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Community-based interventions to detect visual impairment in community-dwelling older adults aged ≥ 75 years: a systematic review

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Abstract

Background Globally, 2.2 billion individuals live with visual impairment (VI). However, many cases remain undetected, particularly among older adults. Therefore, novel interventions for detection are needed. Community-based interventions (CBIs) that target people where they live provide a promising approach. This systematic review aimed to synthesize the existing literature describing potentials and barriers regarding uptake, feasibility, and effects of CBIs in detecting VI among community-dwelling older adults aged ≥ 75 years.

Methods We conducted a mixed methods systematic literature review. PubMed, Scopus, CINAHL, PsycInfo, Cochrane, and Embase were searched for articles with no restrictions on publication date. Studies were eligible if they reported on a CBI to detect VI among older adults aged ≥ 75 years. Two reviewers independently extracted data and appraised the quality and risk of bias of the included studies using the Mixed Methods Appraisal Tool. A narrative meta-synthesis of the relevant evidence was conducted.

Results We identified 3,019 articles of which 26 of varying methodological quality were included. The VI detection methods included surveys, optometric tests, eye examinations, and self-reported visual status. Potentials and barriers regarding the uptake, feasibility, and effects of the interventions were identified at the individual, interpersonal, and community and system levels. Key potentials that may lead to successful interventions included leveraging community resources, tailoring of interventions, targeting underserved populations, high participant satisfaction, increased accessibility, and the use of tele-ophthalmology technology. Conversely, barriers that may negatively affect intervention uptake, feasibility, and effectiveness included financial constraints, poor general health, lack of eye-health awareness, poor referral systems, lack of institutional resources or access to detection technology, and technological challenges.

Conclusion The synthesized results emphasize the importance of developing CBIs that target multiple levels, including the individual, interpersonal, community and system levels. Our results indicate that this may involve combining components such as eye health education, targeted strategies, use of appropriate detection methodologies, and ensuring affordability. These results may inform the development of novel CBIs to foster more effective detection of VI among older populations, improve community eye health, and reduce the burden of VI.

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Keywords Access to eye care, Community-based, Detection, Elderly, Eye disease, Older adults, Underserved population, Visual impairment

Background

Visual impairment (VI) and age-related eye diseases present significant global public health concerns and affect more than 2.2 billion individuals worldwide [1]. Due to the demographic shift towards an ageing population, the number of VI cases is expected to rise [1]. This will lead to an increasing demand for health and care services [2], including eye care [1, 2].

Among older adults, the negative implications of VI extend beyond vision loss alone. There is an increased risk of developing frailty [3–6] and negative implications for overall health, mental health, social life, and everyday activities [7–16]. Many causes of VI and eye disease are treatable, and early detection is essential for preventing or minimizing vision loss [17, 18]. Nevertheless, VI is frequently undetected and undiagnosed, which exacerbate the negative impact of VI [1, 19, 20]. A Cochrane systematic review by Clarke et al., reported that undetected VI is particularly common among older adults aged ≥75 years, with approximately half of these cases being potentially treatable [19]. Particularly, conditions such as glaucoma, cataracts, refractive error, and age-related macular degeneration (AMD), persist to be a challenge [19–24]. In addition to the burden on the individual, late-stage detection and management of eye disease places added strain on healthcare systems already struggling with shortages of ophthalmologists and eye-health professionals [25].

The significant burden of VI underscores the urgent need for effective and novel strategies to ensure early detection and management [1, 26–30]. A promising approach to VI detection that was highlighted by the Lancet Global Health Commission on Global Eye Health is proactive community-based interventions (CBIs), which may be particularly beneficial for reaching underserved populations [27, 29–32]. CBIs aim to improve health and wellbeing across communities and often involve a multicomponent and multi-level strategy, recognizing that the determinants of health operate at the individual, environmental, and system levels [33].

Although CBIs that are used to detect VI have been studied in various countries, to our knowledge, there has been no comprehensive systematic review of the existing evidence encompassing broader perspectives. To address this gap, this study aims to conduct a mixed methods systematic review that synthesize the evidence on the potentials and barriers regarding uptake, feasibility, and effects of CBIs in detecting VI among community-dwelling older adults aged ≥75 years. This provides a better understanding of community-based vision care and may foster the development of novel interventions at the community level.

Methods

The reporting of this systematic review follows the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines [34] (Additional file 1). The protocol for this review was prospectively registered in the international Prospective Register of Systematic Reviews (PROSPERO) database [CRD42023468155]. To enhance flow and understanding, language editing of parts of the manuscript was assisted by the large language model ChatGPT (ver. 2024: OpenAI, San Francisco, CA, USA).

Study selection criteria

Eligibility criteria were developed in accordance with the Population-Intervention-Comparison-Outcome (PICO) framework. Table 1 outlines the inclusion and exclusion criteria.

Search strategy and study selection

The search strategy was developed in accordance with the PICO framework and in collaboration with an information specialist trained within the field of health and medical sciences. The search strategy included an exhaustive combination of the following four keywords of interest: older adults, community-based intervention, detection, and VI/eye disease. The complete search strings and applied search terms (MeSH-terms and entry-terms) are available for each database as a supplemental file (Additional file 2). The comprehensive and preplanned systematic literature search was performed on 10 November 2023 using the following scientific databases: PubMed, Scopus, CINAHL, PsycInfo, Cochrane, and Embase. The search was updated on 28 November 2024. The online software tool Covidence was applied to manage and support a strict and transparent selection of studies. Two reviewers (ANJ and VE) conducted the search in each database. After importing the studies to Covidence, duplicates were initially removed automatically by Covidence ($n = 563$) and then manually by the reviewers ($n = 14$). Subsequently, ANJ and VE independently screened titles and abstracts of the studies identified, followed by full-text screening of studies that appeared to fulfil the selection criteria. If the two reviewers could not reach an

Table 1 Inclusion and exclusion criteria

Characteristics	Inclusion criteria	Exclusion criteria
P*opulation*	Studies that included older adults aged ≥ 75 years. Participants had to be community-dwelling	Studies that only included older adults with known VI, eye disease, or blindness Studies reporting on older adults undergoing regular eye examinations Studies that did not report specifically on individuals aged ≥ 75 years
I*ntervention*	Studies using a community-based approach to recruitment of participants and detection of VI. This should include a geographically limited, non-clinical setting such as (but not limited to) the home, senior centres, and homecare services. Some form of vision assessment had to be carried out in the community setting	Interventions to detect VI in a non-community setting at baseline such as general practice, hospitals, or private clinics
C*omparison*	The presence of a comparison group was not required as an inclusion criterion	
O*utcomes*	Potentials and barriers of the intervention, including (but not limited to) the effect of the intervention on vision, feasibility, participant satisfaction, health-related quality of life, experiences related to the intervention, social and healthcare utilization	Outcomes of multi-component or multi-modal detection that did not report specifically on VI
Study design	Qualitative, quantitative, or mixed methods design	Review articles, editorials, letters to the editor, conference abstracts, and commentaries
Language	Articles published in English, Danish, Swedish, Norwegian, or German	Articles published in languages other than English, Danish, Swedish, Norwegian, or German
Publication year	No restrictions on the year of publication	

VI Visual impairment

agreement, a third senior reviewer (MK) was consulted to reach a consensus.

Data extraction

ANJ and VE independently extracted data from each study, including the first author, publication year, country, objective, study design, population, intervention setting and components, results, and reported potentials and barriers. Discrepancies in the data extraction were resolved through a consensus discussion between the two reviewers and the third senior reviewer (MK). The characteristics of the included studies are presented in Table 2.

Data synthesis

Due to the heterogeneity in characteristics across studies, we completed a narrative meta-synthesis of the evidence. One reviewer (ANJ) conducted the synthesis on potentials and barriers of CBIs. Because CBIs and relevant factors operate at multiple levels, the potentials and barriers were grouped under three levels: individual, interpersonal, and community and system.

Quality appraisal

The quality of the evidence and risk of bias in the included studies were assessed using the Mixed Methods Appraisal Tool (MMAT), version 2018 [55]. Two reviewers (ANJ and BBH) independently performed the quality assessment, and a third senior reviewer (MK) was consulted for the final decision. MMAT consists of a checklist and explanation of each criterion. It provides a detailed explanation of each criterion to evaluate the quality and the risk of bias of included studies [55]. Depending on how many MMAT criteria were met, studies were categorized as high (4–5), moderate (3), or low (1–2) quality. Studies with low methodological quality were not excluded from the review.

Patient and public involvement

Neither patients nor the public were directly involved in conducting this systematic literature review.

Results

Study selection

The search of the electronic databases yielded 3,596 publications, of which 577 duplicates were initially removed. The remaining 3,019 publications were screened based on title and abstract, whereby 2,734 were excluded. Full text assessment of 285 publications led to the inclusion of 26 studies. All studies were published between November 1990 and March 2024. Nine studies were based on the same primary data from larger studies: the Blue Mountain Eye Study [40, 46, 51], the Salisbury Eye Evaluation [30, 47], and the Manhattan Vision Screening and Follow-up Study (NYC-SIGHT) [38, 39, 43, 56]. However, these were included

Table 2 Characteristics of included studies

Author (year), country	Objectives	Design	Participants	Intervention setting and components		Results
				Community	In-clinic	
Adegbehingbe & Majengbasan (2007), Nigeria [35]	To determine the prevalence and causes of ocular morbidity, visual impairment and blindness, and suggest strategies for blindness prevention in a rural population	Quantitative descriptive study	2,201 (75.80%) residents of a local government area aged 8–92 years Rural population	**Home and community hall:** • Questionnaire: demographic, social, and clinical data • Vision assessment	• Participants with signs and symptoms of ocular disease were offered comprehensive eye examination	• 13.5% had ocular morbidity requiring treatment • Main cause: cataract, especially among older participants • Most had never seen an eye care specialist for appropriate ophthalmic care • Many cases could be treated or prevented with appropriate ophthalmic care • **Target age:** Ocular morbidity among participants aged 81–90 years were 1.7% and 0.3% for participants aged ≥ 90 years
Al Gamra et al. (2010), Qatar "VISION 2020" initiative [57]	To determine the prevalence and determinants of bilateral blindness, legal blindness, unilateral blindness and low vision among 50 years and older population of Qatar	Quantitative non-randomized study	2,433 (97.3%) residents of randomly selected clusters aged ≥ 50 years Urban and rural population	**Home and mobile van:** • Phase I: home visit for enrolment and short survey • Phase II: eye examination in a mobile van stationed outside the house	• Phase III: comprehensive re-examination of suspects (within one week) • VA < 6/18 in either eye due to cataract: interview to identify reason for no surgery	• The prevalence of severe VI was 1.67% and low vision 3.66% • Main causes: cataract and glaucoma • Coverage of cataract services: 68.2% • Reasons for delay in cataract surgery: perceiving cataract as an aging process, and adequate vision in the fellow eye • **Target age:** Individuals aged ≥ 80 years: 28.3% had low vision and 14.93% had severe VI
Braithwaite et al. (2020), Trinidad and Tobago NESTT [2]	To estimate the prevalence, causes and risk factors for presenting distance and near vision impairment in Trinidad and Tobago	Quantitative non-randomized study	3,589 (84.2%) non-institutionalized residents aged ≥ 40 years participated in phase I, and 2,790 (65.4%) in phase II Urban and rural population	**Home and community venue:** • Phase I: enumeration and questionnaire and standardized vision assessment • Phase II: home-based eye examination for participants unable to attend the hospital due to e.g., illness or immobility (n = 250)	Phase II: • Structured interview • Comprehensive eye examination and ocular imaging	• 11.88% had distance VI, and 22.3% had uncorrected near VI. Potentially avoidable VI accounted for 86.1% • **Target age:** DVI increased tenfold to > 50% in individuals aged ≥ 80 years compared to those aged 40–49 years
Casas et al. (2019), Colombia [36]	To determine the current prevalence of refractive error, presbyopia, spectacle coverage, barriers to uptake of refractive services, and spectacle correction in people 15 years and older in Bogotá, Colombia	Quantitative non-randomized study	2,886 participants (90%) aged 15–96 years residing in the capital of which 196 (6.8%) were aged ≥ 75 years Urban population	**Home:** • Survey	• Nearby location: eye examination • Ocular alterations: further ophthalmologic examination • Participants with uncorrected refractive error and/or uncorrected presbyopia: questionnaire on reasons for not seeking management before	• 19.3% had VI, with participants aged ≥ 65 years being more likely to have VI • Prevalence of uncorrected refractive error was 12.5%, and 55.2% for presbyopia • **Target age:** Uncorrected refractive error was highest in the 70–79-year age group (19.6%), with presbyopia accounting for 91.4% Higher prevalence of presbyopia (92.8%) in participants aged ≥ 80 years, with uncorrected refractive error accounting for 13.1%

Table 2 (continued)

Author (year), country	Objectives	Design	Participants	Intervention setting and components		Results
				Community	In-clinic	
Dana et al. (1990), USA [37]	To determine the nature and extent of visual disability in an underserved area of rural America	Quantitative non-randomized study	1,136 (91%) participants living in a rural valley of Kentucky, USA, aged ≥ 40 years Rural population	**Home or work site:** • Enumeration • Survey • Eye examination **Local health care facility or home-based examination:** • VA < 20/60 in either eye: full ophthalmologic evaluation • Participants unable to visit the clinic were examined at home	• Referral for follow-up eye care for necessary cases	• Main causes of monocular VI: cataract (39%) and amblyopia (22%) • Main causes of binocular VI: cataract (> 26%), AMD (18%), and diabetic retinopathy (15%) • **Target age:** Highest rates of binocular low vision among individuals aged > 80 years with 1/3 having a BCVA < 20/60 in one or both eyes. The rates of binocular loss due to bilateral cataracts or AMD were 5.0% and 3.3%, respectively. Monocularly impairing cataract prevalence: 11.7%
Diamond et al. (2024a), USA NYC-SIGHT [38]	To describe the benefits of optometric evaluation for detection of vision-affecting conditions in the context of community-based eye health screenings and identify factors associated with having a recent dilated eye exam	Quantitative randomized controlled trial	308 participants at-risk with inadequate eye care, residing in public housing developments, who fall below the NYC.gov poverty measure, aged ≥ 40 years Urban population	**Home, phone, senior centre, public housing developments:** • Self-reported data on demographics, social determinants of health, and clinical characteristics • Questionnaire • Eye examination • Screening failures (VA ≤ 20/40) referred to the on-site study optometrist	• Referral for follow-up eye care for necessary cases	• Optometric exam had high participant rates (83%) and detected and diagnosed ocular conditions • A large and diverse sample size of underserved adults and seniors participated • Optometrists can detect and diagnose a range of potential ocular pathology requiring referral to ophthalmology for dilated eye exams, ocular testing, and cataract surgery • **Target age**: 68 aged ≥ 80 years participated of which 45 did not have a dilated eye exam in over a year/never/cannot remember
Diamond et al. (2024b), USA NYC-SIGHT [39]	To describe a sub-analysis of vision impairment and refractive error rates in the NYC-SIGHT Study population and present significant factors associated with improvable vision impairment and refractive error in enrolled participants	Quantitative randomized controlled trial	308 participants at-risk with inadequate eye care, residing in public housing developments, who fall below the NYC.gov poverty measure, aged ≥ 40 years Developments randomized into usual care (received glasses prescription only) and intervention (free glasses) Urban population	**Home, phone, senior centre, public housing developments:** • Self-reported data on demographics, social determinants of health, and clinical characteristics • Questionnaire • Eye examination • Screening failures (VA ≤ 20/40) referred to the on-site study optometrist	• Referral for follow-up eye care for necessary cases	• High rates of refractive error and vision impairment in the study population, mostly improvable VI (87.8%) • Those with improvable VI were significantly more likely to have a normal fundus image result from the screening and less likely to have an unreadable image compared to those who only had 0–1 Snellen line of improvement • **Target age:** Among participants aged ≥ 80 years, 9 had 0–1 Snellen line of improvements and 50 had ≥ 2 Snellen lines of improvements

Table 2 (continued)

Author (year), country	Objectives	Design	Participants	Intervention setting and components		Results
				Community	In-clinic	
Foran et al. (2002), Australia BMES [40]	To describe temporal changes in the characteristics of older persons with visual impairment in their better eye correctable by refraction	Quantitative non-randomized study	BMES I: 3,654 (82.4%) non-institutionalized permanent residents of the Blue Mountains Region aged 49–97 years during 1992 to 1994 BMES II: 3,509 participants (2,335 cohort survivors + 1,174 individuals who moved to the area and age group) during 1997 to 2000 Urban population	**Home:** • BMES I: recruitment • Home eye examination for frail, elderly persons • BMES II: recruitment	**BMES IIB:** • Repeat examinations for BMES I participants • New participants (BMES II): comprehensive dilated eye examination • Questionnaire	• Some temporal changes in the proportion of the population with VI, both correctable and uncorrectable was observed, with a lower prevalence of overall VI in cross-section II • This could reflect improvements in public education (benefits of regular eye examination), recent trends in some countries for earlier cataract surgery, and an increased availability of local ophthalmologic and optometric services. Conduct of the eye study in the region itself could also have had an impact on community awareness • **Target age:** With each decade of increasing age, the likelihood of correctable VI increased
Foreman et al. (2017), Australia NEHS [41]	To conduct a nationwide survey on the prevalence and causes of vision loss in Indigenous and non-Indigenous Australians	Quantitative non-randomized study	1,738 (77.6%) Indigenous Australians aged 40–92 years, and 3,098 (68.5%) non-Indigenous Australians aged 50–98 years Urban and rural population	**Community centres, mobile clinics, town halls, Aboriginal Corporations, schools, and medical clinics:** • Interviewer-administered questionnaire • Standardized eye examination	N/A	• Indigenous Australians suffer a threefold higher prevalence of VI compared to non-Indigenous counterparts • Main causes of VI were uncorrected refractive error (60.8% and 61.3% of cases), and cataract (20.1% and 13.2% of cases) • AMD in non-Indigenous participants (10.3%) and diabetic retinopathy in Indigenous Australians (5.2%) • **Target age:** VI increases significantly with age among non-Indigenous participants, with ~ 37% in those aged ≥ 90 years • Indigenous Australians exhibited a higher prevalence of VI particularly in the 80–89 age group, with more than four times higher prevalence compared to age-matched non-Indigenous participants

Table 2 (continued)

Author (year), country	Objectives	Design	Participants	Intervention setting and components		Results
				Community	In-clinic	
Haanes et al. (2015), Norway [42]	To determine whether there is consistency between self-assessments and standardised tests of vision and hearing abilities in older people	Quantitative descriptive study	93 home care recipients facing serious health challenges requiring assistance in daily life, aged ≥ 80 years Rural and borough population	**Home:** • Questionnaire: Self-assessment • Eye examination	N/A	**Target age:** • Participants rarely went outside, never left home alone (62%), could not use public transport (73%), and needed an escort or help to take a taxi (26%) • Self-assessment questions constituted a poor test, and cannot be relied upon to accurately identify VA • Nurses' competence in the standardised testing of and detecting sensory impairment in older people need to be improved
Hark et al. (2023), USA NYC-SIGHT [43]	To describe the reasons for referral to ophthalmology and to identify risk factors associated with being referred	Quantitative randomized controlled trial	708 participants living independently in public housing developments, who is at high risk for undetected eye disease, has poor access to eye care and falls at or below the NYC.gov poverty measure, aged ≥ 40 years Urban population	**Home, phone, senior centre, public housing developments:** • Self-reported data on demographics, social determinants of health, and clinical characteristics • Questionnaire • Eye examination • Screening failures referred to the on-site study optometrist within 3 weeks for further examination	• Referral for follow-up eye care for necessary cases	• About 2/3 were recommended for referral to ophthalmology, with a large portion of referrals made for glaucoma (26.7%), retina (24.6%), cataracts (10.5%), and an overdue comprehensive dilated eye exam (14.5%) • The targeted community-based approach provided access to eye care and detected a significant amount of ocular pathology requiring referral to ophthalmology • **Target age:** Age (≥ 80 years) significantly associated with referral to ophthalmology (19.7%)
He et al. (2015), China [44]	To investigate the prevalence and characteristics of primary open-angle glaucoma among the urban population in Pudong New District, Shanghai	Quantitative non-randomized study	2,528 (80.36%) participants residing in Huamu community, Shanghai, aged 50–106 years Urban population	**Community Health Service Centre:** • Questionnaire • Eye examination • Self-rated satisfaction on the screening procedure	• Re-examination of glaucoma suspects	• 92.2% participants were satisfied with the screening process • 88.89% of POAG patients were previously undiagnosed. Diabetic retinopathy and AMD were also detected • Low knowledge on glaucoma among older adults, and lack of clinical experience on glaucoma diagnosis among optometrists and primary care physicians • **Target age:** 5 adults aged ≥ 80 years had POAG
Heinemann et al. (2019), Germany [45]	To determine the prevalence of AMD and assesses whether elderly persons living independently in the community were aware of their AMD	Quantitative descriptive study	281 participants who live independently, and attended senior centres, aged ≥ 60 years Urban population	**Senior centres:** • On the day of screening, all eligible individuals visiting the senior centre were invited to participate • Questionnaire • Eye examination	• Referral to local ophthalmologist as appropriate (retinal or optic disc findings)	• Low awareness of AMD in elderly persons already affected by the disease • Important to establish knowledge of disease status • **Target age:** Increasing proportion of retinal disease with increasing age

Table 2 (continued)

Author (year), country	Objectives	Design	Participants	Intervention setting and components		Results
				Community	In-clinic	
Horowitz et al. (2023), USA NYC-SIGHT	To describe tele-retinal abnormality image findings from the Manhattan Vision Screening and Follow-up Study	Quantitative randomized controlled trial	704 participants at-risk with inadequate eye care, residing in public housing developments, who fall below the NYC.gov poverty measure, aged ≥ 40 years Urban population	**Community room or senior centre:** • Self-reported data on demographics, social determinants of health, and clinical characteristics • Eye examination	• Referral to hospital if a retinal abnormality	• 157 had abnormal retinal images of which 65% did not have an eye doctor • 22.5% of those who failed the VA and IOP screening had an abnormal retinal image, while 20.9% who passed the vision and IOP screening had an abnormal retinal image • 22% were referred to ophthalmology for retina findings • **Target age:** 13.4% (n = 21) participants aged ≥ 80 years had abnormal retinal image
Jacobs et al. (2005), Israel The Jerusalem Longitudinal Study [14]	To determine the impact of visual impairment on self-rated health, function and mortality among community-dwelling elderly	Quantitative non-randomized study	452 participants from the 1920–21 birth cohort (aged ≥ 70 years) residing in West Jerusalem 7 years later, at age 77, 261 (68.3%) participants were re-examined (the longitudinal group) and enrolment of 578 new participants of the same age cohort Urban population	**Follow-up, 1998:** **Home:** • Interview • Eye examination • Comprehensive physical examination	**Baseline, 1990:** • Interview • Comprehensive eye examination	• Some temporal changes: VI prevalence at ages 70 and 77 was 23.2% and 16.6%, respectively • Measured and self-reported VI correlated closely • VI in the elderly increases the risk of social, functional, and medical decline • Participants with VI showed significantly greater dependence in ADL and IADL, poor self-rated health, less ability to rely on friends, increased loneliness • VI at age 70 significantly predicted poor self-rated health, dependence in ADL, general tiredness, and mortality at age 77 • **Target age:** VI erode self-rated health with advancing age. Men aged 77 with VI had significantly more emergency room visits and hospital admissions, and falls were significantly increased amongst 77-year-olds with VI
Li et al. (2008), China [29]	To investigate the prevalence and causes of visual impairment among adults aged 60 and above in Nantong city, China	Quantitative non-randomized study	3,040 (90.69%) examined participants aged ≥ 60 years Urban population	**Community activity centres and homes:** • Eye examination at centre or at home (for disabled)	N/A	• 6.05% had low vision but when using pinhole VA the prevalence dropped to 1.84% • Main cause of bilateral blindness was cataract, and 63.41% were undiagnosed (could be restored through surgery) • 70 eyes were diagnosed with retinal abnormalities, with the majority due to AMD • **Target age:** Participants aged 70–79, 80–89, and ≥ 90 had a higher risk of having bilateral low vision than those in the 60–69 age group

Table 2 (continued)

Author (year), country	Objectives	Design	Participants	Intervention setting and components		Results
				Community	In-clinic	
Mitchell et al. (1996), Australia BMES [46]	To determine the prevalence of open-angle glaucoma and ocular hypertension in an Australian community whose residents are 49 years of age or older	Quantitative non-randomized study	3,654 (82.4%) non-institutionalized residents of the Blue Mountains area, Australia, aged ≥ 49 years Urban population	**Home:** • Home eye examination among 39 frail, elderly persons	• Comprehensive eye examination • Glaucoma suspects were invited for further tests	• 108 were identified as glaucoma cases with 55 (51%) previously undiagnosed • Elevated IOP in 36% of participants previously undiagnosed with glaucoma • **Target age:** Prevalence of glaucoma for participants aged ≥ 80 was 11.4%, and in three women aged ≥ 90 years, advanced glaucomatous cupping was observed during home visits
Muñoz et al. (1999), USA SEE [47]	To describe the overall recruitment experience, and the characteristics of elderly respondents and nonrespondents from a population of older Americans	Quantitative non-randomized study	4,624 non-institutionalized individuals residing in the Salisbury metropolitan area, Maryland, aged 65–84 years Metropolitan population	**Home:** • Short questionnaire (screener) and if eligible, a standardized questionnaire	• Comprehensive eye exam • Self-reported and performance-based measures of function • Questionnaires • Blood extraction for assessment of medical conditions, other than visual problems, that could affect function	• Overall response rate to the home questionnaire was 74%, and 65% for the clinic exam • Participants were more likely to grade their vision as poor and to report dry eye symptoms than refusals • Refusals tended to be older, more likely to report poor health and to report difficulties with ADL's and IADL's, lower education, unmarried, and living alone • Ineligibles were older and more likely to be African American • **Target age:** • Participants aged 75–79: 21% had complete exams, 23.5% had home questionnaire only, while 20.3% refusals with short interview, and 23.6% refusals with no short interview • Participants aged 80–84: 10.9% had complete exams, 31.3% home questionnaire only, 16.8% refusals with short interview, and 14% refusals with no short interview
Naidoo et al. (2013), South Africa [48]	To assess the prevalence of near vision impairment caused by uncorrected presbyopia, and to determine the spectacle coverage for presbyopia in Durban, KwaZulu Natal, South Africa	Quantitative non-randomized study	1,939 (70.2%) examined participants aged ≥ 35 years Urban population	**Home, community halls, schools:** • Interview • Standardized clinical eye examinations	N/A	• High prevalence of presbyopia (77%) in the study area, with low spectacle coverage (4.84%) • Differences between respondents and non-respondents were significant in all demographics • **Target age:** Participants aged ≥ 80 years were less likely to have presbyopia as compared to those aged 35–49 years

Table 2 (continued)

Author (year), country	Objectives	Design	Participants	Intervention setting and components		Results
				Community	In-clinic	
Rabiu (2008), Nigeria KSECP [49]	To provide baseline data for the monitoring and evaluation of the KSECP	Quantitative descriptive study	6,627 (78.9%) residents of Kaduna state of all ages Urban and rural population	**Home:** • Survey and demographics • Eye examination	• Individuals identified with treatable blindness or low vision were referred for further assessment and treatment	• Prevalence of low vision was 3.2% with the leading cause being cataract, refractive error and other corneal opacity • Significant unmet need in cataract, glaucoma and refractive error services in the state • **Target age:** Prevalence of refractive errors ages 80–89 yeas: 11.1% (n = 6), and ages 90–99 years: 7.7% (n = 1)
Rubin et al. (2001), USA SEE [30]	To examine the relationship between psychophysical measures of visual impairment and self-reported difficulty with everyday visual tasks in a population-based sample of individuals 65 years of age and older	Quantitative non-randomized study	2,520 (65%) community-dwelling residents of Salisbury aged 65–84 Metropolitan population	**Home:** • A 2-h interview: Subjective vision disability using the Activities of daily Vision Scale, demographic variables, cognitive status, and comorbidities	• A 4- to 5-h clinic examination • Depression assessed with the depression scale	• 96% of participants (2412) had visual impairment data on all measures. Of these, 6% (n = 144) had binocular acuities < 0.3 logMAR (20/40) while 23% (n = 564) had one or more additional VIs • VI defined by acuity alone is not the only dimension of the association with subjective disability. Additional vision measures are required to understand the impact of VI on everyday life • **Target age:** VA, contrast sensitivity, glare sensitivity, and visual fields decreased at an approximately constant rate with age, whereas stereoacuity remained constant into the mid-70 s and declined at an accelerating rate thereafter
Swanson et al. (1994), USA [50]	Analysis of the implication of the results about the visual status of older adults and the effectiveness of vision screening for older populations	Quantitative descriptive study	201 self-referred residents of the Birmingham, Alabama metropolitan area aged ≥ 65 years Metropolitan population	**Community senior centre and nutrition sites:** • Vision screenings • Self-history	• Participants who failed the screening were referred for an eye examination	• 88.5% of older adults have reduced vision without being legally blind and will fail vision screening • 16.9% were glaucoma suspects, of which 5.5% were known • Low follow-up rates (< 50%) among screening failures • **Target age:** Participants aged ≥ 85 years, mean VA was 20/136 in the right eye and 20/120 in the left. All had 20/50 or worse acuity in at least one eye, and 3 could be considered glaucoma suspects

Table 2 (continued)

Author (year), country	Objectives	Design	Participants	Intervention setting and components		Results
				Community	In-clinic	
Taylor et al. (2005), Australia MVIP and BMES [51]	To assess the prevalence and causes of vision loss in Australia and to project these data into the future	Quantitative descriptive study	8,376 community and 533 nursing home residents residing in Victoria and New South Wales, Australia, aged ≥ 40 years Urban and rural population	**MVIP:** • Questionnaire • Eye examination provided at home for participants unable to attend the local examination centre **BMES:** • Door-to-door census	**MVIP 1992–96 and BMES:** • Standard eye examination **BMES:** • Comprehensive eye examination • Questionnaire	• 76% of low vision caused by uncorrected refractive error (62%) or cataract (14%) • Prevention and treatment of AMD poses a major challenge • **Target age:** The estimated prevalence of low vision increased exponentially with age with 28.75% of individuals aged 80–89 years, and 39.49% of individuals aged ≥ 90 years
Topouzis et al. (2007), Greece TES [52]	To estimate the prevalence of open-angle glaucoma (OAG) in a population-based sample of subjects 60 years of age or older in Thessaloniki, Greece	Quantitative non-randomized study	2,554 (71%) participants residing in Thessaloniki, Greece, aged ≥ 60 years Urban population	**Examination centre at university or home:** • Questionnaire • Examinations at home for individuals unable to visit the examination centre (illness or major disability): VA, IOP, and eye examination	• Comprehensive eye examination	• Prevalence of OAG, POAG, PEXG differed depending on definition (OAG 3.8%—5.5%; POAG 2.7%—3.8%; PEXG 1.1%—1.7%) • Refusals were less likely to have a personal history of eye diseases, to have noted a change in their vision in the previous two years, to report a family history of eye diseases, and more likely to have never visited an eye doctor • **Target age:** Participants aged 75–79 years, and ≥ 80 years: POAG 4.5% and 5.8%, respectively. PEXG 2.4% and 2.5%, respectively. There was a trend for increased POAG prevalence with increasing age
Yang et al. (2022), Hong Kong KT programme [53]	To evaluate the real-world effectiveness and potential cost-effectiveness of a community-based vision care programme for the elderly population aged 60 years or above	Quantitative non-randomized study	8,899 residents of the Kwai Tsing district, Hong Kong, aged ≥ 60 Urban population	**Community centre:** • Eye examination • Questionnaire interview	N/A	• The prevalence of distance VI was relatively high among older people (39.1% presenting VA and 13.8% BCVA). The main cause was uncorrected refractive errors • With refractive error correction, distance VI improved to no VI in 76% of these cases, suggesting that the majority of the elders with distance VI benefited from the CBI • **Target age:** Of participants aged 75 years with distance VI in the worse eye, 50% were correctable, and 50% were uncorrectable, while distance VI based on the better eye had 64.1% correctable and 35.9% uncorrectable

Table 2 (continued)

Author (year), country	Objectives	Design	Participants	Intervention setting and components		Results
				Community	In-clinic	
Zhu et al. (2022), China SDES [54]	To investigate the satisfaction of both individuals with vision-threatening DR and community health centre staff within the SEDS to understand the needs of patients with DR and clarify the difficulties faced by CHC staff	Quantitative non-randomized study	3,817 patients with diabetes, residing in Shanghai aged 35–93 years 240 Community health centre staff Suburban, urban and semi-urban population	**Community health centres and home:** • DR telescreening • Key informant interviews with patients and CHC staff • Survey, both patients and CHC staff	• Participants diagnosed with vision-threatening DR were referred for further diagnosis and treatment	• Patient satisfaction was 96.0%, with 75.8% willing to undergo future telescreening for DR • Staff satisfaction was 48.3% with geographic differences • Disparities between the high satisfaction of patients and the low satisfaction of staff with the comprehensive management system • **Target age:** Among participants aged ≥ 80 years, 73% were satisfied, 21.3% were very satisfied, while 4.3% had no opinion

VA Visual acuity
VI Visual impairment
DVI Distance visual impairment
NVI Near visual impairment
AMD Age-related macular degeneration
BCVA Best corrected visual acuity
BMES Blue Mountains Eye Study
POAG Primary open-angle glaucoma
IOP Intraocular pressure
ADL Activities of daily living
IADL Instrumental activities of daily living
MVIP The Melbourne Visual Impairment Project
OAG Open-angle glaucoma
PEXG Pseudoexfoliative glaucoma
CBI Community-based intervention
DR Diabetic retinopathy
SEDS Shanghai Eye Disease Study
CHC Community health center

as nine separate studies as they employed different aims and analytical foci. Figure 1 illustrates the detailed systematic search process in a PRISMA flowchart and provides details regarding exclusion.

Study characteristics

A total of 16 studies applied a quantitative non-randomized design, six studies applied a quantitative descriptive design, and four studies applied a quantitative randomized trial design. The studies originated from six continents across the following 13 countries: United States ($n = 8$), Australia ($n = 4$), China ($n = 3$), Nigeria ($n = 2$), Qatar ($n = 1$), Trinidad and Tobago ($n = 1$), Colombia ($n = 1$), Norway ($n = 1$), Germany ($n = 1$), Israel ($n = 1$), South Africa ($n = 1$), Greece ($n = 1$), and Hong Kong ($n = 1$). CBIs were mainly conducted in urban settings ($n = 14$) followed by both urban and rural ($n = 7$), metropolitan ($n = 3$) and solely rural ($n = 2$) settings. VI detection was carried out in participants' private homes, community health centres, senior centres, community halls, town halls, work sites, public housing developments, activity centres, and mobile clinics. In 21 studies, a comprehensive in-clinic eye examination or referral to ophthalmology was offered to some or all participants following community-based detection of VI (Table 2). The detection methods identified included surveys, optometric tests, eye examinations, and self-reported visual status. Various optometric tests and eye examinations were performed (Table 3). One Norwegian study specifically

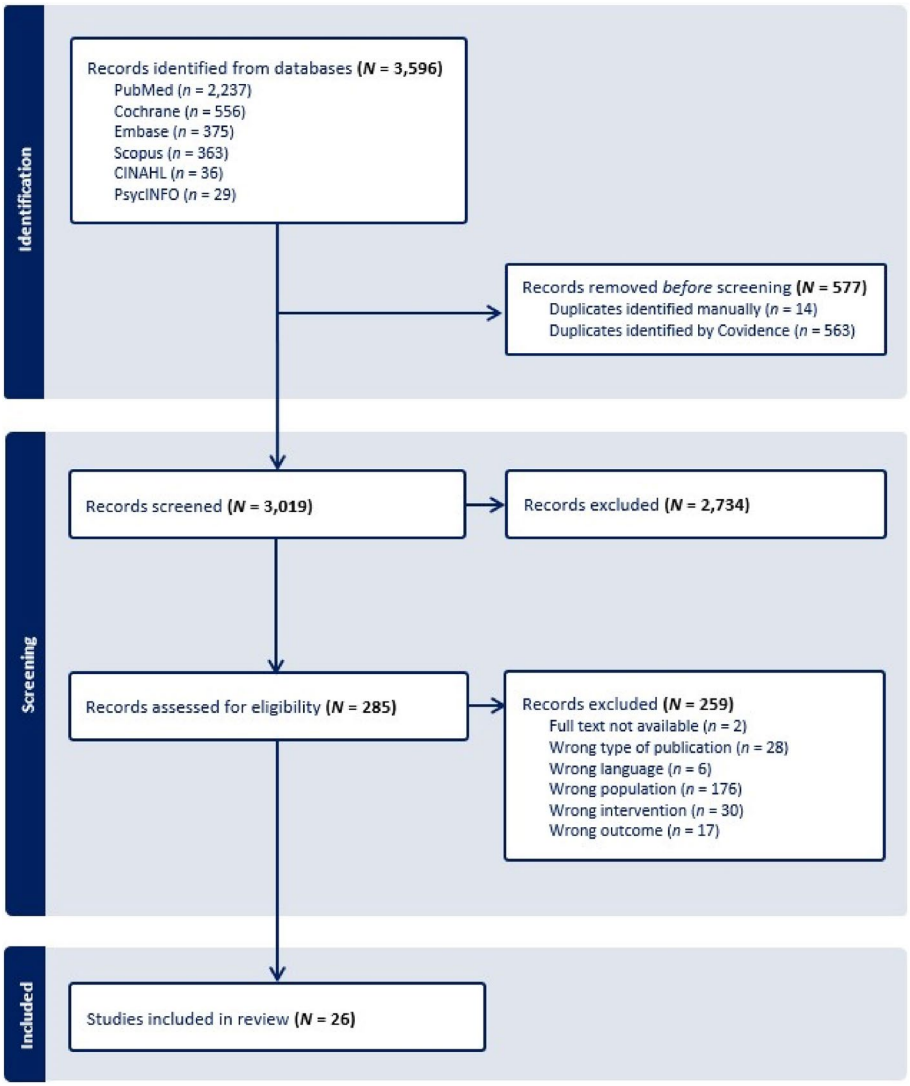

Fig. 1 Preferred reporting items for systematic reviews and meta-analyses flowchart for systematic reviews

Table 3 Measurement methods

Author	Habitual V.A		Auto Refr	BCVA	Pinhole	Contrast Sensitivity	IOP	Slit Lamp	Ophthalmoscopy	Gonioscopy	Retinal image	OCT	Visual Field	Glare Test	Stereo-acuity	Dry Eye Evaluation
	Distance	Near														
Adegbehingbe & Majengbasan, 2007 [35]	1			1			1	1								
Al Gamra et al., 2010 [57]	1		1		1			1	1		1		1			
Braithwaite et al., 2020 [2]	1	2	2	2				2	2	2	2	2	2			
Casas et al., 2019 [36]	1	1		1	1				1							
Dana et al., 1990 [37]	1			2	1		2	2	2		2					
Diamond et al., 2024a [38]	1	1	1	1			1	1	1		1					
Diamond et al., 2024b [39]	1	1	1	1			1	1	1		1					
Foran et al., 2002¤ [40]	N/A		N/A	N/A												
Foreman et al., 2017 [41]	1	1	1	1	1		1	1			1		1			
Haanes et al., 2015 [42]	1															
Hark et al., 2023 [43]	1		1	1			1	1	1		1					
He et al., 2015 [44]	1		1	1			1	1		2	1	2	2			
Heinemann et al., 2019 [45]											1					
Horowitz et al., 2023	1						1				1					
Jacobs et al., 2005 [14]	1			1												

Table 3 (continued)

Author	Habitual V.A		Auto Refr	BCVA	Pinhole	Contrast Sensitivity	IOP	Slit Lamp	Ophthalmoscopy	Gonioscopy	Retinal image	OCT	Visual Field	Glare Test	Stereo-acuity	Dry Eye Evaluation
	Distance	Near														
Li et al., 2008 [29]	1			1	1		1	1	1				1			
Mitchell et al., 1996¤ [46]				2			2	2	2		2		2			
Muñoz et al., 1999* [47]	2										2					2
Naidoo et al., 2013 [48]	1	1	1	1					1							
Rabiu, 2008 [49]	1				1				1							
Rubin et al., 2001 [30]	2			2		2							2	2	2	
Swanson et al., 1994 [50]	1	1					1	1	1							
Taylor et al., 2005 [51]	1			1			1	1	1		1		1			
Topouzis et al., 2007 [52]	1,2			2			1,2	1,2	1	2			2			
Yang et al., 2022* [53]	1		1	1												
Zhu et al., 2022 [54]	1		1								1					

1 = community

2 = in-clinic

N/A = setting not reported

¤ Community-based measurements poorly described

* Sub-studies. Only measurement methods described in the current article are included

V.A. Visual acuity

Auto Refr. Auto refraction

BCVA Best corrected visual acuity

targeted older adults aged ≥80 years [42], whereas the remaining studies included study populations with broader age ranges (5 to 106 years). These studies, however, reported specifically on the target age of this systematic review (≥ 75 years). Detailed data are provided in Table 2.

Quality appraisal of the included studies

An overview of methodological quality appraisal using the MMAT is provided in Additional file 3. All studies reported clear research questions and used appropriate data collection methods. All quantitative non-randomized design studies were appraised as high quality, whereas all quantitative descriptive and quantitative randomized trial studies were appraised as moderate or low quality [55].

Synthesis of results

All studies described potentials and/or barriers of CBI uptake and feasibility, respectively, with few reporting on the effects. Results across studies indicated that CBIs can detect individuals with VI and/or eye disease, with ten studies reporting high rates of previously undiagnosed eye disease, including glaucoma, cataracts, and AMD [2, 35, 38, 41, 43–46, 52, 56]. Themes identified in the studies are shown in Fig. 2 and an overview of the potentials and barriers identified is provided in Table 4.

Individual level

The individual level factors refer to individual characteristics. At this level, four themes were identified: sociodemographic factors, vision and general health, individual awareness and perceptions, and participants' cooperation abilities.

Sociodemographic factors

Sociodemographic differences in intervention uptake were highlighted in 10 studies. Barriers included older age [30, 44, 47, 48, 52, 57] and financial aspects such as uncertainty regarding cost and lack of government or insurance coverage [2, 37, 41, 56]. Also, one study reported being employed as a barrier for uptake [48]. There were discrepancies within the published literature regarding whether a high/low educational level or a particular gender increased or decreased the likelihood of intervention uptake [2, 44, 47, 48]. One study found that in a high-risk population, those referred to ophthalmology for follow-up in the clinic tended to be older [43].

Vision and general health

General health status was reported as a barrier for CBI uptake, with non-participants more likely to report poor health [2, 29, 38, 44, 47], frailty, or requiring assistance with instrumental activities of daily living [2, 30, 44, 46, 47, 50]. One study found that having VI detected at 70 years of age significantly increased the likelihood of poor self-rated health, dependence,

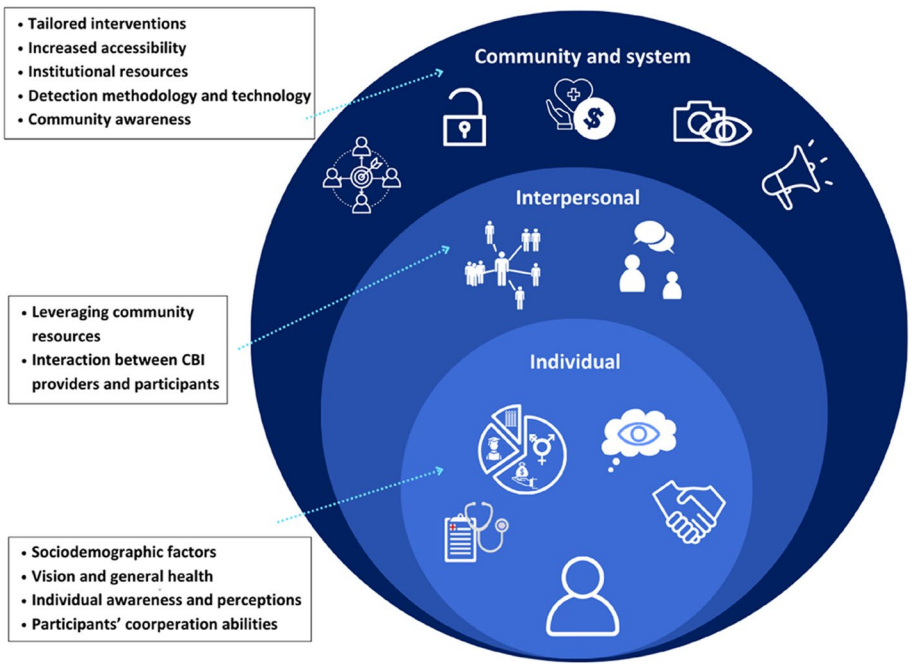

Fig. 2 Themes identified across the included studies

Table 4 Potentials and barriers regarding uptake, feasibility, and effects of CBIs to detect VI

Level	
Individual	**Factors**
Sociodemographic factors	• Older age[a] (–) • Employed[a] (–) • Cost uncertainties among the population[a] (–) • Lower educational level[a] (+/–) • Male[a] (+/–)
Vision and general health	• Poor health status and frailty[a] (–) • Improved visual outcomes[c] (+)
Individual awareness and perceptions	• Low awareness[a] (–) • Knowledge gaps[a] (–) • Misconceptions and myths[a] (–) • Vision not highest priority[a] (–) • Good self-perceived visual status[a] (–) • Increased participant awareness[c] (+)
Participants' cooperation abilities	• Excellent cooperation abilities[b] (+) • Lack of cooperation abilities[b] (–)
Interpersonal	
Leveraging community resources	• Involvement of community leaders, religious leaders, and local guides[a] (+) • Differences in participation rates across communities[a] (–)
Interaction between CBI providers and participants	• High participant satisfaction with CBI providers (+)
Community and system	
Tailored interventions	• Enabled tailored recruitment and detection across local cultural conditions[a,b] (+) • Enabled targeting and reaching underserved populations[a,b] (+) • Improved effectiveness of interventions[b] (+) • High participant satisfaction[a,b] (+)
Increased accessibility	• Increased accessibility due to close geographical proximity[a] (+) • Convenient for participants[a,b] (+) • Reduced the need for transportation assistance[a] (+) • Access barriers to clinical follow-up examinations[b] (–)
Institutional resources	• Time efficient[a] (+) • Low CBI provider satisfaction[b] (–) • Increased workload[b] (–) • Inadequate staffing levels[b] (–) • Insufficient funding[b] (–) • Insufficient provider competencies[b] (–) • Expensive equipment[b] (–)
Detection methodology and technology	• Use of tele-ophthalmology-technologies[b] (+) • Portable fundus camera: easy to use, rapid assessment, and portable[b] (+) • Lack of access to technology[b] (–) • Camera malfunction[b] (–) • Variations in image gradability[b] (–) • Reliability of tests and self-assessment[b] (+/–)
Community awareness	• Increased community awareness[c] (+)

CBI Community-based intervention

[a] Intervention uptake

[b] Intervention feasibility

[c] Intervention effect

(+) Potential

(-) Barrier

(±) Identified as both a potential and a barrier across studies

general tiredness, and mortality at 77 years of age [14]. Another study reported that individuals referred for in-clinic follow-up were more likely to require mobility assistance, have self-reported diseases, and have poorer vision-related quality of life [43]. CBIs could also address treatable eye conditions on site [35, 38, 43]. The level of VI could be reduced by providing refractive error correction as part of the CBI, highlighting the benefits of linking optometric evaluation with providing spectacles [38, 39, 53].

Individual awareness and perceptions

Frequently reported barriers included knowledge gaps and lack of awareness of eye conditions, especially glaucoma and AMD, among the study populations [36, 37, 40, 44, 45, 51, 57]. Other barriers hampering CBI uptake included misconceptions and myths regarding eye conditions, examinations or surgery [29, 36, 37, 57], and apprehension towards surgery [37]. This could create delays in seeking treatment [37, 40]. Additional barriers included not having noted a change in vision, having good self-perceived vision [29, 40, 47, 52], and vision not being of highest priority for various reasons [36, 38, 40]. Intervention effects included that conduction of the study itself increased participant eye-health awareness [40, 54], and one longitudinal study reported lower prevalence of VI in the later cross-section of the same population [40].

Participants' cooperation abilities

Participants' ability to cooperate was an important aspect of intervention feasibility. Two studies reported this as a potential with participants showing excellent cooperation during eye examinations [56, 57]. Conversely, an unwillingness to stay for a full examination, difficulties with comprehension or with concentration during tests, physical disabilities, or time constraints could result in incomplete examinations or no examination [36, 37, 46].

Interpersonal level

The interpersonal level factors refer to the (in)formal social network around an individual (e.g., family, friends, neighbours, and healthcare providers). At this level, two themes were identified: leveraging community resources and interaction with CBI providers.

Leveraging community resources

A total of three mixed-quality studies reported barriers to community engagement and participation across communities despite widespread community mobilization [45, 49, 56]. Conversely, three studies reported that CBI uptake could be increased by seeking cooperation from the informal network, such as community leaders and local guides [36, 49, 54].

Interaction with CBI providers

Two studies reported in three papers described a high degree of participant satisfaction with the CBI providers [38, 39, 54]. One study reported that the interaction between CBI providers and participants is important and must transcend ocular health, because participants often have additional medical conditions that need to be managed [38].

Community and system level

The community and system level refers to environmental factors around an individual (i.e., organizational, community, and the larger health system). The following five themes were identified: tailored interventions, increased accessibility, institutional resources, detection methodology and technology, and increased community awareness.

Tailored interventions

Only potentials were reported under this theme. A major potential was that CBIs enabled recruitment and interventions to be tailored to meet individual and community needs [36, 49, 54]. Consequently, high-risk, older, and frailer populations could be reached [29, 30, 39, 41–43, 52, 56, 57], as well as underserved individuals [2, 37, 41, 43, 52]. Furthermore, study information could be provided to the community prior to recruitment [36, 37]. Such tailoring reportedly increased the effectiveness of CBIs [29, 30, 41, 43, 57]. Positive effects of tailoring interventions included that participants were highly satisfied with the organization of the detection, the rapid feedback, and interpretation of the results [38, 44, 54, 56].

Increased accessibility

Locating interventions in close geographical proximity to participants was reported as a potential for CBI uptake and feasibility. This increased accessibility, particularly among underserved populations [29, 30, 38, 39, 41, 43, 44, 46, 52, 56, 57]; it was also convenient and reduced the need to provide transport [38, 43, 54, 56]. Novel teleophthalmology technologies reportedly increased the feasibility and accessibility of eye care, facilitating collaboration across providers and sectors [38, 39, 43, 50, 56]. Nonetheless, follow-up examinations at the clinic site could be lengthy and often involved travelling a considerable distance, leading to loss to follow-up [38, 47, 50].

Institutional resources

Feasibility barriers linked to the institutions facilitating CBIs included low provider satisfaction, increased workloads, inadequate staffing levels, insufficient funding, lack of provider competences [54], and the cost of portable imaging equipment [2]. These barriers could potentially hinder efficient and effective interventions [54]. Conversely, the NYC-SIGHT studies reported that telephone pre-screening questionnaires could save time in the community and were a feasibility advantage [38, 43].

Detection methodology and technology

The applied detection methodology and technology reportedly affected intervention feasibility. Barriers included camera malfunctions [2, 46], and one moderate-quality study reported variations in image gradability, particularly among older populations, which impacted diagnostic capabilities [45]. Although one study reported that measured and self-reported VI correlated closely [14], two studies expressed concerns about possible reliability issues of visual acuity tests [40] and self-assessment or self-reported data [40, 42]. In particular, one study found high rates of false negatives when participants assessed their own vision [42]. However, this study was appraised to be of low quality. Three studies reported that non-mydriatic fundus photography was a portable, easy-to-use tool that facilitated rapid assessment of patients [43, 45, 56]. Studies from the NYC-SIGHT project emphasized the need for improved access to this technology [43, 56].

Increased community awareness

Increased community awareness was a positive effect of conducting CBIs [40, 43, 45, 54]. Three studies engaged with the study population and wider community and provided an eye-health education presentation to eye-care workers located near the community on the importance of early presentation and the causes of blindness [35, 38, 39].

Discussion

To our knowledge, this is the first systematic review to synthesize the evidence on potentials and barriers regarding uptake, feasibility, and effects of CBIs in detecting VI among community-dwelling older adults aged ≥ 75 years. A total of 26 studies met the inclusion criteria. These were conducted across six continents covering 13 countries and in urban and rural settings. Included studies were primarily based on quantitative non-randomized methods and were appraised to be of varying quality. Our review identifies factors shaping the uptake and feasibility, respectively, of CBIs, and sparsely on the effects.

The overall results indicate that CBIs have the potential to identify older adults with VI and eye diseases. Leveraging community resources, tailoring interventions, targeting underserved populations, high participant satisfaction, increased accessibility, and the use of tele-ophthalmology technology were considered key potentials for successful CBIs that detected VI. Additionally, CBIs may have a positive effect on participants' visual outcomes, although the evidence for this was more limited. The review, however, also identified a range of barriers to effective CBIs. These included financial constraints, poor general health, lack of eye-health awareness, poor referral systems, lack of institutional resources or access to detection technology, and technological challenges. These factors may negatively affect intervention uptake, feasibility and, ultimately, effects. Our results have implications for successful intervention uptake, feasibility and effectiveness.

In their World Report on Vision, the World Health Organization (WHO) emphasized the need for developing new models of eye care [1]. These should include integrated people-centred and holistic approaches, involving engagement of people and communities [1]. Consequently, CBIs have been increasingly advocated as progressive methods for targeting people where they live, while also facilitating cross-sectoral care coordination and engagement of community members [1, 27]. The rationale for CBIs is that by detecting VI in the community, individuals will receive earlier diagnoses and treatment. Our review aligns with the published literature, generally emphasizing the benefits of conducting CBIs. Implementing VI detection methods in geographical proximity to the target population enhances access and may be advantageous when targeting older adults, particularly those in more vulnerable positions [58, 59]. This more flexible approach accommodates individual limitations and needs. Nonetheless, while CBIs have many potentials, moving services into the community may be expensive in terms of finance and other resources [2, 54]. The WHO notes that strengthening community eye care requires adequate funding, appropriate workforce training, a sustainable workforce, coordination with other services and sectors, and effectively-planned referral systems [1].

Many of the barriers identified in this review are deeply embedded in the structure of societies and influenced by circumstances such as policies and cultural norms. For example, research suggests that VI is often considered a natural part of ageing [60, 61], which may hinder early detection of eye diseases. This lack of eye-health awareness and knowing when to respond to symptoms is also recognized by the WHO and others, who note that efforts to change cultural beliefs and enhance public health education are essential components of CBIs designed to detect VI [1, 2, 29, 36, 45, 51]. Targeted education campaigns and material focusing on eye health promotion and prevention may be a way forward. Information on the signs and symptoms of eye conditions, the importance of regular eye examinations, and available treatment options should be disseminated more widely. Although not a focus of this review, the socio-economic context of CBIs should also be considered. In particular, while some potentials and barriers regarding uptake, feasibility, and effects of CBIs in detecting VI may be universal, others may differ between high-income countries

and low-and-middle-income countries, complicating transferability and influencing the effectiveness of VI detection.

In this review, we found that various ophthalmic modalities and optometric tests have been used in CBIs. Concerns about the reliability of vision self-assessment were raised, particularly with regard to false negative results causing too many cases of VI to remain undetected [40, 42]. Consequently, both subjective and objective measurements should be used. Within ophthalmology, interpretation of retinal findings relies heavily on imaging modalities. In our review, concerns related to ensuring gradable images [45], access to technology [43, 56], and the risk of camera malfunction [2, 46] were raised. Nonetheless, technological advances have provided a wide range of opportunities for provision of eye care. For example, tele-ophthalmology may be used in CBIs to enhance access to eye-care services, and particularly for reaching remote and disadvantaged populations [1]. This is consistent with our results [43, 45, 50, 56].

Our review suggests further research opportunities that may enhance our understanding of CBIs and identify the best approaches to improve eye care and early detection of VI. We found that many of the included studies were cross-sectional studies that assessed the prevalence of VI within various communities. Some of these studies only provided detection without subsequent interventions, such as in-clinic follow-up, treatment, or prescription spectacles. A systematic review of the effects of community screening on vision suggested that detection alone does not lead to improved visual outcomes, as this necessitates that follow-up interventions are available, are of high quality, and that participants accept and participate [19]. The lack of high-quality comparative studies and the limited results describing the effects of CBIs on vision and self-perceived quality of vision remain problematic. Consequently, a better understanding is needed of the long-term effects of CBIs on vision and other key outcomes such as vision related quality of life and health and social care service utilization.

An interesting finding was that while we aimed to capture CBIs targeting older adults aged ≥75 years, the majority of studies involved individuals from the general population. This suggests a lack of CBIs that target older age groups. Therefore, further studies that focus on older populations are needed, because the potentials and barriers of using CBIs may vary in different age groups. In particular, individual and social factors that affect older adults must be considered when evaluating the uptake, feasibility, and effects of VI detection. These may include differences in access to transport, physical limitations, and financial resources, all of which may affect an older adult's ability to respond to the advice provided [50]. This is consistent with our results, which indicate that disparities in uptake and engagement may disproportionately affect older populations, and especially individuals with poor general health or frailty [2, 29, 30, 43, 44, 46, 47, 50]. Additionally, a large body of evidence suggests that VI can be important in shaping the functional, mental, and social aspects of people's lives [7, 11, 61–64]. However, this review underscores a need for more evidence that highlights social aspects at the interpersonal level, including social relations, that may affect older adults in responding to CBIs.

Notably, although this systematic review was to include quantitative, qualitative, and mixed methods studies, neither qualitative nor mixed methods studies were identified. Reaching underserved populations using proactive and targeted interventions requires that these are tailored to the unique needs and contexts of each population, which may be revealed by qualitative inquiry [65]. The knowledge gap within the existing literature underscores a need for qualitative and mixed methods studies to provide a more comprehensive understanding that may inform the development of effective and tailored interventions to reach underserved populations.

This systematic review had several strengths. In particular, relevant studies were identified and selected using a comprehensive and robust methodological approach, and included studies were thoroughly assessed. Furthermore, we have strived to produce a transparent, high-quality systematic review to generate evidence suitable for practice and policy, as well as to provide a starting point for further research. Nevertheless, we acknowledge several limitations. First, we found substantial heterogeneity in methodologies across the included studies which precluded conduction of a meta-analysis. Second, we encountered ambiguity in defining 'CBIs' relative to detection of VI as this was not consistently defined. Therefore, applying the in- and exclusion criteria to determine eligible studies was difficult. Third, this review focused on older adults aged ≥75 years, and studies not reporting specifically on this target group were excluded. Fourth, the data extraction process needs to be considered. Only a few studies explicitly described potentials and barriers in the results section, whereas the vast majority of studies addressed these in the discussion section to emphasize the implications for future research and practice. Therefore, this should be considered when interpreting the results, as this may have a more theoretical view impacting on the accuracy of the factual potentials and barriers. Consequently, further research is needed to explicitly study different aspects of these factors. Also, the potentials and barriers identified were highly intertwined, making it difficult to categorize the results; some variations may reflect differences between

cultures, geographical location, or the organization of eye-health services. Acknowledging this, the results should be interpreted as dynamic and highly dependent on a complex interplay between various factors shaping the intervention.

Conclusions

This systematic review identified key potentials and barriers of CBIs in detecting VI among older adults aged ≥ 75 years. The synthesized results emphasize the importance of developing CBIs that target multiple levels, including the individual, interpersonal, and community and system levels. To effectively detect and address VI at the community level, our results indicate that interventions may benefit from combining eye health education, targeted strategies, and the use of appropriate methodologies, as well as ensuring affordability. These results may be used to inform the development of novel CBIs that foster effective detection of VI among underserved older populations, to improve community eye health in the community and to reduce the burden of VI.

Abbreviations

VI	Visual impairment
PRISMA	Preferred Reporting Items for Systematic review and Meta-Analyses
PROSPERO	Prospective Register of Systematic Reviews
MMAT	Mixed Methods Appraisal Tool
NYC-SIGHT	Manhattan Vision Screening and Follow-up Study

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-23112-5.

Additional file 1.

Additional file 2.

Additional file 3.

Acknowledgements

Not applicable.

Authors' contributions

ANJ, VE, MKJ, TLS, and MK contributed to the study concept and design. ANJ coordinated the project. ANJ, VE, and MKJ conducted the literature search. ANJ and VE screened identified publications, performed data extraction and analysis. ANJ and BBH appraised the identified publications. ANJ drafted the initial draft of the manuscript. All authors revised the manuscript and approved the final version of the manuscript.

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Data availability

Complete data from all included studies is provided, and the full search strings used in each search engine are available in the Additional file 2. Data on inter-rater reliability and agreement of quality appraisal are available upon request.

Declarations

Ethics approval and consent to participate

According to Danish legislation as stipulated in the Act on Research Ethics Review of Health Research Projects, studies based on observations and interviews that do not involve human biological material are exempt from institutional review board (IRB) approval by the National Committee on Health Research Ethics.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. World Health Organisation. World report on vision. Vol. 214, World health Organisation. 2019. Available from: https://www.who.int/publications-detail/world-report-on-vision
2. Braithwaite T, Verlander NQ, Peto T, Bartholomew D, Deomansingh F, Bridgemohan P, et al. National Eye Survey of Trinidad and Tobago (NESTT): Prevalence, causes and risk factors for presenting vision impairment in adults over 40 years. Br J Ophthalmol. 2020;104(1):74–80.
3. Liljas AEM, Carvalho LA, Papachristou E, C De Oliveira, Wannamethee SG, Ramsay SE, et al. Vision impairment and risk of frailty: the English Longitudinal Study of Ageing. Lancet. 2016;388:S70.
4. Dinarvand D, Panthakey J, Hassan A, Ahmed MH. Frailty and visual impairment in elderly individuals : improving outcomes and modulating cognitive decline through collaborative care between geriatricians and ophthalmologists. Diseases. 2024;12(11):1–22.
5. Takefuji Y. Frailty and eye diseases : a review of the literature. Eye. 2024;38:648.
6. Ho VWT, Chen C, Merchant RA, Edin M, Edin F. Cumulative effect of visual impairment, multimorbidity, and frailty on intrinsic capacity in community-dwelling older adults. J Aging Health. 2020;32(7–8):670–6.
7. Trott M, Smith L, Veronese N, Pizzol D, Barnett Y, Gorely T, et al. Eye disease and mortality, cognition, disease, and modifiable risk factors: an umbrella review of meta-analyses of observational studies. Eye. 2022;36(2):369–78.
8. McCarty CA, Nanjan MB, Taylor HR. Vision impairment predicts 5 year mortality. Br J Ophthalmol. 2001;85(3):322–6.
9. Heesterbeek TJ, van der Aa HPA, van Rens GHMB, Twisk JWR, van Nispen RMA. The incidence and predictors of depressive and anxiety symptoms in older adults with vision impairment: a longitudinal prospective cohort study. Ophthalmic Physiol Opt. 2017;37(4):385–98.
10. Van Der Aa HPA, Comijs HC, Penninx BWJH, Van Rens GHMB, Van Nispen RMA. Major depressive and anxiety disorders in visually impaired older adults. Investig Ophthalmol Vis Sci. 2015;56(2):849–54.
11. Taipale J, Mikhailova A, Ojamo M, Nättinen J, Väätäinen S, Gissler M, et al. Low vision status and declining vision decrease health-related quality of life: results from a nationwide 11-year follow-up study. Qual Life Res. 2019;28(12):3225–36.
12. Dhital A, Pey T, Stanford MR. Visual loss and falls: a review. Eye. 2010;24(9):1437–46.

13. O'Conor R, Smith SG, Curtis LM, Yoshino J, Vicencio DP, Wolf MS. Mild visual impairment and its impact on self-care among older adults. J Aging Health. 2018;30(3):327–41.
14. Jacobs JM, Hammerman-Rozenberg R, Maaravi Y, Cohen A, Stessman J. The impact of visual impairment on health, function and mortality. Aging Clin Exp Res. 2005;17(4):281–6.
15. Leissner J, Coenen M, Froehlich S, Loyola D, Cieza A. What explains health in persons with visual impairment ? Health Qual Life Outcomes. 2014;12(65):1–16.
16. Livingston G, Huntley J, Liu KY, Costafreda SG, Selbæk G, Alladi S, et al. The lancet commissions dementia prevention, intervention, and care: 2024 report of the lancet standing commission. Lancet. 2024;404:572–628.
17. Bourne RRA, Flaxman SR, Braithwaite T, Cicinelli MV, Das A, Jonas JB, et al. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. Lancet Glob Heal. 2017;5(9):e888–97.
18. Fricke TR, Tahhan N, Resnikoff S, Papas E, Burnett A, Ho SM, et al. Global prevalence of presbyopia and vision impairment from uncorrected presbyopia. Systematic review, meta-analysis, and modelling. Ophthalmology. 2018;125(10):1492–9.
19. Clarke EL, Evans JR, Smeeth L. Community screening for visual impairment in older people. Vol. 2018, Cochrane Database of Systematic Reviews. John Wiley and Sons Ltd; 2018.
20. Lemmens S, Barbosa Breda J, Van Keer K, Jacobs T, Van Landeghem R, De Boever P, et al. The Prevalence of Undiagnosed Age-Related Sight-Threatening Diseases in Self-Proclaimed Healthy Individuals. J Ophthalmol. 2020; (2020).
21. Jayaram H, Kolko M, Friedman DS, Gazzard G. Glaucoma: now and beyond. Lancet. 2023;402(10414):1788–801. https://doi.org/10.1016/S0140-6736(23)01289-8.
22. Neely DC, Bray KJ, Huisingh CE, Clark ME, McGwin G Jr, Owsley C. Prevalence of undiagnosed age-related macular degeneration in primary eye care. JAMA Ophthalmol. 2017;135(6):570–5.
23. Song MY, Kim Y, Han K, Kim JH. Prevalence and Risk Factors of Age-Related Macular Degeneration in South Korea: Korea National Health and Nutrition Examination Survey. Ophthalmic Epidemiol. 2024;1–14.
24. Wahl AM, Musaeus KD, Sørensen TL, Kristiansen M. Reasons for late diagnosis of neovascular age-related macular degeneration: a mixed-methods study. Acta Ophthalmol. 2021;99(3):e443–5.
25. Berkowitz ST, Finn AP, Parikh R, Kuriyan AE, Patel S. Ophthalmology Workforce Projections in the United States, 2020 to 2035. Ophthalmology. 2024;131(2):133–9. https://doi.org/10.1016/j.ophtha.2023.09.018.
26. Bourne RRA, Steinmetz JD, Flaxman S, Briant PS, Taylor HR, Resnikoff S, et al. Trends in prevalence of blindness and distance and near vision impairment over 30 years: An analysis for the Global Burden of Disease Study. Lancet Glob Heal. 2021;9(2):e130–43.
27. Burton MJ, Ramke J, Marques AP, Bourne RRA, Congdon N, Jones I, et al. The lancet global health commission on global eye health: vision beyond 2020. Lancet Glob Heal. 2021;9(4):e489-551.
28. Diehl MK, Wahl HW. Awareness of age-related change: Examination of a (Mostly) unexplored concept. J Gerontol Soc Sci. 2010;65B(3):340–50.
29. Li L, Guan H, Xun P, Zhou J, Gu H. Prevalence and causes of visual impairment among the elderly in Nantong. China Eye. 2008;22(8):1069–75.
30. Rubin GS, Bandeen-Roche K, Huang GH, Muñoz B, Schein OD, Fried LP, et al. The association of multiple visual impairments with self-reported visual disability: SEE project. Investig Ophthalmol Vis Sci. 2001;42(1):64–72.
31. Elam AR, Tseng VL, Coleman AL. Disparities in Vision Health and Eye Care: Where Do We Go from Here? Ophthalmology. 2022;129(10):1077–8.
32. Zhang X, Cotch MF, Ryskulova A, Primo SA, Nair P, Chou CF, et al. Vision health disparities in the united states by race/ethnicity, education, and economic status: findings from two nationally representative surveys. Am J Ophthalmol. 2012;154(6 0):253–62.
33. Committee on Valuing Community-Based Non-Clinical Prevention Programs, Institute of Medicine. An Integrated Framework for Assessing the Value of Community-Based Prevention. Washington DC: National Academies Press (US); 2012. Available from: https://www.ncbi.nlm.nih.gov/books/NBK206935/
34. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, The PRISMA, et al. statement: An updated guideline for reporting systematic reviews. BMJ. 2020;2021:372.
35. Adegbehingbe BO, Majengbasan TO. Ocular health status of rural dwellers in south-western Nigeria. Aust J Rural Health. 2007;15(4):269–72.
36. Casas Luque L, Naidoo K, Chan VF, Silva JC, Naduvilath TJ, Peña F, et al. Prevalence of refractive error, presbyopia, and spectacle coverage in Bogotá, Colombia: a rapid assessment of refractive error. Optom Vis Sci. 2019;96(8):579–86.
37. Dana MR, Tielsch JM, Enger C, Joyce E, Santoli JM, Taylor HR. Visual impairment in a rural appalachian community: prevalence and causes. JAMA J Am Med Assoc. 1990;264(18):2400–5.
38. Diamond DF, Hirji S, Xing SX, Gorroochurn P, Horowitz JD, Wang Q, et al. Manhattan Vision Screening and Follow-Up Study (NYC-SIGHT): optometric exam improves access and utilization of eye care services. Graefe's Arch Clin Exp Ophthalmol. 2024;262(5):1619–31.
39. Diamond DF, Kresch YS, Gorroochurn P, Park L, Horowitz JD, Wang Q, et al. Manhattan Vision Screening and Follow-up Study (NYC-SIGHT): Vision and refractive error results. Clin Exp Optom. 2024;00(00):1–8.
40. Foran S, Rose K, Wang JJ, Mitchell P. Correctable visual impairment in an older population: The Blue Mountains Eye Study. Am J Ophthalmol. 2002;134(5):712–9.
41. Foreman J, Xie J, Keel S, van Wijngaarden P, Sandhu SS, Ang GS, et al. The prevalence and causes of vision loss in indigenous and non-indigenous Australians: the national eye health survey. Ophthalmology. 2017;124(12):1743–52.
42. Haanes GG, Kirkevold M, Hofoss D, Eilertsen G. Discrepancy between self-assessments and standardised tests of vision and hearing abilities in older people living at home: an ROC curve analysis. J Clin Nurs. 2015;24(23–24):3380–8.
43. Hark LA, Lin WV, Hirji S, Gorroochurn P, Horowitz JD, Diamond DF, et al. Manhattan Vision Screening and Follow-Up Study (NYC-SIGHT): Subanalysis of Referral to Ophthalmology. Curr Eye Res. 2023;49(2):197–206.
44. He J, Zou H, Lee RK, Tong X, Tang W, Zhang Y, et al. Prevalence and risk factors of primary open-angle glaucoma in a city of Eastern China: A population-based study in Pudong New District. Shanghai BMC Ophthalmol. 2015;15(1):1–9.
45. Heinemann M, Welker SG, Li JQ, Wintergerst MWM, Turski GN, Turski CA, et al. Awareness of age-related macular degeneration in community-dwelling elderly persons in Germany. Ophthalmic Epidemiol. 2019;26(4):238–43.
46. Mitchell P, Smith W, Attebo K, Healey PR. Prevalence of open-angle glaucoma in Australia: The blue mountains eye study. Ophthalmology. 1996;103(10):1661–9.
47. Muñoz B, West S, Rubin GS, Schein OD, Fried LP, Bandeen-Roche K. Who participates in population based studies of visual impairment? The Salisbury eye evaluation project experience. Ann Epidemiol. 1999;9(1):53–9.
48. Naidoo KS, Jaggernath J, Martin C, Govender P, Chinanayi FS, Chan VF, et al. Prevalence of presbyopia and spectacle coverage in an African Population in Durban. South Africa Optom Vis Sci. 2013;90(12):1424–9.
49. Rabiu MM. Prevalence of blindness and low vision in north central. Nigeria West Afr J Med. 2008;27(4):238–44.
50. Swanson MW. Results of community-based vision screenings of older adults in the Birmingham, Alabama metropolitan area. J Am Optom Assoc. 1994;65:136–41.
51. Taylor HR, Keeffe JE, Vu HTV, Wang JJ, Rochtchina E, Pezzullo ML, et al. Vision loss in Australia. Med J Aust. 2005;182(11):565–8.
52. Topouzis F, Wilson MR, Harris A, Anastasopoulos E, Yu F, Mavroudis L, et al. Prevalence of Open-Angle Glaucoma in Greece: The Thessaloniki Eye Study. Am J Ophthalmol. 2007;144(4):511–20.
53. Yang SC, Law TK, Leung YLL, Tam YY, Sum R, Lian J, et al. An evaluation of a community-based vision care programme for the elderly. BMC Geriatr. 2022;22(1):1–7.
54. Zhu X, Xu Y, Lu L, Zou H. Telescreening satisfaction: disparities between individuals with diabetic retinopathy and community health center staff. BMC Health Serv Res. 2022;22(1):1–9.
55. Hong QN, Pluye P, Fábregues S, Bartlett G, Boardman F, Cargo M, et al. Mixed Methods Appraisal Tool (MMAT) Version 2018 User Guide. McGill Univ. 2018;
56. Horowitz JD, Adeghate JO, Karani R, Henriquez DR, Gorroochurn P, Sharma T, et al. Manhattan Vision Screening and Follow-Up Study: (NYC-SIGHT) Tele-Retinal Image Findings and Importance of Photography. Telemed e-Health. 2024;30(3):664–76.

57. Gamra HA, Mansouri FA, Khandekar R, Elshafei M, Qahtani OA, Singh R, et al. Prevalence and causes of blindness, low vision and status of cataract in 50 years and older citizen of Qatar-A community based survey. Ophthalmic Epidemiol. 2010;17(5):292–300.
58. Srivarathan A, Jensen AN, Kristiansen M. Community-based interventions to enhance healthy aging in disadvantaged areas: Perceptions of older adults and health care professionals. BMC Health Serv Res. 2019;19(1):1–9.
59. Crocker TF, Ensor J, Lam N, Jordão M, Bajpai R, Bond M, et al. Community based complex interventions to sustain independence in older people: systematic review and network meta-analysis. BMJ. 2024;384:e077764.
60. Evans BJW, Rowlands G. Correctable visual impairment in older people: A major unmet need. Ophthalmic Physiol Opt. 2004;24(3):161–80.
61. Swenor BK, Lee MJ, Varadaraj V, Whitson HE, Ramulu PY. Aging With Vision Loss : A Framework for Assessing the Impact of Visual Impairment on Older Adults. 2020;60(6):989–95.
62. Hoogsteen KM, Szpiro S. A holistic understanding of challenges faced by people with low vision. Res Dev Disabil. 2023;138:104517.
63. McCann RM, Jackson AJ, Stevenson M, Dempster M, McElnay JC, Cupples ME. Help needed inmedication self-management for people with visual impairment: Case-control study. Br J Gen Pract. 2012;62(601):530–7.
64. Cheng Q, Okoro CA, Mendez I, Lundeen EA, Saaddine JB, Stein R, et al. Health Care Access and Use Among Adults With and Without Vision Impairment: Behavioral Risk Factor Surveillance System, 2018. Prev Chronic Dis. 2022;19:1–13.
65. Godfrey M. Qualitative research in age and ageing: enhancing understanding of ageing, health and illness. Age Ageing. 2015;44(July):726–7.

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