of their best uncorrected vision was ≤6/18 in the better eye and they had not had prior cataract surgery.

Each facility provided 2 common cataract procedures: extracapsular cataract extraction, also called "small incision cataract surgery," or phacoemulsification. The cost of the surgery was set by each facility on the basis of the relevant health treatment cost circular of the government.

Consented participants were interviewed face-to-face at baseline after vision testing, and follow-up interviews were conducted in each participant's home at 6 and 12 months after referral for cataract surgery. Structured questionnaires were used to collect data on sociodemographics, household economic circumstances, medical history, health service use, out-of-pocket costs, health-related quality of life (measured using the Short Form 12 version 2 tool—Quality Metric, www.qualitymetric.com), and psychologic well-being.[20] Best uncorrected vision was measured by ophthalmic staff during follow-up interviews as described earlier. Vision was recorded as the logarithm of the minimum angle of resolution. The logarithm of the minimum angle of resolution is a continuous score; a smaller value equates to better vision (i.e., 0 = 20/20). The study tools were developed and pilot tested with study investigators in Vietnam to ensure acceptability and applicability. All materials were developed in English, and certified Vietnamese translations were produced.

The primary outcome was health-related quality of life, measured using the Short-form 12v2 questionnaire from which a physical component score (PCS) and mental component score (MCS) are calculated. A validated Vietnamese translation of the tool was used.[21]

The secondary outcome was a multidimensional assessment of household economic circumstances, measured with the following outcomes: (a) work participation; (b) income; (c) asset ownership; (d) economic hardship, and (e) catastrophic health expenditure.

A. Work status: Average number of hours in paid and unpaid work in the previous month.[22]
B. Income: Self-reported estimate of annual household income from all sources. Equivalized income was calculated to account for the household composition[23] and is reported as annual income. Data collection at baseline and 12-month follow-up occurred at the same time of year; thus, it is unlikely that seasonal differences in income and work status affect these data.
C. Asset ownership: Self-reported value of household nonlivestock (i.e., land, motorbikes) and livestock assets.[24]
D. Economic hardship (hardship hereafter): A measure constructed using questions about failure to pay basic living and medical expenses and whether assistance was needed to pay these expenses.[22,25,26] Hardship was a dichotomous variable where a reported inability to make a payment or the need for assistance was classed as a case of hardship.
E. Catastrophic health expenditure: A measure of the burden of out-of-pocket costs for surgery, defined as total health expenditure that exceeded 30% of household income.[27]

Sample size was calculated to detect an improvement in health-related quality of life after cataract surgery. By assuming a loss to follow-up rate of 40%, 266 participants were needed to detect a 4-point difference[28,29] in the physical functioning with 90% power, a 5% 2-sided significance level, and a standard deviation (SD) of 17. We aimed to recruit at least 400 individuals to allow sufficient numbers to investigate the secondary outcome in this analysis. Equal numbers of participants from each study site and a 1:1 ratio of participants from the vision outreach programs and those presenting directly to the health facilities were recruited.

Data analyses were conducted using SAS Enterprise 5.1 (SAS Inc, Cary, NC) and were restricted to participants with baseline and follow-up outcome data following the published analysis plan.[19] A pre-post analysis with comparison with an unmatched control group was prespecified. Because all participants in this study underwent cataract surgery, the analysis was completed without comparison with a control group.

a) Baseline characteristics: We examined differences between participants by location of recruitment and by lost to follow-up status, using the independent *t* test and the chi-square test for continuous and categoric variables, respectively.

b) Change in outcomes after surgery: For quality of life and hours in work, paired *t* test–derived *P* values were compared. To correct for the skewed income and asset ownership data, median differences and 95% confidence intervals (CIs) were calculated by the bootstrapping method.[30] For hardship and catastrophic health expenditure, paired proportions were compared using the McNemar's test to account for the correlation of events over time.

c) Determinants of improvements in quality of life, hours in paid work, income, and hardship at 12 months: A new dichotomous variable was created to signify an improvement in each outcome, defined as follows:

i. Quality of life: ≥5 point increase in the PCS or MCS scores[31];
ii. Paid work participation: ≥10 hours increase in hours per month;
iii. Annual income: US ≥$1000 in the 12 months after surgery;
iv. Hardship: a reduction in the proportion of the study population reporting hardship (i.e., change in hardship status at baseline to "no hardship" at 12 months).

Potential covariates of the categoric improvement end points were identified using univariate analyses ($P < 0.25$). Correlation and first-order interaction between variables were assessed. Five generalized estimating equation models were built using manual variable selection of all variables significant at $P < 0.25$. All models were adjusted for the intraclass correlation coefficient, calculated as between-cluster variance divided by total variance, to account for the clustering effect by site.

Results

A total of 480 participants consented to the study and completed baseline assessments (Fig 1). A total of 462 of 480 participants

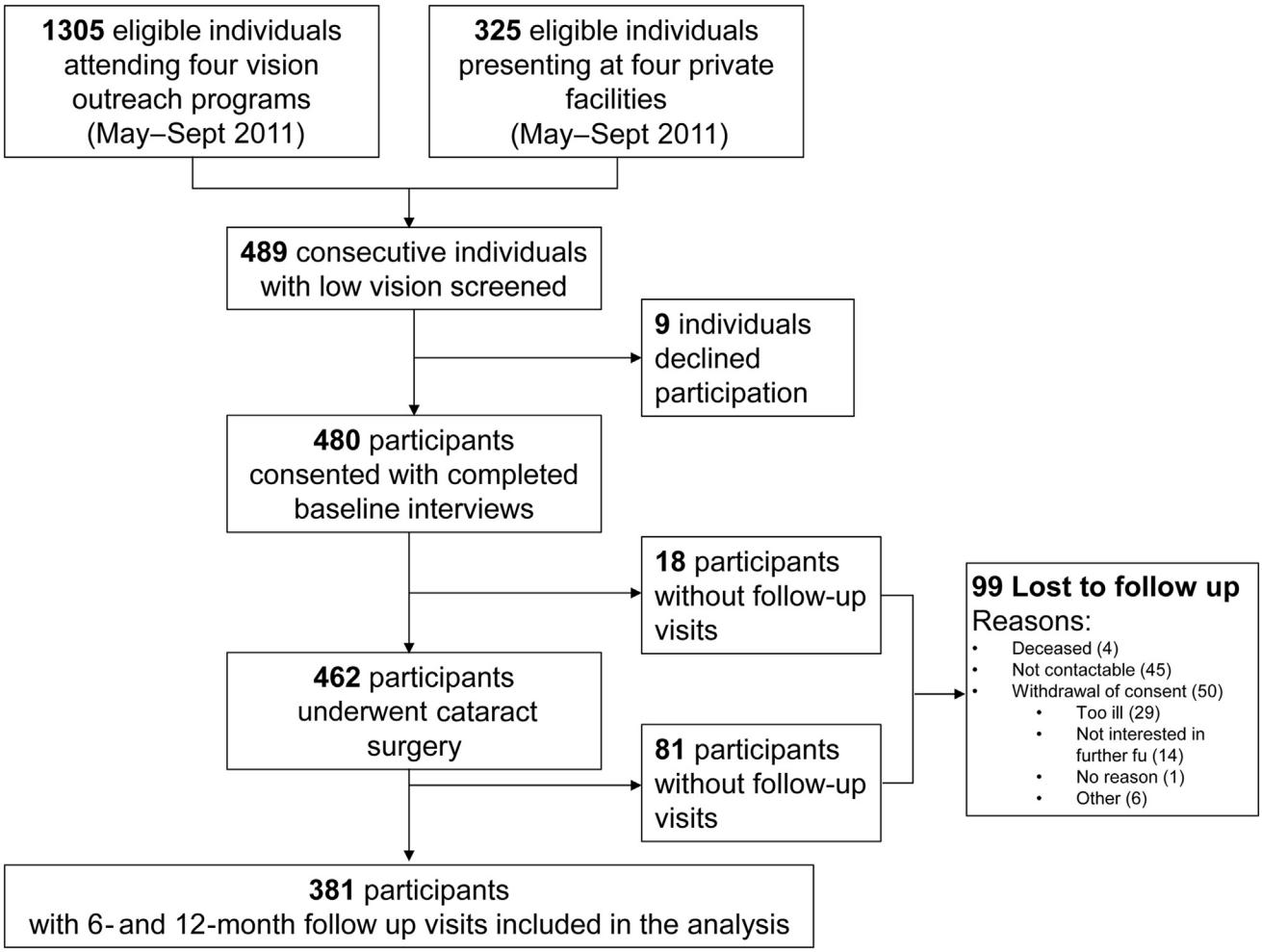

Figure 1. Flow of participants into the study. fu = follow-up.

Table 1. Baseline Sociodemographic Characteristics Overall, by Study Site, and by Location of Recruitment

Baseline Characteristics	Overall n=381	Location of Recruitment		
		Vision Outreach Program n=192	*Eye-Health Facility n=189*	*P Value*
Age, yrs, mean (SD)	70.2 (11.1)	69.9 (10.2)	70.5 (11.9)	0.6
Sex				0.4
Male	132/378 (35%)	62/190 (33%)	70/188 (37%)	
Female	246/378 (65%)	128/190 (67%)	118/188 (63%)	
Marital status				<0.0001
Married	307/369 (83%)	152/183 (83%)	155/186 (83%)	
Single	34/369 (9%)	8/183 (4%)	26/186 (14%)	
Other	28/369 (8%)	23/183 (13%)	5/186 (3%)	
Illiterate/no formal education	45/379 (12%)	31/190 (16%)	14/189 (7%)	0.007
Any health insurance	344/379 (91%)	164/192 (85%)	180/187 (96%)	0.0003
Type of health insurance				
Poor*	35/344 (10%)	24/164 (15%)	11/180 (6%)	0.009
Government (other)	19/344 (6%)	8/164 (5%)	11/180 (6%)	0.6
Voluntary	207/344 (60%)	108/164 (66%)	99/180 (55%)	0.04
Household head	255/361 (71%)	118/183 (64%)	137/178 (77%)	0.009
Farmer	202/279 (72%)	89/119 (75%)	113/160 (71%)	0.4
Source of income				<0.0001
Crops	157/376 (42%)	99/189 (52%)	58/187 (31%)	
Agricultural sidelines	103/376 (27%)	56/189 (30%)	47/187 (25%)	
Family business	54/376 (14%)	20/189 (11%)	34/187 (18%)	
Wages	51/376 (14%)	14/189 (7%)	37/187 (20%)	
Remittances and gifts	11/376 (3%)	0	11/187 (6%)	
Wealth indicators				
Own land	367/378 (97%)	183/191 (69%)	184/187 (98%)	0.1
Electricity	369/376 (98%)	185/190 (97%)	184/186 (99%)	0.3
Running water	200/374 (53%)	89/189 (47%)	111/185 (60%)	0.01
Indoor toilet facility	235/373 (63%)	123/186 (66%)	112/187 (60%)	0.2
Children NOT in school	15/367 (4%)	8/180 (4%)	7/187 (4%)	0.7
Time with vision problems, years, mean (SD)	2.1 (1.7)	2.4 (1.5)	1.9 (1.8)	0.004
Other illness affecting ability to work	186/375 (50%)	91/186 (49%)	95/189 (50%)	0.8
Have a career	227/373 (61%)	95/191 (50%)	132/182 (73%)	<0.0001
Planning to have surgery	364/369 (99%)	185/189 (98%)	179/180 (99%)	0.2
Best uncorrected VA in best eye, logMAR, mean (SD)	1.30 (0.77)	1.35 (0.73)	1.25 (0.80)	0.2
Type of surgery (reported at 6 mos)				
ECCE	178 (47%)	158 (82%)	20 (10%)	<0.0001
Phacoemulsification surgery	203 (53%)	34 (18%)	169 (89%)	<0.0001

ECCE = extracapsular cataract extraction; logMAR = logarithm of the minimum angle of resolution; SD = standard deviation; VA = visual acuity.
*Health insurance for the poor falls within the Compulsory Health Insurance, noncontributory scheme.

(96%) underwent first cataract surgery before their scheduled 6-month interview. The 12-month follow-up was completed in November 2012, and the average follow-up period was 357.2 days (SD, 58.6). At baseline, individuals lost to follow-up were older (mean difference = 4.1 years, $P = 0.0005$), less likely to be married ($P = 0.01$), and less likely to have voluntary health insurance ($P = 0.0003$). There were no other significant differences in sociodemographic characteristics between the participants lost to follow-up and the study population with complete follow-up data.

Participants recruited from the vision outreach programs and directly from the eye-health facilities were similar in age, sex, marital status, and occupation (Table 1). Participants from the eye-health facilities were more likely to be literate, to have some formal education, to identify as the household head, and to generate income from a variety of sources. Although there were high rates of health insurance coverage in both groups, those from the eye-health facilities were less likely to have insurance for the poor or voluntary health insurance. Individuals from the eye-health facilities reported a shorter history of vision problems and were more likely to receive assistance from a family career. At baseline, nearly all participants reported an intention to undergo cataract surgery.

Mean baseline vision in the study population was 1.30 (SD, 0.77) (3/60) without any spectacle correction. Cataract surgery was associated with a significant improvement in vision at 12 months, to 0.55 (SD, 0.38) (6/18−6/24) (mean change: −0.75; 95% CI, −0.68 to −0.83; $P < 0.0001$), although it was not comprehensively assessed with refraction to determine best-corrected visual acuity.

There was a significant improvement in health-related quality of life after surgery (Table 2). Both the PCS and MCS increased significantly by 5.5 units (95% CI, 4.5−6.5; $P < 0.0001$) and 5.0 units (95% CI, 3.6−6.4; $P < 0.0001$), respectively.

Work participation also increased significantly in the 12 months after cataract surgery. The mean number of hours in paid work increased by 44.5 hours per month for participants who were in paid work before surgery (95% CI, 30.75−58.3; $P < 0.0001$), and the mean number of hours in unpaid work increased by 89.5 hours per month (95% CI, 73.4−105.7; $P < 0.0001$).

Participants also reported an increase in median annual household income (median change: US $58; 95% CI, 27−220;

Table 2. Comparison Outcomes at Baseline and Follow-up

A. Quality of Life and Continuous Household Economic Outcomes

Outcome	N = 381	Before Surgery Mean (SD)	After Surgery Mean (SD)	Mean Change, After-Before (95% CI)	P Value Change
Quality of life					
SF12v2					
PCS	364	32.99 (9.69)	38.48 (9.20)	5.49 (4.46−6.53)	<0.0001
MCS	364	44.39 (9.90)	49.38 (8.14)	4.99 (3.61−6.37)	<0.0001
Household economic outcomes:					
Hours in paid work per month	144	90.12 (80.32)	134.58 (86.71)	44.46 (30.65−58.28)	<0.0001
Hours in unpaid work per month	257	92.97 (62.44)	182.52 (117.45)	89.55 (73.39−105.70)	<0.0001
Annual income*,†	306	734 (748)	1005 (3600)	271 (−134 to 675)	0.70
Median‡ (Q1, Q3)	306	451 (244, 947)	509 (309, 947)	58 (27−220)	<0.0001
Asset ownership*	381	1529 (2359)	1393 (1335)	−136 (−389 to 81)	0.70
Median‡ (Q1, Q3)	381	663 (331, 1420)	994 (568, 1657)	331 (237−521)	<0.0001

B. Hardship and Financial Catastrophe

	n	Before Surgery	After Surgery	McNemar's Test P Value	Rate Ratio (95% CI)	P Value
Economic hardship	366	220 (66%)	163 (49%)	<0.0001	0.75 (0.66−0.86)	<0.0001
Financial catastrophe	212	27 (13%)	13 (6%)	0.02	0.47 (0.29−0.78)	0.004

CI = confidence interval; MCS = mental component score; PCS = physical component score; Q1 = Quartile 1; Q3 = Quartile 3; SD = standard deviation; SF12v2 = Short Form 12 version 2.
*Income and assets are reported in US dollars. US $1 ≅ VND₫21,124 (2011).
†Equivalized income is reported, calculated using the Organization for Economic Cooperation and Development equivalence scales. Note: household composition did not change significantly between baseline and follow-up data-collection periods.
‡95% CIs were estimated by the bootstrapping method.

$P < 0.0001$) and median total asset ownership (median change: US $331; 95% CI, 237−521; $P < 0.0001$).

At baseline, 64% of participants reported hardship (Table 2). The most common sources of stress in the previous year were utility bills (e.g., electricity and phone bills) (29.4%), medications (27.8%), medical consultations (23.4%), and health insurance premiums (22.8%). Some 16.5% of participants reported not attending medical appointments, and 23.7% of participants did not purchase medications because of cost. In response to these cost pressures, 35.4% of participants used savings that had been put aside for other purposes, 21.0% asked for assistance from friends and family, and 14.4% used a range of other strategies, including obtaining personal loans, selling assets, and seeking assistance from government support organizations.

There was a significant decrease in the proportion of participants with hardship after surgery (absolute change: −17%, $P < 0.0001$). This represented a rate ratio of 0.75 (95% CI, 0.66−0.86, $P < 0.0001$) for hardship after surgery in the study population.

There was also a significant decrease in the burden of out-of-pocket costs. The proportion of participants experiencing catastrophic health expenditure decreased significantly by 7 percentage points ($P = 0.02$), producing a rate ratio of catastrophic health expenditure after surgery of 0.47 (95% CI, 0.29−0.78; $P = 0.004$).

Tables 3 to 6 (available at www.aaojournal.org) show the univariate relationships for each quality of life and economic improvement variable. From the multivariate analyses, participants who had an improvement in the physical aspects of quality of life (PCS) did not have complications after surgery (odds ratio [OR], 2.0; 95% CI, 1.4−2.5), were not in the poorest households such that they qualified for health insurance for the poor at baseline (OR, 0.8; 95% CI, 0.6−0.9), and were not wealthy enough to have indoor running water or an indoor toilet (OR, 1.4; 95% CI, 1.3−3.3) (Table 7). Those who had an improvement in the mental aspects of quality of life (MCS) were more likely to have had phacoemulsification surgery (OR, 1.4; 95% CI, 1.1−1.7) and came from households that did not have indoor running water or an indoor toilet (OR, 1.4; 95% CI, 1.3−3.3). An increase in the number of hours per month in paid employment was more likely among households that had indoor running water (Table 8). An improvement in annual income was most likely among households that did not have health insurance for the poor at baseline (OR, 0.6; 95% CI, 0.4−0.9). In households that recovered from hardship, the household member who had surgery was more likely to be female (OR, 1.3; 95% CI, 1.1−1.4) and to have better vision at 12 months (OR, 0.6; 95% CI, 0.4−0.8).

Discussion

This study demonstrated that cataract surgery is associated with clinically meaningful improvements in quality of life 12 months after surgery.[31] These results underscore the potentially profound social and health benefits associated with improved vision after removal of a cataract and support other findings on the important relationship between vision and quality of life.[4,5] Given the relatively poor vision measured in the study population before surgery and the high uptake of surgery, ensuring more timely access to this procedure will maximize opportunities for sustaining and improving quality of life within older populations in Vietnam, where blindness due to cataracts continues to be a major contributor to the burden of disease.[32]

By using a multidimensional assessment of household economic circumstances, we reinforced the positive economic outcomes that are experienced relatively soon after surgery. The results highlight the value of achieving optimal vision after surgery because this was a key factor in recovery from hardship. This research also reinforces the

Table 7. Multivariate Results of Population Characteristics Associated with an Improvement in Quality of Life 12 Months after Surgery

Population Characteristics	Improvement in Quality of Life					
	Physical Component Score			*Mental Component Score*		
	OR	*95% CI*	*P Value*	*OR*	*95% CI*	*P Value*
Sex						
Male	1.9	1.0–3.6	0.06	0.7	0.5–1.0	0.08
Female (Ref)						
Age	1.0	1.0–1.0	0.6	1.0	1.0–1.0	0.7
Married						
Yes	0.9	0.5–1.7	0.7	1.3	0.7–2.7	0.4
No (Ref)						
Household has toilet facility indoors/running water						
No	1.4	1.3–3.3	<0.0001	1.4	1.3–3.3	<0.0001
Yes (Ref)						
Vision at 12 mos*	0.9	0.6–1.4	0.6	-	-	-
Complications post-surgery						
No	2.0	1.4–2.5	<0.0001	3.3	0.6–4.1	0.1
Yes (Ref)						
Type of surgery						
Phacoemulsification surgery	0.9	0.6–1.4	0.7	1.4	1.1–1.7	0.02
ECCE (Ref)						
Health insurance for the poor†						
Yes	0.8	0.6–0.9	0.004	1.0	0.8–1.3	0.8
No (Ref)						

CI = confidence interval; ECCE = extracapsular cataract extraction; OR = odds ratio.
See Supplementary file for univariate results for each outcome.
*Vision at 12 months was not identified as a variable for inclusion in the multivariate analysis for improvement in the mental component score.
†Compulsory health insurance, noncontributory scheme.

value of ensuring access to surgery for female patients because female patients undergoing operation return to households that are more likely to recover from hardship 12 months after surgery.

Other studies, although few, have shown that cataract surgery is associated with increased productivity of the person receiving surgery and others in the household who may have had to forego work because of caregiving responsibilities.[7,15] Increases in household income and transitions out of the lowest income categories have been observed, indicating that individuals will return to paid employment when possible after surgery.[15] These factors are important markers of economic well-being and collectively help to signify progress out of impoverishment, particularly for the poorest households. They have important flow on effects for a household in terms of economic empowerment and likely explain the reduction in hardship and financial stress reported in this study after surgery. Such improvements in economic outcomes highlight the potential impact of improved vision on progressing economic development, primarily through allowing people to remain in productive work. This research contributes to the economic argument for ensuring timely access to and availability of cataract surgery.[33]

We found a reduction in catastrophic health expenditure at 12 months, suggesting that health service use had decreased after surgery or that the increase in household income meant that out-of-pocket costs occupied a smaller share of the household's income. This demonstrates that through improvements in economic circumstances, households may be better equipped to face future medical costs. However, the issue of out-of-pocket costs in Vietnam cannot be ignored. Others have shown that cost is a key barrier to accessing cataract surgery and a reason for delaying the procedure.[34,35] With the exception of the poor, in Vietnam cataract surgery is primarily paid for by individuals, through out-of-pocket costs, or through health insurance that requires co-payments.[36] It is clear that within this setting, ensuring timely access to cataract surgery is only part of the solution to improving household economic circumstances and ultimately alleviating poverty. Strategies to improve the uptake and availability of surgery need to take into account the complex health insurance systems in place, which are yet to show evidence of improving the affordability of medical care or mitigating the burden of out-of-pocket costs, especially for poor and near-poor households.[37,38] In addition, they need to consider the broader social determinants that can function as barriers to seeking and accessing surgery, including cost, transport, social support, and education.[39] Addressing these broader determinants will have important flow on effects for improving health and well-being more generally in Vietnam.

Study Limitations

First, uptake of surgery was approximately 100%, so the analysis did not include comparison with our prespecified control group. Our findings are consistent with other similar studies, suggesting that they are unlikely to be the result of

Table 8. Multivariate Results of Population Characteristics Associated with an Improvement in Household Economic Outcomes 12 Months after Surgery

	Improvement in Household Economic Outcomes								
	Hours in Paid Work			*Annual Income*			*Hardship*		
Population Characteristics	*OR*	*95% CI*	*P Value*	*OR*	*95% CI*	*P Value*	*OR*	*95% CI*	*P Value*
Sex									
Female	0.8	0.2–3.3	0.8	0.8	0.6–1.1	0.3	1.3	1.1–1.4	0.001
Male (Ref)									
Age	1.0	1.0–1.1	0.4	1.0	1.0	0.7	1.0	1.0–1.0	0.6
Household head underwent surgery									
Yes	1.7	0.6–4.9	0.3	-	-	-	1.3	0.9–1.9	0.2
No (Ref)							-	-	-
Wealth indicators: Household has toilet facility indoors/running water:									
Yes	3.4	2.3–5.0	<0.0001	1.1	0.8–1.2	0.6	-	-	-
No (Ref)									
Comorbidity									
Yes	0.7	0.4–1.2	0.2	-	-	-	-	-	-
No (Ref)									
Vision at baseline	-	-	-	-	-	-	0.8	0.5–1.2	0.3
Vision at 12 mos	-	-	-	-	-	-	0.6	0.4–0.8	0.003
Type of surgery									
ECCE	-	-	-	-	-	-	0.5	0.2–1.4	0.2
Phacoemulsification surgery (Ref)									
Health insurance for the poor*									
Yes	-	-	-	0.6	0.4–0.9	0.03	-	-	-
No (Ref)									

CI = confidence interval; ECCE = extracapsular cataract extraction; OR = odds ratio.
See Supplementary file for univariate results for each outcome.
(-) Indicates the variable was not identified for inclusion in the multivariate model from the univariate analysis.
*Compulsory health insurance, noncontributory scheme.

trends occurring in the population more generally during the study period. Second, 20.6% of participants were lost to follow-up, and we were not able to confirm the surgical status of most of these individuals. Comparison of the socio-demographic characteristics of those lost to follow-up and those with complete outcome data show that the former were more likely to be older, single, and poorer. It is possible that their dropout from the study was related to important barriers to accessing surgery. Third, there is a gender imbalance in this study population, with approximately two-thirds of study participants being female. However, this imbalance is consistent with trends in the population prevalence of blindness in low- and middle-income countries.[40] Fourth, this study followed standard practice in Vietnam and measured uncorrected vision at baseline and during follow-up. It is expected that many patients would require spectacles after surgery to correct any residual refractive error. Given this, we were not able to accurately investigate the relationship between improvements in the outcomes and best-corrected visual acuity. Although this is outside the scope of this study, we reported low self-reported complications and an improvement in uncorrected vision, and all surgeries involved intraocular lens implantation.

In conclusion, this study demonstrated that cataract surgery in Vietnam is associated with important improvements in quality of life and economic well-being. These results are relevant in a setting such as Vietnam, where rapid economic development is under way, because they signal positive transitions out of poverty associated with a relatively simple, low-cost health intervention. This research also has implications for policy development and service planning. In low- and middle-income countries, cataract impairment is still substantial at the time of surgery, so ensuring timely and affordable access to surgery remains a priority.

Acknowledgments. The VISIONARY study team includes the named authors and the following researchers who contributed to the development and piloting of the study tools and assisted with data collection: Nguyen Ly Kieu Trang, Nguyen Thanh Long, Le Thi Thuy Trang, Nguyen The Hung, Vo Ke Dien, Tran Quoc Dung, Luong Tuan Thien, and Do Thanh Huyen.

References

1. Pokharel GP, Selvaraj S, Ellwein LB. Visual functioning and quality of life outcomes among cataract operated and unoperated blind populations in Nepal. Br J Ophthalmol 1998;82:606–10.
2. Shrestha JK, Pradhan YM, Snellingen T. Outcomes of extracapsular surgery in eye camps of eastern Nepal. Br J Ophthalmol 2001;85:648–52.
3. Tobin S, Nguyen QD, Pham B, et al. Extracapsular cataract surgery in Vietnam: a 1 year follow-up study. Aust N Z J Ophthalmol 1998;26:13–7.
4. Mamidipudi PR, Vasavada AR, Merchant SV, et al. Quality-of-life and visual function assessment after phacoemulsification in an urban Indian population. J Cataract Refract Surg 2003;29:1143–51.

5. Yuen L, Do NH, Vu QL, et al. Cataract surgical outcomes, visual function and quality of life in four rural districts in Vietnam. Clin Experiment Ophthalmol 2011;39:119–25.
6. Harwood RH, Foss AJ, Osborn F, et al. Falls and health status in elderly women following first eye cataract surgery: a randomised controlled trial. Br J Ophthalmol 2005;89:53–9.
7. Polack S, Eusebio C, Mathenge W, et al. The impact of cataract surgery on activities and time-use: results from a longitudinal study in Kenya, Bangladesh and the Philippines. PLoS ONE [serial online] 2010;5:e10913. Available at: http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0010913. Accessed May 13, 2014.
8. Knudtson MD, Klein BE, Klein R, et al. Age-related eye disease, quality of life, and functional activity. Arch Ophthalmol 2005;123:807–14.
9. Baltussen R, Sylla M, Mariotti SP. Cost-effectiveness analysis of cataract surgery: a global and regional analysis. Bull World Health Organ 2004;82:338–45.
10. Lansingh VC, Carter MJ, Martens M. Global cost-effectiveness of cataract surgery. Ophthalmology 2007;114:1670–8.
11. Tabin G, Chen M, Espandar L. Cataract surgery for the developing world. Curr Opin Ophthalmol 2008;19:55–9.
12. Dandona L, Dandona R, Srinivas M, et al. Blindness in the Indian state of Andhra Pradesh. Invest Ophthalmol Vis Sci 2001;42:908–16.
13. Gilbert CE, Shah SP, Jadoon MZ, et al; Pakistan National Eye Survey Study Group. Poverty and blindness in Pakistan: results from the Pakistan national blindness and visual impairment survey. BMJ 2008;336:29–32.
14. Consortium led by The Fred Hollows Foundation. The price of sight: the global cost of eliminating avoidable blindness. Sydney, Australia: PricewaterhouseCoopers; updated February 2013. Available at: http://www.hollows.org.au/sites/default/files/pdfs/research/FHF_Price_of_Sight_Report_final_201302.pdf. Accessed May 13, 2014.
15. Finger RP, Kupitz DG, Fenwick E, et al. The impact of successful cataract surgery on quality of life, household income and social status in South India. PLoS ONE [serial online] 2012;7:e44268. Available at: http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0044268. Accessed May 13, 2014.
16. Kuper H, Polack S, Mathenge W, et al. Does cataract surgery alleviate poverty? Evidence from a multi-centre intervention study conducted in Kenya, the Philippines and Bangladesh. PLoS ONE [serial online] 2010;5:e15431. Available at: http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0015431. Accessed May 13, 2014.
17. Harpham T, Huttly S, Wilson I, De Wet T. Linking public issues with private troubles: panel studies in developing countries. J Int Dev 2003;15:353–63.
18. Lewallen S. Poverty and cataract—a deeper look at a complex issue. PLoS Med [serial online] 2008;5:e245. Available at: http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.0050245. Accessed May 13, 2014.
19. Essue BM, Hackett ML, Mueller A, et al. inVestIgating the pSychologIcal and ecONomic impAct of cataRact surgerY in Vietnam: the VISIONARY observational study protocol. BMC Ophthalmol [serial online] 2011;11:25. Available at: http://www.biomedcentral.com/1471-2415/11/25. Accessed May 13, 2014.
20. Giang KB, Allebeck P, Kullgren G, Tuan NV. The Vietnamese version of the self reporting questionnaire 20 (SRQ-20) in detecting mental disorders in rural Vietnam: a validation study. Int J Soc Psychiatry 2006;52:175–84.
21. Watkins RE, Plant AJ, Sang D, et al. Development of a Vietnamese version of the Short Form-36 Health Survey. Asia Pac J Public Health 2000;12:118–23.
22. General Statistics Office of Vietnam. Vietnamese Household Living Standards Survey, 5th round. VNM_2006_VHLSS_v01_M [Excel file]. 2006. Available at: http://catalog.ihsn.org/index.php/catalog/2155/related_materials. Accessed May 13, 2014.
23. de Vos K, Zaidi MA. Equivalence scale sensitivity of poverty statistics for the Member States of the European Community. Rev Income Wealth 1997;43:319–33.
24. Hargreaves J, Morison L, Gear J, et al. Assessing household wealth in health studies in developing countries: a comparison of participatory wealth ranking and survey techniques from rural South Africa. Emerg Themes Epidemiol [serial online] 2007;4:4. Available at: http://www.ete-online.com/content/4/1/4. Accessed May 13, 2014.
25. Essue B, Kelly P, Roberts M, et al. We can't afford my chronic illness! The out-of-pocket burden associated with managing chronic obstructive pulmonary disease in Western Sydney, Australia. J Health Serv Res Policy 2011;16:223–31.
26. Essue BM, Hackett ML, Li Q, et al. How are household economic circumstances affected after a stroke? The Psychosocial Outcomes In StrokE (POISE) Study. Stroke 2012;43:3110–3.
27. Heeley E, Anderson CS, Huang Y, et al; ChinaQUEST Investigators. Role of health insurance in averting economic hardship in families after acute stroke in China. Stroke 2009;40:2149–56.
28. Bilbao A, Quintana JM, Escobar A, et al; IRYSS-Cataract Group. Responsiveness and clinically important differences for the VF-14 Index, SF-36, and visual acuity in patients undergoing cataract surgery. Ophthalmology 2009;116:418–24.
29. Mangione CM, Phillips RS, Lawrence MG, et al. Improved visual function and attenuation of declines in health-related quality of life after cataract extraction. Arch Ophthalmol 1994;112:1419–25.
30. Efron B, Tibshirani RJ. An Introduction to the Bootstrap. Boca Raton, FL: Chapman & Hall: CRC; 1998:178–99.
31. Norman GR, Sloan JA, Wyrwich KW. Interpretation of changes in health-related quality of life: the remarkable universality of half a standard deviation. Med Care 2003;41:582–92.
32. Keeffe J, Taylor HR, Fotis K, et al; Vision Loss Expert Group of the Global Burden of Disease Study. Prevalence and causes of vision loss in Southeast Asia and Oceania: 1990−2010. Br J Ophthalmol 2014;98:586–91.
33. Grimes CE, Henry JA, Maraka J, et al. Cost-effectiveness of surgery in low- and middle-income countries: a systematic review. World J Surg 2014;38:252–63.
34. Lewallen S, Courtright P. Recognising and reducing barriers to cataract surgery. Community Eye Health 2000;13:20–1.
35. Mathenge W, Kuper H, Limburg H, et al. Rapid assessment of avoidable blindness in Nakuru district, Kenya. Ophthalmology 2007;114:599–605.
36. Tien TV, Phuong HT, Mathauer I, Phuong NT. A health financing review of Viet Nam with a focus on social health insurance: bottlenecks in institutional design and organizational practice of health financing and options to accelerate progress towards universal coverage. World Health Organization; August 2011. Available at: http://www.who.int/health_financing/documents/oasis_f_11-vietnam.pdf. Accessed May 13, 2014.

37. van Doorslaer E, O'Donnell O, Rannan-Eliya RP, et al. Effect of payments for health care on poverty estimates in 11 countries in Asia: an analysis of household survey data. Lancet 2006;368:1357–64.
38. Van Minh H, Phuong TH, Saksena P. Assessment of financial protection in the Viet Nam health system: analysis of Vietnam living standard survey data 2002-2010. World Health Organization; July 2012. Available at: www.wpro.who.int/entity/vietnam/topics/health_financing/vietnam_cata_report_jul_2012.pdf. Accessed May 13, 2014.
39. Brian G, Taylor H. Cataract blindness—challenges for the 21st century. Bull World Health Organ 2001;79:249–56.
40. Abou-Gareeb I, Lewallen S, Bassett K, Courtright P. Gender and blindness: a meta-analysis of population-based prevalence surveys. Ophthalmic Epidemiol 2001;8:39–56.

Footnotes and Financial Disclosures

Originally received: March 6, 2014.
Final revision: April 24, 2014.
Accepted: May 15, 2014.
Available online: July 7, 2014. Manuscript no. 2014-362.

[1] The George Institute for Global Health, The Menzies Centre for Health Policy, University of Sydney, Sydney, Australia.

[2] The George Institute for Global Health, Sydney Medical School, University of Sydney, Sydney, Australia.

[3] The Fred Hollows Foundation, Carlton, Australia.

[4] The Fred Hollows Foundation Vietnam, Da Nang City, Vietnam.

*VISIONARY is a collaborative academic study coordinated jointly by investigators at The George Institute for Global Health and the Fred Hollows Foundation in Australia and Vietnam. The study is funded by a grant provided by the Fred Hollows Foundation, Australia. The research team had full control of all primary data and were not limited in any way by the funder in the completion of this study or the reporting of results. During the course of this work B.E. was in receipt of an Ian Potter Foundation Fellowship and support from a National Health and Medical Research Council (NHMRC) Capacity Building Grant (571372), S.J. received an NHMRC Senior Research Fellowship, M.H. received an NHMRC Population Health Career Development Award and a National Heart Foundation Future Leader Fellowship, and L.K. received an Australian Research Council Postdoctoral Fellowship. These funding bodies had no role in the conduct or reporting of the review.

Financial Disclosure(s):
The author(s) have no proprietary or commercial interest in any materials discussed in this article.

Abbreviations and Acronyms:
CI = confidence interval; **MCS** = mental component score; **OR** = odds ratio; **PCS** = physical component score; **SD** = standard deviation; **VISIONARY** = inVestIgating the pSychologIcal and ecONomic impAct of cataRact surgerY.

Correspondence:
Beverley M. Essue, PhD, The George Institute for Global Health, The Menzies Centre for Health Policy, University of Sydney, PO Box M201, Missenden Road, Sydney NSW 2050, Australia. E-mail: beverley.essue@sydney.edu.au.