



# BRINGING HIGH-IMPACT, GOOD-QUALITY AND LOW-COST EYE CARE CLOSER TO HOME

A CASE STUDY OF KLINIK KATARAK-KEMENTERIAN  
KESIHATAN MALAYSIA



World Health  
Organization  
Western Pacific Region







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# Abbreviations

<b>ECCE</b>	extracapsular extraction
<b>IOL</b>	intraocular lens
<b>KK-KKM</b>	Klinik Katarak-Kementerian Kesihatan Malaysia
<b>MAIWP</b>	Majlis Agama Islam Wilayah Persekutuan
<b>MOH</b>	Ministry of Health
<b>NCD</b>	noncommunicable diseases
<b>NES</b>	National Eye Survey
<b>NBOS</b>	National Blue Ocean Strategy
<b>NGO</b>	nongovernmental organization
<b>OOP</b>	out-of-pocket
<b>PCR</b>	posterior capsular rupture
<b>PE</b>	phacoemulsification
<b>PPKM-HS</b>	Pusat Pembedahan Katarak Majlis Agama Islam Wilayah Persekutuan-Hospital Selayang
<b>UHC</b>	universal health coverage
<b>VA</b>	visual acuity
<b>WHO</b>	World Health Organization



# Foreword

We are pleased to present a case study on cataract surgery service delivery innovation in Malaysia, marking the first production of "**Innovation for Health**", a series of case studies on health innovation in the Western Pacific.

Health innovation is the creation and implementation of novel processes, products, programmes, policies or systems that lead to transformations or improvements in health and equity. In the Western Pacific Region, health innovation is shaped by its diverse geography, cultures and socioeconomic conditions. Technological innovation has played a pivotal role in driving growth across many countries. Meanwhile, various social innovation approaches are fulfilling public health policy objectives and achieving equity in access to care.

COVID-19 has made health innovation more pervasive, involving a wider range of actors than ever before. But the pandemic also hindered health progress towards the Sustainable Development Goals' health targets. To recover and address the challenges of today and tomorrow, more and better health innovations are required.

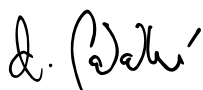
Despite the diversity and abundance, many health innovations have had limited success tackling challenges or contributing to population well-being. Consequently, the vulnerable populations with the greatest needs are often left behind. Furthermore, the absence of proper evaluation and supporting evidence hampers the institutionalization of innovations with the potential for broader impact.

The time has come for governments in the Region to assume the leadership in health innovation and offer lessons to the world: redirect growth-driven innovation models with a focus on well-being and equity while still enabling economic success; scale social innovation to improve equitable access to health; and create spaces for learning and evidence generation for continuous improvement.

The **Innovation for Health** series aims to showcase remarkable examples of health innovation within the Western Pacific Region and to outline the multifaceted roles that governments and ministries of health can play throughout the innovation journey.

This case study traces the path of the cataract surgery service delivery innovation in Malaysia (Klinik Katarak-Kementerian Kesihatan Malaysia, KK-KKM) from the inception to its impact achieved in more than one decade. It provides insights into the creation and evolution of a solution that has significantly improved eye health and care, underscoring that change is not an isolated event but a managed process. Within this process, the Ministry of Health has played an indispensable role by offering championship, direction, value, resources, governance and mechanisms for evaluation. Simultaneously, we acknowledge the inherent challenges within this journey, viewing them not as obstacles but as opportunities to refine and enhance innovations, ultimately leading to the noble goal of eliminating avoidable blindness.

We hope that nations facing similar challenges in remote areas can draw inspiration and lessons from this case study to guide their own innovation journeys in public health.



Dr Zsuzsanna Jakab  
Acting Regional Director for the Western Pacific Region

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# Executive summary

## Introduction

Globally, at least 2.2 billion people have vision impairment and 1 billion of those do not have access to treatment, including 65.2 million cases of cataract. Cataract surgery is widely recognized as the most cost-effective intervention to treat avoidable blindness and is one of the most common ocular procedures performed worldwide. Despite the need, the coverage of surgical care in low-resource settings and among low-income groups has been limited in the global health discourse. Innovation is needed to bridge the gap in cataract surgical treatment globally, regionally and within countries.

In Malaysia, the Ministry of Health (MOH) has been seeking new methods to deliver cataract surgical care to underserved populations since 2010. This case study was conducted to examine service delivery innovation. Barriers and enablers in scaling up the service are identified to address the knowledge gap in strategies for surgical care delivery in low-resource settings and to help other countries facing similar challenges to embark on their own innovation processes in addressing treatable conditions for vulnerable populations.

## Klinik Katarak-Kementerian Kesihatan Malaysia: idea, implementation, value

The concept of a one-stop cataract centre for the urban poor was first conceived in 2010 and operationalized at the end of 2012 with the establishment of a satellite centre at Selayang Hospital, a major MOH referral hospital in the state of Selangor. Through process innovation, patient waiting time for cataract surgery in the centre was reduced from 16 weeks to two weeks.

In parallel with the early development of the one-stop cataract centre, the mobile cataract clinic was conceived and first launched in 2013 in Sarawak. It was operationalized in three Peninsular Malaysian states (Kelantan, Pahang, Terengganu) to offer cataract surgeries in district hospitals with no specialist resources. The concept aims to optimize the specialist resources of provincial hospitals and the under-utilized facilities of district hospitals.

In 2016, the MOH launched the Klinik Katarak-Kementerian Kesihatan Malaysia (KK-KKM), an umbrella initiative to eliminate preventable blindness by delivering high-quality cataract surgical care to vulnerable populations in Malaysia. The one-stop cataract service centre in Selangor and the mobile cataract clinic were rebranded as KK-KKM Static and KK-KKM Mobile. The rebranding efforts catalysed the expansion of decentralized cataract surgery services and the emergence of new service delivery models in other states.

Over the last decade, the two projects have consistently improved the availability, accessibility, quality and affordability of cataract surgical services for the vulnerable population in Malaysia. The one-stop cataract centre (KK-KKM Static) has demonstrated better surgical performance and capacity than MOH referral hospitals and has evolved into a centre of excellence for cataract surgical training and education. Surgeries performed in the rural mobile clinic (KK-KKM Mobile) have an average common complication rate lower than the MOH standard and tertiary referral hospitals.



## Implementation success enablers

Sustainability is a common challenge for outreach eye-care services in many countries. The successful implementation of KK-KKM Static and KK-KKM Mobile for over a decade has been enabled by the following factors:

- 1 A senior-level innovation champion within the MOH providing political support.
- 2 Standardization of service delivery processes to ensure high-volume surgery with good outcomes.
- 3 Multisectoral collaboration to ensure the affordability of surgical care.
- 4 Data collection and routine analysis for surgical performance monitoring and quality control.

## Opportunities for further scaling

The following are recommendations for further scaling of services:

- 1 Institutionalize KK-KKM into national policy and transfer ownership to state health departments.
- 2 Collect data and understand the changing epidemiology to inform resource planning and prioritization.
- 3 Conduct implementation and outcome research to understand the impact and cost-effectiveness of the services.
- 4 Apply systems thinking and establish the link between cataract surgery and public health to obtain wider political support.
- 5 Engage local health workers and communities to co-create scaling strategies.
- 6 Prioritize knowledge transfer and capacity-building of district health workers.
- 7 Improve penetration of advanced surgical technologies in rural settings.

# Introduction



## Global burden and treatment gap of cataract

Globally, at least 2.2 billion people have vision impairment. A conservative estimate using available data shows at least 1 billion of those – almost half – are preventable and remain unaddressed, a number that includes 65.2 million cases of cataract (1). Blindness from cataract is more common in populations with low socioeconomic status and in developing countries (2). More than 90% of vision impairment is preventable or treatable (3).

Cataract surgery is widely recognized as the most cost-effective intervention to treat avoidable blindness, and the most common ocular procedure performed in the world. Many medical and technological advances have been introduced to make cataract surgery safer and faster, including safer anaesthesia, newer techniques, more predictable intraocular lens (IOL) power calculation, improved IOL designs for preventing visual axis opacification, and adjuvant postoperative care. The treatment of complicated cases has benefited from modern vitrectomy machines with minimally invasive instruments, radiofrequency, diathermy and plasma blades. Non-invasive techniques for imaging the anterior and posterior segment of an eye, such as ultrasound biomicroscopy and optical coherence tomography, allow better preoperative evaluation and subsequently better planning of surgical procedure.

Remarkable gains have been made in cataract surgery in the past decades, but progress has not been even. Morbidity rates from cataract conditions requiring subsequent surgery continue to grow in poor regions and among economically disadvantaged populations. Costs of the coverage gap for unaddressed cataract globally are estimated to be US\$ 14.3 billion (4). These are the additional costs required for current health systems using an immediate time horizon. Innovation is needed to bridge the gap in cataract surgical treatment globally, regionally and within countries.

## Burden and treatment gap of cataract in Malaysia

According to the National Eye Survey II (NES II) launched in 2014, 413 000 Malaysians aged 50 and above (1.5% of the total population<sup>1</sup>) were living with vision impairment, of which 113 000 individuals were blind. Untreated cataract (58.6%) was the most common cause of blindness. The prevalence and burden of cataract blindness and vision impairment was higher in rural communities of Borneo States and a few Peninsular States.

Malaysia has a two-tier public and private health-care system in which the public service provided by hospitals under the Ministry of Health (MOH) is highly subsidized and the private sector is driven by substantially higher out-of-pocket (OOP) payment and/or private health insurance (5). As of 2011, cataract surgery service was provided by 36 MOH hospitals, three university hospitals, 59 private hospitals with eye-care services and 128 private eye clinics. With 382 practising ophthalmologists, there was a ratio of one ophthalmologist per 76 078 people. Of these, up to half practised in the private sector and served patients who were financially well-off (6). With heavy government subsidy of

<sup>1</sup> According to the 2010 census, Malaysia's population is 28 334 000, including non-citizens.



the public system, 70% of total eye surgeries in 2010 were handled by public hospitals, which led to a long waiting list for elective procedures. Less than one third of MOH hospitals were capable of performing more than 1000 cataract surgeries per year. Though not evidenced by published data, it is generally accepted by the providers that a four- to six-month waiting time for elective cataract surgery is the norm (7), though the target was to have more than 80% of patients scheduled for cataract surgery within a wait time of 16 weeks.

Apart from supply-side barriers, demand-side barriers to cataract surgery include: lack of awareness that the condition is treatable; access to surgical services due to geographic terrain or OOP expenditure; fear, as well as patients' mobility difficulties; and the need for a family caregiver to provide post-surgery care (8).

## The objective of the case study on cataract surgery service delivery innovation in Malaysia

The MOH launched a series of cataract surgery service delivery innovations in 2010 to tackle the cataract surgical treatment gap in underserved areas of Malaysia. This case study was carried out to examine the conception and implementation of cataract surgical service delivery innovation to disadvantaged populations in Malaysia through the lens of health innovation.

The study methodology included desk reviews of peer-reviewed literature; national policies; programme documents; reports and cataract surgery registry data; and in-depth interviews with policy-makers, programme coordinators and ophthalmologists at national and state levels.

Barriers and enablers in scaling up the service are identified to address the knowledge gap in strategies for surgical care delivery in low-resource settings, and to serve countries facing similar challenges to embarking on their own innovation process in addressing treatable conditions for vulnerable populations.

# Evolution of cataract surgery service delivery innovation in Malaysia





### Early introduction of the one-stop cataract centre in urban Malaysia: 2010–2012

The concept of a one-stop cataract service centre was first conceived in 2010 after the Malaysian Government introduced the National Blue Ocean Strategy to provide a leap in value in public service delivery at a relatively low cost (9). It became operationalized at the end of 2012 with the establishment of Pusat Pembedahan Katarak Majlis Agama Islam Wilayah Persekutuan (MAIWP)-Hospital Selayang (PPKM-HS), a satellite centre to Selayang Hospital, a major MOH referral hospital in the populous Selangor state near Kuala Lumpur.

With an initial investment of 8 million Malaysian ringgit from the Federal Territory Islamic Religious Council (MAIWP), an unused four-storey shop in a shopping complex near Selayang Hospital (where most MOH ophthalmologists on the founding team then practised) was transformed into the one-stop centre, PPKM-HS, to provide cataract surgical services.

Instead of hiring architects and engineers to redesign the building, the team of ophthalmologists reserved the money from the MAIWP to invest in state-of-the-art surgical equipment, and designed the rooms and functions themselves with a goal to streamline the delivery of integrated cataract care. Rooms for preoperative screening, prescription and postoperative evaluations are all on the same floor and connected to one another. The operating room, nurse station and administration office are on different floors.

PPKM-HS developed a specialist rotation-based system to maximize productivity. This system empowered a small in-house team of two optometrists to coordinate visiting ophthalmologists and medical officers from eight tertiary hospitals in federal territories. Preoperative and postoperative care is provided as much as possible by in-house staff, with prescription of surgeries and operations done by visiting ophthalmologists.

A few standard processes were put in place to ensure good outcomes. Optical biometry is used as first-line biometry whenever possible. All selections of lenses are based on a standard protocol. These selections are then validated by another surgeon to ensure minimization of error. The immediate step after prescription and selection of intraocular lenses (IOLs) by medical officers is for the nurse to inform the patient about the surgery process, expected outcome and possible risks and complications. Patients are given one week to determine whether they would like to pursue the surgery. This built-in step is to ensure patients are mentally prepared for the surgery, which also minimizes the risk of surgical difficulties with mentally unprepared patients.

### Standardization of ad hoc eye camps in rural Malaysia: 2013–2015

The mobile cataract clinic was conceived and first launched in 2013 in Sarawak (in Malaysian Borneo) and soon became operationalized in three Peninsular Malaysian states (Kelantan, Pahang, Terengganu) to offer cataract surgeries at district hospitals that lack specialists. A bus is used to transport surgical equipment from the state hospital to district hospitals, and state



ophthalmologists travel to district hospitals to operate. The MOH purchased two buses, one shared across the three states in Peninsular Malaysia and the other covering Sarawak.

Implementing states were selected in accordance with the following criteria: population density; disease burden; cataract surgical coverage; geographic terrain and accessibility by bus; number of district hospitals to cover; local ophthalmologists who can volunteer; and state ophthalmologists who are willing to undertake the coordinating job. In Malaysian Borneo, though Sabah had the highest burden of blindness and lowest surgical coverage, its mountainous terrain posed great challenges for bus travel, and most district hospitals lacked a competent workforce to support primary screening and the surgical process. There was also lack of a local innovation champion.

The mobile cataract clinic restructured and reinvented ad hoc cataract camps with more systematic and organized approaches. In Sarawak, a cataract surgery camp has been in place since the early 1990s. Patients were operated on using the extracapsular extraction (ECCE) method, with no data on surgical performance or patient outcome routinely collected. The mobile cataract clinic switched from the ECCE to the phacoemulsification (PE) surgical method and set up a regular data collection mechanism to monitor surgical performance and patient outcome. Such changes were welcomed by local ophthalmologists who had previous experience volunteering at a cataract camp. This performance monitoring meant more confident surgeons and trust among patients.

Mobile clinics are scheduled on weekend out-of-office hours to allow surgical teams to volunteer. As PE is the main surgical technique, phaco machines and microscopes were transported from state

hospitals to district hospitals. ECCE is still used but only on patients with mature/hyper-mature cataracts. The bus leaves the district hospital after the operation period and returns for one-week and one-month follow-up visits for patient visual outcome evaluation.

Three-level coordination between the MOH management team, state hospital coordinating team, and district hospital supporting team is designed to ensure the effective implementation of each visit. The MOH country coordinator oversees the planning and execution, monitors state-level implementation and engages partners. State hospital coordinators are responsible for: pooling specialists and supporting personnel (optometrists, medical officers and medical assistants); secondary screening and surgery in district hospitals; and liaison with district hospitals covered, the state health department and the MOH. The district hospital coordinator manages patient recruitment, primary eye-care screening, preparation of the operating theatre, and collection of physiological data during the operation period.

The mobile cataract clinic in Sarawak covers seven district hospitals between 50 and 300 kilometres away from the state hospital. District hospitals welcome the project for its improvements in terms of accessibility, affordability and reduced waiting times for cataract care for those living in hard-to-reach villages who may otherwise not choose to have the operation.

Though operationalized at the same time, the mobile cataract clinic in Sarawak consistently outperformed the other three states in surgical volumes. From 2013 to 2015, Sarawak conducted up to half of all cataract surgeries done in all implementing states.

### Rebranding of all decentralized cataract service under Klinik Katarak-Kementerian Kesihatan Malaysia: 2016 onwards

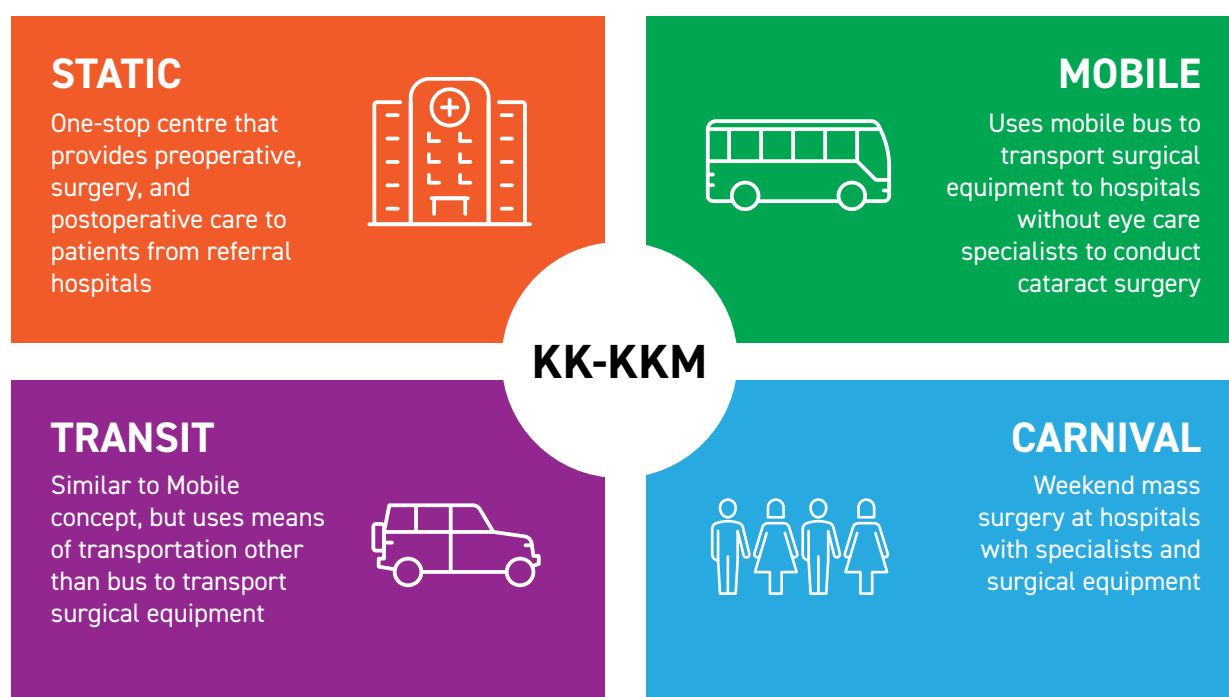
In 2016, the MOH launched Klinik Katarak-Kementerian Kesihatan Malaysia (KK-KKM), an umbrella initiative to eliminate preventable blindness by delivering high-quality cataract surgical care to vulnerable populations in Malaysia. The one-stop cataract service centre in Selangor and mobile cataract clinic in four Malaysian states were rebranded as KK-KKM Static and KK-KKM Mobile (Fig. 1). Rebranding efforts catalysed the expansion of decentralized cataract surgery service in states and the emergence of the new service delivery model (KK-KKM Transit and KK-KKM Carnival). In 2016, Sabah's local cataract eye camp initiative, with its own bus and a free IOLs supply from a faith-based charity, became part of KK-KKM Mobile.

The Transit model emerged after the Mobile model encountered geographic challenges in reaching districts with the mobile unit. The model uses all

means of transportation that can deliver surgical equipment to district hospitals. With Transit, state hospitals provide financial and human resources to deliver cataract surgery service in one district hospital for six to 12 months to clear the cataract surgery backlog. In the MOH Strategic Plan 2016–2020, the hospital cluster concept was introduced to further pool resources to achieve universal access to quality health care. The concept is defined by the MOH as a grouping of hospitals by geographical location within a state, whereby the specialist hospitals are paired with smaller district hospitals. Hospital resources, facilities, manpower and equipment are all shared inside the cluster. Hospital clusters are the foundation for the Transit model. Its implementation in states such as Negeri Sembilan since 2016 demonstrated improvements made in accessibility of cataract surgery and reduction of cataract-induced blindness and vision impairment (10).

Mass surgeries on weekends to overcome backlogs at hospitals with specialist resources became the KK-KKM Carnival model, with 61 district hospitals in nine states participating in the initiative to offer at least one form of KK-KKM service to local populations.

**Fig. 1. A description of the four KK-KKM projects**



Source: Ministry of Health, Malaysia



# Performance of KK-KKM Static and KK-KKM Mobile

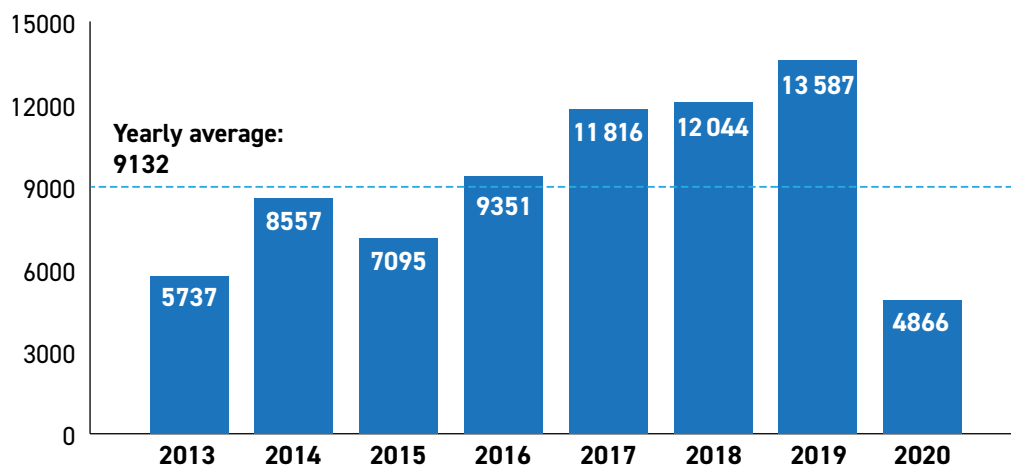


## KK-KKM Static

PPKM-HS (later renamed KK-KKM Static) performed the first cataract surgery in January 2013. Except in 2015 and 2018, when two major building renovations took place, surgical volumes showed an upward trend until the COVID-19 pandemic. The average waiting time for cataract surgery at Static is two weeks, which is six times

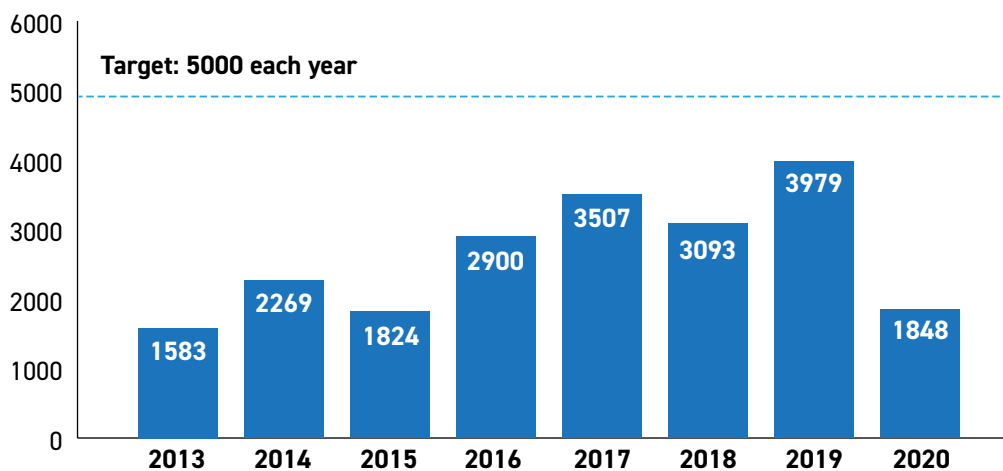
shorter than the target 16-week waiting time in MOH tertiary hospitals. The risk-based two-way referral system between Selayang Hospital and Static allowed two thirds of cataract patients, especially those who presented with advanced poor vision, to receive early surgery at Static. Between January 2013 and December 2020, 73 053 patients were screened (Fig. 2) and a total of 21 003 cataract surgeries were done (Fig. 3).

**Fig. 2. Total number of patients screened in KK-KKM Static: 2013–2020**



Source: National Cataract Surgery Registry, Ministry of Health, Malaysia

**Fig. 3. Total number of cataract surgeries in KK-KKM Static: 2013–2020**



Source: National Cataract Surgery Registry, Ministry of Health, Malaysia

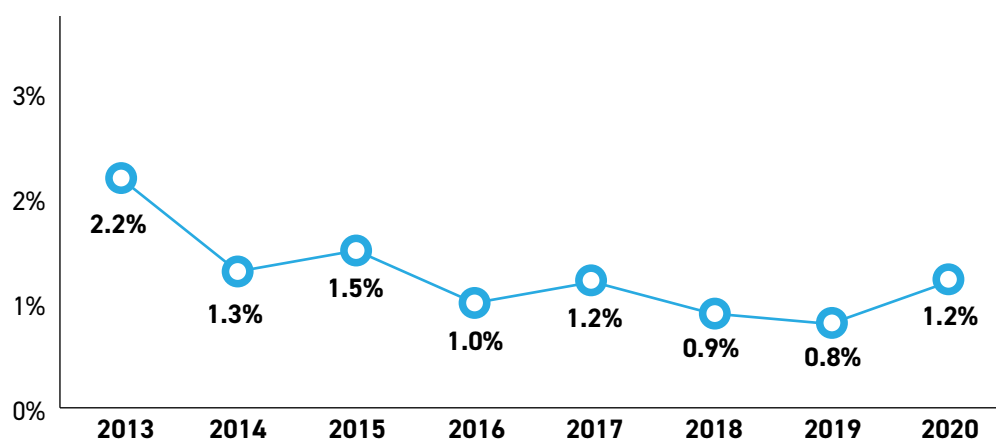


Posterior capsule rupture (PCR) is a common intraoperative complication of cataract surgery and may be associated with a poor visual outcome (11). The PCR rate is an indicator used in KK-KKM for surgical quality monitoring. The PCR rate during cataract surgery in Static from 2014 to 2020 was consistently lower than the 3% national standard<sup>2</sup> and at all other MOH hospitals (Fig. 4). A study published in 2020 compared the refractive outcomes in Static and Selayang Hospital. Results showed that not only did operations performed in Static achieve postoperative refractive outcomes surpassing the benchmark adopted by the Royal College of Ophthalmologists, Static even outperformed Selayang Hospital in postoperative

refractive outcomes. This was the case even when its performance was compared to similar centres in European countries. Streamlined processes and workflows were determined to be the major factors contributing to the superior outcome in Static (12). The percentage of patients without pre-existing ocular comorbidity who obtained a visual acuity (VA) of 6/12 (half of normal vision) or better within three months following cataract surgery in Static was consistently high every year (Fig. 5).

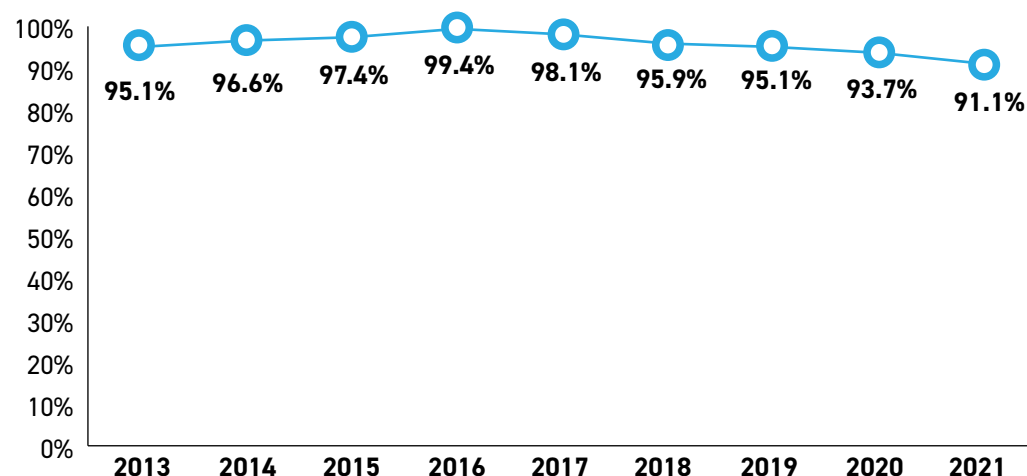
In addition to its core value in delivering cataract surgeries, it soon became apparent that the efficiency and competency of ophthalmologists increased significantly with repetition. The idea of

**Fig. 4. Posterior capsular rupture rate in KK-KKM Static: 2013–2021**



Source: National Cataract Surgery Registry, Ministry of Health, Malaysia

**Fig. 5. Percentage of surgery outcome with visual acuity 6/12 or better in patients with no ocular comorbidity in KK-KKM Static**



Source: National Cataract Surgery Registry, Ministry of Health, Malaysia

<sup>2</sup> 30 cases per 1000 cataract surgery

expanding the focus on surgery to include training and health education emerged. Static has evolved into a centre of excellence for delivery of cataract care and training at all levels, and empowered a large network of the health workforce in varying levels of eye-care facilities across the country. There is now a training programme for registrars in federal territories in their final year and junior specialists who need more coaching and surgeries to be trained and supervised by competent visiting ophthalmologists. During the COVID-19 pandemic, a virtual training programme was started for all MOH and state ophthalmologists nationwide, including a training programme for optometrists from both MOH and private practices focusing on patient consultation and referral, as well as outreach management. This also expanded to orientation on cataract for patients, caregivers, partnering nongovernmental organizations (NGOs) and the general public.

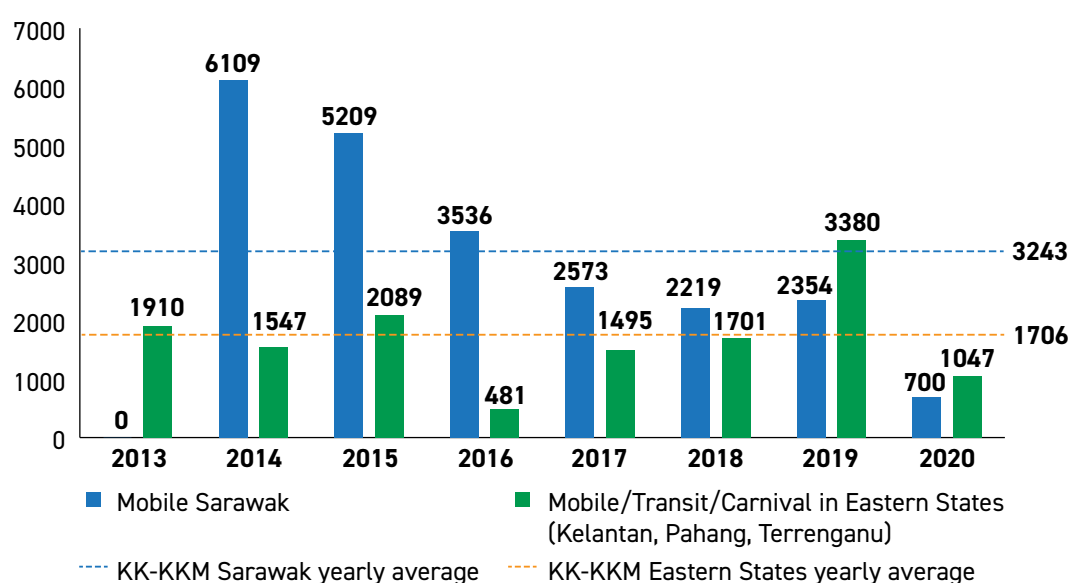
In 2014, Static received the Prime Minister's Innovation Award, the most prestigious recognition of high-impact public service that creates value for the country. In 2015, the project received the Innovative and Creative Group Convention Award at the Prime Minister Office level.

## KK-KKM Mobile

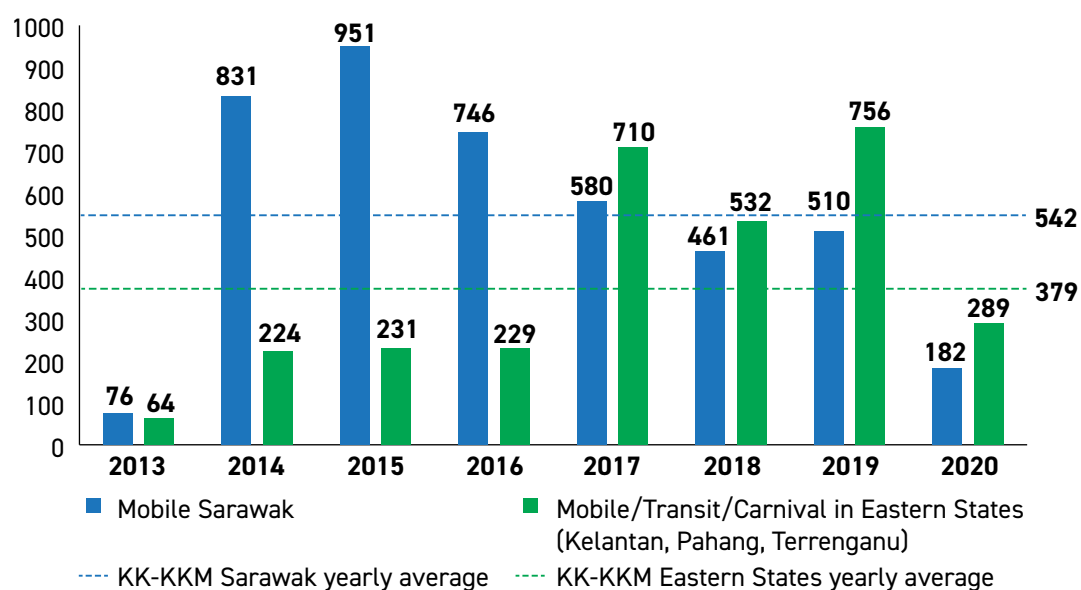
Between 2013 and 2019 in Sarawak, 22 000 patients were screened (Fig. 6) and 4155 surgeries performed (Fig. 7) with a 2.2% average PCR rate (Fig. 8) – lower than the national standard and at tertiary referral hospitals. On average, 88.9% of patients with no ocular comorbidity had VA 6/12 or better three months after surgery (Fig. 9) and more than 97% of patients had outcomes available, suggesting a loss to follow-up rate of less than 3% (Fig. 10). When compared to Transit and Carnival in the three Peninsular states, Mobile in Sarawak performed better in terms of the total number of patients screened, cataract surgeries performed, incidence of capsular complications, and VA 6/12 or better outcome than all other states combined.

Mobile was recognized in 2017 as the highest-impact programme in the MOH by the Health Service Transformation Plan of the Public Service Department (Jabatan Perkhidmatan Awam).

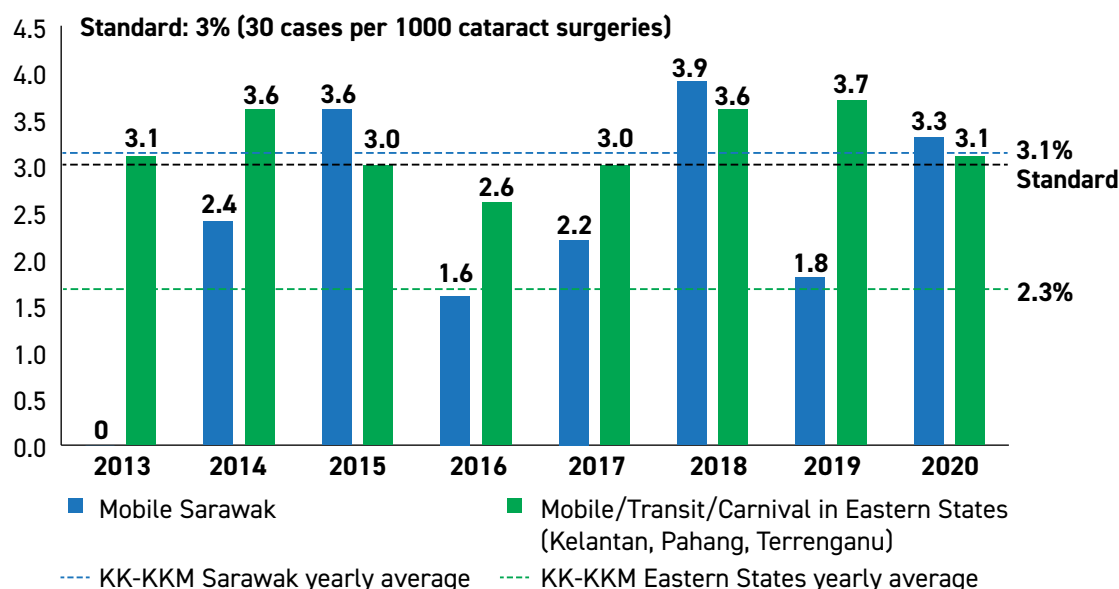
**Fig. 6. Total number of patients screened in KK-KKM Mobile**



Source: National Cataract Surgery Registry, Ministry of Health, Malaysia

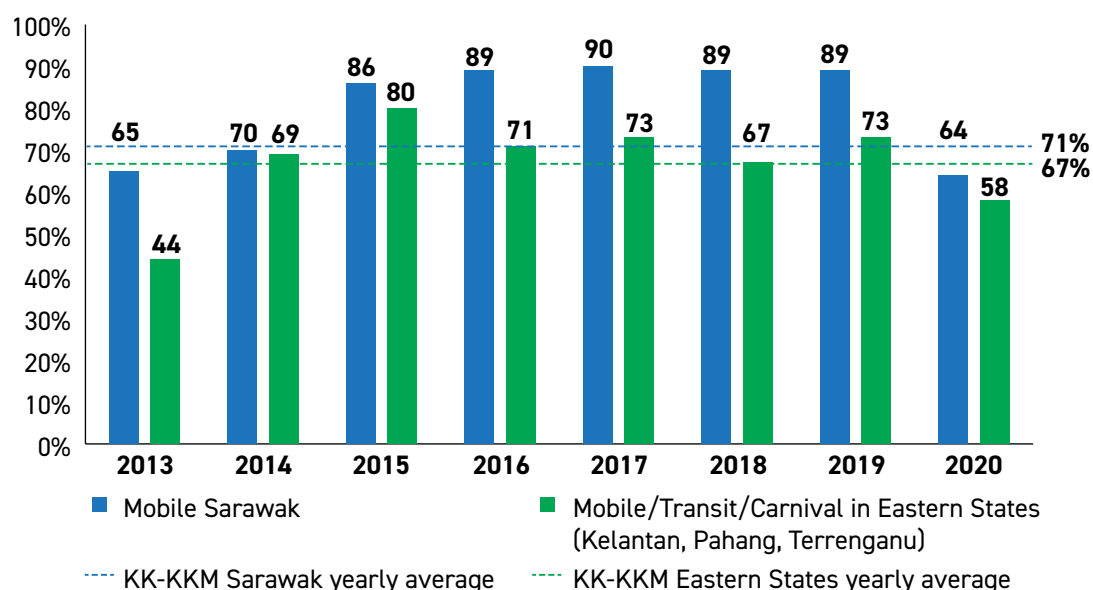
**Fig. 7. Total number of cataract surgeries performed in KK-KKM Mobile**

Source: National Cataract Surgery Registry, Ministry of Health, Malaysia

**Fig. 8. Posterior capsular rupture rate in KK-KKM Mobile**

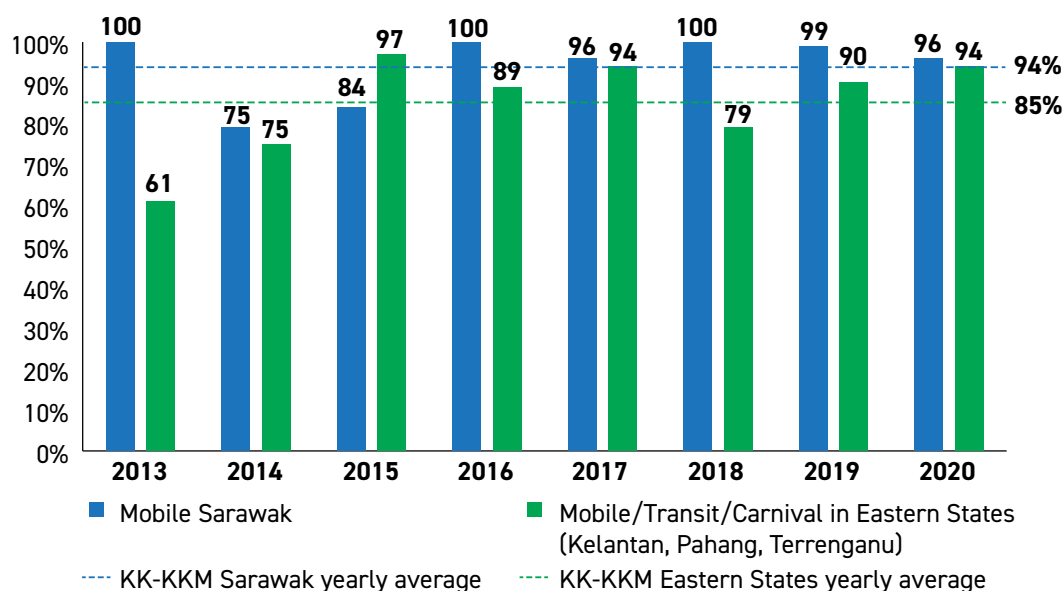
Source: National Cataract Surgery Registry, Ministry of Health, Malaysia

**Fig. 9. Percentage of surgeries with VA 6/12 or better in patients with no ocular comorbidity in KK-KKM Mobile**



Source: National Cataract Surgery Registry, Ministry of Health, Malaysia

**Fig. 10. Percentage of outcome reported (proxy to loss to follow-up) in KK-KKM Mobile**



Source: National Cataract Surgery Registry, Ministry of Health, Malaysia



## Enabling factors of KK-KKM success

There are many examples of outreach eye-care services in many countries and socioeconomic settings, but these are often implemented as time-limited pilots or small-scale, localized, ad hoc projects. It has been difficult to translate outreach eye-care services into large-scale, sustainable and effective strategies for service delivery. The success of KK-KKM in Static and Mobile is derived from several key factors. These include values and principles, strategic choices and a dedicated MOH championship and innovation team that executes its strategies to achieve operational efficiency and high-quality service. This is achieved by using a standardization system of highly trained specialists and supporting staff engineered for high-volume surgery with good outcomes at affordable cost. It involves significant change in the way cataract surgical services were previously delivered in tertiary hospitals in Malaysia. Each step involved in the implementation process – adoption, implementation, sustainment, diffusion and scale-up – depends on a series of processes themselves.

### Value

Malaysia introduced the National Blue Ocean Strategy (NBOS) in 2009 to provide a leap forward in the value of public service delivery at a relatively low cost. The strategy highlighted the importance of collaboration and innovation to reduce costs and maximize output in the public sector. Under NBOS, only programmes that are of low cost, high impact, and can be rapidly executed are to be chosen and implemented. The mission of KK-KKM to deliver cataract surgeries that are high-impact, good-quality and low-cost was also influenced by NBOS.

Strategies adopted by KK-KKM were very much shaped by the principles of reaching out to patients, achieving good outcomes and high impact, at a low cost. Following these values, the achievements made by KK-KKM, exemplified by Static and Mobile introduced and analysed above, were the result of a few strategic choices and masterfully constructed systems which mobilized resources under-utilized in the health-care system.

### Decentralization

The first strategic choice was to decentralize cataract surgery and take it out of tertiary hospitals since it can be done with local anaesthesia. This first choice played a pivotal role, and all later strategic choices were predicated on it. A localized approach to surgery meant a change in the way responsibility and accountability for surgical care is approached. Partly due to the paucity of specialists, KK-KKM projects did not hire full-time, in-house surgeons, but depended on visiting ophthalmologists from MOH hospitals and private practices. To ensure that surgery decentralization would not risk outcome, only certified ophthalmologists were qualified to be visiting specialists in KK-KKM projects.

The idea of having visiting ophthalmologists perform local surgeries outside of tertiary hospitals was challenged by peer ophthalmologists who voiced concerns about the suboptimal surgical environment, which might risk complications. The MOH KK-KKM team insisted that by observing standard procedures for setting up cataract surgery in local environments this risk could be mitigated.

## Performance monitoring and evaluation

Driven by the need for support from the ophthalmologist community, the second strategic choice was to monitor surgical performance and outcome of cataract surgeries done outside of tertiary hospitals. Collection of data pertaining to patients who had cataract surgery was mandated, including the collection of patient demographics, medical history, operative events, postoperative visual outcomes and probable causes for poor outcome in the established Cataract Surgery Registry for KK-KKM surgeries. Data on PCR incidence and patients with poor visual outcome are linked to cumulative sum software to monitor competency of individual surgeons over time. The national standard in Malaysia is 3%. For practising surgeons, the acceptable PCR rate was less than 5%, and ophthalmologists volunteering in any KK-KKM projects who performed less than the acceptable rate would receive advice on performance improvement.

The MOH ophthalmologist team has conducted studies to compare patient outcomes in KK-KKM versus in tertiary hospitals to understand the quality of cataract surgery care since the operationalization of the two flagship projects. These analyses and studies not only proved the quality of outreach cataract services, thus gaining the support of ophthalmic communities, but also assured partners and led to deeper commitment and more resources for the projects.

## Systems thinking: vertical and horizontal service integration

The third strategic choice was to provide an end-to-end cataract care pathway. Full-time personnel were recruited to coordinate vertical integration of and transition between primary and tertiary hospital services that encompass cataract education, preoperative assessment, risk-based triage, surgical treatment and postoperative care. Patients are engaged and empowered by nurses who provide post-diagnosis education on cataract surgery and decision-making support. High-risk cataract cases are redirected to MOH or state hospitals rather than being operated locally. Apart from vertical integration, horizontal integration of cataract services and social services was achieved. A full-time medical social worker is staffed to match cataract patients with welfare programmes such as PeKa B40<sup>3</sup> and charity support to waive or reduce OOP expenditure incurred by patients.

<sup>3</sup> PeKa B40 (<https://protecthealth.com.my/peka-b40/>) is offered to Malaysian citizens who are at the bottom 40% household income range, also known as the B40 group.

## Whole-of-society approach

With the Director-General at MOH as the innovation champion, and direct project management by ophthalmologists at MOH, the fourth strategic choice was to take a whole-of-society approach and invite non-MOH actors to support project implementation. Stakeholders identified from the non-health sector included national or state-level non-profit organizations and local faith-based councils, as well as businesses with various levels of involvement. A total of 26 organizations have donated free IOLs to KK-KKM. The MAIWP made a strategic investment in setting up the physical space for Static and provides annual contributions to maintain and upgrade surgical equipment. NGOs such as the Rotary Club and Lions Clubs are the most informative and consultative partners who, beyond IOL donation, not only help recruit patients, carry out cataract education, share programme operating costs, but also voice their concerns and share their knowledge with the MOH ophthalmologist team to further improve implementation on specific issues.

Funding from the MOH and MAIWP has been consistent for KK-KKM Static. For Mobile, funding from the MOH has been consistently complemented by NGO partners. Patient IOLs are supported by the government welfare programme and NGOs. The MOH and state implementation teams as well as surgical teams have been committed throughout the last decade. Meaningful participation of non-state actors demands transparency and accountability. NGO partners are invited to join outreach visits to observe patient outcome, brainstorm new solutions to expand outreach service coverage and find new ways to reduce operational cost in Sarawak. By giving partners more roles and responsibilities under MOH management, partners such as the Rotary Club have made KK-KKM project an organizational priority.



# Trying and learning

## Using a bus to transport equipment

Before KK-KKM Mobile became operationalized, Sarawak State Hospital suggested the use of buses to transport patients to the State Hospital instead of transporting equipment from the State Hospital to district hospitals. The state implementation team tried this model and found additional cost constraints – bringing cataract patients from remote communities to the State Hospital meant additional food and lodging costs for patients and caregivers, which inflated the cost per patient assisted and limited the scale that donors and partners could support. This rapid experimentation resulted in buy-in from the State Hospital for the original design of using a bus to deliver surgical instruments and doing surgeries in operating theatres at district hospitals.

## Fixed schedule

When it first began in 2013, the schedule of KK-KKM Mobile visits were based on requests received from district hospitals and the availability of visiting ophthalmologists. After a few visits to district hospitals, the inadequate volume of patients who presented for screening and surgery pushed the MOH coordinator to switch to establishing a fixed schedule for the whole calendar year of 2014. Dates for screening, operation and postoperative follow-up visits at each district hospital must not be changed once they are fixed. Often questioned by the state Mobile team due to unforeseeable human resources constraints, the MOH coordinator remains adamant about sticking to the promises made to rural patients and caregivers who need to travel at least hours and up to days for a hospital visit. The annual fixed schedule since 2014 allowed district hospitals to recruit patients for primary screening, identify those who need secondary screening by visiting optometrists, and advertise operation dates in advance.

## Patient recruitment

The effectiveness of patient recruitment varies across different district hospitals. In Sarawak, geographically broader districts with more catchments (such as Sri Aman, Butong) usually have more patients who present at each Mobile visit. At the same time, these patients usually come with more advanced cataracts that are more challenging for local surgeries – surgical instruments transported to district hospitals are usually older and less precise, and they demand higher competency and concentration from ophthalmologists during operations. Multiple promotion strategies have been tried out by district hospital teams to reach rural communities: banners, flyer dissemination in rural health clinics, public agencies such as fire and police stations, hotspots such as markets and eateries, as well as mosques and churches. After a few visits, district coordinators observed that patients who came for regular medical check-ups would ask when the bus would come again, meaning the physical presence of a bus is itself a platform for promotion. This then became a standard practice of KK-KKM Mobile – the bus would stay at the district hospital to advertise the service from the beginning of screening to the end of the operation period. With anecdotal evidence suggesting that older patients depended on children to tell them about the bus, district hospitals targeted young patients who visit the hospital for other reasons.



# Challenges for scaling





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## **Supply of service may fall behind demand due to shortage of highly trained specialists**

Until now, high-quality surgery has been made possible by highly trained ophthalmologists and supporting personnel from state hospitals. However, the key production input – specialist capacity – has not greatly expanded to cater to an exponentially larger volume of cataract surgery. The shortage of specialists limits the scaling potential of KK-KKM. Malaysia had around 790 ophthalmologists in 2022, more than half of whom were practising in the private sector. The country would need 1200 more practising ophthalmologists by 2030 to achieve a cataract surgery rate of at least 3000 per million people per year as recommended by the World Health Organization (WHO). Although there are approximately 60 new ophthalmologists each year, not all of them will become certified and qualified specialists, and only a fraction are likely to choose cataract surgery as their main specialty. Ophthalmologists and supporting staff who work together as the team that runs the system are passionate and disciplined, but they may burn out eventually if the resource pool itself is not expanded.

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## **The unmet need of knowledge transfer to health workers in district hospitals**

In KK-KKM Sarawak, the state hospital management team has an interest in training paramedics in district hospitals to further cut the cost of each Mobile visit. In Sarawak's current arrangement, the seven district hospitals covered receive only one or two trips each year, suggesting a low frequency of on-the-job training. Paramedics need training at a much higher frequency from the state or MOH

hospitals to build their competency in the use of medical instruments and in troubleshooting whenever equipment breaks down. As state buy-in is driven by the accommodation of their interest, there needs to be novel approaches to coach supporting staff in district hospitals.

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## **Lack of local ownership within state health departments**

There is a trade-off between partnership and ownership. Despite the championship of the Director-General and annual contributions from the MOH, the strategic role played by the MAIWP in setting up and scaling PPKM-HS reduces the MOH's incentive to take on more ownership. In Mobile, state health departments lack the incentive to take ownership and contribute to the project, instead leaving the MOH team to seek support from NGOs and private and charitable funds. Scaling of the two projects would be difficult and slow as it solely depends on the goodwill and capacity of committed partners. For example, medical equipment and instruments used in Mobile projects are either borrowed from state hospitals or lent by private sector companies, such as Zeiss. Compared to tertiary hospitals, the various medical equipment and instruments used by the Mobile team are often older models, which require more competent ophthalmologists for successful operations. After almost 10 years in operation, even these outdated models as well as the transport buses now need to be upgraded as they risk malfunctioning or breaking down during outreach visits.



# Considerations for future innovation



**Acknowledging success and constraints, new ways of problem-solving should be introduced to sustain and scale the two outreach projects.**



### **Collect data and understand the changing epidemiology**

As the population of older people in Malaysia increases, so does the burden of age-related eye diseases such as cataract, diabetes and glaucoma. Prevalence data from NES II in 2014 may now be outdated and underestimate the incremental burden associated with an ageing population. More up-to-date data should be collected to understand the prevalence and burden of cataract-induced blindness and vision impairment so that resources can be allocated to improve the service coverage of the populations most in need.



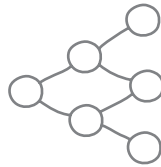
### **Conduct implementation and outcome research to understand the impact**

Research should be conducted to evaluate contributions made by each of the KK-KKM projects to effective cataract surgical coverage. Cost-effectiveness analyses of KK-KKM projects have not been thoroughly examined and should be conducted to identify opportunities for further improvement in resource optimization. Implementation studies should be conducted to gain a better understanding of how enabling factors and constraints evolve over time. Barriers to cataract surgical coverage in different regions should be further examined to optimize resource planning and develop an evidence-based implementation strategy.



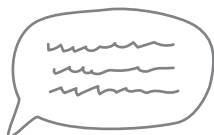
### Establish the link between cataract surgery and public health

With the proportion of preventable and treatable blindness due to noncommunicable eye health conditions continuing to increase and the demographic shift to an ageing population, the avoidable blindness problem will be magnified along with a heightened urgency to scale up solutions to treat preventable cataract. Efforts to promote wider access to cataract surgical services should be aided by taking multisectoral policy actions and developing consensus among noncommunicable diseases (NCD) and healthy ageing stakeholders to warrant more political attention and financial sustainability. Cataract surgical service should be integrated into universal health coverage (UHC) responses as the provision of cataract surgery will be increasingly critical for ensuring UHC. Further public health actions promoting eye health and raising awareness for cataract should be defined and prioritized in parallel with medical actions. Nonsurgical cataract management should be considered and studied, given the increasing competition in financial resources from other health priorities and the needs of a growing ageing population who may not desire a surgical procedure (13). Institutionalization of KK-KKM in national strategic plans for eye care would also give the initiative greater policy leverage to engage a more diversified portfolio of stakeholders and resources.



### Engage local health workers and communities to co-create a scaling strategy

There is a need to improve collaboration, communication and coordination between MOH and state health departments, funding partners and local communities. Building reciprocal allyship should be considered as an essential scaling strategy. For KK-KKM Mobile, recognizing the service delivery model has a linear growth pattern driven by the scale of investment suggests that disruptive innovation might be needed to scale its impact. Health workers in district hospitals and socially disadvantaged patients should be invited to voice their ideas, concerns and solutions, and play an active role in the design and implementation of outreach service delivery. PPKM-HS is operationalized in Selangor where the supply of ophthalmologists is above the national average and health resources are most concentrated. To replicate its success in states with less specialist resources, adaptation or fundamental renewal of the model may be needed. More resources should be invested in a phase of experimentation and exploration to identify the renewed model that is a good fit for states where the logistical difficulty and cost of pooling enough visiting ophthalmologists and medical officers might inflate if the Static model is replicated without local adaptation. State stakeholders who understand local needs, the availability of resources, and existing capacity and constraints, should be invited to co-design a context-specific Static model.



### Prioritize knowledge transfer and capacity-building of district health workers

Increasing the supply of a capable health workforce is essential to improve access to surgical care. The high-intensity, low-frequency nature of KK-KKM Mobile visit-based mentoring and learning has not been sufficient to train ophthalmic nurses and assistants in district hospitals to be able to support surgeries. New ways of knowledge transfer are needed to train primary health workers and nurses to independently take on follow-up tasks. Increasing the awareness of KK-KKM projects among state health departments will gain more resources to sustain and expand the capacity-building activities for district health workers.



### Improve penetration of advanced technologies

KK-KKM Mobile has mostly depended on old models of surgical equipment – which require staff with more technical knowledge to conduct regular checks, troubleshoot and report problems. Although the use of old models has not resulted in any risk in patient outcome, access to better surgical technologies would lower the risk of surgical challenges when operating on advanced cases. Complementing on-the-job training, new ways of training can be explored to equip staff in district health facilities with the technical knowledge to manage surgical technologies, prevent equipment breakdown and avoid compromises in patient safety. Through local capacity-building, the operational cost of each Mobile visit incurred to state hospitals may also be reduced and financial and human resources capacity can be redirected to other priorities.



# Considerations for Member States with similar challenges



Contextual challenges to surgical care provision in low-resource settings are common, including financial, geographic and cultural barriers. Based on findings from this case study, below are a few considerations for countries which may have similar or higher burden of cataract.

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## **Understand the burden**

While many countries have achieved remarkable success in reducing their cataract burden, the epidemiology has become more complex due to population ageing. Investments and efforts made in finding new solutions to deliver cataract surgical services should be directed towards populations with the most pressing need. Recognizing the challenges in conducting national surveys, finding new ways of sampling data through field visits might lead to considerable insight to support intervention prioritization and resource allocation.

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## **Make a long-term financial commitment**

When budgeting for cataract surgical service, policy-makers should consider cost-effective case-finding strategies, such as screening camps and vision centres for identifying and encouraging individuals to undertake surgical services. Progress in service delivery innovation is correlated with financing commitment. The downsizing of KK-KKM Mobile after 2015 suggests that the lack of earmarked funding could lead to de-prioritization. The dedication of MOH resources, and engagement of global and local philanthropy, would sustain the commitment for change.

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## **Take a multisectoral approach**

Efforts to promote wider access to cataract surgical services should be aided by developing consensus among public health policy communities and NCD stakeholders to warrant more attention and investment. Further public health actions promoting eye health and raising awareness for cataract should be prioritized in parallel with medical actions.

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## **Identify innovation champions committed to change**

Senior leadership who champion innovation from the ideation stage are essential as they can advocate for added resources. Once innovation has taken off and demonstrated its impact, institutionalization in policies and national strategies would sustain and scale up the changes.

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## **Monitor implementation and outcome**

Routine monitoring of surgical competency and patient outcome in interventions that decentralize and redistribute surgical resources should be introduced. This will also contribute to the evidence base for the optimal distribution of surgical services in low- or middle-income countries across the Region.



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