



Cost-effectiveness analysis of a mobile health solution (Peek) to improve screening, referral and treatment of patients with visual impairment compared to Periodic Health centre-based outreach clinics in Trans Nzoia County, Kenya.

Key messages

- Peek Community Eye Health Solution (herein referred to as Peek) is an online platform for capturing and analysing data from eye health programmes. It uses smartphones to enable non-specialists (e.g. community health workers) to accurately screen for vision issues. Features such as automated text message reminders and data dashboards for service providers are intended to drive improved adherence and service improvements.
- Peek increases access to eye care services both at Primary Health Centres (PHC) and at a referral hospital. For instance, nearly three times more patients were screened and treated at the PHC when using Peek compared to the Standard of care approach (periodic health centre-based outreach clinics). Furthermore, two times more visually impaired patients were treated at the referral hospital after a referral from PHC when using Peek compared to the Standard of care approach.
- On average, the per-patient cost of screening and treating a visually impaired patient is lower both at a PHC and at a referral hospital when using Peek compared to the Standard of care approach. At PHC, it costs **KES 1,035 (USD 10.35)** per patient when using Peek compared to **KES 1,896 (USD 18.96)** when using the Standard of care approach. Although it is more costly to treat a patient at a referral hospital than at a PHC, the government/donor would on average save **KES 26,360 (USD 263.60)** per visually impaired patient treated at a referral hospital when using Peek compared to the Standard of care approach.
- Value for money would be achieved if the government was to invest at least **KES 509 (5 USD)** per an additional patient screened and treated at PHC but an investment of at least **KES 36,567 (366 USD)** would be required at the referral hospital.
- The government and other stakeholders should invest in the implementation of Peek to increase access and utilisation of eye care services (both screening and treatment) in Kenya.
- To improve scale-up, PHC facilities should be the centre of the implementation of Peek because they are more accessible to patients as opposed to referral hospitals that are often far making patients incur additional costs that are a barrier to accessing eye care services. This will require strengthening of PHC infrastructure and capacity.
- The government can partner with the private sector to provide IT technical support and infrastructure to sustain the implementation of Peek as the government provides oversight.

Introduction

Access to and utilization of eye care services remains low in most low- and middle-income countries (LMIC) despite the high burden of avoidable vision impairment in these countries. Mobile health (mHealth) solutions such as the Peek Community Eye Health Solution (hereafter referred to as Peek) have been developed, validated and rolled-out in Kenya and have been shown to improve access to eye care services, however, mHealth for eye care use has been low especially in the rural settings in LMICs despite being inexpensive and not demanding large equipment. We examined the cost-effectiveness of Peek, a mobile-based application for capturing and analysing data from eye health programmes. Peek uses smartphones to enable non-specialists (e.g. community health workers) to accurately screen for vision issues and has a built-in referral and follow-up mechanisms to support programme improvement. Peek was compared to the standard of care (periodic facility-based outreach clinics) which did not include door to door screening but did include sensitization for attending a triage outreach clinic and treatment at primary health care (PHC) facilities and the referral hospital (Kitale Eye Unit – KEU). using data from a randomised controlled trial conducted in Trans Nzoia county in Kenya.

Key Findings

Table 1 shows the cost of delivering screening using Peek and the Standard of care approach. Personnel costs contribute the largest share of the overall costs in both approaches. The door to door screening using Peek contributed the largest portion of the personnel costs whereas staff costs at the PHC contributed the largest share of the personnel costs in the standard of care approach. Furthermore, over three times more people (9,386) attended triage at PHC after a door-to-door screening using Peek compared to the Standard of care approach (3,071).

Table 1 Input costs for the intervention and control arms

	Intervention (Peek)			Control (Standard of care approach)		
	KES	USD	% of total costs	KES	USD	% of total costs
Personnel	4,402,000	43,144	50.2	1,855,600.0	18,187	47.6
Door to door (Screening)	3,382,600	33,153	38.5	0	0	0
Primary Health Centre (Clinic)	959,400	9,403	10.9	1,815,600	17,795	46.6
Referral Hospital	60,000	588	0.7	40,000	392	1.0
Programme costs	3,752,634	36,780	42.8	1,768,479.3	17,333	45.4
Training costs (Trainers, location, printing & supplies)	1,440,871	14,122	16.4	717,479.3	7,032	18.4
Treatment supplies (Eye drops)	1,516,800	14,866	17.3	931,000.0	9,125	23.9
SMS costs	614,963	6,027	7.0	n/a	n/a	n/a
Registration and records	180,000	1,764	2.1	120,000.0	1,176	3.1
Logistics	621,750	6,094	7.1	271,000.0	2,656	7.0
Transport (Fuel, vehicle rental maintenance)	293,000	2,872	3.3	77,000.0	755	2.0
Rent and Airtime (& Meals)	328,750	3,222	3.7	194,000.0	1,901	5.0
Total	8,776,384	86,018	100.0	3,895,079	38,176	100.0
Number of people screened during the door to door screening		27,692			0	
Number of people attending PHC		9,386			3,071	
Number of patients attending Hospital		552			211	

KES – Kenya Shillings; USD – American Dollars; PEEK – Portable Eye Examination Kit; n/a – not applicable (cost not incurred).

Cost-effectiveness

On average, it is less costly to screen and treat a patient using Peek compared to the Standard of care approach at both PHC and a referral hospital. It costs KES 1,035 per patient screened and treated at PHC when using Peek compared to KES 1,896 when using the Standard of care approach (Table 2). This is as a result of the higher number of people attending triage at PHC upon referral from the door to door screening when using Peek. As expected, a lower investment is required to screen and treat a person for visual impairments at a PHC facility compared to a referral hospital. For instance, value for money would be achieved if the government was to invest at least KES 509 per an additional patient screened and treated at PHC but an investment of at least KES 36,567 would be required at the referral hospital. Figure 1 indicates the probability that Peek would be cost-effective compared to the Standard of care approach over a range of investment values (willingness to pay thresholds) that policymakers might consider as the maximum cost they are willing to pay to screen and treat a visually impaired patient at a PHC (Figure 1). For instance, there is a 93% chance that the additional cost of Peek compared to the Standard of care approach is at or below KES 1,000 per true-positive patient screened and treated at a PHC facility. Both the willingness to pay thresholds at a PHC and referral hospital are lower than the Kenyan Gross Domestic Product (GDP) per capita recommended as a threshold by the WHO making this a cost-effective intervention.

Table 2 Base-case cost-effectiveness results

	Peek Arm (Intervention)	Standard Arm (Control)	Incremental
COMMUNITY			
Costs in KES at PHC	1,314,970	913,843	401,127
Number of true positives per 10,000 population attending triage at PHC	1,271	482	789
ICER in KES/true positive case at PHC			509
Unit cost of screening and treatment at PHC	1,035	1,896	
HOSPITAL			
Costs in KES at KEU	1,255,582	891,385	364,197
Number of patients attending KEU per 10,000 population referred from PHC	20	10	10
ICER in KES/patient attending KEU			36,576
Unit cost of screening and treatment at KEU	62,779	89,139	

ICER – Incremental Cost-effectiveness Ratio

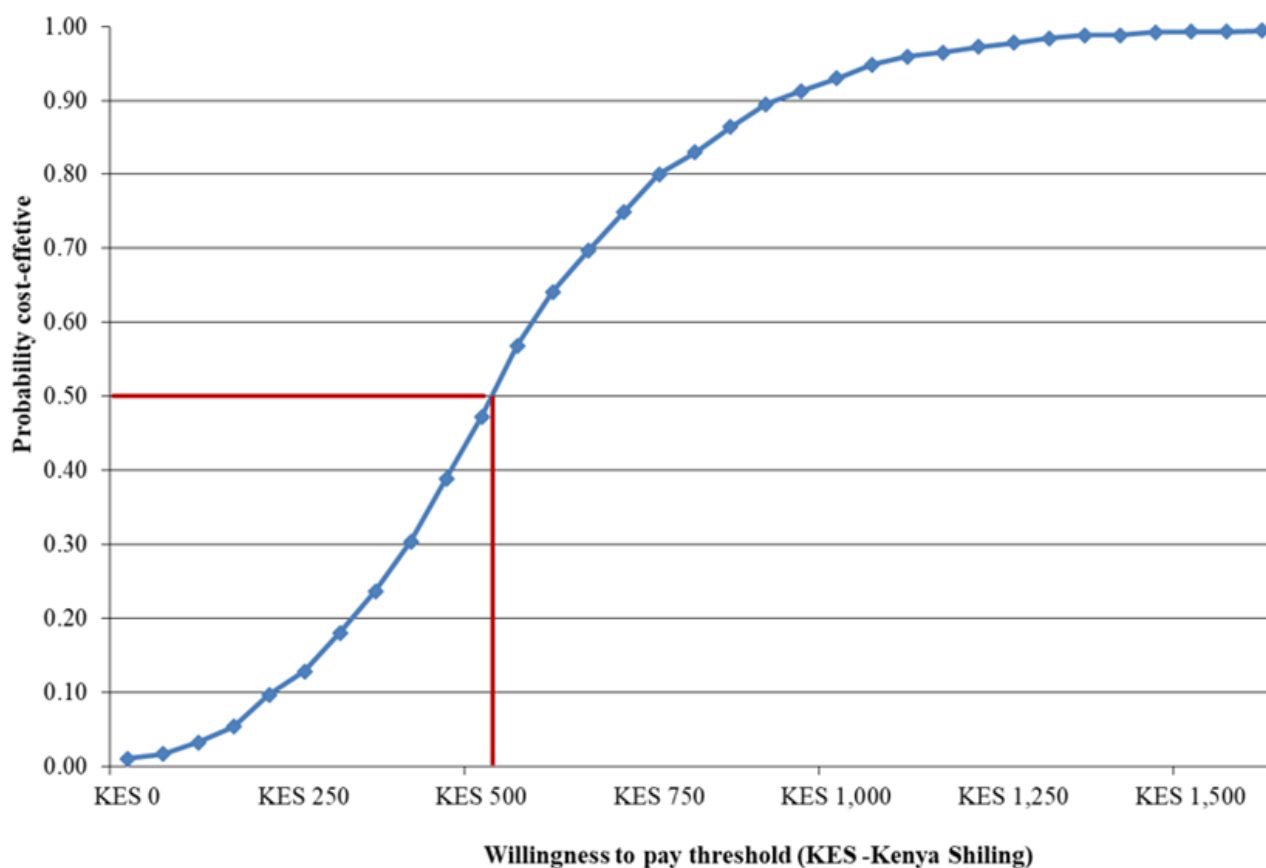


Figure 1: Cost-effectiveness acceptability curve showing the probability that Peek is cost-effective compared to the Standard of care approach in screening and treating true positive patients at a primary health care facility.

Summary and Recommendations

- Screening using Peek in the community improves access to eye care services at PHC for patients with eye problems. It also increases the uptake of referrals of people with vision impairments from PHC to the next level of eye care unit for further evaluation and treatment.
- It is less costly to screen and treat patients both at PHC and referral hospital when using Peek compared to the Standard of care approach.
- There is, therefore, an urgent need for the government to scale up Peek nationally to improve access to and utilisation of eye care services (both screening and treatment) to visually impaired patients in Kenya.
- Interventions to strengthen the infrastructure and capacity of primary health care facilities to adequately provide eye care services will improve both access to eye care services to the patients and the affordability of eye care services not only to the government/donor but also the patient by removing the financial barrier to accessing eye care services from far referral hospitals.
- The government can partner with the private sector to provide IT technical support and infrastructure to sustain the implementation of Peek.

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