Ten-Year Incidence of Cataract Surgery in Urban Southern China: The Liwan Eye Study

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• PURPOSE: We sought to estimate the 10-year incidence of cataract surgery and its associated factors in an adult urban Chinese population.
• DESIGN: Population-based cohort study.
• METHODS: The Liwan Eye Study is a population-based study initiated in 2003 with 1405 eligible participants. All baseline participants were invited to return for a 10-year follow-up examination with the same protocol. Having incident cataract surgery was defined as participants with native crystalline lens at baseline who underwent cataract surgery performed in either eye during the 10-year follow-up period. A detailed questionnaire was administrated to collect information regarding income, education, and medical history of hypertension and diabetes at baseline examination.
• RESULTS: Seven hundred ninety-one (86.2%) of 918 eligible survivors attended the 10-year follow-up examination, and 778 participants without previous binocular cataract surgery were eligible for analysis. The overall 10-year incidence of any cataract surgery was 73 of 778 patients (9.4% [95% confidence interval 7.4%-11.7%). The incident cataract surgery increased with age, and increased from 1.5% among participants 50 to 54 years of age, to 23.2% for those ≥75 years of age ($P < .001$); the same trends were also observed for incident unilateral ($P < .001$) and bilateral surgery ($P < .001$). In the multivariate logistic regression model, income >¥1000 renminbi (approximately $141.30) (odds ratio [OR] 0.2, $P = .023$), education level (OR 0.1, $P < .001$), and presence of diabetes (OR 3.9, $P = .038$) had a significant positive effect on cataract surgery incidence.
• CONCLUSIONS: Approximately 1 in 10 participants ≥50 years of age underwent cataract surgery over 10 years. The incidence was lower than that reported in developed countries, suggesting a substantial unmet demand even in a major urban city in China. (Am J Ophthalmol 2020;217:74–80. © 2020 Elsevier Inc. All rights reserved.)

CATARACT REMAINS THE LEADING CAUSE OF VISUAL impairment and blindness among older populations worldwide, particularly in developing countries such as China.[1–3] Global data published by World Health Organization estimated that of the estimated 76 million people with visual impairment in China, 36.5% of the cases are believed to be attributed to cataract.[1] Cataract is the most common eye disease that impacts quality of life,[4–6] self-reported health,[7] and limits one's ability to remain independent with aging.[4] With an aging Chinese population, a significant increase in the burden of cataract is projected, highlighting the importance of increased efforts to reduce the burden of cataract.

Cataract surgery is a safe and effective treatment for visually significant cataract,[8] and >90% of patients will improve in their ability to perform daily activities of living after surgery.[9] Although substantial efforts have been made to increase the cataract surgery rate, previous data suggest that China has the lowest cataract surgery rate in Asia, with 1067 cases performed per million population in 2014.[10] A range of factors—including high surgical fees,[11] a lack of skilled cataract surgeons,[12] and the unbalanced distribution of medical resources between urban and rural areas—likely contribute to this disparity.[13]

Previous cross-sectional, population-based studies have reported the prevalence of cataract surgery in different regions of China,[2,14–16] with rates ranging from 2.9% in the Beijing Eye Study[14] to 4.4% in the baseline Liwan Eye Study.[16] Furthermore, in 2008, a Nine-Province Survey of adults ≥50 years of age living in the rural areas of mainland China reported a cataract surgery coverage rate of 2.09%.[2] While these studies provided excellent insights into the cataract surgery coverage in China, there have been substantial economic changes and population aging since their completion. Furthermore, there is a paucity of data on incident cataract surgery in China,[17,18] with most reports coming from high-income countries.[19–21] Thus, updated data on prevalence, incidence, and factors associated with cataract surgery in China is vital for effective policy formulation and resource allocation.

The purpose of the current study was to assess the 10-year incidence of cataract surgery and its associated factors in urban Southern China in the Liwan Eye Study.

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METHODS

• **STUDY POPULATION:** The Liwan Eye Study is a population-based cohort study carried out in an urban district of Guangzhou, Southern China. Detailed information of the baseline methodology of the Liwan Eye Study has been described elsewhere.[22] In brief, 1405 subjects ≥50 years of age who resided in the selected district for >6 months were recruited and completed the eye examinations in 2003. With the exception of those who died, moved away from the study area, or were unable to be reached, all participants in the baseline study were invited to take part in the 5- and 10-year follow-up examinations. Nine hundred twenty-four (87.5%) of the 1056 eligible survivors (173 died, 112 unable to be reached, and 64 moved away) attended the 5-year follow-up, while 791 (86.2%) of the 918 eligible survivors (320 died and 167 moved away) attended the 10-year follow-up examination. All follow-up procedures adhered to the same protocol as that in the baseline examinations. A questionnaire regarding education, income, occupation, and medical history of hypertension, diabetes, and glaucoma was administered at baseline examination. A questionnaire of greater detail, including information on education, income, insurance status, and other socioeconomic data, was collected for each participant at the follow-up examination.

Ethical approval for the study was obtained from the Zhongshan University Ethics Review Board, and the Research Governance Committee of Moorfields Eye Hospital, London. The study was conducted in accordance with the tenets of the World Medical Association's Declaration of Helsinki. Written informed consent was obtained from all subjects.

Each participant underwent presenting visual acuity (PVA) assessment with their habitual refractive correction using an Early Treatment Diabetic Retinopathy Study vision chart. PVA was initially assessed in the right eye, followed by the left eye. Participants underwent noncycloplegic autorefraction and assessment of best-corrected visual acuity (BCVA) in each eye if PVA was <20/40 in either eye. Examination of the anterior and posterior segment was carried out using a slit lamp (Topcon SL-8Z with Nikon- D1x digital image system) and +78 diopter (D) lens at 16× magnification by an experienced ophthalmologist (M.H.) before and 30 minutes after dilation of the pupil (1% tropicamide plus 2.5% phenylephrine mixed drops, 3 drops administered 5 minutes apart) in those with a BCVA of ≤20/40 or if the lens and fundus status could not be assessed satisfactorily. Participants who had closed angles with raised intraocular pressure were not dilated. Height and weight were measured after removing coats and shoes, and body mass index was defined as the ratio of participant's weight divided by height squared.

Having incident cataract surgery was defined as participants with native crystalline lens at baseline who underwent cataract surgery performed in either eye during the 10-year follow-up period. For those with incident cataract surgery, we obtained detailed medical information (type of cataract surgery, date of cataract surgery, and name of the hospital) through a detailed eye care questionnaire.

• **STATISTICAL ANALYSIS:** All statistical analyses were performed using Stata 10.0 software (StataCorp, College Station, Texas, USA). The Student t test was used to compare continuous variables, while the Pearson χ^2 or Fisher exact test was used for the comparison of categorical data. The 10-year incidence of cataract surgery stratified by age and gender were calculated. Age was defined as the age at baseline in the current analysis. A univariate logistic regression model was used to test for significantly associated factors in the subjects with 10-year incident cataract surgery. Variables with $P < .5$ in the univariate model were included in multivariate logistic regression analysis. $P < .05$ was considered statistically significant.

RESULTS

AMONG THE 1405 PARTICIPANTS WHO PARTICIPATED IN the baseline examination, 791 (86.2%) of the 918 eligible survivors attended the 10-year follow-up visit. Of the 294 participants (27.1% of survivors) who did not attend the 10-year follow-up examination, 167 (56.8%) had moved from the study area and 127 (43.2%) declined participation. The basic characteristics of participants and nonparticipants have been reported elsewhere.[23] In brief, the 791 participants were younger, more likely to be male, and had higher rate of hypertension. Education, income, diabetes status, and baseline history of cataract surgery did not vary significantly between the 2 groups.

Of the 791 participants re-examined at the 10-year follow-up visit, 13 were excluded because of previous binocular cataract surgery at baseline examination, leaving 778 participants with sufficient data to determine the incidence of cataract surgery. The overall 10-year incidence of any cataract surgery was 9.4% (95% confidence interval 7.4-11.7). The incident cataract surgery increased with age, from 1.5% among participants 50 to 54 years of age to 23.2% in those ≥75 years of age ($P < .001$). Similar age-related trends were observed for incident unilateral surgery ($P < .001$) and bilateral surgery ($P < .001$). The incidence of cataract surgery was 9.9% for women and 8.7% for men ($P = .577$) (Table 1).

The 10-year incidence of cataract surgery was approximately double that of the 5-year incidence (9.4% vs 4.8%, $P = .001$). The 5- and 10-year incidence rates were the same among participants <65 years of age (1.5% vs 1.5%) but were significantly higher at the 10-year follow-up among subjects ≥65 years of age (17.4% vs 7.1%) (Table 2).

TABLE 1. Ten-Year Incidence of Cataract Surgery by Age and Gender

	All Persons		Male		Female	
Surgery	N	n (%)	N	n (%)	N	n (%)
Unilateral, age range						
50-54	197	3 (1.5)	81	1 (1.2)	116	2 (1.7)
55-64	254	2 (0.8)	112	0	142	2 (1.4)
65-74	258	19 (7.4)	110	7 (6.4)	148	12 (8.1)
≥75	69	9 (13.0)	30	4 (13.3)	39	5 (12.8)
Total [95% CI]	778	33 (4.2) [2.9-5.9]	333	12 (3.6) [1.9-6.2]	445	21 (4.7) [2.9-7.1]
Bilateral, age range						
50-54	197	0	81	0	116	0
55-64	254	7 (2.8)	112	5 (4.5)	142	2 (1.4)
65-74	258	26 (10.1)	110	7 (6.4)	148	19 (12.8)
≥75	69	7 (10.1)	30	5 (16.7)	39	2 (5.1)
Total [95% CI]	778	40 (5.1) [3.7-6.9]	333	17 (5.1) [3.0-8.1]	445	23 (5.2) [3.3-7.7]
Any cataract, age range						
50-54	197	3 (1.5)	81	1 (1.2)	116	2 (1.7)
55-64	254	9 (3.5)	112	5 (4.5)	142	4 (2.8)
65-74	258	45 (17.4)	110	14 (12.7)	148	31 (21.0)
≥75	69	16 (23.2)	30	9 (30.0)	39	7 (18.0)
Total [95% CI]	778	73 (9.4) [7.4-11.7]	333	29 (8.7) [5.9-12.3]	445	44 (9.9) [7.3-13.0]

CI = confidence interval.

TABLE 2. Comparison of 5- and 10-Year Incidence of Cataract Surgery in the Liwan Eye Study

	Unilateral Surgery			Bilateral Surgery			Any Cataract Surgery		
Characteristics	5-Year, n (%)	10-Year, n (%)	*P* Value	5-Year, n (%)	10-Year, n (%)	*P* Value	5-Year, n (%)	10-Year, n (%)	*P* Value
Age, years			<.001			<.001			<.001
50-54	3 (1.5)	3 (1.5)		0	0		3 (1.5)	3 (1.5)	
55-64	1 (0.4)	2 (0.8)		2 (0.7)	7 (2.8)		3 (0.6)	9 (3.5)	
65-74	13 (3.9)	19 (7.4)		11 (3.3)	26 (10.1)		24 (7.1)	45 (17.4)	
≥75	9 (9.0)	9 (13.0)		5 (5.0)	7 (10.1)		14 (14.0)	16 (23.2)	
Gender			<.001			<.001			.001
Male	12 (3.1)	12 (3.6)		5 (1.3)	17 (5.1)		17 (4.4)	29 (8.7)	
Female	14 (2.7)	21 (4.7)		13 (2.5)	23 (5.2)		27 (5.2)	44 (9.9)	
Total	26 (2.9)	33 (4.2)		18 (2.0)	40 (5.1)		44 (4.8)	73 (9.4)	

In univariate logistic regression analysis, participants with a monthly income >1000 renminbi (RMB; approximately $141.30) (odds ratio [OR] 0.3, $P = .031$) and those with a higher level of education (OR 0.4, $P = .006$) were more likely to have undergone cataract surgery, while age, gender, diabetes status, hypertension status, body mass index, and baseline PVA were not associated with incident cataract surgery. In the multivariate logistic regression model, having a monthly income >1000 RMB (OR 0.2, $P = .023$), a higher level of education (OR 0.1, $P < .001$), and the presence of diabetes (OR 3.9, $P = .038$) was significantly associated with incident cataract surgery (Table 3).

Of the 113 eyes (33 eyes of unilateral surgery and 40 eyes of bilateral surgery) that underwent cataract surgery during the 10-year follow-up period, 103 eyes (91.2%) were pseudophakic and 10 eyes (8.9%) were aphakic. Seventy-nine of 113 eyes (69.9%) had a postoperative PVA ≥20/63, while 29 eyes (25.7%) had a PVA <20/63~≥20/400, and 5 eyes (4.4%) had a PVA <20/400. The corresponding figures for BCVA were 84.1%, 12.4%, and 3.5%, respectively (Table 4). For the 34 eyes with PVA <20/63, poor outcomes were attributable to complications of cataract surgery in 5 eyes (14.7%), other ocular comorbidities in 13 eyes (38.2%), and uncorrected refractive error in 16 eyes (47.1%). Of the 5 eyes with PVA <20/400, 2 (40.0%)

TABLE 3. Factors Associated with 10-Year Incidence of Cataract Surgery

Baseline Factors	Participants with Incident Cataract Surgery	Participants with BCVA <6/18 Because of Cataract in Either Eye Without Incident Cataract Surgery, n (%)	Univariate Logistic Regression, OR (95% CI)	Age and Sex Adjusted Logistic Regression, OR (95% CI)	Multivariate Logistic Regression, OR (95% CI)
Total, %	73	92			
Age, years, mean ± SD	69.7 ± 6.9	70.5 ± 8.2	0.9 (0.9-1.0)	0.9 (0.9-1.0)	1.1 (0.9-1.1)
Female, n (%)	64 (69.6)	44 (60.3)	0.7 (0.4-1.3)	0.7 (0.4-1.3)	2.3 (0.9-6.3)
Education, none, n (%)	17 (25.4)	42 (47.2)	0.4 (0.2-0.8)	0.4 (0.2-0.8)	0.1 (0.1-0.4)
Low income, <1000 RMB ($141.30 USD), n (%)	38 (76.0)	61 (91.0)	0.3 (0.1-0.9)	0.3 (0.1-0.9)	0.2 (0.1-0.8)
Diabetes, present, n (%)	11 (15.9)	10 (11.0)	1.5 (0.6-3.9)	1.6 (0.6-4.0)	3.9 (1.1-13.8)
Hypertension, present, n (%)	37 (53.6)	47 (52.2)	1.1 (0.6-2.0)	1.1 (0.6-2.0)	
BMI, ≥25 kg/m^2, n (%)	17 (60.7)	11 (39.3)	0.8 (0.3-1.9)	0.8 (0.3-2.0)	
Baseline PVA, worse-seeing eye; logMAR, mean ± SD	1.4 ± 0.9	1.5 ± 1.0	0.9 (0.7-1.3)	0.9 (0.7-1.3)	

BCVA = best-corrected visual acuity; BMI = body mass index; CI = confidence interval; logMAR = logarithm of minimal angle of resolution; OR = odds ratio; PVA = presenting visual acuity; RMB = renminbi; SD = standard deviation; USD = US dollar.

TABLE 4. Distribution of Best-Corrected Visual Acuity Level After Cataract Surgery Stratified by Presenting Visual Acuity

	BCVA at 10-Year Follow-Up, n (%)					
PVA at 10-Year Follow-Up	≥20/40	<20/40 ~ ≥20/63	<20/63 ~ ≥20/200	<20/200 ~ ≥20/400	<20/400	Total Eyes
≥20/40	56 (100.0)	0	0	0	0	56 (100.0)
<20/40 ~ ≥20/63	17 (73.9)	6 (26.1)	0	0	0	23 (100.0)
<20/63 ~ ≥20/200	10 (37.0)	6 (22.2)	11 (40.7)	0	0	27 (100.0)
<20/200 ~ ≥20/400	0	0	1 (50.0)	1 (50.0)	0	2 (100.0)
<20/400	0	0	0	1 (20.0)	4 (80.0)	5 (100.0)
Total	83 (73.5)	12 (10.6)	12 (10.6)	2 (1.8)	4 (3.5)	113 (100.0)

BCVA = best-corrected visual acuity; PVA = presenting visual acuity.

were attributable to cataract surgery complications and 3 (60%) were a result of ocular comorbidities (glaucoma, n = 1; high myopia, n = 2).

DISCUSSION

THE INCIDENT RATE OF CATARACT SURGERY IS constantly changing with the rapid development of the economy and population aging. Therefore, updated data on the incidence of cataract surgery may play an important role in effective policy formulation and resource allocation through an improved knowledge of the distribution and demand for cataract surgery and factors associated with uptake. This study describes the 10-year incidence and factors associated with cataract surgery in an older adult population residing in urban Southern China. We observed an overall rate of 9.4% incident cataract surgery with an annual incidence of 0.9%. Having an income >1000 RMB, a higher education level, and the presence of diabetes were significantly associated with incident cataract surgery.

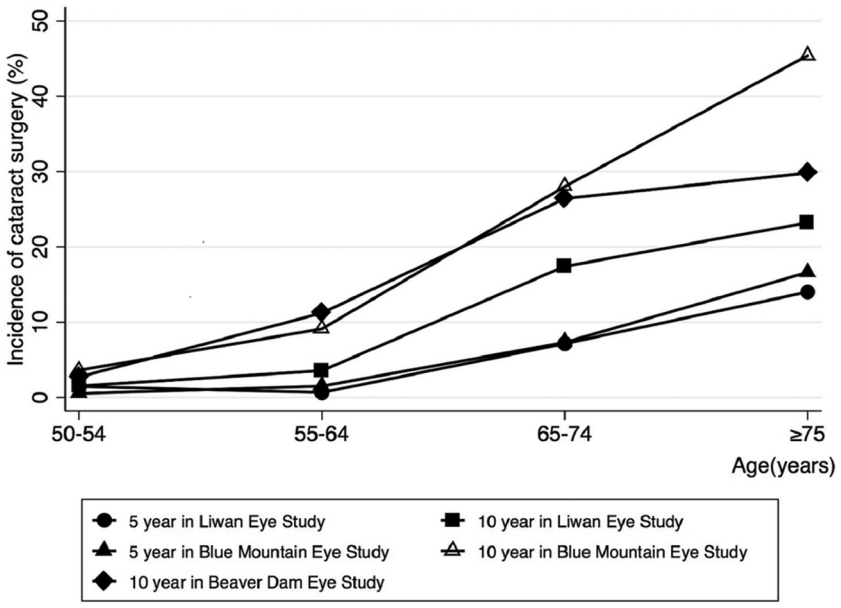

FIGURE. Comparison of 5- and 10-year incident cataract surgery between the Liwan Eye Study (LWES), the Blue Mountains Eye Study (BMES), and the Beaver Dam Eye Study (BDES). The graph shows that 10-year incident cataract surgery increased with ages in all studies ($P < .05$), but it was much lower in the LWES than what was found in BMES (9.38% vs 17.8%) and BDES (9.38% vs 13.0%). All studies showed a similar 10-year incident rate of cataract surgery in subjects 50 to 54 years of age and 55 to 64 years of age, but when focused on subjects ≥75 years of age, the LWES shows the lowest rate (23.2%), while it was 29.8% in the BDES and 45.4% in the BMES. The disparity between the 5- and 10-year incident rate in the LWES was smaller than that found in the BMES.

TABLE 5. The 10-Year Incidence of Cataract Surgery in the Liwan Eye Study, Blue Mountains Eye Study, Beaver Dam Eye Study, and the Age-Related Eye Disease Study

	Incident Cases, %			
Characteristics	LWES	BMES	BDES	AREDS
Age, years				
50-54	1.5	3.6	2.7	—
55-64	3.5	9.1	11.2	—
65-74	17.4	28.0	26.4	—
≥75	23.2	45.4	29.8	—
Gender				
Male	8.7	14.4	10.0	24.7
Female	7.9	20.2	15.2	28.5
Total	9.4	17.8	13.0	26.7

AREDS = Age-Related Eye Disease Study; BDES = Beaver Dam Eye Study; BMES = Blue Mountains Eye Study; LWES = Liwan Eye Study.

The 10-year incidence of cataract surgery in this cohort (9.4%) was notably lower than the previous international reports from high income countries—the reported 10-year incidence of cataract surgery was 13.0% in the Beaver Dam Eye Study (BDES),[20] 17.8% in the Blue Mountains Eye Study (BMES),[19] and 29.1% in the Age-Related Eye Disease Study (AREDS).[21] However, because cataracts are strongly age-related and the age distributions of the Liwan Eye Study differ to those in the abovementioned studies, comparing age-specific rates is more appropriate. A comparison of the age-specific rates with the BMES and the BDES revealed that the incidence of cataract surgery remained notably lower in participants 50 to 54 years of age (Liwan = 1.5%, BMES = 3.6%, and BDES = 2.7%) and those ≥75 years of age (Liwan = 23.3%, BMES = 45.4%, and BDES = 29.8%) (Figure; Table 5).[19,20] The reasons for a much lower incidence rate in our study cohort are unclear. We speculate that this may be attributable to the insufficient capacity of service provider as well as the perception of surgery amongst residents living in Liwan district, an old town of Guangzhou city. These findings highlight that when compared with international standards, improvements in the accessibility of cataract surgery services may be warranted in urban Southern China, particularly among participants >75 years of age.

In China, population-based data investigating the incidence of cataract surgery is scarce, and the present study provides the first data on the 10-year incidence. The annual incidence of cataract surgery over a 7-year period in the Shihpai Eye Study from Taiwan was similar with that in the current study for those ≥65 years of age (annual incidence 2.1% vs 1.9%).[24] While the Beijing Eye Study reported the five-year incidence of cataract surgery to be 1.8%,[17] which is notably lower than the five-year (4.8%)[18] and ten-year (9.4%) incidence figures from the

Liwan Eye Study. With respect to age-specific rates, the annual incidence of cataract surgery in the Beijing Eye Study remained lower than that in the current study among participants aged 55-64 years (Liwan = 0.35%; Beijing = 0.14%), 65-74 (Liwan = 1.74%; Beijing = 1.08%), and those aged 75 years and older (Liwan = 2.32%; Beijing = 1.9%).The observed differences may in part be explained by the variations in sampling regions used in the Beijing Eye Study and the Liwan Eye Study. That is, the Beijing Eye Study recruited participants from four rural districts (and 3 urban districts), where accessibility to eye health services is known to be low.[25] The difference in age inclusion criteria (Beijing Eye Study ≥40 years vs Liwan Eye Study ≥50 years) is also likely to be contributory.

In line with the findings of other reports,[15,26,27] income and education status were significantly associated with incident cataract surgery in the current study. Over the past 2 decades, several targeted interventions have been successful in improving China's health insurance coverage rate (>95% across the nation),[25,28] and as a result there is some evidence that indicates that cost may no longer be a major barrier to the uptake of surgery in urban China.[29] Cross-sectional data suggest that there has been an improvement in the national cataract surgery rate in China, reaching 3000 cases per million population in many major cities including Beijing, Shanghai, and Guangzhou,[10] which may provide some evidence of the impact of these initiatives. However, given that 16.1% of our study sample had incident visual impairment (BCVA <20/60) at the 10-year follow-up examination, of which cataract was the leading cause (44.4% of those ≥75 years of age), eliminating the backlog of cataract related visual impairment remains a formidable challenge in urban China.

The strengths of our study include its population-based design, high re-examination rates (86.2% of eligible patients) and standardized procedures at baseline and follow-up visits. There are also some limitations. First, younger participants were less likely to participate at the 10-year follow-up examination. This may have resulted in selection bias, leading to an overestimation of incidence rates. Second, it is difficult to observe the progression and incident nuclear, cortical, and posterior subcapsular lens opacities because of a lack of standardized slit lamp lens photographs and retroilluminated photographs based on Lens Opacity Classification system III. Third, only 92 participants with visually significant cataract who needed to have cataract surgery were included in the logistic model, the statistical power of which may be compromised by the small sample size. In addition, some relevant risk factors, such as smoking and outdoor time, were not collected at baseline and therefore were not included in the current analysis. Finally, Liwan district is an old town of Guangzhou city where socioeconomic status is among the lower middle in the city, whereas the population tends to be stable and easier for participant enumeration. While these study findings are representative of an urban Chinese population, more data are needed to understand the situation in rural China.

In conclusion, the 10-year incidence of cataract surgery in the Liwan Eye Study (9.4%) was higher than that previously Chinese reported by the Beijing Eye Study, but notably lower than those in other high-income countries. Individuals ≥75 years of age were particularly underserved. The need for further improvement of cataract surgical service volume in urban southern China remains a major priority.

CRediT AUTHORSHIP CONTRIBUTION STATEMENT

LANHUA WANG: INVESTIGATION, FORMAL ANALYSIS, Writing - original draft, Writing - review & editing. **Rui Gong:** Formal analysis, Writing - original draft. **Stuart Keel:** Writing - review & editing. **Zhuoting Zhu:** Writing - review & editing. **Mingguang He:** Conceptualization, Methodology, Writing - review & editing, Supervision, Funding acquisition.

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REFERENCES

1. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. *Br J Ophthalmol* 2012;96(5):614–618.
2. Zhao J, Ellwein LB, Cui H, et al. Prevalence and outcomes of cataract surgery in rural China the China nine-province survey. *Ophthalmology* 2010;117(11):2120–2128.
3. Liang YB, Friedman DS, Wong TY, et al. Prevalence and causes of low vision and blindness in a rural chinese adult population: the Handan Eye Study. *Ophthalmology* 2008;115(11):1965–1972.
4. Obstbaum SA, American Academy of Ophthalmology, American Society of Cataractand Refractive Surgery, European Society of Cataract and Refractive Surgeons.

Utilization, appropriate care, and quality of life for patients with cataracts: American Academy of Ophthalmology, American Society of Cataract and Refractive Surgery, and European Society of Cataract and Refractive Surgeons. *Ophthalmology* 2006;113(10):1878–1882.
5. Polack S, Kuper H, Mathenge W, Fletcher A, Foster A. Cataract visual impairment and quality of life in a Kenyan population. *Br J Ophthalmol* 2007;91(7):927–932.
6. Lee BS, Munoz BE, West SK, Gower EW. Functional improvement after one- and two-eye cataract surgery in the Salisbury Eye Evaluation. *Ophthalmology* 2013;120(5):949–955.
7. Wang JJ, Mitchell P, Smith W. Vision and low self-rated health: the Blue Mountains Eye Study. *Invest Ophthalmol Vis Sci* 2000;41(1):49–54.
8. Lansingh VC, Carter MJ, Martens M. Global cost-effectiveness of cataract surgery. *Ophthalmology* 2007;114(9):1670–1678.
9. Behndig A, Montan P, Stenevi U, Kugelberg M, Lundstrom M. One million cataract surgeries: Swedish National Cataract Register 1992-2009. *J Cataract Refract Surg* 2011;37(8):1539–1545.
10. Wang W, Yan W, Fotis K, et al. Cataract surgical rate and socioeconomics: a global study. *Invest Ophthalmol Vis Sci* 2016;57(14):5872–5881.
11. He M, Chan V, Baruwa E, Gilbert D, Frick KD, Congdon N. Willingness to pay for cataract surgery in rural Southern China. *Ophthalmology* 2007;114(3):411–416.
12. Lin Y. Comparative study on preventing avoidable blindness in China and in Nepal. *Chin Med J (Engl)* 2007;120(4):280–283.
13. Shi L. Health care in China: a rural-urban comparison after the socioeconomic reforms. *Bull World Health Organ* 1993;71(6):723–736.
14. Liu B, Xu L, Wang YX, Jonas JB. Prevalence of cataract surgery and postoperative visual outcome in Greater Beijing: the Beijing Eye Study. *Ophthalmology* 2009;116(7):1322–1331.
15. Li EY, Liu Y, Zhan X, et al. Prevalence of blindness and outcomes of cataract surgery in Hainan Province in South China. *Ophthalmology* 2013;120(11):2176–2183.
16. Huang W, Huang G, Wang D, Yin Q, Foster PJ, He M. Outcomes of cataract surgery in urban southern China: the Liwan Eye Study. *Invest Ophthalmol Vis Sci* 2011;52(1):16–20.
17. Zhang JS, Xu L, Wang YX, You QS, Wang JD, Jonas JB. Five-year incidence of age-related cataract and cataract surgery in the adult population of greater Beijing: the Beijing Eye Study. *Ophthalmology* 2011;118(4):711–718.
18. Huang W, Zheng Y, Wang L, et al. Five-year incidence and postoperative visual outcome of cataract surgery in urban southern China: the Liwan Eye Study. *Invest Ophthalmol Vis Sci* 2012;53(13):7936–7942.
19. Kanthan GL, Wang JJ, Rochtchina E, et al. Ten-year incidence of age-related cataract and cataract surgery in an older Australian population. The Blue Mountains Eye Study. *Ophthalmology* 2008;115(5):808–814.e801.
20. Klein BE, Klein R, Lee KE. Incidence of age-related cataract over a 10-year interval: the Beaver Dam Eye Study. *Ophthalmology* 2002;109(11):2052–2057.
21. Koo E, Chang JR, Agron E, et al. Ten-year incidence rates of age-related cataract in the Age-Related Eye Disease Study (AREDS): AREDS report no. 33. *Ophthalmic Epidemiol* 2013;20(2):71–81.
22. He M, Foster PJ, Ge J, et al. Prevalence and clinical characteristics of glaucoma in adult Chinese: a population-based study in Liwan District, Guangzhou. *Invest Ophthalmol Vis Sci* 2006;47(7):2782–2788.
23. Wang L, Huang W, Huang S, et al. Ten-year incidence of primary angle closure in elderly Chinese: the Liwan Eye Study. *Br J Ophthalmol* 2019;103(3):355–360.
24. Kuang TM, Tsai SY, Liu CJ, Ko YC, Lee SM, Chou P. Seven-year incidence of age-related cataracts among an elderly Chinese population in Shihpai, Taiwan: The Shihpai Eye Study. *Invest Ophthalmol Vis Sci* 2013;54(9):6409–6415.
25. Meng Q, Xu L, Zhang Y, et al. Trends in access to health services and financial protection in China between 2003 and 2011: a cross-sectional study. *Lancet* 2012;379(9818):805–814.
26. Zhao J, Xu X, Ellwein LB, et al. Cataract surgical coverage and visual acuity outcomes in rural China in 2014 and comparisons with the 2006 China Nine-Province Survey. *Am J Ophthalmol* 2018;193:62–70.
27. Xu J, Zhu S, Li S, Pizzarello L. Models for improving cataract surgical rates in southern China. *Br J Ophthalmol* 2002;86(7):723–724.
28. Fang J, Wang X, Lin Z, Yan J, Yang Y, Li J. Variation of cataract surgery costs in four different graded providers of China. *BMC Public Health* 2010;10:543.
29. Yin Q, Hu A, Liang Y, et al. A two-site, population-based study of barriers to cataract surgery in rural china. *Invest Ophthalmol Vis Sci* 2009;50(3):1069–1075.