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Proposed framework for the integration of refractive error services into the eye health ecosystem in Kenya via social enterprise

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The global burden of uncorrected refractive error demands for adoption of different approaches inclined towards scaling effective refractive error coverage. While innovative approaches such as utilization of telemedicine is being adopted by social enterprises in different parts of the world to scale refractive error service delivery, commercial entrepreneurship still dominates the optical industry in Kenya with minimal focus on accessibility and affordability. However, to achieve effective refractive error coverage across the economic pyramid, integration of enterprises inclined towards fulfilling a social mission through innovative approaches such as telemedicine is desirable. This study thus developed a framework for the integration of refractive error services into the eye health ecosystem in Kenya, via social enterprise. This was an exploratory study which entailed a scoping review of current models used by social enterprises and development of a framework for the integration of refractive error services into the eye health ecosystem via social enterprises, through expert opinion. The data was collected through telephonic and online interviews with key opinion leaders. The preliminary framework developed was presented to the key opinion leaders for comments and inputs through the Delphi technique. Thereafter, the final proposed framework for integration of refractive error services into the eye health ecosystem in Kenya via a social enterprise was developed. All of the key opinion leaders 10 (100%) agreed that social enterprises are worthy of attention when it comes to scaling cost effective refractive error service delivery in Kenya. A total of (n = 28; 80%) Key Opinion leaders identified vision centres, (n = 28; 80.0%) cross-subsidization, (n = 32; 91.4%) skills development, (n = 35; 100%) partnership and (n = 35; 100%) technology as critical components in scaling effective refractive error coverage in a resource constrained country such as Kenya. There was consensus among all the key opinion leaders (n = 35; 100%) that social enterprises are well placed to implement innovative approaches such as telemedicine to scale effective refractive error coverage in Kenya. The framework developed integrates aspects such as technology, partnership, referral, cross-subsidization, skills development and vision centres. It is anticipated that through engagement of social enterprises, integration of critical aspects such as human resources, awareness/education, cost efficiency, research and service delivery could potentially be enhanced.

Keywords Framework, Integration, Refractive error, Social enterprise, Telemedicine

Globally, uncorrected refractive error (URE) which is the presenting visual acuity of less than 6/12 in the better eye with an improvement of at least two lines after refraction[1] remains the leading cause of visual impairment with its burden majorly felt by the population at the base of economic pyramid in developing countries[2]. While it is estimated that 90% of the population with URE resides in low and middle income countries, the correction of URE only requires a simple pair of glasses[3]. Moreover, in keeping with the principle of universal eye health (UEH), each and every one should be able to access and afford the available refractive error (RE) services regardless of their economic status and geographical location[4]. However, eye care services are still poorly sought by the general population in Kenya due to challenges around human resources and lack of awareness. In Kenya

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for instance, there are approximately 1,091 eye care professionals who are majorly distributed in urban areas[5]. Given that there are approximately 47.5 million Kenyans who are in need of eye care services[6], there is unequal distribution of the available human resources to attend to this population warranting the need for recognizing social enterprises to assist in the implementation of innovative approaches such as telemedicine which entails utilization of information and communications technology to provide healthcare and training of health workers remotely[7]. For instance, during Covid-19, the utilization of telemedicine by social enterprises was acknowledged by the Ministry of Health[8] as a viable alternative in delivering healthcare services during emergency. However, minimal literature exists on the utilization of telemedicine concept within the eye health ecosystem in Kenya by the existing social enterprises. Given that the dominant private sector in the optical industry in Kenya are reluctant to uptake on emerging concepts such as telemedicine, integration and engagement of social enterprises is desirable. Hence this study intends to assess the situation and develop a model which integrates social enterprises embracing innovative approaches into the eye health ecosystem with an aim of scaling refractive error services.

A social enterprise (SE) is an organization that participates in business ventures through a commercial approach in order to fulfill a social purpose by offering alternative service delivery intervention models that can be harnessed by public healthcare services[9]. For instance in India, the concept of cross-subsidization has been adopted by SE such as the LV Prasad Eye Institute and the impact has scaled RE service delivery to the underserved population[10]. Again, in Pakistan, the Brien Holden Vision Institute established vision centres to scale accessibility and availability of RE services across the economic pyramid[11]. While the social entrepreneurship concept is majorly inclined towards addressing public health concern such as RE through introduction of different approaches, the core output is majorly directed towards creating a sustainable resultant outcome. The theory focuses on reasons for embarking on the problem, the actions and the resultant outcomes. This may warrants the needs for integration given that commercial enterprises dominates the optical industry with majority of the public health sector lacking RE services[12], integration of SE which are more into social mission is desirable to complement the efforts of the commercial enterprises. Even though SE may potentially supplement the efforts of commercial enterprises, factors such as lack of policy regulation have been shown to limit them from achieving their full potential[13]. Therefore, this study intends to develop a framework which integrates SE into the existing eye health ecosystem to ensure a complementary delivery approach of RE services.

The development of this framework was motivated by the need to address existing limited human resources in the eye health ecosystem in Kenya, the absence of RE services largely within the public health sector in Kenya, the cost barriers, barriers around awareness on RE and the lack of research by eye care professionals on possible avenues of scaling effective RE coverage[5]. Taking cognizance of the human resources challenge in the eye health ecosystem in developing countries such as Kenya[14], there is a dire need for integration of SE who are prioritizing aspects such as skills development for primary vision technicians and strengthening of the referral pathway[15]. In Kenya, approximately 71% lives in rural areas[16] while most eye care professionals such as optometrists, ophthalmologists and ophthalmic clinical officers who are allowed to do refraction operates within urban areas. With cost barriers among the population in dire need of RE services[17], aspect such as subsidization is desirable. However, to the best of our knowledge, there is no comprehensive framework in Kenya inclusive of referral, cross-subsidization and skills development coordinated by SE hence, warranting the need for this study.

Material and methods

This was an exploratory study conducted from September 2022-September 2023 and entailed a scoping review of the existing policy documents used by social enterprises (SEs) in Kenya and other documents inclined towards addressing URE. The scooping review of the policy reports and planning documents and workforce inventory frameworks was undertaken. The scooping review entailed identification of documents and relevant literature through the Google Search engines of PubMed and Google Scholar. A Boolean operator was used to identify the relevant documents included in the final review. Given the burden of URE, the development of this framework was anchored on the social entrepreneurship theory which addresses issues around the motive of embarking on social entrepreneurship, the course of action and the resultant outcome[18]. The review was intended to identify whether SE engages in a team approach, cross-subsidization, referral, vision centres/refraction points, skills development and technology integration for the development of the framework. An assumption was made that a team approach may potentially strengthen the relationship between existing eye care professionals and primary vision technicians. The second assumption was that cross-subsidization would address the cost barriers. The third assumption was that a strengthened referral pathway may ensure quality RE service delivery. The fourth assumption was that establishment of vision centres integrated in the public health sectors would potentially scale RE service delivery if technology integration is undertaken. Finally, an assumption was made that prioritizing skills development may potentially scale human resources in the eye health ecosystem and enhance effective RE coverage. The intention of the review was to provide a justification for the need of integrating SE into the eye health ecosystem in Kenya to scale RE service delivery.

After the scooping review, a five-point Likert scale was used to assess to what extent the key opinion leaders agreed or disagreed with the constructs considered for the development of the framework. The key question in the Likert scale was; to what extent do you agree or disagree with the proposed concept of combining skills development, partnership, technology, referral, subsidization and vision centres in the development of a framework for integration of RE services into the eye health ecosystem in Kenya.

After the preliminary framework was developed, it was presented to the key opinion leaders for an input through a Delphi technique. To ensure representation from diverse stakeholder groups from the Delphi rounds, groups of all stakeholders were located all over from community members, policymakers, and healthcare providers to ensure increased participation and the range of perspectives taken into consideration. Within our expert panel, we determined that three Delphi rounds using email for correspondence would be sufficient to

achieve consensus and stability[19,20]. We aimed to retain a minimum of 10 key opinion leaders after three rounds of Delphi participation, and based on our experience with previous Delphi studies, we planned for 40% attrition in each round. Ten key opinion leaders was considered adequate given that SE is a new concept in Kenya and involving a specific set of individuals who understands the concept was considered ideal. The inclusion criteria for the key opinion leaders was based on the recommendation from the Ministry of Health in partnership with SE delivering eye care services in Kenya. Given that the Ministry of Health engages SE constantly to monitor their activities and performances, it was deemed ideal to engage them in identifying the relevant key opinion leaders. The recruitment of the key opinion leaders was conducted through a formal letter sent to the Ministry of Health to provide the list of stakeholders involved in coordinating activities between the SE and the Ministry of Health. Thereafter, the list was provided and the individuals were contacted with the details about the study and a request to consent to participate in the study. The rationale for including a section of individuals from the SE was to ensure that the validity of the information they provided could be ascertained and be compared to other experts who are not directly involved in the SE sector. To ensure that the minimum number of 10 key opinion leaders was achieved, we estimated that 35 invitees would be required in the first round of the Delphi. We adopted two approaches to convene the key opinion leaders engaged in eye care delivery in Kenya. Rather than approaching the Ophthalmic Services Unit Kenya alone which the Ministry of Health body coordinating eye care services, we chose a group of stakeholders in eye health working towards achieving universal health coverage to contribute towards validation of the proposed approaches to be integrated into the existing models. Secondly, key opinion leaders in our initial set of 35 contacts were invited to recommend colleagues who, in their opinion, would be interested in participating in the Delphi based on their work or expertise. Throughout the Delphi process, key opinion leaders were blinded to the identity of others, except for the individuals who referred us to the subsequent key opinion leaders. Survey content was never associated with a key opinion leader identifier; only the researchers could associate key opinion leaders with responses. All the questions included sought the respondents' area of professional expertise. An email reminder was sent to the key opinion leaders on a weekly basis to increase the response rate. The final ten key opinion leaders included the administrator in-charge of eye care services at the Ophthalmic Services Unit Kenya, an ophthalmologist representing the Ophthalmological Society of Kenya, an optometrist representing the Optometrists Association of Kenya, an Information and Communication Technology expert from an international SE, an optometrist in-charge of training of the optical technicians, a policy expert representative from the Kenya Society for the Blind, the head of partnership wider NGOs Africa from an international SE, two ophthalmologists operating regional SE and a representative for the ophthalmic clinical officers. A representative from the ophthalmic service unit Kenya was included given that this is the organ in-charge of eye health within the Ministry of Health. The inputs were analyzed and summarized thereafter resent to the key opinion leaders anonymously. The process was repeated until a consensus based on the summarized key opinion leaders inputs was achieved. The key question during the Delphi technique was; could you provide your view on the developed framework for the integration of RE services into the eye health ecosystem?

During the Delphi rounds, a systematic and meaningful synthesis of responses was ensured through drafting and refining the questions asked to the key opinion leaders in every round. The questionnaire was piloted among members of our authorship team who were not directly involved in designing the Delphi. We communicated with the key opinion leaders in English and used Google Forms to conduct our surveys.

A pre-specified definition of consensus was developed based on two criteria[21]. First, the key opinion leader was eligible to have achieved consensus around a given survey item if at least 70% of respondents agreed with that item. When using a five-point Likert scale, we defined "disagreement" as a score of two or less. This criterion ensured that a strong majority of respondents agreed with any included survey item. Secondly, an item was said to have achieved consensus only if none of the dissenting respondents raised concerns that were fundamentally incompatible with the inclusion of that survey item. This criterion aligns with approaches from formal consensus decision-making, where a structured discussion is used to understand and resolve the merits and drawbacks of a given proposal[22]. This approach recognizes that essential insights can be tendered by a minority of decision-makers, and attends to the substance of minority opinions. Procedurally, these minority opinions were gathered by requiring that key opinion leaders offer free-text comments if they disapproved of a survey item. We analysed these free-text responses and incorporated that feedback into subsequent rounds of the Delphi and into the final task shifting framework. As the analysis advanced, an emphasis on and reiteration of certain issues above others became more apparent. These elements coalesced into the final categories and themes.

Round I was designed to elicit broad and general concepts from the key opinion leaders using unstructured, open-ended, questions:

1.1 What is, in your opinion, the potential of the proposed approaches for integration into the eye health ecosystem in Kenya?

1.2 What are the three to five characteristics of social enterprises that make it suitable for integration into the eye health ecosystem in Kenya?

1.3 What are three to five examples of activities that the social enterprises could undertake to ensure success in RE service delivery?

Following Round I, the researchers combined and analysed the key opinion leader's responses in taxonomy according to common themes and categories. We attempted to make the items on each list mutually exclusive and comprehensive. We synthesized these findings in a survey to elicit participants' level of agreement with each of the themes and categories on a five-point Likert scale for Round II. This survey also offered free-text response options for key opinion leaders to add additional comments or categories as required.

Once all the responses from Round II were received, the data was reviewed further by the researchers. Concepts were eliminated and retained on the basis of the key opinion leader's scores and collapsed into more general categories, including potential of SE integration into the eye health ecosystem in Kenya. These results

were sent back to the key opinion leaders as a survey for Round III. Key opinion leaders were asked to review the final list of items, state whether they agreed or disagreed with each item, and voice concerns or comments in free text. Following Round III, the researchers integrated the experts' consensus responses into a reasonable and manageable set of concepts and sub-concepts to form the framework[21]. The final constructs were finally considered based on their potential in propelling the achievement of Sustainable Development Goals (SDG) and Integrated People Centred Eye Care (IPEC).

Thematic analysis was carried out by categorizing the codes into categories using NVivo Software, Version 11 and themes based on the semantic meaning of the codes. It was an iterative process consisting of both deductive and inductive processes[23]. Initial codes and categories were generated from the interview guides (deductive process). New categories that consist of similar codes were added as required to capture the participants' comments in details (inductive process). During this inductive process, the themes were identified by repetitions, similarities and differences[24]. Electronic data was stored in password protected networked computers to ensure confidentiality.

This study was performed in accordance with the Declaration of Helsinki, and has been approved by the Biomedical Research Ethics Committee (BREC/00,004,105/2022) and Maseno University Ethics Review Committee (MUERC/1051/22). Informed consent to participate in the study was obtained from all participants. The study was conducted in accordance with the tenant of the Helsinki Declaration.

Results

Demographics of the opinion leaders and their views on social enterprises

The responses accrued during the three rounds of Delphi included 35 key opinion leaders for the first round, 25 key opinion leaders for the second round and 10 key opinion leaders for the final round of Delphi. The key opinion leaders for the final round of Delphi comprised of females (n = 4; 40.0%) and males (n = 6; 60.0%) within the age group of 40–50 years. The average duration for the key opinion leaders dealing with eye care services included for the three rounds was 7 years.

Scooping review

The scooping review from the identified 29 (100%) SE documents revealed that all the SE engages in awareness creation with only 6 (20.7%) SE engaged in skills development. Based on the various constructs, technology was utilized by 3 (10.3%) SE, vision centres establishment 7 (24.1%), partnership 29 (100%), referral 29 (100%) and cross-subsidization 19 (65.5%).

Table 1 provides details on the current situation of SE in Kenya and the proposed approaches derived from the reviewed policy documents.

The documents included for the scooping review are shown in Fig. 1

Key opinion leaders view on the constructs from scooping review

There was consensus amongst all key opinion leaders that primary vision technicians trained by SEs should be regulated by law governing the human resource, seven (70%) indicated agreement and three (30.0%) strong agreement with this suggestion. While seeking key opinion leaders views on whether SEs should be treated as businesses which can train their personnel outside the existing human resource framework for eye health, only two (20.0%) agreed with this opinion with the remaining eight (80%) were neutral on this.

Delphi round I

Based on the success reported from the LV Prasad Eye Institute , the proposed models was presented to key opinion leaders for inputs to ensure a more holistic approach for the Kenyan context. The preliminary proposed framework presented to the key opinion leaders is shown in Fig. 2 based on the social entrepreneurship theory.

The key opinion leaders provided their feedback and comments as shown in Table 2

Delphi round II

Based on the comments from the key opinion leaders, the framework was modified as shown in Fig. 3 and followed by key opinion leaders' inputs thereafter.

Key opinion leaders' views on the modified proposed framework

All of the key opinion leaders (n = 25; 100%) stated that the constructs of the proposed framework are crucial in addressing URE. However, they denoted that it will be very difficult to address URE if partnership is not prioritized (quote 1). As a result, the key opinion leaders suggested that the first aspect to be considered in addressing URE is enhancing partnership between SEs, stakeholders in eye health, public and private sectors. The key opinion leaders reiterated that eye care professionals, stakeholders in eye health and social entrepreneurs should be at the forefront in advocating for RE service delivery as they understand the population in dire need of RE services (quote 2).

1. "The model for integrating refractive error into the eye health ecosystem should first prioritize partnership"-Opinion leader #08.
2. "The only people who understand the groups in dire need of refractive error services are the eye care professionals in collaboration with stakeholders in eye health, as a result, they should be involved in advocating for ways which will ensure each and every one have access to refractive error services"-Opinion leader #06.

Indicators	Current situation	Proposed approach
Skills development	Social enterprises pay high rates to engage the limited human resources	Train primary vision technicians on subjective refraction and allow them to operate under supervision by optometrists through telemedicine. Through integration of telemedicine, the primary vision technicians could scale RE services to remote areas and with the limited optometrists in urban areas, they should supervise the technicians. This will ensure that the populations residing in remote areas do not have to move to urban areas to seek RE services
	Lack of licensing of primary vision technicians trained by social enterprises	Integrate the licensing of primary vision technicians into an existing professional body as paraprofessionals. Through existing bodies such as the Optometrists Association of Kenya, trained technicians can be registered as paraprofessionals and be supervised by optometrists
	Primary vision technicians trained by social enterprises not allowed to undertake refraction	Integrate telemedicine as a means of quality assurance and skills development. The telemedicine should be limited to subjective refraction
	Attrition of primary vision technicians trained by social enterprises	Undertake competitive recruitment of candidates and evaluate for value fit. This will ensure that only passionate community members are trained
	Conflict of interest among primary vision technicians and eye care professionals	Integrate skills development into existing training institutions offering eye health courses Involvement of eye care professionals in the up skilling of primary vision technicians, and in the implementation of telemedicine
Vision centres	The private sector dominates the optical industry	Establish refraction points/vision centres across the public health sector and integrate telemedicine for knowledge and skills sharing, as well as quality assurance
Partnership	Most social enterprises and commercial enterprises operate independently	Integrate social enterprises into the public health sector through a strengthened partnership. This integration is to ensure that social enterprises deliver their services within the public health sectors where majority of the population seek their healthcare services
Technology	Limited human resource	Undertake skills development and integrate telemedicine. The technology is to strengthen the quality of services provided by the technicians
Referral	Paper based referral approach	Integrate mHealth to ensure that all referrals can be traced
Awareness creation	Facility based delivery approach	Integrate public health awareness approaches such as the vision corridors Integrate BE HEALTHY BE MOBILE (BHBM) for utilization by primary vision technicians to scale myopia awareness
Cross-subsidization	Lack of patient service charter across private and public health sectors	Integrate spectacles rates within the patient service charters
	Lack of spectacles services within the public health sector	Integrate refractive error services within the public health sector. Given that majority of the population seek health services from the public health sectors in Kenya; RE should be available to ensure that they benefit from such services Introduce subsidized spectacles within the public health sector. This is intended to ensure that each and everyone benefits from RE services
	Unregulated spectacles prices	Establish policies regulating spectacles prices. The spectacles prices should be regulated to ensure that even the population at the base of the economic pyramid residing in rural areas benefits from RE services
	Only government employees benefit from spectacles through the National Hospital Insurance Fund	Change policies to allow all contributors access spectacle services through the insurance. Given that most contributors are self-employed, the insurance should be comprehensive to allow the population to benefit from RE services

Table 1. Proposed aspects to be included in the development of the framework presented to key opinion leaders.

Delphi round III

Based on the key opinion leader's views, the framework was modified further into three categories; policy strengthening, team approach and advocacy as shown in Fig. 4 with key opinion views thereafter.

Key opinion leaders' views on the further modified proposed framework

All of the key opinion leaders (n = 10; 100%) stated that the framework is comprehensive and inclusive of various aspects that have the potential of addressing URE. However the key opinion leaders suggested for breaking down the framework to show how each step will be undertaken systematically (quote 3).

This framework is comprehensive and inclusive, however, I think showing the steps systematically will make it easier to adopt- Opinion leader#05.

Based on the further modified framework derived from the key opinion leaders' inputs, a final inclusive SE framework was developed anchored on the social entrepreneurship theory as shown in Fig. 5.

Major areas for action and recommendations for the success of this framework

For the success of this framework in scaling effective RE, we proposed individuals undertake the actions with recommendations as shown in Table 3.

Anticipated potential of this framework towards achievement of the Integrated People-Centered Eye Care

The World Health Report on Vision[25] acknowledges the significance of IPEC in propelling the Universal Health Coverage (UHC). In tangent with this report, we projected that this framework can be ideal in addressing the World Health Report on Vision on IPEC through the following mechanisms;

1. Empower people and community: This framework entails community engagement through competitive recruitment of community members and empowering them through skills development so that they can engage in promotive and preventive eye health services to the community. Through skills development, this

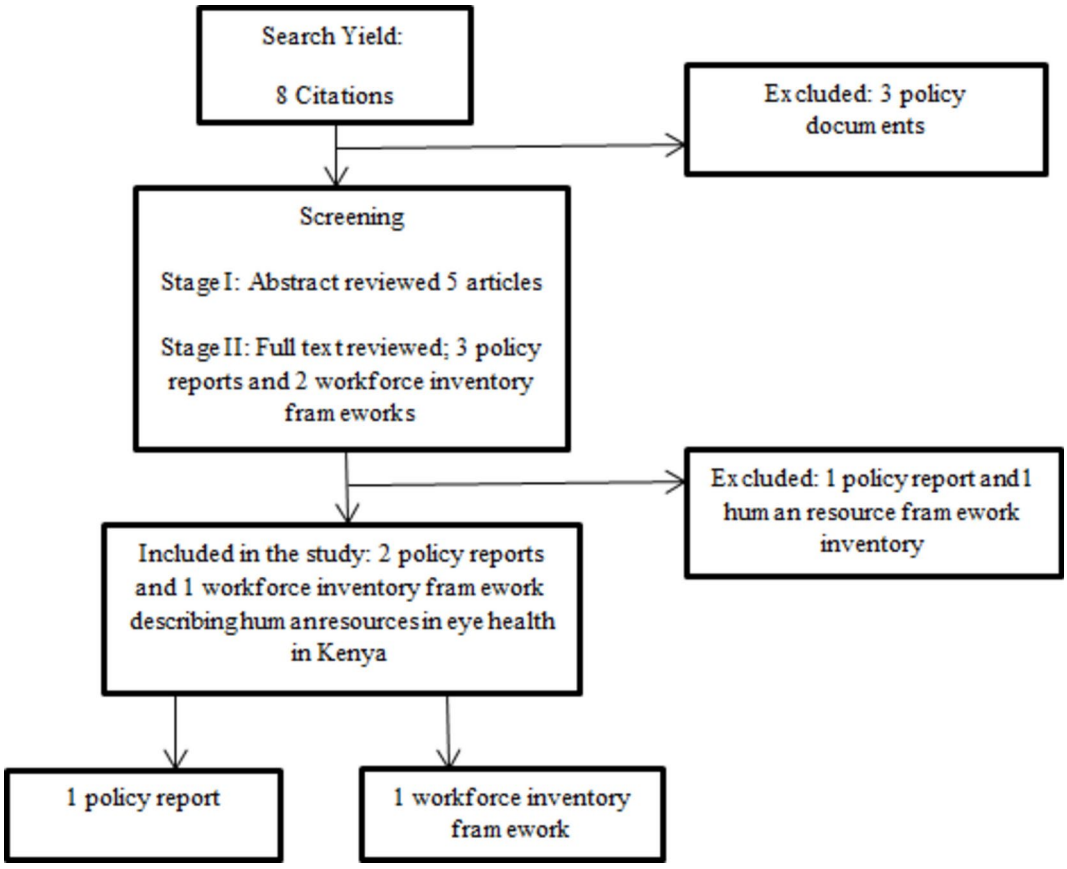

Fig. 1. Scooping review.

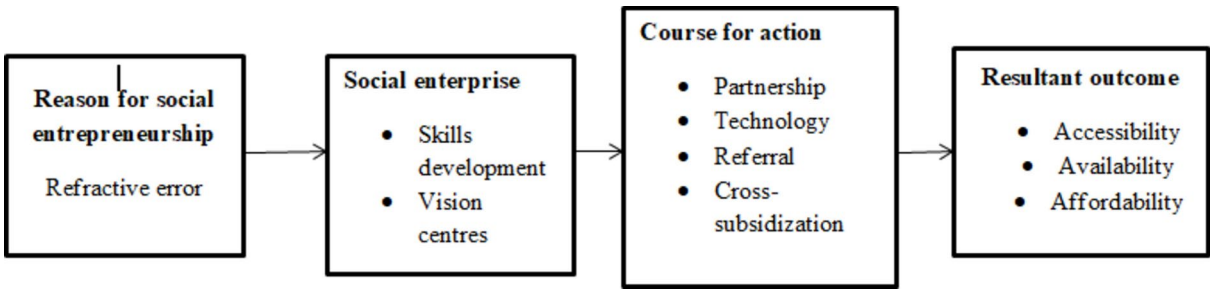

Fig. 2. Preliminary proposed framework for the integration of RE services via social enterprise.

framework supplements the human resource gap and empowers community members to earn a livelihood by selling subsidized spectacles.

2. Aligning the model of care: This framework advocates for integration of telemedicine across all levels from community level to tertiary level with an aim of ensuring comprehensive RE service delivery.
3. Coordinated services: This framework advocates for integration of vision centres across the private and public health sectors coordinated by telemedicine with an aim of enhancing availability and scaling of RE services.
4. Create an enabling ecosystem: This framework advocates for a strong policy strengthening across all stakeholders in eye health and those outside the eye health sector. In addition, this framework advocates for changing of policies like the National Hospital Insurance Fund so as to provide comprehensive RE services to all contributors. At the same time, this framework advocates for the integration of telemedicine and mHealth into the existing health information system.

Theme	Sample size	Quotes
Supporting SE	(n = 35; 100%)	*"It will be more interesting if the framework can show social entrepreneurs and most preferably the framework should stress that eye care professionals should be at the forefront of being social entrepreneurs"*-Opinion leader #03 *"I think many eye care professionals are more commercial oriented and this shouldn't be so as they are the cornerstone for the success of a social enterprise"*-Opinion leader #07
Integrate training into existing training institutions	(n = 32; 91.4%)	*"Allowing social enterprises to train human personnel through social firms should be discouraged completely as some social firms may not employ professional eye care providers to undertake the trainings hence warranting a compromised quality of trainees"*-Opinion leader #08
Proper training on refraction	(n = 30; 85.7%)	*"The main challenge we have is recruitment of candidates to be trained and if the proposed approach is adopted then it will show the value of the training initiative and right candidates will be accrued as opposed to the current approach where we have look for candidates just to meet the target without proper evaluation"*-Opinion leader #05
Utilization of telemedicine by community health volunteers	(n = 35; 100%)	*"Quality of refractive error management is very important and social enterprises should also engage the community health volunteers in such trainings as they are already recognized by the government"*-Opinion leader #10
Establishment of vision centres	(n = 28; 80%)	"*The least that social enterprises should not do is to train personnel through social firms and allow them to setup too many refraction points which are underequipped and think of engaging professional from public and private sectors as this may not work*"-Opinion leader #07
Partnership	(n = 35; 100%)	*"The moment each provider wants to deliver refractive error services independently then we still have a long way to go, as a result, partnership should be prioritized"*-Opinion leader #09
Technology	(n = 35; 100%)	*"Technology is very important and being that there are inadequate human personnel to attend to the growing population, technology will address issues such as detection of refractive error"*-Opinion leader #06
Introduce subsidized RE services	(n = 35; 100%)	*"Since social enterprises must also generate some revenue to sustain themselves, they can partner with other sectors in eye health so that their services can be used for subsidization"*-Opinion leader #09
Subsidization	(n = 28; 80.0%)	"*Setting up a policy framework that includes subsidization will be very important as it will enhance affordability which remains a major barrier for refractive error service delivery*"-Opinion leader #02
Referral	(n = 27; 77.1%)	*"The eye health ecosystem ranging from private, social enterprises and even the public sector cannot address refractive error effectively without a referral chain"*-Opinion leader #07

Table 2. Key opinion leaders' views and inputs on the preliminary proposed framework.

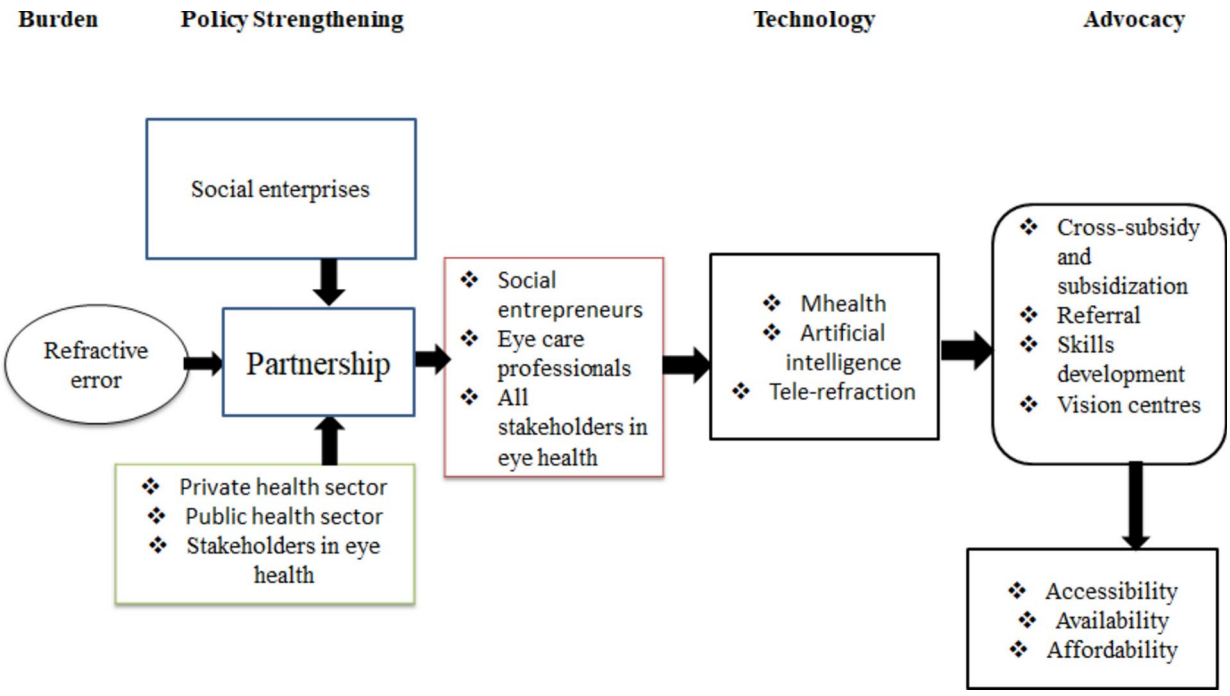

Fig. 3. Modified proposed framework for integration of RE services via social enterprise.

Anticipated potential of this framework towards achievement of the Sustainable Development Goals

According to Zhang et al.,[26], visual impairment poses a major public health challenge; hence to achieve sustainable development goals (SDG), visual impairment should be addressed. Therefore, we projected that this framework if implemented will address the following SDG;

- SDG 1 (no poverty): This framework integrates the concept of skills development on the basics of refraction with an intention of empowering community members to engage in provision of subsidized spectacles to the

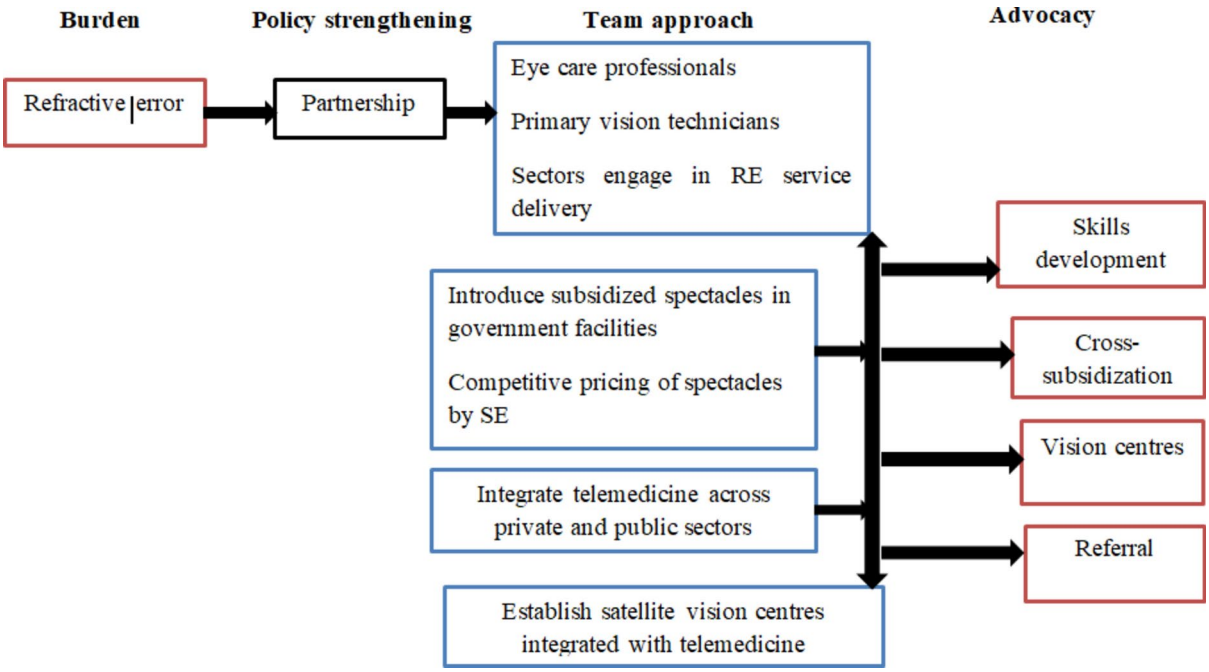

Fig. 4. Further modified proposed framework for integration of RE services via social enterprise.

community members. Through this approach, the community members empowered will be able to earn a livelihood from the sales of subsidized spectacles. Notwithstanding, the community members who have had challenges with accessibility, availability and affordability will be able to benefit from the subsidized spectacles and remain productive.

- SDG 2 (no hunger): This developed framework will address the hunger challenge through integration of subsidized eyeglasses to the government facilities and private facilities to allow the population at the base of the economic pyramid to access and afford the available RE services. Therefore, the underserved population who benefits from such services will constructively undertake their daily activities and thereby earn a living.
- SDG 4 (quality education): This framework will enhance this aspect through scaling of RE services by creation of refraction points across the private and public sector together with the introduction of subsidized spectacles. Notwithstanding, this framework advocates for myopia control in schools through training of teachers on the basics of eye health including recording of visual acuity. Finally, through creation of the refraction points stocked with quality subsidized spectacles, the population across the economic pyramid with URE will access and afford the RE services hence improve quality of life as it relates to education and learning.
- SDG 5 (gender equality): The framework enhances this aspect by including all genders during the skills development stage and establishing satellite vision centres coordinated through telemedicine to ensure that each and every one is able to access RE services.
- SDG 8 (decent work and economic growth): This framework addresses this aspect through skills development of community members to serve the vision centres through outreach activities and engaging community members in the delivery of RE services while earning a livelihood. At the same time, through provision of subsidized spectacles, the base of pyramid population will access the services and with good vision, they will be economically productive.
- SDG 10 (reduced inequalities): This framework addresses this aspect by encouraging community engagement in which primary vision technicians can attend to the base of pyramid population in remote areas through integrated telemedicine. Again, recruitment of community members for skills development is based on value fit approach, hence equality.
- SDG 17 (partnership): This framework addresses this aspect through advocacy for a strong partnership among stakeholders in eye health and those outside the eye health sector. At the same time, through establishment of vision centres in public and private health facilities integrated with a team approach, a strong partnership will be achieved.

Overall anticipated outcome of this framework if implemented

Based on structured advocacy[27], we anticipate that through discussion on challenges around URE with stakeholders in eye health, well informed suggestions would potentially influence the decision-makers to act and facilitate implementation of this framework. Since this is the first framework developed for utilization in Kenya, we suggest that the government of Kenya in partnership with all stakeholders in eye health should adopt the framework and influence the policymakers to recognize the potential of integrating SE into the eye health ecosystem. Notwithstanding, the existing SEs in Kenya should streamline their current models and include the constructs proposed within the developed framework. Tactically, this framework should be owned by the

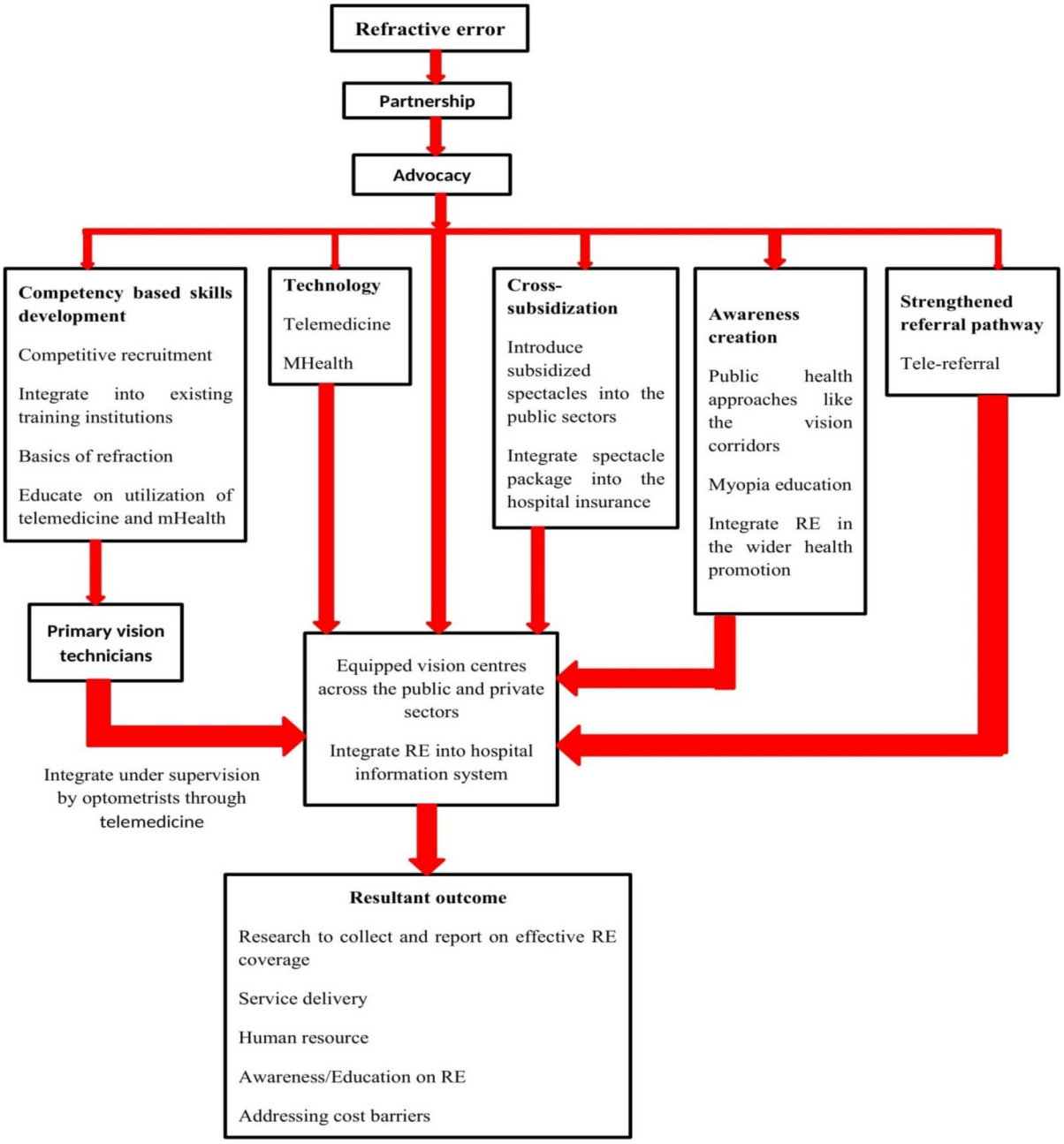

Fig. 5. Final inclusive social enterprise framework for integration of RE services.

Ophthalmic Services Unit at the Ministry of Health. We anticipate a scaled RE services delivery in Kenya if this framework can be implemented as per its intent.

Discussion

According to Naidoo et al.[28], scaling up refraction services in resource constrained countries such as Kenya should entail skills development of individuals without prior training on eye health such as the nurses and the community health volunteers. This approach could propel the achievement of the World Health Organization recommendation on human resources for eye health to the population[29]. Even though the human resources within the general healthcare remains limited[30], skills development may only be effective if innovative approaches are integrated to strengthen the approach. In consideration, this developed framework incorporates skills development as a key element desirable for scaling human resources to address URE among the growing population in Kenya. While SE can undertake competency based skills development independently, integration of such skills development into the existing training institutions offering eye health courses is desirable. Such integration will not only be cost effective but will strengthen the relationship between eye care professionals and primary vision technicians undertaking such skills development. However, given that the scope of practice for

Key areas of action	Designated persons	Recommendations
Legislation of social enterprises	National Government, SE representatives, social entrepreneurs	• Lobby for recognition of SE in Kenya for smooth operations • Training institutions should train upcoming professionals on social entrepreneurship and commercial entrepreneurship so that the professional decides on which path to venture in
Team approach	SE, Commercial Enterprise (CE), all stakeholders in eye health	• Creating a strong referral pathway integrated with telemedicine from community level to tertiary level
Referral	Eye care professionals, SE, CE, all stakeholders in eye health	• Integrate telemedicine and mhealth in all public and private health sectors • Encourage utilization of telemedicine by the existing human resource in eye health
Technology development	Eye care professionals, government, NGOs, social entrepreneurs, stakeholders in eye health, innovative technology companies	• Develop innovative technologies through continuous research • Integrate telemedicine training in existing training institutions • Conduct refresher training on telemedicine among existing eye health professionals across all sectors
Skills development	Ministry of Health (MoH), SE, CEs, Eye care professionals, local administration officials	• A competitive recruitment approach assessing value fit should be adopted • Integration of skills development in existing training institutions offering eye health courses
Partnership	MoH, SE, CE, stakeholders in eye health	• All stakeholders from eye health and those outside should partner through well documented memorandum of understanding • Community engagement and involvement should be strengthened • All stakeholders in eye health should maximize on their area of potential with an aim of supporting other sectors
Establishment of vision centres	MoH, SE, CE, Eye care professionals	• Establishment of vision centres within the existing government and private facilities without eye units • Establish refraction points within government facilities with eye units but lack RE services • Link the vision centres with other established eye units through telemedicine
Social entrepreneurs	Eye care professionals, tertiary training institutions	• Training institutions should mentor eye care professionals on the aspect of social entrepreneurship
Subsidization	MoH, SE, CE, stakeholders in eye health	• Integrate spectacles provision into the National Hospital Insurance Fund (NHIF) for all contributors • Subsidize taxes for bulk purchase of frames and lenses • Introduce subsidized spectacles into the public health sectors

Table 3. Major areas for action and recommendations.

primary vision technicians with skills development has been limited to awareness creation and referral in the eye health ecosystem in Kenya[31], this proposed framework intends to supplement this gap through prioritization of telemedicine integration with an aim of scaling RE services to the underserved remote areas. Therefore, this proposed framework recognizes the potential of primary vision technicians with skills development if supervised by optometrists through telemedicine to undertake subjective refraction.

According to Du Toit et al.[32], effective utilization of eye health resources requires a coordinated collaboration between eye health and other organizations or health departments. This implies that a team approach is ideal in facilitating quality RE service delivery. In tangent with this, the developed framework prioritizes the need for a strengthened partnership and a team approach within the eye health ecosystem as proposed by Naidoo & Govender[33]. Currently in Kenya, the private sector dominates the optical industry with the public health sector lacking RE services[34]. This implies that partnership between the private and public sector remains underutilized with a consequent negative impact on the population seeking RE services from the public health sector. However, for effective RE coverage to be achieved, this developed framework highlights the need for a strengthened partnership between all sectors engaged in RE service delivery, establishment of refraction points/vision centres within the public health sector and the need for engaging the private sector in running the vision centres within the public health sector. Therefore, the developed framework projects that strengthening partnership and adopting a team approach will ensure an effective RE coverage.

A SWOT analysis by the Kenya Ministry of Health[35], showed that digitalizing eye health through telemedicine is an opportunity for action to aid in addressing the limited number of eye care professionals to attend to the growing population in Kenya. This implies that the Ministry of Health Kenya acknowledges the need for integration of telemedicine and establishment of policies recognizing telemedicine in the eye health ecosystem. Hence, this developed framework proposes how telemedicine should be integrated into the eye health ecosystem in Kenya. The developed framework denotes that telemedicine can only be relevant in the eye health ecosystem if skills development is prioritized. This will ensure that primary vision technicians with skills development are deployed in remote areas to deliver RE services under supervision of an optometrist. However, this developed framework advocates for inclusion of the primary vision technicians supported by SE within the laws governing human resources in eye health in Kenya for effective integration and utilization of telemedicine. Therefore, this developed framework acknowledges the need for integration of SE to aid in advocating for utilization of telemedicine and telereferral within the eye health ecosystem in developing countries to address challenges around accessibility and availability of RE services.

Challenges around availability of RE services could potentially limit the achievement of the 2030 IN SIGHT in developing countries such as Kenya[36]. This is attributed to the unavailability of RE services within the public health sectors in Kenya. Hence, to address this unavailability, the developed framework advocates for adoption of the vision centre approach which has been shown to offer services on spot while reducing barriers and cost, improving health seeking behavior, community engagement and enhancing gender equity across the economic pyramid. In India, the concept of cross-subsidization has been adopted by SE such as the LV Prasad Eye Institute and the impact has scaled RE service delivery to the underserved population[10] similar to Pakistan where the Brien Holden Vision Institute established vision centres to scale accessibility and availability of RE services across the economic pyramid[11]. Given that the vision centre approach has not received recognition in Kenya, the

Kenya Society for the Blind (KSB) in partnership with other non-governmental organizations (NGOs) such as the OneSIGHT EssilorLuxottica Foundation is slowly adopting this approach to strengthen RE services delivery within the public health sector[37]. Although the integration of the vision centres within the public health sector by the KSB model is not based on population-based studies, the initiative is worth scaling. Meanwhile, this framework denotes that scaling the vision centres alone with minimal focus on human resources may not address URE effectively; concurrent efforts should be directed towards the aforementioned. Therefore, this developed framework highlights the need for prioritizing skills development and integration of the primary vision technicians within the vision centres established in the public health sector under supervision by optometrists through telemedicine. Through provision of subsidized spectacles, the base of pyramid population will access the services and with good vision, they will be economically productive. Finally, through creation of the refraction points stocked with quality subsidized spectacles, the population across the economic pyramid with URE will access and afford the RE services hence improve quality of life as it relates to education and learning.

In developing countries such as Kenya, majority of the population in need of RE services are not able to afford the available RE services[38,39]. This could be attributed to the unregulated spectacle rates in Kenya giving the dominant private sector monopoly to set high charges which majority across the economic pyramid cannot afford[40]. In consideration of this gap, this developed framework advocates for cross subsidization of RE services and integration of spectacles within the public health sector with an aim of allowing the population across the economic pyramid seeking services from the public health sector to access and afford the available RE services. While cross subsidization has been adopted by SEs in other countries such as India for the delivery of eye care services[41], its uptake in Kenya remains weak warranting the need for integrating SE to introduce this concept within the public sector. This framework advocate for introduction of subsidized spectacles within the public sector by SEs and engaging primary vision technicians in selling subsidized spectacles at a competitive margin to the private sector. Therefore, this framework advocates for policy changes to ensure that all contributors of the National Hospital Insurance Fund can access comprehensive RE services. This framework will entails community engagement through competitive recruitment of community members and empowering them through skills development so that they can engage in promotive and preventive eye health services to the community. Hence the community members empowered will be able to earn a livelihood from the sales of subsidized spectacles. Notwithstanding, the community members who have had challenges with accessibility, availability and affordability will be able to benefit from the subsidized spectacles and remain productive.

Currently in Kenya, the private sector dominates the optical industry with an aim of generating profits, thus integrating the concept of social entrepreneurship maybe marred with resistance from quarters within the private sector. Again, with telemedicine being an emerging concept in Kenya, piloting of the concept is desirable for its feasibility in the eye health ecosystem. This study did not highlight the cost implication of rolling out telemedicine into the eye health ecosystem warranting the need for such studies in future. The limitations of this study included a small sample size for the Delphi technique and the reliance on expert's opinion. A pilot of this framework should be undertaken to ascertain its feasibility in the Kenyan context.

In conclusion, this inclusive social enterprise framework is the first to be developed in Kenya with an aim of scaling RE through integration of SE into the eye health ecosystem and adoption of innovative approaches. Even though this framework has been developed for utilization in the Kenyan context, it is anticipated to act as a benchmark for other developing countries for adoption with an aim of scaling effective RE coverage. We anticipate that this developed framework can address aspects around human resources challenge, cost barriers, awareness creation and scale service delivery under a strengthened partnership and advocacy. We anticipated that addressing these aspects will enhance accessibility, awareness, affordability and availability of RE services across the economic pyramid through public health and facility based approaches. While this framework could face challenges with implementation given that commercial enterprises enjoys the monopoly within the optical industry, strengthened partnership is desirable to eliminate such challenges. Notwithstanding, financial constrains could deter effective implementation of this framework. Therefore, each sector engaged in the delivery of RE services should contribute in every aspect of the framework based on their strengths.

Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

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Author contributions

SM: conceptualization; formal analysis; writing—original draft; writing—review and editing; visualization. KN: conceptualization; review and editing; visualization; supervision; RH: conceptualization; review and editing; visualization; supervision.

Declarations

Competing interests

The authors declare no competing interests.

Additional information

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