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Utilisation, Expenditure and Risk-Adjusted Trends in Eye-Care Services in the Private Sector, South Africa

Abstract

Background: Eye disease is a leading and increasing cause of avoidable visual impairment, yet population-level data on eye-care utilisation and expenditure in the South African privately insured sector are limited. We characterised the delivery, cost and risk-adjusted trends of eye-care services across all registered medical schemes.

Methods: We analysed anonymised, aggregated statutory submissions covering approximately 9.1 million beneficiaries for financial years 2019–2024. Officially published benefits-paid statistics served as the control (denominator) file against which service-line data were reconciled. Eye-care activity was examined through two complementary lenses: professional services delivered by eye-care disciplines (ophthalmology, optometry, optical dispensing, orthoptics) and eye-related inpatient admissions (ICD-10 H00–H59). Utilisation was risk-adjusted by direct age standardisation to the pooled beneficiary structure, and stratified by age, sex, province and scheme type.

Results: In 2024, eye-care professional benefits totalled R8.29 billion (3.3% of total scheme benefits of R249.8 billion), split almost equally between ophthalmology (R4.06 billion; 453 practices) and optometry (R4.23 billion; 3,186 practices). Ophthalmology benefits were 94.2% risk-funded versus 43.8% for optometry. Eye-related inpatient benefits rose from R1.13 billion (2019) to R2.82 billion (2024); cataract accounted for roughly 70% of inpatient eye spend. The age-standardised eye admission rate rose from 10.0 to a peak of 29.7 per 1,000 (2023) before falling to 20.7 per 1,000 (2024); age standardisation only modestly attenuated the crude trend, indicating the rise was not driven by population ageing alone. Two-thirds (66.9%) of eye admissions occurred in beneficiaries aged ≥ 60 years. Restricted schemes showed persistently higher age-standardised admission rates than open schemes (24.3 vs 17.7 per 1,000 in 2024). Per-beneficiary eye-care spend varied 2-fold across provinces (R561–R1,144).

Conclusions: Eye care is a material and growing component of private-sector health expenditure in South Africa, dominated by cataract surgery and refractive/optometric services and marked by substantial geographic and scheme-type variation. Age standardisation confirms genuine growth in demand beyond demographic change, with implications for benefit design, provider network planning and equity of access.

Keywords: Eye care; Cataract; Optometry; Ophthalmology; Health expenditure; Medical schemes; Age standardisation; South Africa

Research Article

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Introduction

Visual impairment and blindness impose a large and

inequitably distributed burden on individuals and health systems. In 2020 an estimated 43 million people were blind and more than a billion lived with a preventable or as-yet-uncorrected vision impairment, with cataract and uncorrected refractive error remaining the two leading causes of avoidable vision loss worldwide [1,2]. Both conditions are highly amenable to intervention: cataract surgery is among the most cost-effective procedures in all of medicine,5 and refractive correction requires only a spectacle prescription, yet global coverage of each remains incomplete [3,4]. As populations age and the prevalence of diabetes climbs, demand for cataract surgery, refractive services and the management of diabetic retinopathy is projected to rise steeply [5-8], placing sustained pressure on the arrangements that finance eye care [9].

In South Africa these pressures play out within a two-tiered health system. Roughly one in six people is covered by a registered medical scheme, financed through a combination of risk-pooled contributions and individual medical savings accounts and regulated under the Medical Schemes Act [9]. Schemes must fund a defined set of Prescribed Minimum Benefits (PMBs), which include cataract surgery for advanced visual impairment, but routine refractive and optical services are typically met from discretionary day-to-day benefits or savings [7,8]. The result is a distinctive financing landscape in which surgical (ophthalmological) and primary (optometric) eye care are funded through structurally different mechanisms a distinction that, as we show, has real consequences for members. The public sector, by contrast, has long struggled to reach national cataract-surgery targets [10,11] and the wider sub-Saharan region carries a disproportionate share of avoidable blindness relative to its ophthalmic workforce [6,12].

Despite the scale of the privately insured sector, published analyses of eye-care utilisation and expenditure across this population are scarce; most South African and regional evidence concerns the public system or is derived from prevalence surveys rather than financing data [6,10,13]. Routine statutory returns submitted by schemes offer an unusually complete, census-level picture of who receives eye care, from which providers, for which conditions, and at what cost. Yet these returns are seldom exploited for condition-specific analysis, and still more rarely risk-adjusted to separate a genuine change in demand from a shift in the age structure of the covered population.

This study was designed to address that gap. Using anonymised, aggregated statutory data covering essentially the entire medical-scheme population over six financial years, we set out to (i) quantify the volume, cost and funding source of eye-care services delivered by ophthalmologists, optometrists and allied disciplines; (ii) describe variation across all available demographic and structural dimensions age, sex, province and scheme type; (iii) characterise trends over time in eye-related inpatient admissions and expenditure; and (iv) risk-adjust utilisation by direct age standardisation, so that observed trends and between-group differences could be interpreted net of demographic change. Throughout, the officially published benefits-paid statistics were used as a control file to anchor and validate the analysis.

Materials and Methods

Study Design and Data Sources

We conducted a retrospective, census-level analysis of routine administrative data submitted by all registered South African medical schemes for financial years 2019 to 2024. Data were supplied as anonymised, pre-aggregated statutory extracts containing no patient identifiers; each record represents a cell of covered lives or claims cross-classified by scheme, demographic and service attributes. Six linked extracts were used:

(i) a benefits-paid control extract giving total amounts claimed and paid, and average beneficiaries, by scheme, benefit option, financial year, age band, beneficiary type, sex and province (approximately 0.82 million records; 2019–2025); (ii) a professional-services distribution extract giving practising-provider counts, visits, beneficiaries treated and benefits paid by discipline and province for 2024; (iii) an inpatient morbidity extract (statutory table B.4) giving admissions, inpatient days and benefits by diagnosis (International Shortlist for Hospital Morbidity Tabulation groupings), scheme type and age band (2019–2024; ~1.03 million records); (iv) a discipline-by-diagnosis extract (statutory table B.14) for 2021–2024; (v) a beneficiary-count trend extract (2014–2024); and (vi) a diagnosis-group dictionary mapping ICD-10 ranges to reporting categories.

The Control (Denominator) File

The officially published benefits-paid extract was designated the control file. It constitutes the authoritative, reconciled statement of total scheme expenditure and covered lives and was used for three purposes: (a) to validate the analysis aggregate benefits and beneficiary counts derived from all other extracts were reconciled against it before any rates were computed; (b) to express eye-care spend as a share of total scheme benefits; and (c) as the source of exposure denominators. The field Average Beneficiaries, the mean number of lives covered over the reporting year, provided beneficiary-years of exposure by age, sex and province and was used as the denominator throughout. Summed nationally it reproduced the published industry total of approximately 9.1 million beneficiaries, confirming completeness. The 2025 partial year present in the control file was excluded from all analyses.

Definition of Eye-Care Services

Eye care was operationalised through two complementary and deliberately non-overlapping lenses. The professional-services lens captured all activity billed under the eye-care disciplines: ophthalmology (medical and surgical specialists), optometry (including supplementary optometry and ocular therapeutics), optical dispensing and orthoptics. The disease lens captured eye-related inpatient admissions classified to ICD-10 chapter VII, Diseases of the eye and adnexa (H00–H59), sub-divided into cataract (H25–H26, H28) and other eye disease. Because professional (largely ambulatory) services and inpatient admissions represent different settings, the two lenses are reported separately and are not summed, to avoid double counting.

Data Cleaning and De-Duplication

Categorical fields were standardised for leading and trailing whitespace, and age-band and province labels were harmonised. A material structural artefact was identified in the discipline extracts: several discipline codes carried multiple synonymous text labels (for example, code 70 appeared as “Optometrists”, “Supplementary Optometrists” and “Ocular Therapeutics”, and code 26 as both “Ophthalmology” and “Any Discipline”), with mirrored values that would triple- or double-count expenditure if naively summed. We therefore aggregated strictly at discipline-code level, retaining a single canonical label per code (ophthalmology, optometry, optical dispensing, orthoptics). This correction reduced the apparent 2024 eye-care professional benefit from an inflated R16.8 billion to a de-duplicated R8.29 billion and is essential for valid inference.

Risk Adjustment

Utilisation was risk-adjusted for the confounding effect of population age structure using direct standardisation. Age-specific eye-admission rates were computed as admissions divided by beneficiary-years of exposure within each of nineteen age bands. Age-standardised rates were obtained by applying these age-specific rates to a fixed standard population defined as the pooled 2019-2024 beneficiary age distribution, so that year-on-year and between-group comparisons are net of demographic drift. The same method was applied to compare open and restricted schemes, using scheme-type-specific exposure obtained by linking each scheme’s registration number to its scheme type. Sex standardisation was not applied to inpatient rates because the inpatient extract did not carry sex; where sex was available (control and discipline-by-diagnosis extracts) it is reported descriptively.

Statistical Analysis and Ethics

Analyses were descriptive and are reported as counts, expenditure in South African Rand (R), and rates per 1,000 beneficiary-years. Per-beneficiary expenditure was computed as benefits paid divided by exposure. Provider supply was expressed per 100,000 beneficiaries. Data were processed in Python (pandas). Because the study used only anonymised, aggregated data with no possibility of re-identification, it did not constitute research on human participants; no individual consent was required. The work adheres to the principles of the Declaration of Helsinki.

Results

Covered Population and Control Totals

The covered population was stable across the study period, ranging from 8.92 million beneficiaries in 2019 to 9.11 million in 2024. Total scheme benefits paid rose

from R178.4 billion in 2019 to R249.8 billion in 2024, a nominal increase of 40.0% over five years (Table 1). Benefits dipped in 2020 (R169.8 billion), consistent with deferred and suppressed utilisation during the first year of the COVID-19 pandemic, before resuming growth. All service-line aggregates reconciled to within reporting tolerance against these control totals.

Financial year	Beneficiaries (million)	Total benefits (R billion)	Benefits per beneficiary (R)	Year-on-year change (%)
2019	8.92	178.4	19,995	–
2020	8.9	169.8	19,079	–4.9
2021	8.91	196.9	22,097	16
2022	9.06	209.2	23,099	6.3
2023	9.05	229.4	25,343	9.6
2024	9.11	249.8	27,428	8.9

Table 1. Covered population and total scheme benefits (control file), 2019-2024.

Eye-Care Professional Services, 2024

In 2024, professional eye-care services accounted for R8.29 billion in benefits paid 3.3% of all scheme benefits delivered by 3,659 practising provider entities across 2.27 million visits (Table 2). Expenditure was split almost equally between ophthalmology (R4.06 billion) and optometry (R4.23 billion), but the two disciplines differ markedly in structure. Optometry operated through seven times as many practices (3,186 vs 453) and served more than three times as many beneficiaries (1.37 million vs 0.41 million) at a lower benefit per beneficiary (R3,078 vs R9,919) and lower cost per visit (R3,398 vs R5,561). The starkest contrast is in funding source: 94.2% of ophthalmology benefits were paid from the risk pool, consistent with the PMB status of cataract and other surgical eye conditions, whereas only 43.8% of optometry benefits were risk-funded, the balance being drawn from members' savings accounts reflecting the discretionary classification of routine refractive and optical care. Optical dispensing and orthoptics were negligible by comparison (together <0.1% of eye-care benefits).

Note: Beneficiaries treated are counted within each discipline and overlap across disciplines (a beneficiary may consult both an optometrist and an ophthalmologist); the total is therefore not additive and is shown as.

Discipline	Practices	Visits	Beneficiaries treated	Benefits (R million)	Cost per visit (R)	Benefit per beneficiary (R)	% from risk pool
Ophthalmology	453	7,94,871	4,09,225	4,059.00	5,561	9,919	94.2
Optometry	3,186	14,76,331	13,73,883	4,229.30	3,398	3,078	43.8
Optical dispensing	16	1,268	1,297	4.5	4,601	3,437	43.4
Orthoptics	4	71	73	0.03	523	391	38.8
All eye care	3,659	22,72,541		8,292.80			68.4

Table 2. Eye-care professional services by discipline, 2024 (de-duplicated at discipline-code level).

Variation by Geography, Age and Sex

Eye-care spend per beneficiary varied roughly two-fold across provinces (Figure 1; Table 3). The Eastern Cape (R1,144), Western Cape (R1,108) and KwaZulu-Natal (R1,039) exceeded the national average of about R910, while Mpumalanga (R561), North West (R622) and Limpopo (R681) fell well below it. Provider supply was uneven: Gauteng concentrated 35% of all eye-care practices, whereas per-capita supply (practices per 100,000 beneficiaries) was highest in Limpopo (64.5) and lowest in North West (29.5) and Northern Cape (29.7) indicating that a relatively dense optometric footprint in some under-spending provinces did not translate into higher expenditure, likely reflecting differences in case mix, referral to surgery and benefit take-up rather than access alone.

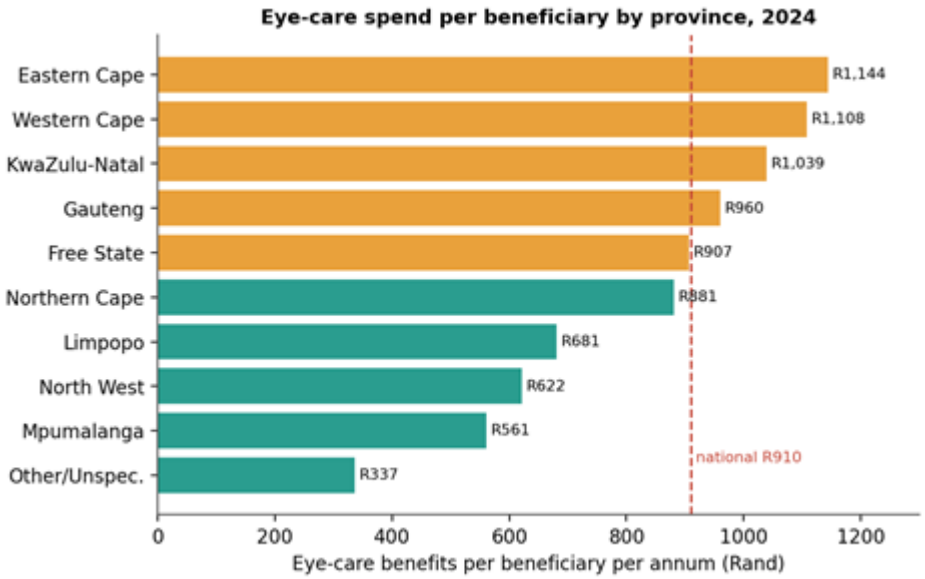

Figure 1: Eye-care benefits paid per beneficiary by province, 2024. Dashed line marks the national mean (~R910). Provinces above the mean are shown in amber

Province	Practices	Practices per 100,000	Benefits (R million)	Benefit per beneficiary (R)	Visits per beneficiary
Eastern Cape	225	34.3	749.6	1,144	0.34
Western Cape	509	38.6	1,460.80	1,108	0.28
KwaZulu-Natal	538	45	1,242.50	1,039	0.29
Gauteng	1,278	38.2	3,214.60	960	0.25
Free State	162	40.9	359.3	907	0.24
Northern Cape	57	29.7	169.2	881	0.24
Limpopo	310	64.5	326.9	681	0.24
North West	142	29.5	299.2	622	0.19
Mpumalanga	191	35.8	298.9	561	0.18

Table 3. Eye-care professional services by province, 2024.

The age profile of eye-related inpatient care was strongly skewed towards older beneficiaries (Figure 2). In 2024, two-thirds (66.9%) of all eye admissions occurred in beneficiaries aged 60 years or older, with the single largest volumes in the 65-74 year bands. Cataract admissions tracked this distribution closely and became the dominant admission type from around age 55, underscoring the age-driven nature of surgical eye demand. Where sex was recorded (control and discipline-by-diagnosis extracts), utilisation was modestly higher among female beneficiaries, consistent with their greater representation in older age bands and higher health-seeking behaviour; the analysis did not detect a sex differential large enough to alter the substantive findings.

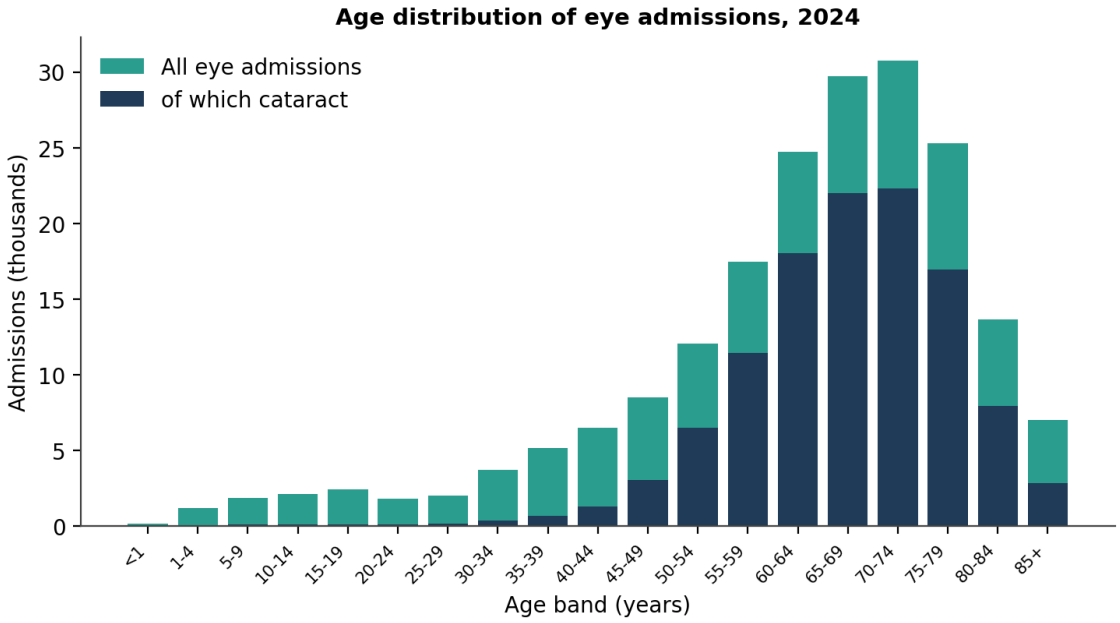

Figure 2: Age distribution of eye-related inpatient admissions, 2024, showing cataract as a share of the total. Cataract becomes the predominant admission type from the mid-50s onward

Trends in Eye-Related Inpatient Care, 2019–2024

Eye-related inpatient benefits rose steadily from R1.13 billion in 2019 to R2.82 billion in 2024, a 149% nominal increase that substantially outpaced the 40% growth in total scheme benefits over the same period (Table 4). Cataract consistently accounted for approximately 70% of eye-related inpatient expenditure, with cataract benefits rising from R914.6 million to R1,974.9 million. Admission volumes were more variable: total eye admissions climbed from 84,758 (2019) to a peak of 274,141 (2023) before falling to 196,246 (2024). The exceptionally low 2019 figure and the 2023 peak are partly attributable to reporting completeness and to a post-pandemic catch-up in deferred elective surgery, respectively. The blended benefit per admission was R14,392 in 2024; cataract, a higher-cost procedure, averaged R17,315 per admission.

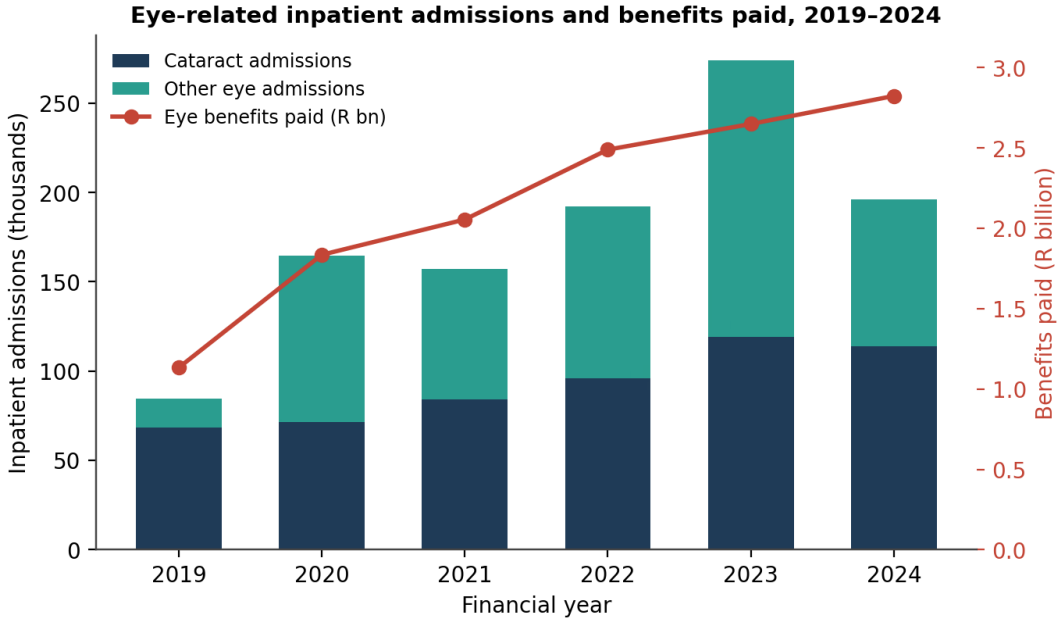

Figure 3: Eye-related inpatient admissions (stacked bars: cataract vs other eye disease, left axis) and total eye benefits paid (line, right axis), 2019–2024

Financial year	Cataract admissions	Other eye admissions	Cataract benefits (R m)	Other eye benefits (R m)	Total eye benefits (R m)	Cataract share (%)
2019	68,548	16,210	914.6	219	1,133.50	80.7
2020	71,573	92,906	1,193.70	641.9	1,835.60	65
2021	83,955	73,144	1,423.20	632	2,055.20	69.2
2022	95,885	96,229	1,685.40	804.7	2,490.10	67.7
2023	1,19,257	1,54,884	1,753.80	896	2,649.80	66.2
2024	1,14,055	82,191	1,974.90	849.4	2,824.30	69.9

Table 4. Eye-related inpatient admissions and benefits by diagnosis group, 2019–2024.

Risk-adjusted utilisation trends

Because eye disease is heavily concentrated in older beneficiaries, part of the observed rise in admissions could reflect gradual ageing of the covered population. Direct age standardisation to the pooled 2019–2024 age structure showed that this was not the principal driver (Figure 4). The age-standardised eye admission rate rose from 10.0 per 1,000 beneficiaries in 2019 to a peak of 29.7 per 1,000 in 2023, then eased to 20.7 per 1,000 in 2024. Standardised and crude rates tracked closely throughout the standardised 2024 rate (20.7) was only marginally below the crude rate (21.6) confirming that demographic drift explained little of the trend and that the growth reflected genuine changes in the propensity to receive inpatient eye care, including post-pandemic recovery of deferred surgery.

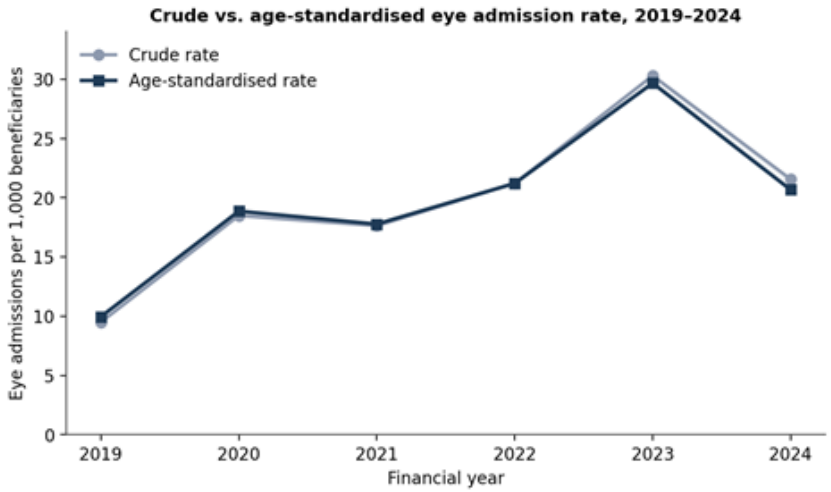

Figure 4: Crude versus age-standardised eye admission rate per 1,000 beneficiaries, 2019–2024. Close agreement between the two series indicates that population ageing accounts for only a small part of the trend

Age-standardised rates differed consistently by scheme type (Table 5). Restricted schemes typically employer- or industry-based recorded higher standardised eye admission rates than open schemes in every year of the study, reaching 24.3 versus 17.7 per 1,000 in 2024. Because the comparison is age-standardised, the gap is not explained by the older age profile of restricted-scheme membership and instead points to differences in benefit richness, member composition and care-seeking. Both scheme types showed the same 2023 peak and 2024 moderation.

Financial year	Open schemes	Restricted schemes	Restricted: open ratio
2019	10.28	9.36	0.91
2020	15	24.25	1.62
2021	15.11	21.36	1.41
2022	16.23	28.07	1.73
2023	27.21	32.05	1.18
2024	17.7	24.34	1.38

Table 5. Age-standardised eye admission rate per 1,000 beneficiaries by scheme type, 2019–2024

Reconciliation with the control file

Expressed against the control totals, eye care is a small but non-trivial and disproportionately growing component of scheme expenditure. Professional eye-care services represented 3.3% of total 2024 benefits, while eye-related inpatient benefits grew at more than three times the rate of overall benefits between 2019 and 2024 (149% vs 40%). Combining the two lenses conceptually acknowledging partial overlap in ophthalmology fees total identifiable eye-related expenditure approached R9–10 billion in 2024, or of the order of 4% of scheme benefits, a figure consistent with the ageing, diabetes-driven demand profile documented above.

Discussion

Eye care sits at the intersection of an ageing population, a rising diabetes burden and a financing system that treats surgical and primary services very differently, yet the privately insured segment of that system has rarely been examined in its own right.7,10 This study set out to fill that gap: to quantify the volume, cost and funding source of eye care across all registered South African medical schemes, to map its variation by age, sex, province and scheme type, to trace its trajectory over six financial years, and to establish, through direct age standardisation, whether any observed growth reflected genuine change in demand or merely the ageing of the covered population. Anchoring every service-line figure to the published benefits-paid control totals allowed these questions to be answered at census scale with an unusual degree of confidence. Four findings emerged, and each speaks to the wider literature in an instructive way.

First, eye care proved to be a material and fast-growing cost centre. Professional eye-care benefits reached R8.29 billion in 2024 3.3% of all scheme benefits while eye-related inpatient spending almost tripled over the study period, outpacing the 40% growth in total scheme expenditure by a wide margin. This trajectory is consistent with the long-standing projection that demand for eye services would rise as populations age and diabetes becomes more prevalent [13-16], and it lends empirical, financing-side weight to global burden-of-disease estimates that have hitherto rested largely on prevalence modelling [1,2,4]. That cataract surgery repeatedly shown to be among the most cost-effective of all health interventions [17-19], accounts for roughly 70% of inpatient eye spend suggests that this growth, while substantial, is buying high-value care rather than low-value activity.

Second, the sector was structurally bifurcated in a way that carries direct consequences for members. Ophthalmology and optometry commanded almost identical total budgets, yet sat on opposite sides of the risk–savings divide: 94% of ophthalmology benefits were paid from the risk pool, reflecting the PMB status of cataract and other surgical eye disease, whereas fewer than half of optometry benefits were, the balance being drawn from discretionary savings. Routine refractive and optical care is therefore exposed to savings depletion and out-of-pocket cost in a way that cataract surgery is not [20]. This matter because uncorrected refractive error remains one of the largest and most avoidable causes of vision impairment globally [3,21], and because the prevalence of both myopia and presbyopia is rising [13,14]. A benefit structure that leaves spectacle correction dependent on the state of a member's savings account risks reproducing, within an insured population, the very coverage gaps that population surveys document in the wider region [6,17]. The finding gives a concrete, financing-level mechanism for a barrier that the access literature has generally framed in terms of cost and

geography [22,23].

Third, the rise in surgical demand was genuine rather than demographic. Age standardisation to the pooled beneficiary structure barely attenuated the upward trend the standardised 2024 admission rate (20.7 per 1,000) sat only marginally below the crude rate (21.6) so the growth cannot be explained by an ageing membership alone. Part of the increase plainly reflects the post-pandemic recovery of deferred elective surgery, a pattern visible in the 2020 dip and the 2023 peak, but the sustained level shift is more consistent with rising underlying activity, improving surgical throughput and the accumulating ophthalmic consequences of diabetes [15,16]. This is an important corrective: without standardisation, an observer might reasonably have attributed the whole trend to demographic drift and concluded that no change in provision was warranted. The analysis shows the opposite, and in doing so illustrates why routine utilisation reporting in this sector should be risk-adjusted as a matter of course [24].

Fourth, the geographic and scheme-type variation had clear equity implications. Per-beneficiary eye-care spend varied roughly two-fold across provinces and, tellingly, tracked provider density only weakly Limpopo combined the densest optometric footprint with below-average expenditure. Access to eye care thus appears to be shaped less by the raw availability of practitioners than by case mix, referral pathways into surgery and the architecture of benefits, echoing evidence from other African settings that workforce supply is necessary but far from sufficient for effective coverage [6,12,22,23]. The persistently higher age-standardised admission rates in restricted schemes, net of age, are consistent with richer benefit designs and distinct member populations rather than with greater clinical need, and they deserve scrutiny from a fairness perspective. Read alongside the concept of effective cataract surgical coverage [22], these gradients suggest that measuring inputs spend, practitioner counts is a poor proxy for whether beneficiaries are actually receiving the sight-restoring care they need.

Taken together, the results argue for closer monitoring of optometric savings exposure, for network and theatre-capacity planning calibrated to a cataract-heavy, elderly demand profile, and for standardised, risk-adjusted reporting of eye-care utilisation that would let schemes and the regulator separate a real change in need from a demographic or reporting artefact the kind of integrated, people-centred information base that the World Health Organization has advocated [24]. One methodological finding reinforces the last point: de-duplicating the mirrored discipline labels in the raw returns halved the apparent size of the sector, from an inflated R16.8 billion to the reconciled R8.29 billion. That such a large distortion could pass undetected without validation against the published control totals is a caution to anyone analysing these statutory extracts, and a reminder that data provenance deserves the same rigour as the analysis built upon it.

Strengths and Limitations

The principal strength of this study is its coverage: essentially the entire medical-scheme population, reconciled against officially published control totals, over six years and across all major eye-care disciplines and diagnoses. Several limitations should be borne in mind. The data are aggregated administrative submissions, not clinical records, so we cannot verify diagnoses, visual-acuity outcomes or the appropriateness of care, and refractive error is only partially observable because much optometric activity is coded to examination rather than to a specific ICD chapter. Expenditure is reported in nominal Rand and has not been deflated; part of the year-on-year growth reflects medical inflation. Reporting completeness varies across years the anomalously low 2019 inpatient counts and the 2023 peak are at least partly artefacts of submission timing and post-pandemic catch-up, and should not be over-interpreted as a smooth epidemiological trend. Inpatient rates could be standardised for age but not sex, as the inpatient extract lacked sex. Finally, the professional-services extract was cross-sectional (2024 only), so the discipline-level split could not itself be trended; the longitudinal analysis rests on the inpatient extract. The de-duplication decision, although conservative and validated against the control file, could in principle under- or over-state activity for the small allied disciplines.

Conclusion

This national, census-level analysis established that eye care is a substantial, structurally distinctive and fast-

growing component of privately financed health care in South Africa. It was dominated by cataract surgery in an elderly population and by optometric refractive services funded largely from discretionary savings, and it was marked by pronounced provincial and scheme-type variation that persisted after risk adjustment. Crucially, age standardisation showed that the rise in surgical eye demand reflected genuine change rather than population ageing alone. Routine, risk-adjusted surveillance of eye-care utilisation anchored to the published benefits-paid statistics used here as a control would strengthen benefit design, provider-network planning and equity monitoring, and help ensure that a growing and largely avoidable burden of visual impairment is met both efficiently and fairly.

Declarations

Ethics approval and consent to participate

This study analysed only anonymised, aggregated administrative data with no possibility of individual re-identification and did not constitute research on human participants; ethics approval and individual consent were therefore not required. The work adheres to the principles of the Declaration of Helsinki.

Consent for publication

Not applicable; no individual-level or identifiable data are reported.

Availability of data and materials

The analysis draws on statutory returns submitted by registered medical schemes to the Council for Medical Schemes (CMS). The aggregated benefits-paid statistics used as the control file are published by the regulator and are publicly available; the granular record-level extracts are held under the Council's data-governance framework and may be made available on reasonable request, subject to the applicable permissions and confidentiality safeguards.

Competing Interests

The author is employed by the CMS, the regulator that collects and curates the statutory data analysed in this study. The author declares no financial competing interests. The views expressed are those of the author and do not necessarily represent the official position of the CMS.

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Author's Contributions

MMW conceived and designed the study, curated and analysed the data, and wrote the manuscript. The author read and approved the final version.

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