Evaluation of the Statewide Eyesight Preschooler Program (StEPS) Final Report

2018

NSW GOVERNMENT

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Abbreviations

ABS	Australian Bureau of Statistics
ACECQA	Australian Children's Education and Care Quality Authority
CALD	Culturally and Linguistically Diverse
CEA	Cost-effectiveness analysis
EMR	Electronic medical record
EN	Enrolled nurse
FTE	Full-time equivalent
GP	General practitioner
ICER	Incremental cost-effectiveness analysis
LHD	Local health district (where StEPS services are based)
MCEETYA	Ministerial Council on Employment, Education, Training and Youth Affairs
NHMRC	National Health and Medical Research Council
NSW	New South Wales
NQS	National Quality Standard (for preschools)
POOC	Paediatric Ophthalmic Outpatient Clinic
PPV	Positive predictive value
PSA	Probabilistic sensitivity analysis
QALY	Quality adjusted life year
RCT	Randomised controlled trial
RN	Registered nurse
SES	Socio-economic status
StEPS	State-wide Eyesight Preschooler Screening Program

1 Executive summary

In New South Wales (NSW) the State-wide Eyesight Preschooler Screening (StEPS) program has offered free vision screening to all four year-old children since 2008. The screening program is conducted in preschools, childcare centres and other children's services, with the aim of detecting vision problems prior to children starting school, at an age when reliable vision testing can be achieved and treatment for childhood ocular conditions is more effective than when they are older. The intent is that early detection and referral for treatment will benefit lifelong vision and potentially, improve learning outcomes. NSW is the only state or territory in Australia offering a universal vision screening program to preschool children. In 2014, an evaluation of StEPS screening and diagnostic outcomes concluded that a high screening rate in the targeted age range was achieved by the program, referring just over eight per cent of children for further assessment (Blows et. al. 2014). Over 90 per cent of those referred required treatment or further review.

Evaluation of the NSW StEPS program: 2017 to 2018

The objective of the evaluation commissioned by the NSW Ministry of Health in 2017 was to examine the process, outcomes and economics of StEPS as implemented from 2009 to 2016. A multi-disciplinary team from the University of Technology Sydney (UTS) was contracted to undertake the evaluation, giving consideration to the appropriateness, effectiveness and efficiency of StEPS. StEPS is promoted and delivered through NSW Local Health Districts (LHDs) and the Sydney Children's Hospital Network (SCHN), providing an opportunity to evaluate the various models of implementation and service at this level. Evidence provided by the evaluation aims to generate points of discussion and implication that can assist the Ministry to ensure that StEPS is best able to meet stakeholder needs and to enhance the outcomes of this worthwhile program.

The evaluation used a comprehensive range of qualitative and quantitative methods to provide information against the StEPS key evaluation objectives (see section 3 Methods for details). StEPS activity and referral outcomes data reported by the LHDs was used to ascertain the quantitative data described in this report, including the economic evaluation. Identification of the different models of implementation and service in LHDs was established through workshops with StEPS staff. Methods used to obtain the views of stakeholders included a survey and interviews with NSW preschool and childcare facility directors, an online survey of family's experiences of StEPS and interviews with the parents/carers of children referred by StEPS. Views on referral outcomes were sought through interviews with the staff of Paediatric Ophthalmic Outpatients Clinics (POOCs) and telephone interviews with other eye health professionals involved in the care of children referred from StEPS. Together, these methods provide a sound basis for the conclusions reached in this evaluation.

These findings were synthesised in the final report to provide an overall assessment of the program and to make suggestions and discuss implications of the way the program is delivered. However, some findings are moderated by limitations in data quality related to referral outcomes. A technical appendix is provided separately to this report, containing more detail of the methods used and findings of the evaluation.

Evaluative assessment of StEPS

Appropriateness

The StEPS program model is unique in Australia and internationally and is one of the largest, most systematically implemented and evidence-based vision screening programs available. Key features of StEPS design—the target age, referral criteria, inclusion of secondary screening, trained nurse and lay screeners, use of catch-up clinics and other outreach/follow up by StEPS coordinators, and use of an age-appropriate, gold standard visual acuity test (HOTV LogMAR chart) are supported by current international guidelines and research evidence related to preschool vision screening programs.

There is variation in local implementation models, mostly related to staffing configuration. This variation appears to reflect responses to contextual factors in different LHDs and, for the most part, is not associated with different referral or outcome patterns. The exception is the use of casual rather than permanent screening staff: the latter associated with lower rates of referral, including 'unable to be screened' referrals, suggesting less false positive referral and indicating that it may be preferable to engage permanent staff when available.

The process by which StEPS engages with preschools is broadly similar across LHDs and appears to work well in terms of engagement, while minimising impact on preschool operations. As of 2018, all StEPS programs now include catch-up clinics. This is highly appropriate given analyses of previous years' data that showed the screening rate was on average 19% higher in LHDs where catch-up clinics were available.

It is also noteworthy that StEPS appears to enjoy sound support among key stakeholder groups – including parents, preschool directors, StEPS coordinators and eye health care professionals. This support was maintained, even though some preschools face administrative challenges in administering the consent process, while StEPS coordinators often report that the administrative load associated with consent processes, data handling and reporting are hard to deliver within resources. Importantly, findings indicate that screening causes minimal distress to children, and families are mostly happy with the screening service. Overall, StEPS is an appropriate universal early childhood vision screening program.

Effectiveness and efficiency

The StEPS program is effective in terms of achieving a high rate of vision screening in the target population. Since 2009, an estimated 96.4% of four-year-olds in NSW have been offered the opportunity to be screened through StEPS. While the 80% target of screening eligible children has not been met in all LHDs, most are consistently tracking close to or achieving target. In rural and regional areas and for Aboriginal children, screening rates have been steadily improving. Across the state from 2009 to 2016, 75.6% of four-year-olds (564,825 children) have had their vision screened by StEPS.

Health professionals report a negligible rate of false positive referrals, expressing that the majority of children referred through StEPS require active treatment. They strongly iterate that these children would not have been detected and brought into care in the absence of the program. An additional and unforeseen advantage of StEPS was the referral of children who were 'unable-to-be-tested', resulting in the further referral and management for other conditions, such as autism and developmental delay. This represents a potential but as yet unquantified 'value-add' of the program.

The main constraint on measuring the effectiveness and efficiency of the program relates to post-screening referral pathways and reporting of outcomes. About 11% of referrals are lost to follow-up. Of particular note, 10.9% of the high priority referrals in rural and regional LHDs did

not have outcomes reported or were lost to follow-up. This compared to 4.9% in metropolitan LHDs. The accuracy of outcomes that are parent-reported is uncertain, while inconsistency in the classification of ocular disease for the purpose of reporting outcomes, contributes further.

The overall cost of running StEPS in NSW was approximately $4 million per year. Modelling estimated that the StEPS program was similarly cost-effective to other prevention programs and represented good value for money on that basis.

Key Implications

Drawing on the findings in relation to the objectives of the evaluation, the following implications have been identified, which may inform future implementation and service by StEPS.

Encouraging and improving access and engagement

1. **Availability of information in common languages other than English**

   To increase the engagement of families from culturally and linguistically diverse (CALD) backgrounds in the program, it is proposed that consent forms, information related to the program and where possible results of screening be made available in the most commonly-spoken community languages, particularly Vietnamese, Mandarin and Arabic.

2. **Simplify the process of parental consent**

   The consent process poses a large burden on parents, preschools and StEPS staff. We suggest that options to reduce administrative burden and increase access and rates of screening be explored. A potential method may be to build StEPS consent into preschool enrolment, which would reduce administration processes related to the distribution and collection of consent forms.

3. **Further participation of preschools and childcare centres in StEPS**

   A consistently reported challenge to improving access to the program for children across all LHDs was lack of engagement of a small number of preschools and childcare centres. StEPS staff reported that this sometimes occurred when there was a new centre, or a new director in the preschool. To work towards universal access, it is advised that methods to foster and encourage involvement of all preschools in StEPS be explored further.

4. **Increase public awareness of the StEPS program**

   To increase screening rates within preschools and childcare centres visited by StEPS and facilitate participation by children in family day care or those who are cared for at home, it is suggested that there should be increased promotion of the program. This could include information advising how parents might directly access screening for their children.

5. **Guidelines and resourcing to embed the delivery of catch-up clinics**

   Catch-up clinics provide an opportunity for children who were absent from preschool or childcare on the day of screening, or who are not enrolled in a preschool or childcare centres visited by StEPS, to be screened in the community. It is encouraging that catch-up clinics are now a feature within all LHDs, given their association with higher screening rates. This positive development should be supported in program guidelines, and where needed, resourced to ensure that these are further developed and sustained. Guidelines should further promote consistency in the way catch-up clinics are utilised and promoted to have the greatest impact.

Maintaining quality and consistency of screening

6. **Ensure use of the HOTV LogMAR chart for screening across the program**

   The majority of LHDs have transitioned recently to the HOTV LogMAR visual acuity chart. For those that have not, this should be strongly encouraged. Although data to examine the impact of this change on referral patterns is not yet available, the evidence suggests that the HOTV LogMAR chart is a more valid and appropriate test for screening.

7. **Further research of referral criteria and changes in referral patterns**

   With the transition to HOTV LogMAR chart within StEPS, it is recommended that further research is conducted to examine any consequent changes in referral patterns and whether current referral criteria remains appropriate or requires revision. This includes the visual acuity cut-offs for referral, the priority of referral and accordingly the most appropriate referral pathway.

8. **Ongoing training and other support for screeners**

   The evaluation has demonstrated that the program benefits from well-trained, experienced screeners. In light of this, it is advised that there is an ongoing and strengthened focus on training and development (including refresher training) for screeners. This may also support their retention, particularly in areas where frequent turn-over of staff creates a greater level of referral. It would be appropriate for this to be implemented by StEPS orthoptic staff within LHDs according to a state-wide directive.

9. **Extend the availability of secondary screening where there are gaps**

   The current evaluation has shown that access to secondary orthoptic screening reduces the number of high priority referrals directed to POOCs and may detect false positive referrals. It is proposed that the availability and scope of secondary screening be extended and used more consistently throughout the StEPS program.

Strengthening referral pathways

10. **Explore strategies to improve uptake of post-referral services**

    Barriers to follow-up care are often financial or related to convenience and/or access. To encourage parents to access services and improve post-referral follow-up rates, it is suggested that innovative strategies to increase follow-up care are explored and trialed. For example, co-location of secondary orthoptic screening with optometry and/or optical dispensing may provide greater convenience for families. While, subsidies for the purchase of glasses may reduce the financial burden for those with the greatest need.

11. **Consider better ways to manage referral of children**

    There may be benefit in investigating the feasibility and implications of expanding the role of secondary screeners to provide a more supported triage service for children eligible or borderline for high priority or routine referral after primary screening. This may assist referrals to be more appropriately targeted to the most relevant service, whether that be optometric services, private or public paediatric ophthalmology or POOCs. This may also improve continuity of care, reduce the likelihood of loss to follow-up and prevent inappropriate referral to POOCs. It is also likely to ensure that urgent cases receive timely and appropriate care.

12. Continue to focus on post-screening parent engagement

It is suggested that clearer information about local post-screening referral pathways be provided to parents coupled with an emphasis on compliance with referral to ensure best outcomes for their child. If the role of orthoptic secondary screeners were to be expanded to include triage (see key implication 11), it would be appropriate for secondary screeners to promote compliance through parental education. This may also reduce the rate of non-follow-up. This is of particular importance in rural and regional areas, and for Aboriginal children and families. For some Aboriginal families, this work may be supported through engagement with Aboriginal community health organisations.

13. Advocacy for timely management of eye conditions

StEPS staff are unable to refer children directly to individual eye care practitioners. While optometric services are the most widely distributed eye care service, particularly in rural and regional areas, StEPS staff report that some optometrists decline to manage children. This can be a significant barrier to initial and on-going care. This is exacerbated by the lack of POOCs outside the Sydney metropolitan area and likely contributes to more than double the rate of non-follow-up for high priority referrals in rural and regional LHDs compared to metropolitan LHDs. Incentives for optometrists in rural and regional areas could be used to strengthen StEPS referral pathways. However, not all eye care and medical practitioners are confident in assessing young children's vision. Additional training on the assessment of paediatric vision could be provided to optometrists and general practitioners to support their roles in the care and on-going management of children referred from StEPS.

Improving data quality and reporting

14. Explore options to improve data entry and limit administrative burden

The process of entering screening results from paper-based forms completed at the time of screening means that there is double-handling of data and potential for errors through this process. Additionally, the administrative burden of entering results into electronic medical records could be reduced if screeners were able to directly enter results at the time of screening. Options to facilitate this could be explored and though they may represent an initial cost, in the longer term it may be possible to provide a saving.

15. Classification of ocular conditions for reporting of outcomes

It is advised that the current categories used for the reporting of outcomes by eye health practitioners be simplified and incorporate specific definitions for each classified eye condition in order to improve consistency and accuracy of reporting and data management. A further proposal is to collect data on the source of reported outcomes and whether or not treatment has been implemented as a result of a StEPS referral.

16. Electronic reporting of outcomes by eye health professionals

It was suggested that the efficiency of StEPS, and the quality of data regarding referral outcomes would be increased with the development of an electronic portal for recording screening, referral and treatment information. This would assist the process for reporting outcomes by eye health professionals and remove the requirement for parents to bring a paper-based form to their eye practitioner appointment. This may also reduce the administrative burden on StEPS coordinators related to following up referral outcomes and manually entering these into electronic medical records.

17. **Reporting requirements for POOCs**

    POOCs are required to collect data and report outcomes to the NSW Ministry of Health, however, there is limited availability of complete data. This is a barrier to evaluating the effectiveness and efficiency of POOC clinics and the overall success of the StEPS program in treating ocular conditions and improving vision or preventing further vision loss. We recommend that reporting requirements to the Ministry of Health are fully implemented and process and guidelines are further developed to improve data collection.

Conclusion

Overall, the evaluation of the StEPS program has revealed a highly appropriate and effective strategy for guiding young children to early intervention and treatment for childhood ocular conditions. It is one of the most successful screening programs of its type on an international scale. Even though highly successful, there is scope to improve aspects of the program. These are largely focused on achieving better referral outcomes for children in rural and regional areas as well as children in disadvantaged metropolitan regions, coupled with higher rates of engagement of CALD populations. The key implications outlined should be considered in the context of streamlining and strengthening linkages between the individual LHD StEPS services and the wider eye health care community providing post-referral care.

Recommendations

It is recommended that:

- The StEPS program is continued as an appropriate, effective and efficient vision screening service.
- Catch-up clinics are maintained and expanded where necessary to further improve the universality of the screening program.
- There is ongoing training and support of screeners in order to retain experienced staff and improve accuracy of referral
- There is an evidence-based classification and definition of eye conditions used to report outcomes of referral so that data consistency improves and analysis of outcomes is strengthened.

2 Key Findings

The key findings of the 2017-18 evaluation are presented in relation to the specific objectives of the StEPS program evaluation and based on examination of the process, outcomes and economic evaluation of StEPS.

1. Models of StEPS implementation and service

StEPS coordination: StEPS implementation varies across LHDs, primarily around the staffing configuration. Six LHDs have a dedicated full time StEPS coordinator (noting that in one case, a coordinator was shared between two LHDs) and four LHDs have a dedicated part time coordinator. StEPS coordinators were registered nurses and in one case an orthoptist. Where a service did not have a dedicated StEPS coordinator, the screeners undertook more of the coordinator duties.

Employment status: The majority of LHDs (9) employed screening staff on a permanent basis, while others employed casual staff, with an average full-time equivalent of 0.32 screening staff to 1,000 children. The majority of LHDs (11) employed registered or enrolled nurses as screeners, while technical assistants/lay screeners were employed in four LHDs on a permanent basis.

Administration: Around three-quarters of StEPS services have dedicated administrative staff who assist with booking preschools, sending information and consent packs to preschools, and data entry. Where LHDs did not have administrative staff, the coordinators and screeners performed these duties.

Secondary screening: Five StEPS services have funding for orthoptic secondary screening, although orthoptic secondary screening is available in nine LHDs.

Engagement with preschools: The process by which StEPS engages with preschools and child care facilities is broadly consistent across LHDs. Administration officers handle most of the booking process in eight LHDs, while vision screeners handle bookings in five LHDs. The StEPS Coordinator handles bookings in two LHDs.

Vision Testing: All but two StEPS services are exclusively using the HOTV LogMAR chart for screening. Most services began using HOTV LogMAR charts from 2017. Most StEPS services are preferencing a six metre testing distance while two consistently use three metres.

Catch-up clinics: As of 2018, all StEPS programs offer catch-up clinics.

2. Access to StEPS

Number of children offered screening: From 2009 to 2016, 719,686 four year-olds were offered vision screening by StEPS, representing 96.4% of four year-olds in NSW during that period. Of these, 84% accepted the offer. While a small percentage of parent/carers declined, just over 13% of parents did not return the consent form.

Number of children screened: StEPS conducted vision screening for 564,825 children (overall 75.6 per cent) in this eight year period. The rate of vision screening against the projected population of four year-olds in the years 2009 to 2016 increased from 67.3% to 74.5% during this period. This represents 7.2 percentage point increase, with the target of 80% reached for three consecutive years, 2013 - 2015.

Rural and regional LHDs: The most consistent rise in the number of children screened occurred in rural and regional LHDs, with the 80% target meet and exceeded since 2012.

Aboriginal children screened: From 2009 to 2016, 26,207 Aboriginal children have had their vision screened by StEPS, rising from 1,908 in 2009 to 4,368 in 2016. This represents a more than doubling of the number of Aboriginal children being screened by StEPS in that period.

Factors associated with proportion of children screened: Panel regression analysis shows that the rate of acceptance of the offer of screening, absenteeism on the day of screening and the rate of children not screened for other reasons, significantly affected the percentage of children screened by StEPS. These factors are largely uncontrollable by StEPS services.

The staffing configuration (FTE of vision screeners, screener employment status and screener qualifications), whether an LHD is metropolitan or rural and regional, the projected population of four year-olds or the involvement of administrative staff in bookings, had no significant association with the screening rate.

Impact of catch-up clinics: Panel regression also showed that the screening rate is on average 19% higher in LHDs where StEPS catch-up clinics are available.

3. Referral pathways

Number of children referred: In the period from 2009 to 2016, of the 564,825 four year-old children screened, 19.2% were referred from StEPS to an eye health professional or to have a vision re-test in 12 months. This referral rate remained steady over the eight years studied, with little variation between metropolitan, and rural and regional LHDs.

Reason for referral: Of the 53,169 children directly referred, almost 25% were classified as high priority (13,246 children with vision ≤ 6/18). Over half of the children referred were routine priority referrals (58.3% with vision between 6/9-2 and 6/18) and a further 16.8% were referred as ‘unable to be screened’ or with an incomplete screening. The additional 55,214 children, who had a ‘borderline pass’ on vision screening, had their families advised to organise a repeat vision test in 12 months.

Factors associated with patterns of referral: The use of permanent vision screeners is significantly associated with a lower rate of both routine priority referrals and ‘unable to be screened’ referrals, compared to the use of casual screeners, while there was no significant difference in the rate of ‘high priority’ referrals. Referral rates did not significantly differ between registered/enrolled nurses and technical assistant/lay staff.

Impact of secondary screening: Based on panel data modelling, the availability of secondary orthoptic screening in LHDs for ‘high priority’ referrals is significantly associated with higher rates of routine referrals, potentially due to a more accurate assessment of the vision of possible high priority referrals. Secondary screening for children classified as ‘unable to be screened’ is associated with lower rates of routine referrals and borderline passes, while its availability for routine referrals is significantly associated with a lower rate of high priority referrals. Based on currently available data, it is not possible to determine conclusively the overall impact of secondary screening.

Referral pathways in LHDs: Referral pathways vary depending on the availability of POOCs (metropolitan area only), the referral criteria of local POOCs and local availability of private ophthalmologists. The most common referral pathway, in particular for rural and regional children, is to an optometrist.

4. Referral Outcomes

True positive referrals: From September 2013 to December 2016, of the 17,710 children referred from StEPS who attended an eye practitioner and who had a report of the outcome of their referral, nearly 73% required some mode of treatment or surveillance. Of these, the majority had a new eye condition detected (39.2%), or else were being monitored and reviewed (19.6%), required further investigation (7%) or were already under care (6.9%). This means that in just over three years StEPS screeners identified 5,725 children who had previously not been identified as needing eye care.

Failure to act on referral: 10% of parents/carers did not act on a referral from StEPS resulting in over 2,000 children not attending an eye care practitioner. This is lower for high priority referrals (6.6%, 340 children) than routine referrals (17.2%, 1184 children). For high priority referrals, 10.9% were not acted on by parents/carers in rural and regional LHDs compared to 4.9% in metropolitan LHDs.

Loss to follow-up: During this period, 11.3% of the outcome of StEPS referrals were lost to follow-up (2,504 children). This ranged from 1.2% up to 23.5% depending on the LHD. There are no obvious patterns to the rate of loss to follow-up, with comparable service configurations and follow-up processes associated with high and low rates of loss to follow-up. However, the contribution of the rate of results notification from eye health professionals is unknown.

The biggest challenge reported by StEPS staff is following up on outcomes from eye health professionals. While results notifications are regularly received from POOCs clinics, the rate of return is variable from other eye health professionals. This is despite StEPS coordinators and screeners spending considerable time following up on referral outcomes.

False positive referrals: Excluding the children lost to follow-up and where parents/carers did not act on a referral, no abnormality was detected in 28.2% of routine referrals and 15.8% of 'high priority' referrals, although there is wide variation between StEPS services.

Diagnoses made: From September 2013 to December 2016, at least 991 preschoolers referred from StEPS were diagnosed with amblyopia, at least 4,326 were prescribed glasses, at least 539 diagnosed with strabismus, and at least 404 were diagnosed with another mixed ocular condition or ocular pathology including; cataract, glaucoma, an optic nerve disorder, nystagmus and ptosis.

5. Perspectives and experiences

StEPS Staff: The staff were overwhelmingly positive about StEPS and reported their passion for their roles in the program. The greatest challenge expressed was the lack and variability of administrative support. Where there were low levels of administrative support, StEPS screeners and on occasion, the coordinators filled this role. The concern was particularly evident in the larger LHDs and those that employed casual staff.

Obtaining the results of referral was identified as the most commonly reported challenge for StEPS staff, with considerable time spent trying to determine attendance and diagnosis, due to poor return of the referral slips by eye care practitioners, particularly optometrists. As a consequence, many outcomes were obtained from parents, who often were unable to give accurate reports of the results of eye examinations. StEPS coordinators also reported that the complexity of the outcome reporting form hindered the accurate recording of outcomes.

Preschool and Childcare Facility Directors: The directors expressed satisfaction with the StEPS program in both survey and at interview. They were highly satisfied with the information

provided by StEPS and generally felt that the program caused little disruption to their operation and fitted well with their normal program.

The level of satisfaction with the service and its operation decreased in those preschools and childcare facilities where the proportion of children from CALD families increased. This particularly related to the availability of suitable information for these families. Outer regional and remote preschools expressed less satisfaction than those located in metropolitan and large regional centres. Overall, obtaining consent forms was the most challenging aspect of StEPS for these directors.

Parents and carers: At interview, parents were extremely positive about the StEPS program and the benefits it provided for early detection and intervention for eye conditions in their children. Parents reported that without the program they would not have had their child's vision checked, were not aware of the importance of early vision screening and were not aware of any symptoms related to their child's eye condition. Parents also said that they found the information regarding referral supplied by StEPS was helpful. Waiting times for an appointment at a POOC was noted to be between one to two months and a matter of weeks with a private ophthalmologist.

Eye care professionals: All eye care professionals strongly emphasised the importance of the StEPS program and how well the program detected eye conditions that would have otherwise gone unreported. They felt that false positive referrals were rare and that the screening was accurate. Many expressed that they were not familiar with the StEPS referral outcome form because they seldom saw it produced by the parents and sometimes would be unaware that the child had been referred by StEPS.

POOCs: The staff of POOCs were universally positive about the program, the importance of screening, the facilitation of early intervention and that StEPS was a valuable service for children. Challenges reported by staff in POOCs included levels of staffing and resources to meet the demands of incoming referrals, limited availability of paediatric ophthalmologists and limited space.

There was variation in the way dedicated StEPS clinics were implemented in POOCs, largely based on whether StEPS referrals were provided on-going care within the dedicated StEPS clinic or were discharged from the StEPS clinic to paediatric ophthalmic or general ophthalmic clinics. Those that provide on-going care had the longest wait time and the rate of new referral exceeded the discharge rate. Conversely those that discharged children to the general and paediatric ophthalmic clinics found that these clinics were struggling with the demand of onward referral. There was also variability in the number of referrals received by each POOC and staffing levels.

Low levels of false positive referrals: The rate of false positive referrals from StEPS was reported to be negligible or nil by both POOCs staff and private paediatric ophthalmologists. This was for both high priority and routine referrals, indicating that treatment was required across all levels of priority. Where false positive referral was observed, it was often children who had been 'unable to be assessed' either at initial or secondary screening. These children were observed to frequently be autistic or have global developmental delay that was typically undiagnosed. This represents an added value of the StEPS program, with these children subsequently referred on for appropriate care.

6. Economic Evaluation

Costs of running StEPS: The overall cost of running StEPS in NSW was estimated to be approximately $4 million per year, which equates to a cost per screened child of $49.21.

Compared to no screening, the StEPS program cost an additional $130 per child and yielded on average 0.009 additional quality adjusted life years (QALYs) which equates to a cost-effectiveness of $14,032 per QALY gained.

Costs over time: Based on population and budget projections, the cost per screened child reduced over time and this was consistently observed across all measured LHDs. It was estimated that in 2020 the total cost of running StEPS would be approximately $4.2 million per year, which equates to $37.37 per eligible child.

The results were sensitive to assumptions of: treatment rates; sensitivity, specificity and prevalence; and health-related quality of life of untreated refractive error. Increased confidence in the estimation of these parameters would improve the robustness of the cost-effectiveness results.

StEPS cost-effectiveness: Once different models of implementation were considered, improvements in the screening rate and improvements in attendance at referral appointments had the largest impact on cost-effectiveness. There was less evidence to support the use of non-nursing staff (compared with nursing staff) in terms of cost-effectiveness. The confidence in these results was limited by the small number of LHDs.

Once productivity losses associated with blindness (societal perspective) were considered, cost-effectiveness improved ($13,942 /QALY gained).

The economic analysis demonstrated that the StEPS program reduced blindness and increased participation in society. With increased participation in employment, the increase in wages exceeded the health care costs.

3 Introduction

Visual development occurs in early childhood and during this period, if there is any interruption to development that is not corrected, a child's optimal visual potential is not reached and cannot be regained at a later stage. This is most strongly shown in the visual condition known as amblyopia that arises when a child has an eye turn (strabismus), where there is unequal refractive error between the two eyes, or if light is unable to reach the back of the eye (retina) as can occur in congenital cataract. This can lead to a failure of the development of vision, most commonly in one eye, more rarely both eyes. But it is monocular amblyopia that is of greatest concern to vision screening programs, as children seldom report the poorer vision in one eye and parents seldom detect it. If untreated in childhood, the permanent reduction or loss of vision in one eye has been shown in adulthood to increase the risk of an amblyopic individual becoming visually impaired. Additionally, it is thought that sub-optimal vision in children can negatively impact educational outcomes. Vision screening in childhood is considered to be important to facilitate early detection and treatment of ocular conditions and to maximise visual and educational potential at an age where visual development is still malleable.

The earlier the detection of any ocular condition, the better the prognosis for achieving normal vision. Vision conditions such as amblyopia, small angle strabismus and refractive errors are usually only detected by vision screening at the age when a child becomes cognitively able to be assessed by adult-like vision tests, generally considered to be between the ages of three and five. Traditionally, the second age for vision screening of children in Australia following infancy was during the first year of schooling, largely for reasons of gaining universal access to the children at age five to six years. However, detecting and correcting vision disorders in four year-old preschoolers prior to commencing their first year of school helps to encourage confident learners and ensures earlier access to treatment.

3.1 State-wide Eyesight Preschooler Screening (StEPS)

The StEPS program is an initiative funded by the NSW Ministry of Health that offers all four year-old children in NSW free vision screening. In line with the NSW Ministry of Health StEPS policy directive (PD2018_015), it is the responsibility of each LHD to coordinate and deliver the program to four year-old children via preschools, childcare centres and other children's services. The objectives of the StEPS program are to:

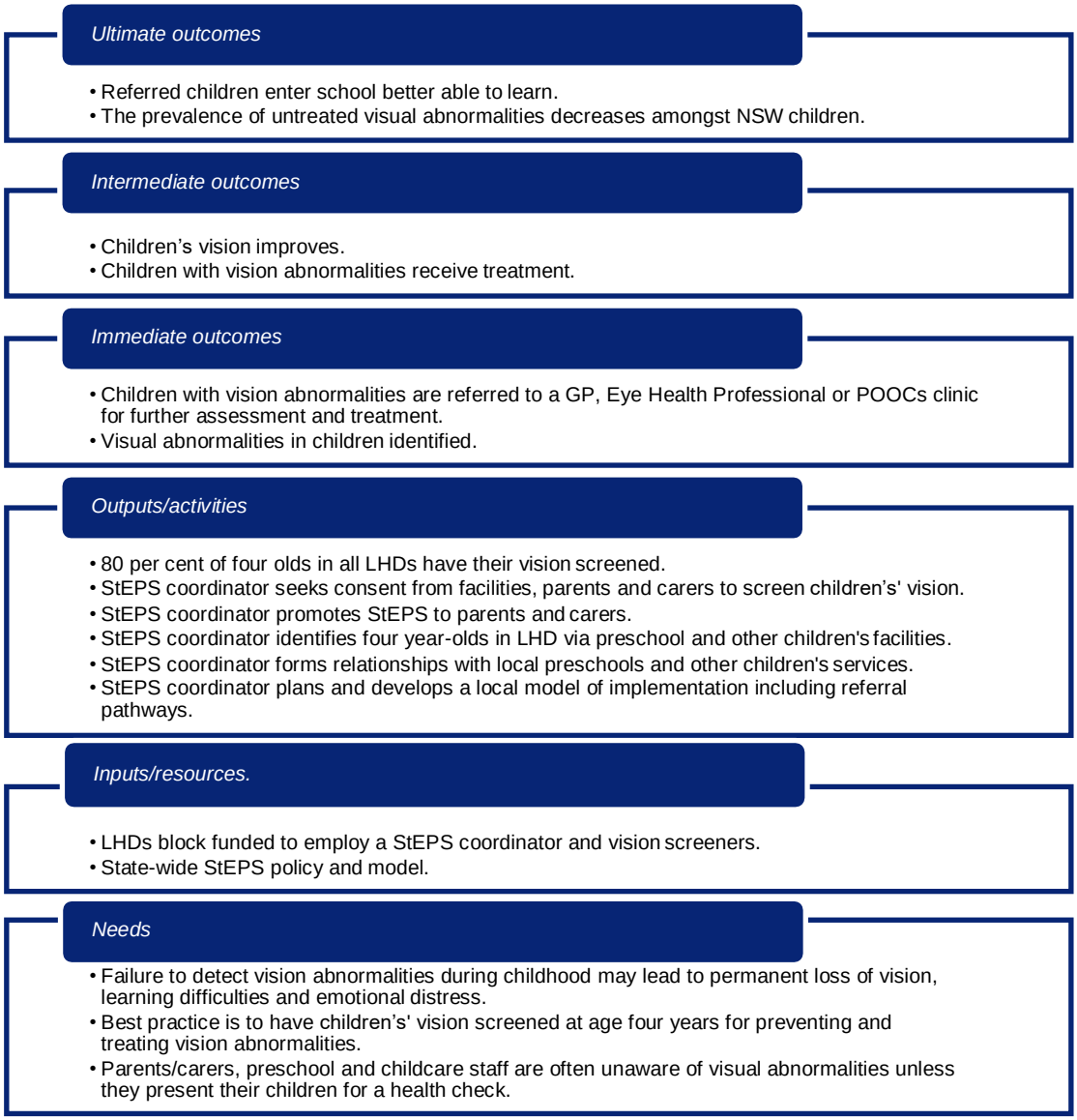
- Conduct universal, population-based vision screening for four year-olds in NSW that meets the World Health Organisation criteria for screening tests and programs
- Facilitate the early detection of potential vision problems in four year-old children, which is an age where treatment outcomes can be maximised
- Ensure that children referred from the StEPS program receive timely and appropriate referral, diagnosis, intervention and treatment
- Optimise good vision in children prior to starting school.

The StEPS program meets the World Health Organisation and the National Health and Medical Research Council criteria for a screening program.

StEPS has been operating since 2008, when it formalised a recommendation for vision screening at age four, as part of regular health checks. The StEPS program is an important

component of the NSW Personal Health Record, the 'Blue Book', which recommends vision surveillance at the one to four weeks, six to eight weeks, six months, 12 months, 18 months, two years and three years child health checks, and a monocular visual acuity screen with an assessment at the four year child health check. A high-level program logic for the StEPS program can be found in Figure 1.

Figure 1: Program logic for the StEPS program



The StEPS program is administered by all LHDs, with the exception of the South Eastern Sydney and Illawarra Shoalhaven LHDs where the program is administered by the Sydney Children's Hospital Network. Each LHD employs a StEPS coordinator to manage the program and a team of vision screening staff. If children fail the screening test based on a set of criteria, they are referred for further testing or treatment, based on the measured level of visual acuity. LHDs are responsible for the promotion, service delivery and uptake of the StEPS program as well as developing relationships with childcare centres, preschools, parents, GPs, optometrists and ophthalmologists in their respective LHD.

NSW is the only state or territory in Australia offering a universal vision screening program to preschool children. In fact, only Sweden and parts of Canada undertake universal visual acuity screening in the year before school. Some international jurisdictions may provide visual acuity screening for children once they enter school, however, this is generally limited to certain geographical areas and is not standardised. Thus, StEPS is a unique screening program and is aligned with current international evidence of gold-standard practice in preschool vision screening.

3.2 Evaluating StEPS

An evaluation of the StEPS screening and diagnostic outcomes based on 2010-2011 data was published by Blows et al. 2014. It concluded that the program was achieving a high screening rate in the targeted age range, while referring just over 8% of children for further assessment. Over 90% of those referred required treatment or review. The 2014 study did not evaluate the outcomes associated with the various models of implementation in LHDs or the appropriateness of the program for the key stakeholders including preschools, parents and carers, StEPS coordinators and vision screeners, and health professionals along referral pathways.

This evaluation

This evaluation extends the findings of the 2014 evaluation to provide a comprehensive understanding of the appropriateness, effectiveness and efficiency of StEPS overall and where possible, compare various models of implementation. This will support the NSW Ministry of Health to assess the success of StEPS and guide any future decisions about the way StEPS is implemented. Based on the evidence available, this work has culminated in key implications to increase: program efficiency, access and uptake; ensure appropriate referral pathways are in place and improve referral outcomes and reporting. The evaluation commenced in June 2017 and concluded in September 2018.

The specific objectives of the StEPS program evaluation are to:

1. **Models of Implementation:** Identify and describe different models of implementation and service components of the StEPS program at LHD level.
2. **Access:** Examine access to StEPS at state-wide and LHD level and within key population groups, and how this relates to different models of implementation.
3. **Referrals:** Examine the effectiveness and appropriateness of referral pathways, including cost and time to access to diagnostic and treatment services;
4. **Outcomes:** Investigate the extent to which StEPS is achieving optimal results in screening and referral outcomes, both at a state-wide level and by different models of implementation.
5. **Experiences and Perspectives:** Explore the experiences and perspectives of StEPS in the community amongst parents and carers, preschool and childcare facilities, eye health professionals, and POOCs.
6. **Economic Evaluation:** Investigate the costs of implementing StEPS and undertake an economic evaluation of StEPS.
7. **Recommendations:** Make recommendations as appropriate, to increase program efficiency, reach and uptake; ensure ongoing monitoring of the StEPS program; and improve referral outcomes and reporting

4 Methods

This evaluation used a comprehensive range of qualitative and quantitative methods to provide information against key evaluation objectives, which was then synthesised to provide an overall assessment of the program and recommendations.

4.1 Background Systematic Review

A systematic review of national and international peer reviewed literature on vision screening in preschool-aged children, and international vision screening guidelines, was undertaken to inform all aspects of the evaluation. The systematic review did not directly address any of the evaluation objectives but, provided context through which the findings of the evaluation may be interpreted. The complete systematic review including detailed methods is contained in Supplement 1.

4.2 Models of Implementation

As StEPS uses a devolved model of funding, LHDs may vary in their implementation of the program within the guidelines and procedures outlined in the State-wide Eyesight Preschooler Screening (StEPS) Program Policy Directive.[1] Objective 1 of the StEPS program evaluation was to identify and describe different models of implementation and service components of the StEPS program at LHD level. The models of StEPS implementation across all 15 LHDs[2] with StEPS services were mapped during workshops with StEPS Coordinators, vision screeners and administrative staff. The service elements mapped were:

- Staffing configurations (both FTE and the qualifications of staff)
- The process by which StEPS services engage with preschools, childcare facilities and other children's services, particularly around bookings and parental consent
- The screening process on the day of screening
- The availability and use of additional screening including catch-up clinics (for children who are absent on the day of screening) and secondary orthoptic screening
- Referral pathways used and how these relate to the priority of referral e.g. routine and high priority referrals
- Follow up with eye health professionals and parents/carers to capture referral outcomes and diagnoses
- Data entry and reporting.

Service maps were generated using Microsoft Visio and accuracy was confirmed with StEPS Coordinators from each LHD. Information from the service maps was coded to create variables used in other analyses, to determine the impact of different models of implementation and service features on the effectiveness, efficiency and cost of StEPS (objectives 2, 4 and 6).

[1] NSW Ministry of Health 2012, *State-wide Eyesight Preschooler Screening (StEPS) Program Policy Directive.* [PD2018_015]
[2] Note: there are 16 LHDs, however, South East Sydney and Illawarra Shoalhaven are combined for the purposes of providing StEPS services and are therefore counted as one LHD for data collection and analysis.

4.3 Access to StEPS

The coverage of the StEPS program and access to screening by key population groups and how this relates to models of implementation (Objective 2) was determined by analysis of quarterly StEPS activity data provided by the NSW Ministry of Health. StEPS activity data obtained for this analysis covered the period from October 2008 to December 2016. This data is routinely reported by StEPS coordinators within each LHD to the NSW Ministry of Health and includes the number of children offered screening, the number of screening consents received, the number of children screened, the outcome of screening and the Aboriginal status of children screened.

Data for 2008 was excluded from the analysis as only six months of StEPS activity data was available for this year. Data for 2017 was not available for this report. Data was combined annually for analysis of screening and referral rates, as screening primarily occurs in the second and third quarters of the year (i.e. terms two and three). This reflects the fact that StEPS is delivered according to the preschool year. Analysis was performed using Microsoft Excel and Stata version 14.

Screening activity rates were determined from projections of the number of four year-olds per LHD from 2008 to 2016 provided by the NSW Ministry of Health and was obtained from Health Statistics NSW, based on 2014 population Census data with adjustments by Centre for Epidemiology and Evidence, NSW Ministry of Health. To determine factors that impact the StEPS screening rate, a random effects panel analysis was undertaken (refer to Appendix C for technical details). The variables used to account for the screening rate were derived from the StEPS activity data and mapping of models of StEPS implementation. These included:

- The rate of acceptance of the offer to be screened;
- The rate of absenteeism on the day of screening;
- The rate of children not screened for other reasons;
- The availability of catch-up screening clinics;
- The FTE of vision screeners per 10,000 projected four year-olds in an LHD for each calendar year (note: assumes constant staffing since 2008);
- The projected number of four year-olds in an LHD for each calendar year;
- Whether screeners are permanent or casual employees;
- Whether screeners are nurses (registered or enrolled) or technical assistants;
- Whether administration officers assist with booking of preschools; and
- Whether the LHD is metropolitan or rural or regional.

4.4 Referrals from StEPS

This analysis relates to Objective 3 of the evaluation objectives. The criteria for referral is outlined in the StEPS program policy directive.[1] The rates of referral from StEPS and the pattern of these referrals according to the proportion of referrals classified as high priority (visual acuity in one or both eyes <6/18), routine referral (<6/9-2), borderline pass (6/9-1 or 6/9-2) and unable to be assessed at the time of screening, was determined from StEPS activity data from 2009 to 2016. The impact of models of implementation on referral patterns was investigated using a random effects panel regression. The variables used to account for the referral rate were

derived from the StEPS activity data and mapping of models of StEPS implementation. Analysis was performed using Microsoft Excel and Stata version 14. Technical details of the statistical model is available in Appendix C.

4.5 StEPS Referral Outcomes

Each LHD also reports quarterly to the NSW Ministry of Health on referral outcome data. Referral outcome data is received six months and two weeks after the close of the quarter. This reporting lag allows time for appointments, investigation and diagnosis and for StEPS Coordinators to seek outcome information from parents if a report is not received from an eye health professional.

Quarterly StEPS referral outcomes data from September 2013 to December 2016 was provided by the NSW Ministry of Health and was used to analyse StEPS referral outcomes and subsequent diagnoses of children referred following screening by StEPS (Objective 4). For descriptive analysis of StEPS outcomes and diagnoses, the quarterly data was pooled. For statistical modelling of referral outcomes, the quarterly data was used to assemble a longitudinal dataset.

Table 1: Diagnosis categories used for analysis

Primary diagnosis or outcome	Diagnosis or outcome	StEPS diagnosis categories pooled
Amblyopia	Amblyopia	Amblyopia Mixed - amblyopia & refractive error
	Anisometropic amblyopia	Mixed - anisometropia & amblyopia
	Strabismic amblyopia	Mixed - strabismus & amblyopia Mixed - strabismus & amblyopia & refractive error
	Strabismic anisometropic amblyopia	Mixed – strabismus & anisometropia & amblyopia
Prescribed glasses	Refractive error	Refractive error – mild to moderate Refractive error – moderate to high
	Anisometropia	Anisometropia Mixed anisometropia & refractive error
Strabismus		Strabismus Mixed - strabismus & refractive error Mixed - anisometropia & strabismus
Emmetropia		Emmetropia
Other vision disorders		Other mixed condition
Ocular pathologies	Serious/sight-threatening ocular pathology	Cataract Optic nerve disorder Glaucoma Corneal Pathology Nystagmus
	Infection/non-sight-threatening ocular pathology	Conjunctivitis Chalazion
	Ptosis	Ptosis
	Binocular vision disorders (excluding strabismus)	Binocular vision disorders (excluding strabismus)
	Colour vision deficiency	Colour vision deficiency
	Miscellaneous	Miscellaneous

Those children referred from screening and determined to be true positive cases, included those with a previously undiagnosed ocular condition, those requiring ongoing monitoring or further investigation and those who were currently under eye care. The rate of false positive referral (children with no abnormality detected) was calculated as an indication of the positive predictive value of StEPS. The proportion of children lost to follow-up and whose referral was not acted on by their parent/carer was also determined.

From September 2013 to December 2016 there were 24 reported diagnosis categories in StEPS referral outcomes data. For the purposes of analysis, categories were pooled as (outlined in Table 1). This pooling aligns with StEPS diagnosis reporting in Blows et al. (2014). Comments for other mixed conditions and miscellaneous diagnoses were coded into existing diagnosis categories where possible.

4.6 Perspectives and Experiences

This section relates to Objective 5 of the evaluation objectives and obtained survey and interview responses of key stakeholders for the StEPS program.

4.6.1 Preschool and childcare facility director survey

An online survey using Qualtrics was administered to preschool directors to canvass their experiences and perspectives with StEPS. Email addresses for 3,834 preschools were received from StEPS Coordinators. The survey was administered over a six week period from 13 November 2017 to 22 December 2017. All preschools with known email addresses were invited to participate. Weekly reminders were sent to non-respondents and partial respondents.

The final sample comprised 800 responses which represented a 21% response rate. The sample and sampling frame share similar characteristics across LHDs. This is confirmed by the non-significance of a chi-square test comparing the observed and expected distribution of responses by LHD ($\chi^2(14)$ 19.552; p=.145). Further representativeness against the sampling frame testing could not be conducted because no other information about the sampling frame was known prior to the survey.

As the entire sampling frame were invited to participate in the survey, sampling weights were not applied to the responses. Based on information from the Australian Children's Education and Care Quality Authority (ACECQA), the sample is representative of all NSW preschools by the type of service ($\chi^2(4)$ 3.937; p=.415) and service quality as assessed by the National Quality Standard ($\chi^2(4)$ 1.083; p=.897). Accordingly, weights for non-response were also not applied to the data as the final sample was representative. No other information was available for non-respondents to base survey weights on. More detail of respondent profiles is contained in Appendix C.

The survey questions are contained in Appendix B. The majority of data obtained was quantitative in nature and analysis was performed using Microsoft Excel and Stata version 14. Technical details of the analysis are available in Appendix C. In brief, survey responses were analysed using ordered logistic regression to identify preschool characteristics associated with the level of agreement to specific statements about StEPS including communication, operation, challenges and enablers. Some open response questions were included in the survey and analysed thematically.

4.6.2 Preschool and childcare facility director interviews

A total of 20 preschool and childcare facility directors participated in a 30 minute face-to-face interview. Directors who were contacted for interviews had indicated in the survey that they were willing to be followed up, and participation in the interview was voluntary. Appendix D presents the interview questions.

4.6.3 Parent Interviews

A total of 20 interviews were undertaken with parents/carers of children who had been screened by StEPS between 2015 and 2018 and had received follow-up treatment as a result of the screening. Parents were invited to participate by eye health professionals who were providing follow-up treatment (POOCs) or through StEPS coordinators. Interview questions are contained in Appendix B.

4.6.4 Parent Survey

An online survey using Qualtrics was advertised to women aged 25 to 44 years and who were parents, through Facebook from 28 May to 28 June 2018. The data collected was anonymous.

The advertisement received 288,626 total impressions and reached 35,024 individual persons. On average, each person saw the advertisement about eight times in total. The advertisement for the survey appeared on 35,024 Facebook timelines and 1,144 people clicked on the link to the survey (more than a 3% click-through conversion), but only 62 surveys were completed. This is about a 5% conversion rate, which is lower than the Facebook average of 9%.

The final sample comprised 62 surveys, 37 of which were from parents whose children had been screened by StEPS and relevant to the survey aims of exploring parent experiences and satisfaction with StEPS. Appendix B details the survey questions provided to respondents.

4.6.5 Eye Health Care Professional Interviews

Interviews were undertaken with orthoptic staff at StEPS Paediatric Ophthalmic Outpatient Clinics (POOC). There are in total five POOC clinics, all located within public hospitals in metropolitan Sydney; Bankstown Hospital, St George Hospital, Sydney Eye Hospital, Westmead Children's Hospital and Sydney Children's Hospital (Prince of Wales Hospital). In addition, there are two satellite clinics administered by one of the primary POOCs, located in Mt Druitt and Campbelltown. The orthoptic heads of department and other staff involved in the StEPS program were approached at each location and invited to participate in an interview to garner their opinions and experiences with StEPS. A total of nine orthoptic staff involved in coordination of the POOC and examination of children referred from StEPS consented and were interviewed, between one and three staff members from each of the five POOC clinics.

Interviews were structured around set questions designed to obtain information on the operational configuration of the clinics within the context of the hospital outpatient department, the number of referrals obtained and whether clinics were at or exceeding capacity to take referrals, the process for triaging, examining and managing referrals and comments about the strengths or areas for improvement of the StEPS program. Interview questions are contained in Appendix B. Common themes emerging were identified.

Further interviews were conducted with eye health care professionals involved in referral pathways from StEPS, namely optometrists and paediatric ophthalmologists. Contact lists of local optometrists who examine children referred from StEPS were provided by some StEPS coordinators. Other optometrists were also approached and invited to participate. Paediatric

ophthalmologists who receive referrals from the StEPS program both within hospital POOC clinics and in private ophthalmology practices were also invited to participate. A total of 15 interviews were conducted with eye health professionals across NSW and within both metropolitan and rural/regional areas. Interview questions are contained in Appendix B. Interviews were transcribed, with emerging themes identified and summarised.

4.7 Economic Evaluation

The economic evaluation focused on seven main questions in three key areas:

1. Costs
    a. What are the costs per annum involved in running the StEPS program at a state-wide and LHD level?
2. Base case cost-effectiveness analysis
    a. Do the benefits of the StEPS program justify the financial cost of the program?
    b. Is the StEPS program a good use of funds or are there more appropriate ways to spend the budget?
    c. Do the benefits for individuals outweigh the costs/harms of the program?
3. Scenario analysis - models of implementation
    a. Are different models more cost effective that others?
    b. Are different components of StEPS more cost effective than others?
    c. Which model of implementation is the most cost effective?

A Markov model was used to investigate a hypothetical cohort of four year-olds undergoing vision screening, using decision analysis software. A base-cost utility model synthesised data from this evaluation, the literature and expert opinion. Further detail of the economic evaluation is described in Appendix D.

4.7.1 Introduction to economic evaluation

The key purpose of economic evaluation is to inform decision-makers about the consequences and efficient allocation of health care resources. Economic evaluation is particularly important when a new initiative offers health benefits at additional costs, as is likely for screening programs. Within a constrained health care budget, determining the additional cost that would be paid for a given health gain is important when ascertaining whether such incremental costs represent value for money.

The rationale for the cost-effectiveness study reported here is that a screening program will lead to potential efficiency savings made through earlier diagnosis. In turn, this should be associated with improved health outcomes.

The usual approach to economic evaluation involves three steps:

1. a determination of the incremental effectiveness, which is measured as the additional benefits associated with the intervention relative to no intervention, which in this case is screening;
2. a determination of the incremental costs, that is, the difference in costs between screening and no screening; and

3. a determination of the incremental cost-effectiveness ratio (ICER), calculated using the following ratio:

$$ICER = \frac{Cost_{\,Screening} - Cost_{\,No\ screening}}{Effectiveness_{\,Screening} - Effectiveness_{\,No\ Screening}}$$

To allow comparison of effectiveness in one area with effectiveness in another, it is preferable for an economic evaluation to undertake a cost-utility analysis. A cost-utility analysis generates an ICER as described above using a generic outcome measure, defined as one which can be utilised in different areas of healthcare. A common generic outcome measure is the QALY. This is a measure of effectiveness which combines morbidity and mortality dimensions into one composite measure of outcome. Cost-utility analysis are the gold standard for economic evaluations in health care (Drummond et al. 2015).

Economic evaluation not only focuses on the expected cost and effects. It also measures the uncertainty in those values. For this reason, economic evaluation usually draws upon a range of data sources. For example, the effectiveness may be obtained from a randomised control trial (RCT), but other clinical outcomes, costs and health-related quality of life may be derived from other sources, such as surveys or cohort studies. Decision analytical models such as Markov models provide a method of bringing the different type of evidence together.

A review of the literature found a paucity of evidence on the cost-effectiveness of vision screening programs that were applicable to the StEPS model. Internationally, screening programs cover a range of ages (Rein et al. 2012), are staffed by a range of different providers (Konig et al. 2000; Rein et al. 2012; Schlichtherle et al. 2000) and employ alternative screening tools (Hopkins et al. 2013). There was very limited literature in the Australian setting.

4.7.2 Empirical approach

The first stage of the economic evaluation was to measure the costs of the program (Question 1a). A top-down approach is used, whereby a calculation of total expenditure for a given program is presented by the total units of activity (e.g. screened four year-olds), to derive a unit cost. This approach uses aggregate, budgetary data provided by the LHDs to estimate a unit cost per screening population. The advantage of this approach is that it provides a reliable, simple method of measuring the expenditure required to replicate the service as well as providing a straightforward per unit cost. The limitation of this approach is that top-down costing cannot be used to reliably forecast how costs might change due to improvements in outcomes. These calculated costs are used to inform the cost–utility analysis.

Section 5.6.2 focuses on the development of a base-case cost-utility model (Question 2a to Question 2c).The costs that are considered are the costs of implementing the StEPS program, and costs of detected and undetected eye diseases. The outcome of interest is QALY. The model used a health services perspective.

A scenario analysis is also developed to explore the models of implementation (Question 3a to Question 3c).The results from this process evaluation (Section 3.1 of the main report), showed that the model of StEPS implementation varied across LHDs in a number of areas: staffing configuration; catch-up clinics; referral pathways to POOC's clinics; outcome follow-up following referral; use of secondary screening and administration support. From these differences we identified potential drivers of cost-effectiveness that were measurable. To conduct this analysis,

the base-case model developed in Section 5.6.2 was modified to explore the following scenarios:

1. The additional benefits of catch-up clinics
2. The use of secondary screening using orthoptists
3. The availability of nursing staff vs non-nursing staff in screening
4. Follow up of those who screened positive.

Additionally, a societal perspective was considered, by including the reduction in productivity that occurs with untreated refractive error and blindness.

4.7.3 Data

Data for the analysis were obtained from several sources. The first source was LHDs, who provided detailed budget summaries and statistics on their eligible population. There were a total of 99,428 children who were eligible to be screened in 2017. Budget summaries were provided by seven of the 15 LHDs. An additional six LHDs completed self-reported cost summaries. The budget summaries formed the basis of the costing analysis (Question 1). The self-reported cost summaries were used to inform the models of implementation and served as a quality assurance measure to consider any costs that were incurred outside of the budget summaries[3].

The second source of data used to populate the model was the findings of the current StEPS evaluation (screening, referral and treatment rates). Data were also sourced from the Australian Bureau of Statistics (ABS) (2017) clinical literature, Medicare Benefits Schedule, NSW Health, the Federal Department of Health and expert opinion.

4.8 Ethics Approval

This evaluation received the following ethics approvals:

- UTS Human Research Ethics Committee (Reference number: ETH17-1592)
- Aboriginal Health and Medical Research Council Ethics Committee (Reference number: 1305/17)
- NSW Population and Health Services Research Ethics Committee (Reference number: HREC/17/CIPHS/32)
- Northern Sydney LHD Human Research Ethics Committee (Approval number: LNR/17/HAWKE/336).

Site specific approvals to conduct qualitative research with NSW Health staff were obtained from all LHDs where StEPS operates.

Surveys were conducted electronically and electronic consent was obtained. The data collected was anonymous. Written informed consent was obtained from all interview participants prior to interview.

[3] For example, some LHDs reported motor vehicle costs outside of the budget summaries, while others included it in their budget.

5 Results

The following sections outline results from the service model mapping; analysis of access, referral and outcomes data from StEPS; and survey and interview data on the experiences and perspectives of key stakeholders, as aligned to the objectives of the current evaluation.

5.1 Models of Implementation

This section of the report relates specifically to Objective 1 of the StEPS program evaluation:

Objective 1: To identify and describe different models of implementation and service components of the StEPS program at LHD level.

The StEPS program is centrally funded by the NSW Ministry of Health, but is delivered by LHDs through a devolved service model. The overall service requirements and procedures are guided by the StEPS Policy Directive[4] that outlines:

- Vision screening protocols including consent requirements, referral criteria and follow-up and reporting requirements;
- Requirements for targeting four year-old children, including disadvantaged children and children with special needs;
- The responsibilities of StEPS staff; and
- Training requirements for vision screeners.

Within these requirements LHDs have flexibility around how they deliver StEPS to meet the policy objectives.

Service-mapping workshops were conducted with StEPS Coordinators, StEPS primary and secondary screeners and administration officers across all 15 StEPS services, to determine the model by which StEPS was implemented in each location.

5.1.1 Overview of StEPS models

Table 2 presents a summary of the StEPS model of implementation within each LHD and detailed service maps are presented in Appendix A. Overall, there was substantial variation in the implementation of StEPS between LHDs, with respect to staffing, offering catch-up clinics, access to secondary screening and referral pathways utilised. However, the process for engaging preschools, conducting screening and following up on screening results were similar across all LHDs.

[4] NSW Ministry of Health 2012, *State-wide Eyesight Preschooler Screening (StEPS) Program Policy Directive.* [PD2018_015]

Table 2: Summary of StEPS models

LHDs with StEPS services	FTE StEPS Coordinator	Total FTE vision screeners	FTE vision screener per 1,000 four year-olds[5]	Vision screeners qualifications	Vision screener employ. status	FTE Orthoptist (StEPS funded)	Admin support (StEPS funded)	Test distance	Test used	Catch-up clinics offered	Access to secondary orthoptic screening	Refer to POOCs	Number of outcome follow up attempts
1	Approx. 0.15	Approx. 0.42	Unclear	RNs	Casual	0	No (provided as part of broader AWH general admin)	6m	Sheridan Gardiner	Yes	No	No	No limit but aim to discharge within 2 months of screening
2	No dedicated allocation (role delivered by Manager Children and Families)	1.3	0.30	RNs	Perm. PT	0	No (provided as part of broader Children and Families admin)	6m	HOTV since Jan 2017	Yes	Children unable to be screened (LHD funded)	No	2 phone attempts plus case review to seek alternative contact opportunities
3	No dedicated allocation (role delivered by Manager Child and Family Services)	0.6	2.0	Health Education Officer	Perm. PT	0	No	3m	HOTV since Jan 2017	Yes	No	No	Minimum of 2 phone calls and 2 letters
4	1.0	4.3	0.37	ENs	Perm. FT or PT	Contract for one clinic per month.	0.6	6m	HOTV since July 2016	Yes (Hunter Region only)	Children unable to be screened and all referrals	No	2 phone attempts and one other pathway if available (e.g. via preschool)
5	0.6	0.85	0.33	RNs	Casual	0.24	0.2	6m	HOTV since Jan 2016	Yes	Children unable to be screened and general referrals	No	4 or 5 phone attempts
6	0 (Coordinator role delivered by another LHD)	1.1	0.34	RNs or ENs	Casual (pool of approx. 30)	0	0.5 (delivered by another LHD)	6m	½ HOTV and ½ Sheridan Gardiner	Yes	No	No	No limit
7	0 (part of Nurse Manager Primary Care and Health role)	1.32	0.28	Technical assistants	Perm. PT	0	0.4	6m	HOTV since Jan 2017	Yes	Children unable to be screened (LHD funded)	HP referrals	Up to 3 phone attempts

Source: StEPS service mapping workshops 2018

[5] The number of four year-olds is based on population projections for the 2017 calendar year provided by the NSW Ministry of Health.

LHDs with StEPS services	FTE StEPS Coordinator	Total FTE vision screeners	FTE vision screener per 1,000 four year-olds[6]	Vision screeners qualifications	Vision screener employ. status	FTE Orthoptist (StEPS funded)	Admin support (StEPS funded)	Test distance	Test used	Catch-up clinics offered	Access to secondary orthoptic screening	Refer to POOCs	Number of outcome follow up attempts
8	0.6	Unclear	Unclear	RNs	Casual (pool of 10)	Unclear (casual)	0.4	6m	HOTV since May 2016	Yes	Children unable to be screened and all referrals	No	No limit – aim to discharge within 12 months of referral
9	1.0	2.86	0.27	RNs	Perm. PT	0	0.47	6m	HOTV since Oct 2016	Yes	No	HP referrals	2 phone attempts
10	1.0	3.26	0.21	Technical assistants	Perm. PT	0.68	1.0	6m	HOTV since Jan 2017	Yes	Children unable to be screened and all referrals	HP referrals	2 phone attempts + letter if HP referral
11	0.5	5.65	0.38	RNs and ENs	Perm. FT or PT	1.0	0.6	6m	HOTV since Mar 2017	Yes	Children unable to be screened and HP referrals	All referral given the option	3 phone attempts
12	0.5 (also coordinates another adjacent LHD)	0.7	0.26	RNs or ENs	Casual (pool of 15-20)	0	0.5 (1 FTE total but also another LHD)	6m	HOTV since Jul 2017	Yes	No	No	No limit
13	0 (part of Nurse Manager Child and Family Health role)	1.58	0.21	RNs	Perm. PT	0	0.24 (receive an additional 0.26 FTE funded from other programs)	6m	HOTV since Jan 2017	No (will offer from 2018)	Children unable to be screened and HP referrals (LHD funded)	Children unable to be screened and HP referrals	2 attempts for HP only (1 phone and 1 letter). General referrals rarely followed up
14	1.0	2.4	0.67	Aboriginal Health Workers and Technical Assistants	Perm. PT	0	0.4	3m	Sheridan Gardiner (HOTV from Jan 2018)	No	No	No	3 attempts (seek consent to follow up with eye health professional)
15	1.0	3	0.21	RNs and ENs	Casual (pool of 8)	0	0.84	6m	HOTV since Jul 2016	Yes	Children unable to be screened (funded in kind by RIDBC)	Children unable to be screened and HP referrals	Up to 6 or 7 – phone, SMS, email and letter

[6] The number of four year-olds is based on population projections for the 2017 calendar year provided by the NSW Ministry of Health.

5.1.2 Staffing configuration

StEPS coordinators

In 10 of the 15 LHDs with StEPS services, there was a dedicated coordinator for StEPS (Table 2). In six LHDs, the coordinator was employed full-time, and was part-time in another four. In the five remaining LHDs, coordination was delivered by managers as part of a broad portfolio of child and family health services and programs. Where StEPS did not have a dedicated coordinator, greater responsibility was placed on screeners for follow up of referrals and data entry. The majority of coordinators had nursing qualifications and one was qualified as an orthoptist.

Administrative staff

In 12 of 15 LHDs, the StEPS program had dedicated administrative staff to assist with booking preschools, registering children in electronic medical record (EMR) systems, scanning and uploading consent forms and following up of outcomes. Two of the remaining three services received administrative support from a broader pool of staff employed within the LHD.

Vision screening staff

There was variation in the number, employment status and qualifications of vision screening staff across LHDs. Based on 2017 population projections of four year-olds per LHD,[7] the number of vision screeners varied from 0.21 to two FTE per 1,000 children eligible for screening by StEPS. Excluding two services where the number of screening staff was unclear and one outlier with the highest ratio of screening staff, the average was 0.32 FTE vision screeners per 1,000 four year-old children.

Generally, there were a greater number of screening staff in rural and regional LHDs, likely related to geographical spread of preschool and childcare services and the necessity for travel. The LHD with the highest ratio of screening staff (2.0 FTE per 1,000 four year-olds) had no administrative support and screening staff are responsible for delivering all aspects of StEPS.

The majority of StEPS services (n=11) employed screening staff with nursing qualifications (EN or RN). While, in the remaining four LHDs, screeners were technical assistants with a previous experience such as health education officers, Aboriginal health workers or early childhood workers. In nine StEPS services, screening staff were employed in a permanent part-time or full-time capacity, and in six LHDs, they were casually employed (Table 3).

Table 3: Screening staff qualifications and employment status by LHD

		Qualification		
		Registered or enrolled nurses	Technical assistance or other non-nursing staff	Total
Employment Status	Permanent part-time or full-time	5	4	9
	Casual	6	-	6
	Total	11	4	15

[7] The number of four year-olds is based on population projections for the 2017 calendar year provided by the NSW Ministry of Health.

In LHDs where casual screening staff were employed, the number of vision screening staff was considerably higher. This was, in particular, for non-metropolitan services with screening staff strategically located across the LHD to minimise travel requirements. In all but one LHD, the pool of casual screeners had been fairly stable over a number of years. StEPS staff commented during service mapping workshops that the decision to employ casual screeners was to lower costs during school holidays when no screening occurs. In LHDs with permanent screening staff, it was reported that screeners often use downtime and holiday periods to catch up on data entry, begin preparations for the following year or take annual leave.

Orthoptists

Five LHDs allocate funding from StEPS to employ or contract either a full-time or part-time orthoptist. However, secondary orthoptic screening is available in four other LHDs. In three of these, an orthoptist who is employed through another service within the LHD, provides secondary StEPS screening. In one LHD, secondary screening is provided in kind by an external organisation and although this arrangement has been in place for some years, it is unclear if there is a formal service agreement in place.

5.1.3 Engagement of preschools, childcare centres and parents

The process for engaging preschools, childcare centres and other children's services were similar for most StEPS services. Preschools are contacted to confirm interest in participating in the program in either Term One, or Term Four of the preceding year. In general, preschools and children's services are booked in at the same time each year.

One to two months prior to the booking, preschools are often contacted again to confirm and are then asked to indicate the number of four year-olds enrolled. Service mapping in all LHDs indicated that these numbers are rarely accurate and are often overestimated. Hard copies of StEPS information, promotional material and consent forms are subsequently posted to preschools, to be distributed to parents/carers. It is then the responsibility of preschools to arrange consent. One to two weeks prior to the booking, preschools are again contacted to confirm the number of children for whom consent has been received. However, service mapping revealed that preschool staff and vision screeners frequently resort to obtaining written or verbal consent from parents on the day of screening.

The main difference between LHDs in the way StEPS services engage preschools is around the role of the StEPS Coordinator, vision screeners and administration staff in this process. In eight LHDs, administration officers are responsible for the majority of liaison and logistics around bookings and distributing information and consent packs. In six of these services, final confirmation of the booking and number of children for whom consent has been received is made by screening staff. In five LHDs, vision screeners handle the entire booking process while in two LHDs, StEPS Coordinators arrange all booking details. These two LHDs have minimal administration support and only casual screeners. In one LHD, orthoptic staff handle booking arrangements for a small number of preschools catering for children with special needs and where the orthoptist conducts the StEPS screening.

Smaller preschools are in most cases offered screening on one day, while, larger preschools are offered screening on multiple days to provide greater access. In some LHDs, larger preschools are also offered a second booking later in the year for children who were three years old at the time of the first screening, not enrolled in preschool at the time of first screening or were absent.

5.1.4 Vision screening procedures and processes

The screening test

In 2016, StEPS transitioned from screening vision with the Sheridan Gardiner chart, to using the HOTV LogMAR vision chart. Most LHDs transitioned to HOTV LogMAR chart at the start of 2017, although some transitioned mid-2016. As of the start of 2018, all but two StEPS services will use HOTV LogMAR chart. In one LHD, all vision screeners will continue to use Sheridan Gardiner charts in 2018, while in one other screeners will continue to transition throughout 2018.

Feedback from screening staff on the change in vision chart was largely positive, with a major positive that the HOTV LogMAR chart is easier for children to engage with. StEPS Coordinators and vision screeners cited this as a reason for a reduction in the number of children unable to be screened. However, there was concern raised about the addition of a 6/15 line on the HOTV LogMAR chart. Using the Sheridan Gardiner test that had a line of 6/12 optotypes with a 6/18 line immediately above, children with visual acuity worse than 6/12 who would have potentially only been able to read the 6/18 line, were considered a high priority referral. There was concern amongst some StEPS staff that the insertion of a 6/15 line on HOTV LogMAR charts could possibly increase the number of false negative high priority referrals. Whether there is an impact of HOTV LogMAR chart on referral patterns will become clearer as StEPS activity data from 2017 onwards becomes available.

Screening environment

Thirteen StEPS services primarily use a test distance of six metres, only occasionally using a three metre distance. The remaining two services favour screening at three metres, citing space constraints in most of the preschools they attend. Screeners using a six metre distance expressed that they do not have to compromise the quality of the screening environment to find an appropriate six metre space. Overall, it was reported that it is rare that preschools do not make a suitable space available, such that vision screeners may refuse to screen. The requirements for a screening space are clearly articulated in the information sent to preschools by all StEPS services. In addition, the majority of preschools have hosted StEPS on multiple occasions and have established acceptable spaces for screening.

Where less ideal screening environments were provided, this was mostly due to noise or lack of privacy. Some StEPS staff also commented that occasionally screening is conducted outside on a verandah or balcony to facilitate the test distance. As this is not recorded, it is unclear whether screening in suboptimal environments impacts screening accuracy, however, it is likely it would, especially where children may be distracted by excessive noise distracts or there is high glare.

Catch-up clinics

The majority (85%) of StEPS services offer catch-up or absentee clinics at community health centres for children absent from preschool on the day/s of screening. Catch-up clinics are also offered to four year-old children who attend family day care. One LHD will begin offering catch-up clinics in 2018, although children who were absent from screening were previously offered an appointment with an orthoptist.

Screening in 12 of the 13 catch-up clinics was undertaken by StEPS screeners. In one LHD, catch-up clinics have previously been conducted by an orthoptist, but will shift to StEPS screeners from 2018. The frequency and location of catch-up clinics vary between LHDs, but most follow the schedule of screening across the year. Catch-up clinics are often run during the

school holiday period. Only one LHD offers catch-up clinics on weekends despite this intuitively being the most convenient time for parents/carers to attend.

Appointments are required in nine of 13 LHDs, while the other four accept 'drop-ins'. It was noted that the number of children attending catch-up clinics in these four LHDs is unpredictable, although non-attendance for bookings at the other LHDs was described by staff as being relatively common. In most LHDs, children also have the opportunity to have their vision screened as part of four year-old health checks if they were not screened as part of StEPS. This data is provided to StEPS coordinators.

Secondary screening

Nine of the 15 StEPS services have access to secondary screening by an orthoptist. While, all but one metropolitan Sydney LHD has access to secondary screening, five of the six StEPS services without access are located in rural and regional LHDs. One rural/regional LHD offers secondary screening but, clinics are only available in the major urban centre and are inaccessible by children in large parts of the LHD.

The use of secondary screening varies between LHDs. In three of the four LHDs where access to secondary screening is funded outside of StEPS, only children who were unable to be screened by a vision screener (e.g. due to disability or behaviour) are offered secondary screening. High priority referrals are additionally offered secondary screening in the fourth of these LHDs. In the five LHDs where secondary orthoptic screening is delivered by a StEPS-funded orthoptist, children who were unable to be screened, high priority and in some LHDs, also routine referrals are offered secondary screening.

5.1.5 Referral pathways

Variation in referral pathways can be broadly categorised into Sydney or non-Sydney. StEPS services operating in Sydney LHDs have the option of referring children to POOCs, optometrists or private ophthalmologists via a general practitioner. However, in rural and regional LHDs, the majority of referrals including high priority referrals, are to an optometrist or general practitioner due to limited local availability of POOCs or private paediatric ophthalmology. Although, some regional centres have access to a private ophthalmologist or community outreach ophthalmology service. It was reported in two LHDs that high priority referrals from locations close to an interstate border are occasionally referredinterstate.

Most Sydney LHDs offer referral to POOCs to high priority referrals, while the families of most routine referrals are advised to take their children to an optometrist for further assessment. Only one Sydney-based StEPS service reported offering general referrals a POOCs referral. This pattern of POOCs referrals does not necessarily reflect the referral criteria of nearby POOCs. For example, POOCs at Sydney Eye Hospital, Sydney Children's Hospital Randwick and St George Eye Clinic accept both high priority and general referrals (for an orthoptic appointment). Despite this the StEPS services that refer to these POOCs only offer this service to children who are high priority referrals.

5.1.6 Follow up of referral outcomes

All StEPS Coordinators commented that follow up of outcomes is the greatest challenge for their service. It was estimated by StEPS staff that less than half of all results notification slips are returned from eye health professionals. It was reported that results are always returned from POOCs and often from private ophthalmologists, but less frequently from optometrists. Due to the low return rate, StEPS Coordinators and/or vision screeners are often required to follow up

with parents/carers to either obtain a verbal result or consent to follow up the result with the eye health professional their child attended.

The StEPS Policy Directive stipulates a minimum of two follow-up attempts with parents or carers. All StEPS services are complying with this but many are exceeding this with a combination of phone, SMS, email and letter correspondence. One StEPS service also includes a self-addressed stamped envelope with the referral letter they leave for parents/carers after screening. StEPS staff in this service believe that this has increased the percentage of results notification slips returned, although this has not been measured.

5.2 Access to StEPS

This section of the report relates specifically to Objective 2 of the StEPS program evaluation:

Objective 2: To examine access to StEPS at state-wide and LHD level and within key population groups, and how this relates to different models of implementation.

The StEPS activity data reported as quarterly by StEPS coordinators from the 2009 to 2016 calendar years was used for this analysis. Data for 2008 was excluded, as only six months of activity data was available and StEPS operates according to the preschool year. Data for 2017 was not available for this report. Access rates have been estimated based on projections of the number of four year-old children in NSW provided by the NSW Ministry of Health.

5.2.1 The number of children offered screening

From January 2009 to December 2016, 719,686 four year-old children were offered screening by StEPS. This is 96.4% of all estimated four year-old children over that period.[8] 97.6% and 93.4% were offered screening in metropolitan and rural and regional LHDs, respectively. This aligns with the high preschool attendance rates in NSW (CESE 2016).

Although offers are based on verbal estimates of enrollments from preschools and the number of consent forms distributed, these figures suggest that StEPS is providing the opportunity for most four year-olds in NSW to have their vision screened. This supports the effectiveness of the preschool-dependent delivery model, especially in consideration of national early childhood education policy that encourages preschool attendance in the year before school.

Of children offered screening from 2009 to 2016, 84% of parents/carers accepted the offer. Acceptance was higher in rural and regional LHDs (88.4%) compared to metropolitan LHDs (82.2%) and has been stable over time. Overall, 80.9% of estimated four year-olds were provided consent to be screened (80.3% in metropolitan LHDs and 82.5% in rural and regional LHDs).

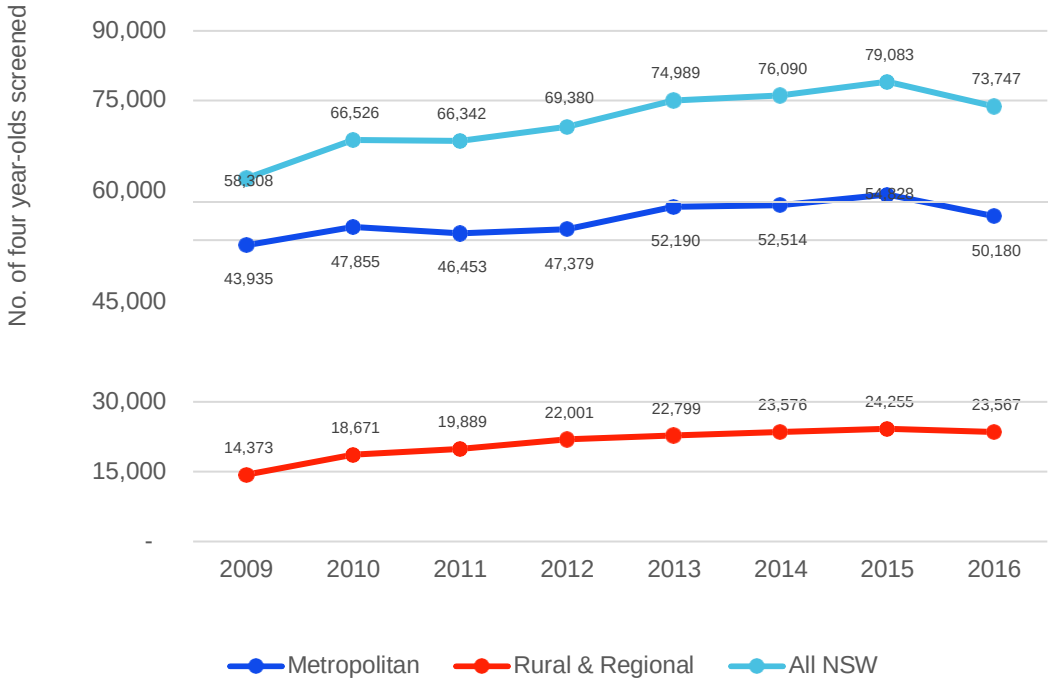
Only 2.7% of parents/carers declined consent for their children to be screened (1.2% due to previous screening and 2.5% for 'other' reasons). A bigger challenge is that 13.3% of parents/carers did not return consent forms.

5.2.2 The number of children screened by StEPS

Between 2009 and 2016, StEPS screened a total of 564,825 children, 75.6% of estimated four year-olds. The number of children screened increased over time across both metropolitan and regional and remote NSW (Figure 2). This upward trend is aligned with both an increase in the number of four year-old children in NSW over this period and an increase in children enrolled in preschool in the year before school.[9] There was a decrease in the number of children screened in 2016, primarily in metropolitan locations, although without 2017-2018 data available, it is unclear if this is the beginning of a downward trend.

[8] Source: StEPS activity data and population projections provided by the NSW Ministry of Health.
[9] Australian Bureau of Statistics 2017, Preschool Education Australia *(ABS Cat. No. 4240).*

Figure 2: The number of children screened by StEPS



The screening rate across NSW increased by 7.2%, from 67.3% to 74.5% between 2009 and 2016, however, this trend was not statistically significant (t=2.522; p=.052, Figure 3). While, the screening rate increased by 28% in rural and regional LHDs with a significant upward trend over time (t=4.594; p=.004), it remained stable in metropolitan LHDs with only a slight decrease of 1.3% (t=.501; p=0.638).

Screening rates across both metropolitan and rural and regional LHDs decreased in 2016, such that the overall screening rate was 5.5% below the 80% target rate. However, it is unclear if this is the beginning of a downward trend. If 2016 data is excluded, there has been a significant increase in the screening rate across all NSW (t=5.506; p=.003) and rural and regional LHDs (t=6.160; p=.002), but still not metropolitan LHDs (t=2.284; p=.071).

The 80% target screening rate has been met twice across all NSW (Figure 3). The target has never been met across metropolitan LHDs, although was above 75% between 2013 and 2015. The target was met five consecutive years from 2012 to 2016 in rural and regional LHDs.

Figure 4 examines this by individual LHD. The 80% target rate was met by an average of 40% of LHDs across all years. In all years except 2014 and 2015, fewer LHDs reached the 80% target than met the target. Only one LHD consistently met the 80% target across all years and, it was reached in seven of eight years by another LHD. The 80% target was met half the time in 50% (n=3) of metropolitan and 50% (n=3) of rural and regional LHDs (6 in total).

Figure 3: The percentage of total predicted four year-old children screened by StEPS

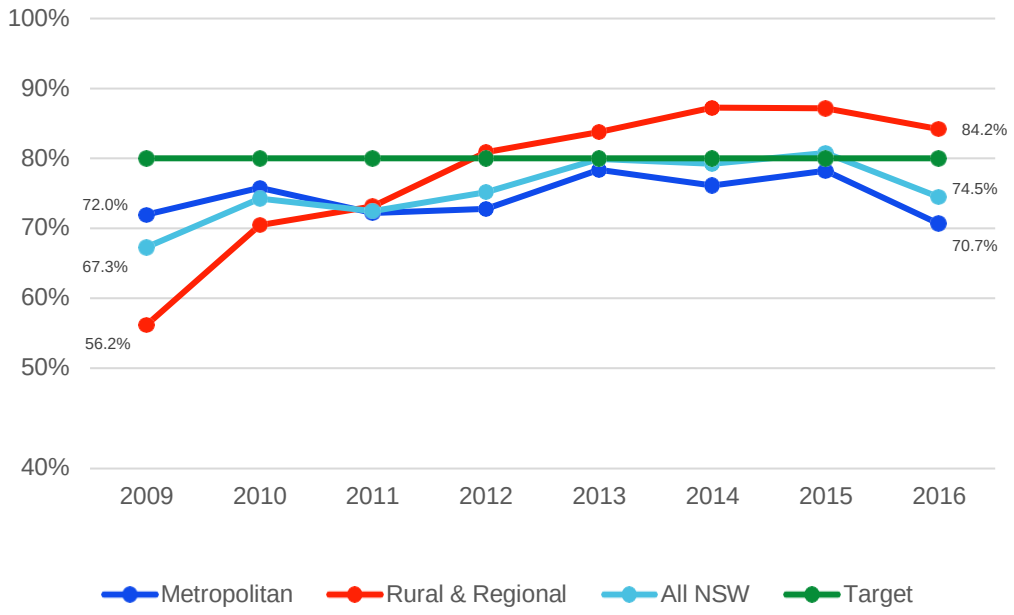
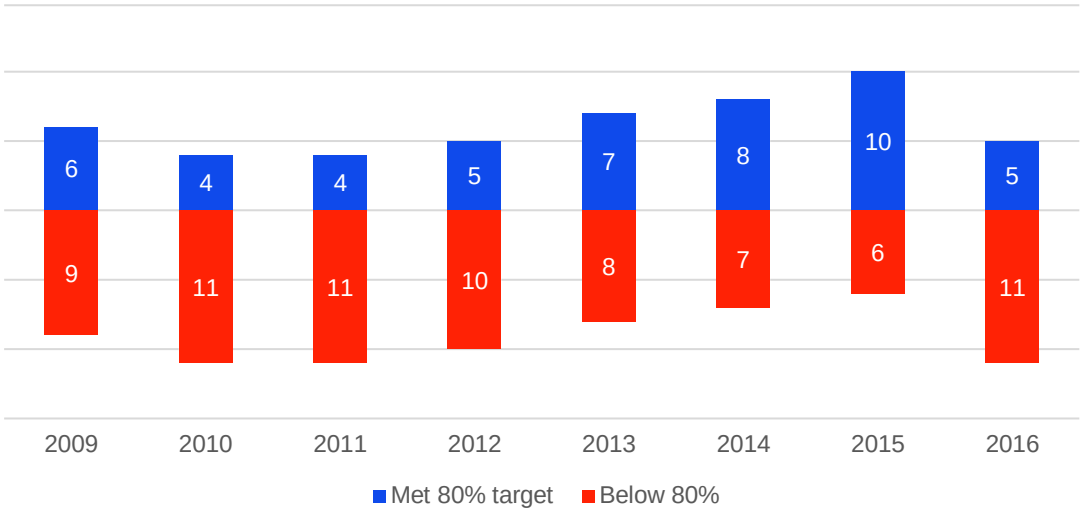


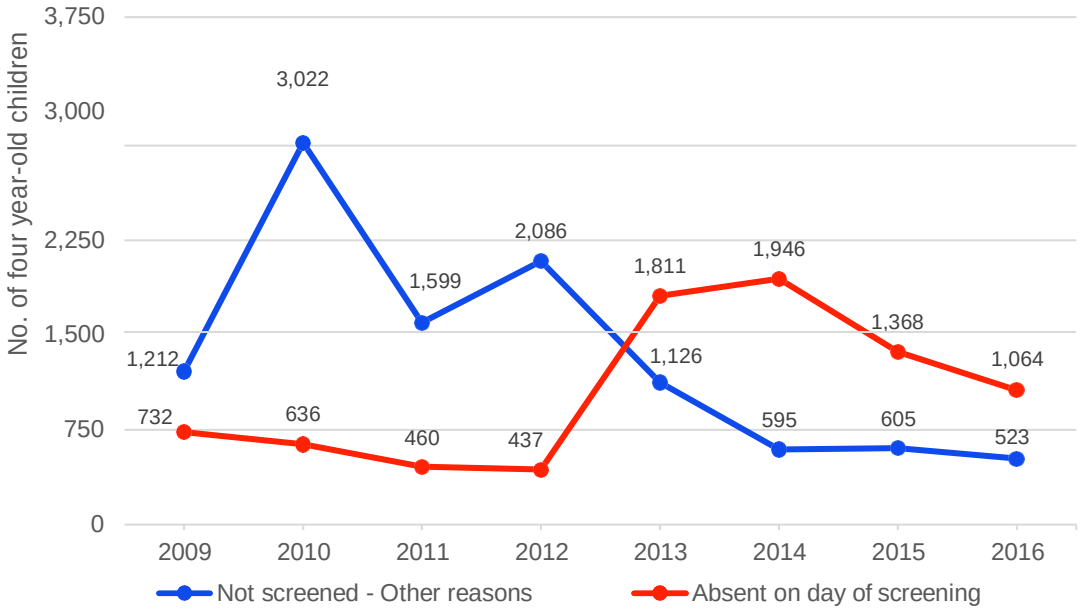
Figure 4: Number of LHDs that met 80% target screening rate



Note: Albury Wodonga Health is included from 2015 and 2016.

For children who were given consent, 6.3% were not screened because they were absent on the day of screening (n=37,831). A further 0.3% were not screened for other reasons (n=2,037). The number of children absent increased sharply in 2013 but, declined after 2014, and the number of children not screened for other reasons declined after 2012 (Figure 5). This is presumably due to national and NSW early childhood and preschool policy that encourages at least 20 hours of preschool participation per week in the year before school.

Figure 5: Number of children not screened for whom consent was received



5.2.3 Access to StEPS by Aboriginal children

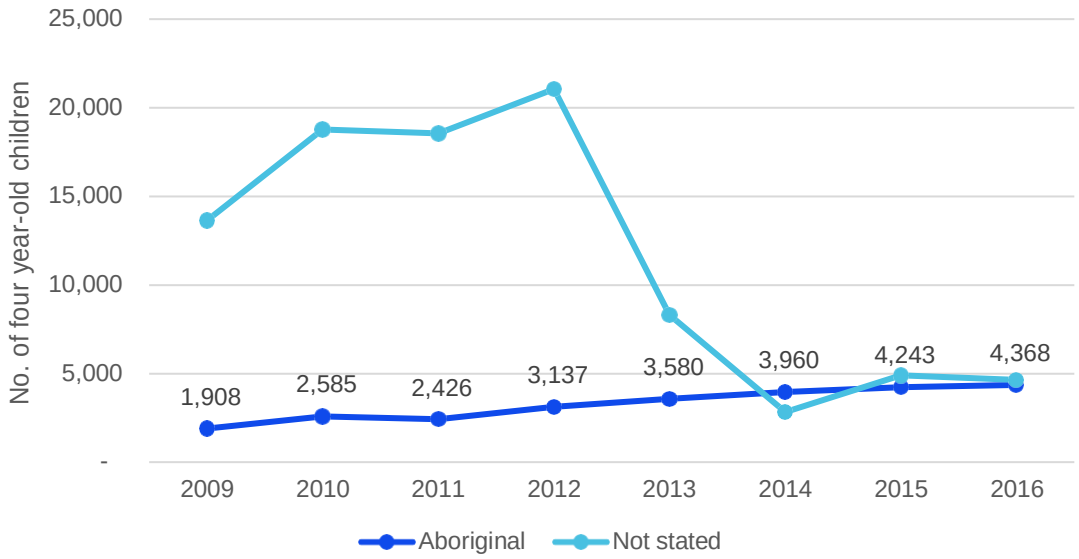
Figure 6 shows that the number of Aboriginal children screened by StEPS steadily increased over time to be more than double in 2016 compared to 2009. A total of 26,207 Aboriginal children were screened by StEPS over this period.

From 2012 to 2014, the rate of StEPS recording of Aboriginal status has increased. It is likely that the increase in access by Aboriginal children mainly reflects increasing enrolment of Aboriginal children in preschool.[10]

It is not possible to determine the screening rate of Aboriginal children by StEPS because population projections of the number of Aboriginal four year-old children are not available. Importantly though, the screening rate has been steadily increasing.

[10] Australian Bureau of Statistics 2017, Preschool Education Australia *(ABS Cat. No. 4240)*.

Figure 6: The number of Aboriginal children screened by StEPS



5.2.4 Factors influencing StEPS screening rates

To determine the factors that impact screening rate, a random-effects panel model analysis was undertaken (refer to Appendix C for further technical details). Factors were derived from StEPS activity data and models of implementation.

Table 4 outlines the results with additional results provided in Appendix C. In summary, the availability of catch-up clinics had the greatest impact on screening rates, increasing the screening rate by 19.3%, holding all other variables constant. As expected, an increase in the rate of acceptance (i.e. returned consent) increased the screening rate while, non-screening due to absenteeism and 'other reasons' decreased the screening rate. The staffing configuration and number of four year-olds residing in an LHD had no significant impact on the screening rate.

Table 4: Summary of random effects panel data modelling for StEPS screening rates

	Screening rate increase or decrease	Significance (p-value)
Rate of acceptance of screening offer	1.3%*	.001
Rate of absenteeism of day of screening	-1.3%*	.007
Rate of children not screened for other reasons	-4.0%*	.012
Availability of catch-up clinics	19.3%*	.047

*Note: * indicates that the parameter estimate is statistically significant at the 5% significance level. The parameter estimates have been converted to changes in attendance rate using the calculation provided in Appendix C.*

5.3 Referrals

This section of the report relates specifically to Objective 3 of the StEPS program evaluation:

Objective 3: To examine the effectiveness and appropriateness of referral pathways, including cost and time to access diagnostic and treatment services.

StEPS activity data from 2009 to 2016 was used to investigate referrals patterns and how these were influenced by models of StEPS implementation.

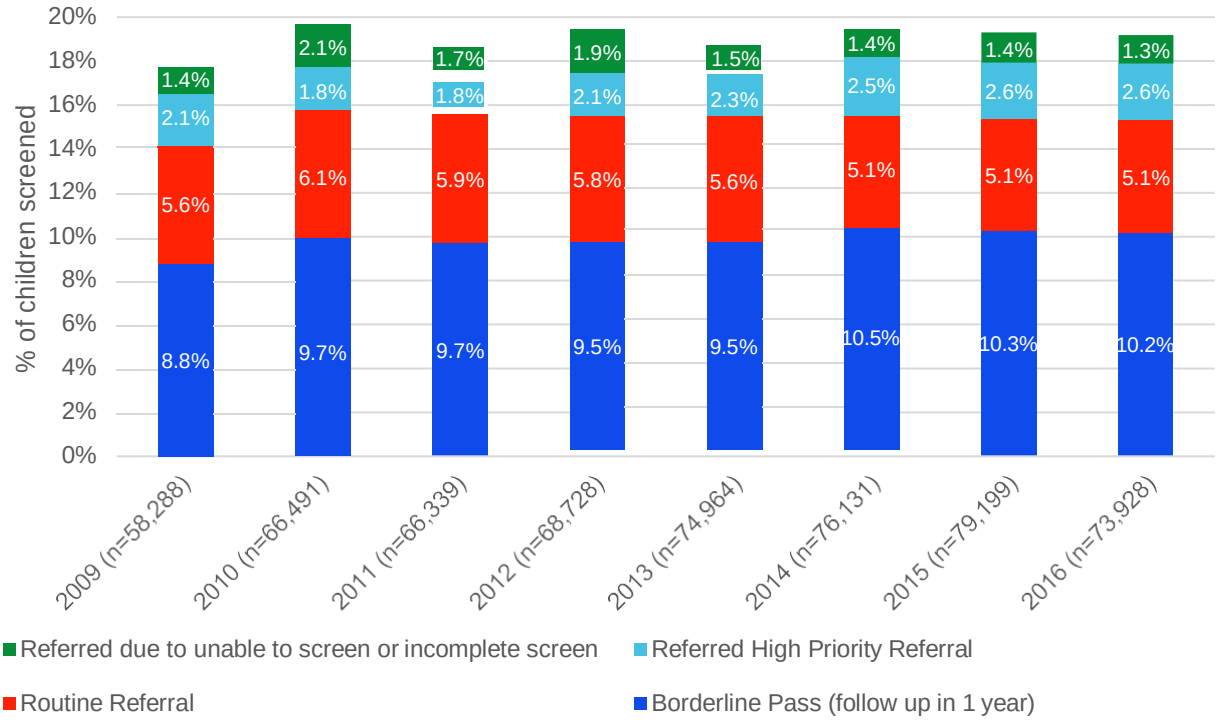
5.3.1 Referrals to eye health professionals from StEPS

From 2009 to 2016, 81.1% of children who were screened by StEPS passed with a visual acuity of 6/9 or better. This largely remained steady each calendar year.

Figure 7 shows that from 2009 to 2016, the percentage of children screened who achieved either a borderline pass or were referred also had little fluctuation. Overall from 2009 to 2016, a total of 564,068 children were screened by StEPS, and 53,169 were immediately referred to an eye health professional. A further 55,214 achieved a borderline pass on vision screening, giving 108,419 children (19.2%) who did not attain 6/9 vision or better at screening. The numbers of children referred by category of referral are as follows:

- 31,015 scored less than 6/9-2 but better than 6/18 in one or both eyes and were routinely referred to their general practitioner or eye health professional for further vision assessment (58.3% of total immediate referrals and 5.5% of children screened)
- 13,246 children were classified as high priority referrals (i.e. visual acuity of 6/18 or below) (24.9% of total immediate referrals and 2.3% of children screened)
- 8,908 were referred as they were unable to be screened or were incompletely screened (16.8% of total immediate referrals or 1.6% of children screened)
- 55,214 children (9.8% of all children screened) received a ‘borderline’ pass, with parents/carers advised to have their child’s eyes re-tested by a general practitioner or eye health professional in 12 months.

Figure 7: StEPS referral categories between 2009 and 2016



Note: (n=) represents the total number of children screened that year.

A comparison of referral rates between metropolitan and rural and regional LHDs revealed that:

- Between 2009 and 2016, there was little difference in high priority (0 to +0.7 percentage points) and routine (+1.0 to -1.2 percentage points) referral rates between metropolitan and rural and regional LHDs (-0.7 to 1.0 percentage points).

- However, on average 2.7% more children were assessed as a borderline pass in metropolitan LHDs compared to rural and regional LHDs. In line with this, on average, 2.6% fewer children passed vision screening in metropolitan LHDs compared to rural and regional LHDs.

5.3.2 Factors influencing StEPS referral rates

Analysis of the raw data revealed substantial variation in referral rates between individual LHDs. Therefore, a random effects panel regression analysis was undertaken to identify factors that are significantly associated with referral rates. Detailed model specifications and results can be found at Appendix C. Table 5 summarises the findings as follows:

- The referral rate was significantly lower in LHDs that employ vision screeners on a permanent rather than casual basis (-3.2%), for both routine referral (-2.0%) and unable to be screened referrals (-1.1%). Employment status was not significantly associated with the rate of high priority referrals. From 2009 to 2016 this equates to permanently employed screeners making 18,130 fewer referrals than casual screeners assuming all else is equal between LHDs and models of implementation.

- Referral rates were not significantly associated with whether vision screeners had nursing qualifications or not. Nor was the ratio of vision screeners (FTE) to the projected number of four year-olds.

- The availability in some LHDs of secondary orthoptic screening for children who were unable to be tested by the primary screeners, was significantly associated with lower rates of routine referral (-0.8%) and borderline passes (-3.9%) in those LHDs. However, due to a probable propensity to send children 'unable to be screened' to secondary screening, an LHD with secondary screening was significantly associated with a higher rate of children unable to be screened (+1.5%), coupled with an overall higher rate of referral (+2.0%). How secondary screening affects referral is difficult to definitively determine without categorisation for StEPS activity reporting both before and after secondary screening. Nor is it possible to determine if there is a greater tendency to complete primary screening for some 'difficult to screen' children, in the absence of secondary screening.

- In LHDs with secondary screening available for children initially assessed as high priority referrals, there was a significantly increased rate of routine referrals (+1.5%). This suggests that the secondary screening is able to more definitively determine the category of referral in some cases.

- Secondary screening for cases of routine referral was significantly associated with a lower rate of high priority referrals (-1.9%) in those LHDs with the service, but had no impact on the rate of routine referrals themselves. This could reflect a tendency for some screeners to refer children with visual acuity only marginally better than the cutoff of 6/18, along a high priority pathway when secondary screening is not available.

- Metropolitan LHDs were significantly associated with a higher rate of borderline passes (+6.9%). The reason is unclear but it could reflect better quality screening environments. Service mapping suggested that overall it is easier to find a suitable place for screening in metropolitan preschools compared to rural and regional preschools. Lack of easy access to referral services and the associated costs in rural areas, may also cause screeners in rural and regional LHDs to make a more final determination of visual level at the time of screening.

- It was not possible to test the impact of referring to POOCs clinics on overall referrals as high collinearity with being in a metropolitan LHD resulted in that variable being omitted from the model.

Table 5: Summary of random effects panel data modelling for StEPS referral rates

	Total referrals	Routine referrals	High priority referrals	Unable to be screened	Borderline pass
Number of four year-olds in LHD	<0.001%	<0.001%	<0.001%	<0.001%	<0.001%
Metropolitan c.f. rural and regional	-0.5%	0. 8%	-0.9%	0.3%	6.9%*
FTE screeners (per 10,000 four year-olds)	1.4%	0.4%	0.4%	0.4%	0.4%
Vision screeners nurses c.f. non-nurses	-1.4%	-0.1%	-0.4%	-0.4%	2.0%
Vision screeners permanent c.f. casual	-3.2%*	-2.0%*	-0.2%	-1.1%*	-1.4%
Catch-up clinics available	1.4%	0.1%	1.0%	-0.5%	-1.8%
Secondary screening offered for children 'unable to be screened'	2.0%*	-0.8%*	0.9%	1.5%*	-3.9%*
Secondary screening offered for high priority referrals	2.3%	1.5%*	0.7%	N/A	0.7%
Secondary screening offered for routine referral	-2.2%	0.5%	-1.9%*	N/A	3.0%

*Note: * indicates that the parameter estimate is statistically significant at the 5% significance level. The parameter estimates have been converted to changes in attendance rate using the calculation provided in Appendix C.*

5.4 Referral outcomes

This section addresses Objective 4 of the StEPS program evaluation:

Objective 4: Investigate the extent to which StEPS is achieving optimal results in screening and referral outcomes, both at state-wide level and by different models of implementation.

Referral outcomes were analysed using StEPS referral outcome data collected from September 2013 to December 2016. Records were available for 22,591 referrals.

5.4.1 Loss to follow-up

Following up on the outcomes of referrals is important for determining the accuracy and the effectiveness of StEPS screening. Table 6 shows the referral outcomes reported between September 2013 and December 2016. Overall, 11.3% of referrals were reported as 'lost to follow-up', that is the family was unable to be contacted or an outcome could not be ascertained due to lack of reporting from the eye care practitioner. This was highest for children referred because they were 'unable to be screened' (13.5%), followed by referrals for further assessment (11.5%), and lowest for high priority referrals (9.3%). Rates of loss to follow-up by individual LHDs showed significant variation, ranging from 1.2% to 23.5%.

The lower rate of loss to follow-up for high priority referrals relative to other referrals presumably reflects their greater referral to either POOCs or private ophthalmologists in some LHDs. StEPS staff reported a high rate of results notification by POOCs during service mapping workshops, and commonly reported greater effort following up on high priority referrals. It was also reported in all LHDs that it is a challenge receiving results notifications from optometrists where the majority of routine referrals are directed.

Table 6 also shows that loss to follow-up is a bigger challenge across rural and regional LHDs (15.5%) compared to metropolitan LHDs (9.0%). While there are no obvious service characteristics including the staffing configuration that were associated with the rate of loss to follow-up, five of eight LHDs with less than 10% loss to follow-up are in a metropolitan LHDs, while four of seven LHDs that recorded more than 14% loss to follow-up were in rural and regional LHDs.

Table 6: Rate of loss to follow-up for StEPS referrals between rural/regional and metropolitan LHDs

	Routine referrals	High Priority Referrals	'Unable to be screened' referrals	Total referrals
Rural & Regional (n=7,898)	16.0% (n=5,029)	11.2% (n=1,796)	20.6% (n=1,073)	15.5%
Metropolitan (n=14,693)	8.8% (n=8,108)	8.5% (n=4,168)	10.5% (n=2,417)	9.0%
Total (n=22,591)	11.5% (n=13,137)	9.3% (n=5,964)	13.5% (n=3,490)	11.3%

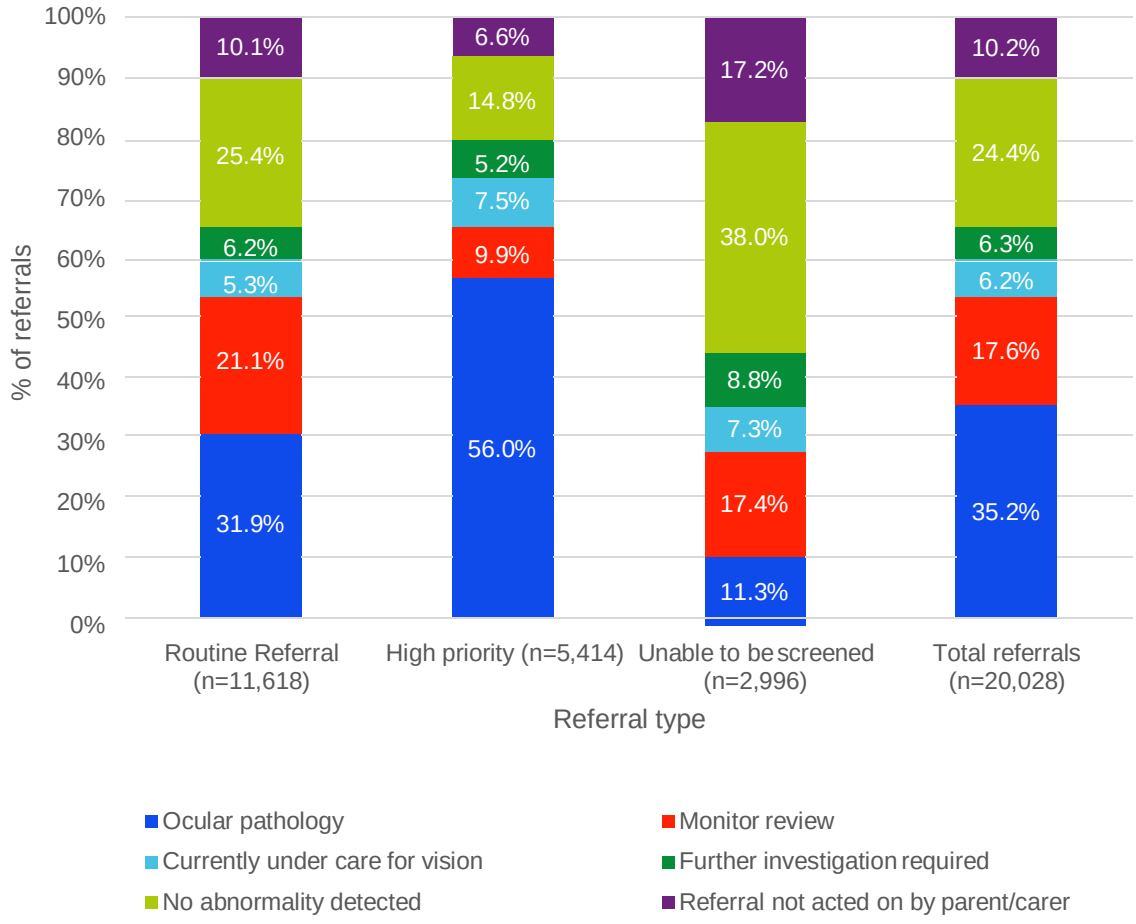
StEPS service mapping did not reveal any processes that might be associated with the rate of loss to follow-up. The modes of contact with parents/carers and the amount of effort dedicated to following up was similar for services with high and low rates of loss to follow-up.

The findings suggest that the rate of loss to follow-up may be due to a combination of the rate of return of results notification slips from eye health professionals, and challenges contacting parents/carers for results. It is also possible that a proportion of those lost to follow-up have not acted on referrals. This may contribute particularly to the higher rates of loss to follow-up in rural and regional areas. Given the effort StEPS services go to following up parents/carers, a better process to encourage results notification from eye health professionals would have a positive impact on the volume (and accuracy) of results notification and workload of StEPS staff.

5.4.2 Referral outcomes

The referral outcomes are reported from September 2013 and December 2016. Note that children who were lost to follow-up were excluded from the analysis, with 9,454 records available for analysis. Figure 8 below describes this analysis.

Figure 8: StEPS referral outcomes



Note: Excludes children lost to follow-up.

Approximately 10% of parents/carers did not act on a referral from StEPS. Importantly this is lowest for high priority referrals (6.6%). However, 17.2% of parents/carers of 'unable to be screened' referrals did not act on the recommendation to attend an eye care practitioner. In rural and regional LHDs, 15.5% of referrals were not acted on compared to 9% in metropolitan LHDs. For high priority referrals, 10.9% were not acted on in rural and regional LHDs compared

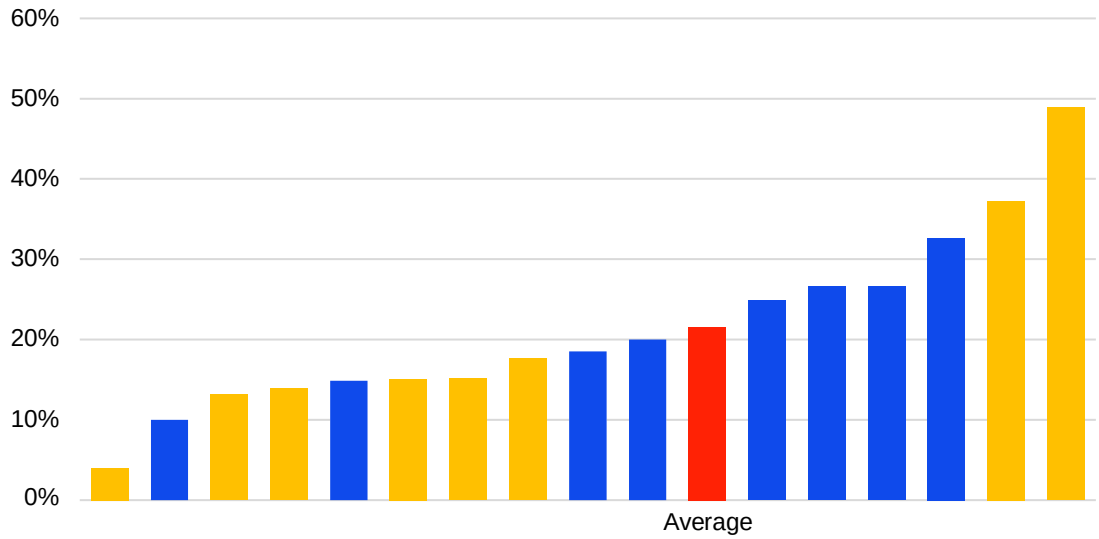
to 4.9% in metropolitan LHDs.

Excluding the children lost to follow-up and those whose referral was not acted upon, 17,710 children attended an eye practitioner and had their ocular status reported. Previously undetected ocular pathology was identified in 39.2% (6948 children), 19.6% were assigned to be monitored and reviewed, 7.0% required further investigation and 6.9% were currently under care. This indicates that 72.7% of children referred from StEPS received some form of eye care, including 65.8% (5,725 children) who had previously been without eye care. The combined percentage of true positives was higher for high priority referrals (84.2%) than routine referrals (71.8%) and was just over half (54.0%) of the children who had been unable to be assessed in StEPS.

No abnormality was detected for 15.8% of high priority referrals, 28.2% of routine referrals, and 46.0% of children referred because they were unable to be screened. This indicates a higher positive predictive value (PPV) of screening (i.e. fewer false positives) as visual acuity decreases. It is not possible to determine the negative predictive value, specificity or sensitivity of StEPS screening from StEPS administrative data alone, as the number of false negatives and therefore true negatives are unknown.

Figure 9 shows the rates of no abnormality (or false positives) as detected by each LHD. The figure depicts a false positive detection rate between 4% and 49%, with little distinction or pattern obvious between metropolitan, or rural/regional LHDs.

Figure 9: Rates of no abnormality (false positives) by LHD between 2013 and 2016



Note: Gold columns indicate LHDs classified as Rural/Regional and blue columns denote Metropolitan LHDs. Average is across all LHDs.

Further analysis suggests that the percentage of false positives was broadly similar when comparing rural and regional to metropolitan LHDs. The median percentage of false positive routine referrals was higher in metropolitan LHDs, while conversely the median percentage of false positive high priority referrals was higher across rural and regional LHDs (Table 7).

Table 7: No abnormality referrals from Sep 2013 to Dec 2016

		Routine Referrals			High Priority Referrals		
	LHD	# of No abnormality detected referrals	# of routine referrals	% of No abnormality referrals	# of No abnormality detected referrals	# of high priority referrals	% of No abnormality referrals
Rural and Regional	1	11	71	15.5%	2	34	5.9%
	2	22	132	16.7%	2	28	7.1%
	3	314	1756	17.9%	108	811	13.3%
	4	315	729	43.2%	46	258	17.8%
	5	113	611	18.5%	20	233	8.6%
	6	346	670	51.6%	25	96	20.6%
	7	15	430	3.5%	8	177	4.5%
	8	70	440	15.9%	22	196	11.2%
	Median	**91.5**	**525**	**17.3%**	**21**	**186.5**	**9.9%**
Metro	1	116	1328	8.7%	9	389	2.3%
	2	257	1275	20.2%	10	382	2.6%
	3	431	1553	27.8%	376	1622	23.2%
	4	238	677	35.2%	103	480	21.5%
	5	167	1309	12.8%	19	638	3.0%
	6	139	501	27.7%	22	255	8.6%
	7	225	1035	21.7%	10	230	4.3%
	8	141	432	32.6%	16	254	6.3%
	Median	**196**	**1155**	**24.5%**	**17.5**	**385.5**	**5.3%**

** Rural/Regional and Metropolitan LHDs were classified as per information available on the NSW Health website*

However, analysing percentages alone might not reveal the true effect of different models of StEPS implementation on the false positive rate due to interplay between factors. Therefore, quarterly referral outcomes reported from September 2013 to December 2016 were analysed using random effects panel modelling. The rate of referrals where no outcome was detected (false positives) was regressed against the following factors in LHDs:

- Number of FTE screeners per 10,000 estimated four year-olds
- Metropolitan versus rural and regional location
- Permanent versus casually employed vision screeners
- Vision screeners with nursing qualifications or without
- Availability of secondary screening for high priority or routine referrals
- Access to POOCs for high priority or routine referrals.

The analysis suggests that only the availability of secondary screening has an association with the percentage of referrals where no abnormality was detected, resulting in an 8% increase in the percentage of false positives for high priority referrals (p=.011). This suggests that secondary screening of high priority referrals identifies a proportion of false positives, but that the screening result is not changed to a pass or borderline pass following secondary screening. Other than the factors analysed, there are no other obvious differences in models of StEPS implementation which explain the variation in PPV between LHDs. The observed variation could relate to the competency of individual screeners, although all undertake the same training and operate in similar environments.

A more likely explanation is variation around the way outcomes are reported, including the number of results notifications received from eye health professionals compared to verbal reports from parents/carers. This is supported by data from StEPS in Western NSW, which had the lowest percentage of referred children where no abnormality was detected (3.8%). This service also has the lowest rate of loss to follow-up (1.9%). Service mapping revealed that the StEPS Coordinator does not accept verbal parent/carer outcomes reports. Rather they sought consent from parents/carers to follow up with the eye health professional the child attended. In most cases it could be expected that a report from an eye health professional will be more accurate than from a parent/carer. However, this approach would not be feasible in those LHDs with much larger numbers of children within existing levels of staffing.

5.4.3 Effectiveness of StEPS: diagnoses

The true test of the effectiveness of StEPS is implementation of surveillance and treatment based on diagnosis provided to children referred from vision screening. This is particularly important given that early detection and treatment of some eye conditions improves the treatment outcomes, and potentially the ability of children to enter school as confident learners.

Table 8 summarises the primary diagnoses for children followed up after referral. The total for each referral category excluded children lost to follow-up and those whose parents/carers did not act on a referral. Children who were being monitored and reviewed and those requiring further diagnostic assessment, also did not have a definitive diagnosis. This left 8,161 children who had a potential diagnosis. However, the number of referrals where the presence of ocular pathology or condition was recorded was 7,049 (1,112 missing data). Additionally, based on these records, only 6,141 had an actual diagnoses recorded (908 incomplete records). This last component of missing data is most likely due to inaccurate data entry.

A comparable analysis to that by Blows et al (2014), was conducted to establish the proportions of different diagnoses in all children referred across all LHDs. Of the 10,436 children referred to an eye health professional or their general practitioner for further vision assessment, 3.1% (n=991) were diagnosed with amblyopia, 22.3% (n=4,326) were prescribed glasses, 2.3% (n=539) were diagnosed with strabismus and 1.3% (n=404) were diagnosed with other vision disorders.

Of the 5,057 children referred as high priority, 12.9% were diagnosed with amblyopia, 36.1% were prescribed glasses and 6.0% were diagnosed with strabismus. A further 4.1% were diagnosed with other mixed conditions or ocular pathologies including cataract, an optic nerve disorder, glaucoma, corneal pathology, nystagmus and ptosis.

These rates of diagnosis are considerably lower than those reported by Blows et al. (2014). While the authors used earlier StEPS referral outcomes data, they also focused on one metropolitan and one rural and regional LHD with low rates of loss to follow-up. To replicate this

approach, referral diagnoses were analysed for one metropolitan and one rural and regional LHD with loss to follow-up rates of less than five per cent.

Across the two LHDs the loss to follow-up rate was 4.1%. A further 7.3% of parents/carers did not follow up on the referral. The loss to follow-up rate was 3.4% and 3.8% for high priority and routine referrals, respectively. The rate of parents/carers who did not follow up on referral was 3.7% and 6.2% for high priority and routine referrals, respectively. Of 1,503 referrals where ocular pathology was recorded on data entry, the specific diagnosis was recorded for 1,404 (93.4%), around 6% higher than the rate across all LHDs.

Table 8: Primary diagnoses or other outcomes for preschoolers referred from StEPS, September 2013 to December 2016

	High priority referrals (n=5,057)	Routine referrals (n=10,436)	Referrals due to child inability to screen (n=2,466)
Amblyopia			
Amblyopia	290 (5.7%)	147 (1.4%)	9 (0.4%)
Anisometropic amblyopia	234 (4.6%)	106 (1.0%)	3 (0.1%)
Strabismic amblyopia	126 (2.5%)	62 (0.6%)	9 (0.4%)
Strabismic anisometropic amblyopia	-	5 (0.05%)	-
Total amblyopia	650 (12.9%)	320 (3.1%)	21 (0.9%)
Prescribed glasses			
Refractive error	1,664 (32.9%)	2,241 (21.5%)	168 (6.8%)
Anisometropia	161 (3.2%)	82 (0.8%)	10 (0.4%)
Total glasses	1,825 (36.1%)	2,323 (22.3%)	178 (7.2%)
Strabismus	176 (3.5%)	171 (1.6%)	30 (1.2%)
Emmetropia	5 (0.1%)	2 (0.02%)	1 (0.04%)
Other mixed conditions	126 (2.5%)	80 (0.8%)	3 (0.1%)
Ocular pathologies			
Serious/sight-threatening	33 (0.7%)	11 (0.1%)	2 (.08%)
Infection/non-sight-threatening	1 (0.02%)	9 (0.1%)	2 (0.1%)
Ptosis	23 (0.5%)	8 (0.1%)	-
Binocular vision disorders (excluding strabismus)	3 (0.1%)	15 (0.1%)	-
Colour vision deficiency	-	14 (0.1%)	3 (0.1%)
Miscellaneous	19 (0.4%)	31 (0.3%)	13 (0.5%)
Total ocular pathologies	79 (1.6%)	88 (0.8%)	20 (0.8%)

Note: Total referrals excludes lost to follow-up and were referrals where not followed up by parents/carers.
Note: No information available on 'no eyesight pathologies'.

Table 9: Primary diagnoses or other outcomes for preschoolers referred from StEPS in two LHDs, September 2013 to December 2016

	High priority referrals (n=757)	Routine referrals (n=1,572)	Referrals due to inability to screen (n=460)
Total amblyopia	112 (14.8%)	84 (5.3%)	5 (1.1%)
Total prescribed glasses	398 (52.6%)	588 (37.4%)	70 (15.2%)
Strabismus	22 (2.9%)	16 (1.0%)	6 (1.3%)
Other mixed conditions	4 (0.5%)	7 (0.4%)	-
Total ocular pathologies	10 (1.3%)	6 (0.4%)	2 (0.4%)

Source: StEPS referral outcomes data provided by the NSW Ministry of Health.

Table 9 shows the reported outcomes across the two LHDs. The reported prevalence of amblyopia was only slightly higher than in all LHDs combined (+1.9% for high priority referral and +2.2% for routine referrals). However, the percentage of children prescribed glasses was considerably higher than in all LHDs combined (+16.5% for high priority referrals and +15% for routine referrals). The rates of amblyopia and glasses prescribed in these two LHDs still varied considerably from those reported by Blows et al (2014). This may be explained by the different time period and LHDs used in the current analysis.

To determine the population prevalence of ocular conditions detected by StEPS, the percentage of children diagnosed with amblyopia, strabismus and who were prescribed glasses from the total population of children screened, was calculated. The total population screened between 2013 and 2016 was 303,909 children (Figure 2). Excluding those who were lost to follow-up (n=22,591, Table 6) and those where referral was not acted on by parents/carers (n=2020, Figure 8) the total population was determined to be 279,298 children. Based on the diagnoses outlined in Table 8, 991 children were diagnosed with amblyopia giving a prevalence of 0.35%, 377 had strabismus with a prevalence of 0.13% and 4,326 children were prescribed glasses giving a prevalence of 1.55%.

Given the high rate of loss to follow-up and anecdotally high rate of parental reporting of outcomes across LHDs, the actual rates of diagnoses for preschoolers referred from StEPS is unclear and the numbers described here are unlikely to reflect true population prevalences. According to StEPS staff, outcome information provided by parents/carers is often vague due to the low medical literacy of many parents/carers and may not indicate a complete diagnosis. StEPS staff also reported that it can be difficult to interpret results notifications from some eye health professionals and that the complexity of diagnosis categories in the outcomes reporting table makes it difficult to accurately report. These factors are likely to contribute to incomplete or inaccurate reporting of referral outcomes.

5.5 Experiences and perspectives of StEPS

This section of the report relates specifically to Objective 5 of the StEPS program evaluation:

Objective 5: To explore the experiences and perspectives of StEPS in the community amongst parents and carers, preschool and childcare facilities, eye health professionals and POOCs.

A variety of methods were used to garner the opinions of key stakeholders regarding the StEPS program. Information on the experiences and particular challenges for StEPS staff were obtained during service mapping focus groups. Opinions raised by staff at service mapping were noted and are summarised here as common themes that arose. Verbatim quotes were not obtained during service mapping. Two methods were used to investigate the experiences and perspectives of preschool and childcare facility directors; a survey which has been quantitatively analysed and a series of interviews which were transcribed verbatim and are thematically discussed. A survey of parents was conducted through the Facebook platform to obtain opinions from parents who may not have consented to screening, and may or may not have been referred and/or followed up. Additionally, interviews of parents of children who had been referred from the StEPS program were conducted. POOCs clinic staff and eye health professionals were also interviewed.

5.5.1 StEPS staff

The experiences of StEPS staff engaged during service mapping sessions were generally positive, with staff clearly passionate about StEPS and their role. Staff expressed the importance of the program and the positive impact they had observed of detecting eye conditions through StEPS for children and their families.

StEPS staff were also asked about their major challenges and potential solutions to those challenges. These are summarised below.

Administrative support

A lack of administrative support was the major challenge identified by a number of StEPS services. While the majority of StEPS services have access to administration officers, this is predominantly part-time and not always dedicated just to StEPS.

Administration offices most often handle preschool bookings, and the distribution of information and consent packs, which is seen as invaluable by StEPS Coordinators and vision screeners. However, vision screeners spend a considerable amount of time entering data. Screening staff are often required to register children in the electronic medical records (EMR) systems, enter screening results and scan and upload consent forms. This is particularly challenging for larger StEPS services and where vision screeners are casually employed. One metropolitan StEPS service provides vision screeners laptops to enter screening results on site, which requires consent forms to be returned in advance so that children can be pre-registered in the EMR system. It was commented by rural and regional screeners that poor internet access would make this approach unfeasible for them.

It was acknowledged that vision screeners are the appropriate staff to enter screening results but the consensus was that registering children and uploading consent forms should be undertaken by administrative staff. Administration officers are currently supporting some StEPS services with this, but the time allocation was generally reported to be insufficient.

It is difficult to determine an appropriate FTE of administration support for StEPS as it is influenced to some extent by whether screeners are permanent or casual, and broader support from medical records departments with scanning consent forms available in select LHDs. However, StEPS services that had at least 0.6-0.8 FTE of dedicated administrative support per 10,000 four year-olds were able to use that support to variably assist with preschool bookings, child registration and the uploading of consent forms.

Engaging preschools and consent

StEPS staff overwhelmingly stated that most preschools are very supportive of StEPS. This is confirmed by findings from the survey of preschool directors (see section below). However, the consent process creates uncertainty around bookings. Booking lengths are allocated based on a combination of previous screening volumes and confirmation of returned consent from preschools. Despite this, all vision screeners who were consulted stated that they obtain a significant volume of consent, often verbal, on the day of screening and in some cases find that preschools have considerably overestimated the number of four year-olds that will be screened. Both of these situations create inefficiency.

Three LHDs have attempted to address this by requiring preschools to return consent forms to the StEPS administration officer prior to being allocated a booking. Another LHD will implement this in 2018. One of these LHDs will only make a booking if consent has been received for 10 children due to constraints on screening capacity. It was reported that this results in a significant number of preschools, childcare centres and other children's services missing out on StEPS screening each year. Another LHD does not require consent forms to be returned but will only carry out screening if a preschool has received consent for at least five children two weeks prior to the booking date.

No solutions were offered by StEPS staff to this challenge, acknowledging that the consent process has to be the responsibility of preschools and that it is a burden on preschool staff. On face value, the requirement that preschools return consent forms prior to screening has merit, although consent for some children will still need to be obtained on the day of screening. Some screeners suggested that online consent would be easier for some preschools and parents but, others indicated that many services would still prefer paper consent. All agreed that regardless of the consent system that is implemented, there will always be a need to obtain consent on the day from many parents/carers.

Follow up of referral outcomes

Obtaining the results of StEPS referrals was the most commonly reported challenge by StEPS staff. As mentioned previously (section 5.1.6), results notification slips are inconsistently returned by eye health professionals, particularly from optometrists, where the majority of referrals are directed. This results in both extensive follow-up attempts with parents/carers and a large number of outcomes reported as lost to follow-up (unable to contact). The latter makes it difficult to determine the accuracy of vision screening and the effectiveness of StEPS.

StEPS in one LHD provides a stamped self-addressed envelope with referral letters but this is the only alternative strategy reported. Another solution offered was for an electronic referral and results notification form but this could be impractical given that parents/carers are responsible for choosing an eye health professional and making a booking. Staff in one LHD suggested making a list of local optometrists available on their StEPS website. They could then refer parents/carers to this list. The requirement for eye health professionals to be on that list would be that they are competent at working with children and pledge a commitment to return results

notification slips. There would be a financial incentive for eye health professionals to comply as they could receive more referrals from StEPS.

Data entry and reporting

StEPS staff reported that data entry into EMR systems and StEPS reporting to the NSW Ministry of Health are major challenges within existing resources. According to most StEPS Coordinators their budget allocations have not increased yet the requirements for data entry, in addition to screening demand, have increased. The challenges associated with data entry into EMR systems was described above. However, currently StEPS Coordinators are required to keep manual databases for reporting activity and outcomes to the Ministry of Health, as the EMR systems in LHDs do not have the functionality to generate StEPS reports in the format required. It is noted that work is currently underway within the Ministry of Health to address this.

StEPS Coordinators also commented that the complexity of the StEPS outcome reporting template makes it difficult to accurately record results. There are currently 24 diagnosis categories that can be populated from the results notification form which has eight multiple response categories. The majority of StEPS Coordinators expressed that it is often difficult to know which diagnosis category to enter for a child, especially when they are required to interpret medical reports from eye health professionals. It was also stated that verbal outcomes from parents/carers are often of questionable accuracy and lack the detail required to record the diagnosis appropriately. These challenges are evident in the analysis of referral outcomes data (section 5.4.3) which, revealed significant inconsistency between the number of diagnoses recorded and the number of children indicated to have ocular pathology.

From a StEPS-wide monitoring perspective, the timing of outcome reporting also appears to be a challenge. There is intended to be a six month lag between activity and outcome reporting. This suggests that outcomes for referrals made in January to March should be reported in July-September the same year and so on. However, StEPS Coordinators commented that it can take longer than six months for high priority referrals to receive a diagnosis and treatment, for results to be returned, or for some parents to act on a referral. Therefore, some StEPS Coordinators are allowing more than six months for outcomes to be reported. This means that referral numbers in the referral outcomes data reports do not necessarily match the number of referrals made six months (i.e. two quarters) prior.

Referral pathways

There is variation in the referral pathways depending on location and resulting access to POOCs. While this does not represent a challenge for StEPS staff, it is a challenge for the effectiveness of StEPS. In particular, in LHDs outside of Sydney, there are few referral pathways for high priority referrals that do not involve considerable time and expense for families to access paediatric ophthalmology services. It was also reported that in some regional and remote locations, not all optometrists bulk-bill their patients. In these locations there was also a reported lack of available paediatric ophthalmology services, and a number of optometrists and general ophthalmologists were stated to not cater for paediatric patients. The costs of accessing appropriate eye care services and for regional and rural locations, a lack of access, particularly to paediatric ophthalmology services without extensive travel, were raised as barriers to follow up for children referred from StEPS. StEPS Coordinators appeared to be unaware if there are any programs to offer parents financial support for high priority referrals to access paediatric ophthalmology services. Metropolitan-based services reported that extensive wait times for POOCs were a barrier to follow-up, particularly when financial barriers prevented access to private paediatric ophthalmology services.

Concern was raised by some StEPS staff that children referred to GPs may not be appropriately referred onwards. The cost of glasses was also reported as a challenge for some families and concerns were raised by StEPS Coordinators about the inappropriate prescription of glasses for some children.

5.5.2 Preschool and Childcare Facility Directors

The following results relate to the electronic survey of preschool and childcare facility directors, which provided both quantitative and qualitative data. In total, 801 preschool or childcare facilities responded to the electronic survey.[11] The majority of services (98.6%, n=789) indicated that they participated in StEPS in 2017. A small proportion of respondents (5.3%, n=43) also participated in another screening program in 2017, most commonly administered by a local optometrist (n=30). These findings confirm that StEPS is overwhelmingly the predominant vision screening program preschools participate in.

Participation of children in StEPS

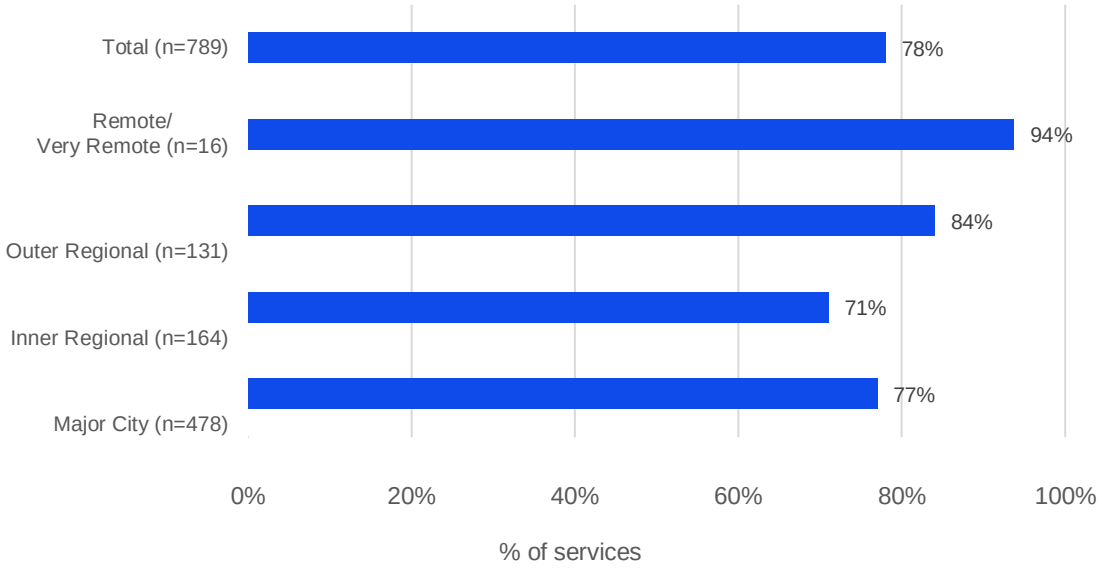
At 78% of responding facilities, more than 75% of enrolled four year-old children were estimated to have their vision screened as part of StEPS in 2017. This aligns with screening rates calculated from the StEPS activity data (see section 5.2.2). Figure 10 shows that this varied by location, with inner regional locations the least likely (71%) and remote (94%) and outer regional services (84%) the most likely to report high participation.

Respondents were asked to indicate the main reasons for children to not have their vision screened by StEPS. Of those that offered a reason (n=458), the most common were absence on the day of screening (38%), had already had their vision screened elsewhere (31%) or parents/carers did not return consent forms (19%). Only 4% of respondents indicated that children did not have their vision screened because parents/carers actively declined consent.

The majority (84%) indicated that no particular group(s) of children were less likely to have their vision screened as part of StEPS than others. Where a particular group of children were indicated to be less likely to have their vision screened, this was most commonly children with disability (10%), due to difficulty engaging with the test (81%) or already having had their vision screened (16%). This aligns with comments by StEPS vision screeners during site visits. Aboriginal children (2%) and children from language backgrounds other than English (1.5%) were rarely cited as being less likely to have their vision screened than other children, with the reason being attributed to absenteeism or parents/carers not returning the consent form.

[11] When drawing conclusions from the survey findings it is important to consider that the response rate was 21%. Although the final sample was representative of the sampling frame, and the population of NSW preschools on a number of characteristics, it is possible that that the final sample is not representative of the perspectives and experiences of all preschools, childcare centres and other children's services.

Figure 10: Percentage of services where more than 75 per cent of four year-olds participate in StEPS



Information and communication about StEPS

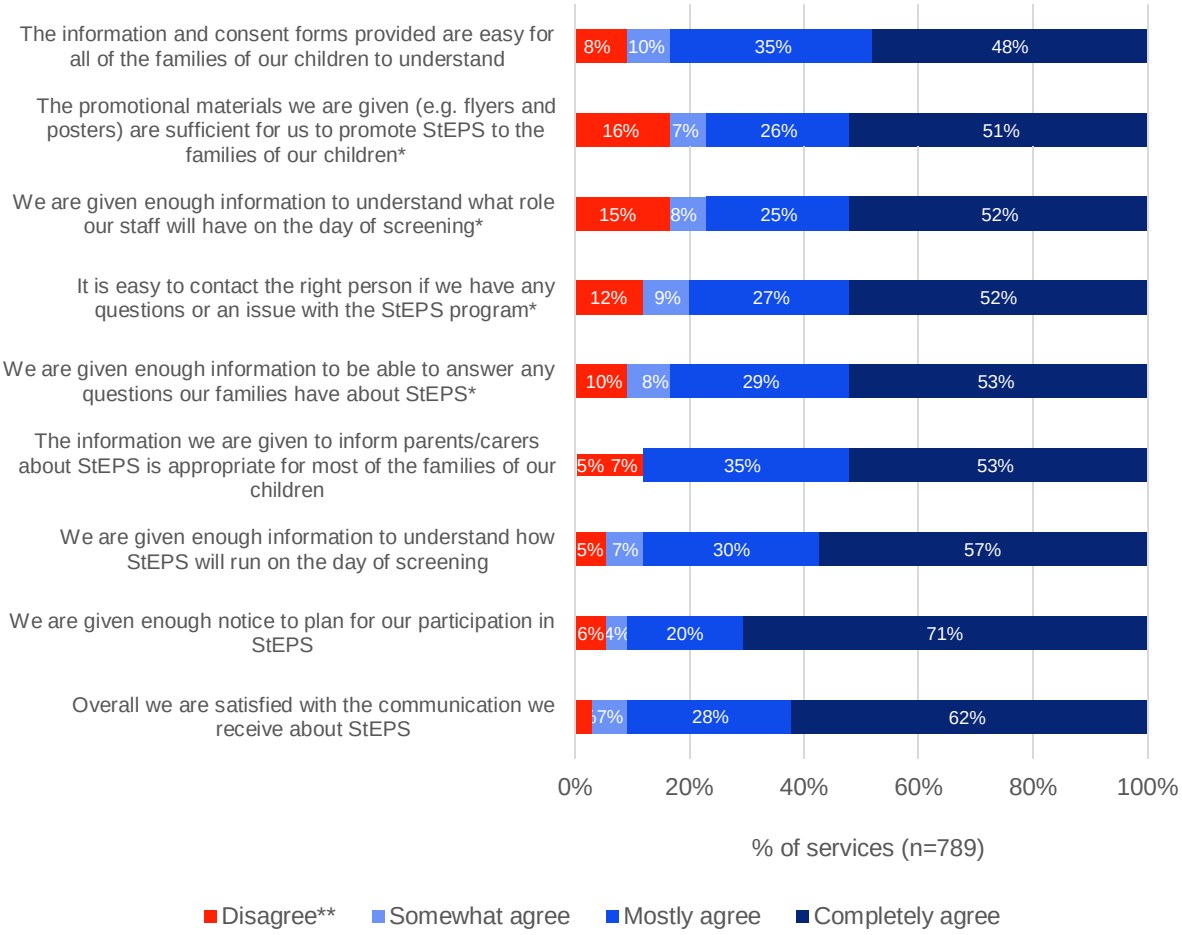
Satisfaction with information provided

Overall, 97% of respondents indicated that they were satisfied with the communication received about StEPS (Figure 11). There were high levels of agreement that information and materials to promote StEPS, obtain consent and plan for participation were appropriate. The responses also indicate that it is easy for preschool and childcare services to contact someone from StEPS to answer any questions. Importantly, there was also high agreement that the information provided for families is appropriate and easy to understand (92%).

Respondents who indicated disagreement with any of the statements (Figure 11) were asked to indicate why. A total of 198 reasons were given across all nine survey items. The most common reasons indicated that information could be simplified for preschools about what is required on the day of screening (n=48) and for parents including consent forms (n=26), that promotional materials could be simplified and provided in a broader range of formats (n=42) and that parent information and consent should be translated into different languages (n=30).

Respondents were also invited to make general comments about the information provided as part of StEPS. A total of 405 comments were given. Almost three quarters of these were positive, highlighting the adequacy and clarity of information to make clear what will be required on the day, promote awareness amongst parents and encourage participation in StEPS (n=294).

Figure 11: The adequacy of information and communication provided by StEPS



** Item reverse coded. ** Due to low numbers of responses the completely disagree, mostly disagree and somewhat disagree categories have been collapsed into a single disagree category.*

Characteristics impacting satisfaction with information provided

Survey responses were analysed using ordered logistic regression to identify service characteristics associated with the level of agreement to specific statements about the information and communication as part of StEPS (more details about model specification can be found in Appendix C). The results of this analysis are presented in Table 10.

Satisfaction with information was found to decline as the proportion of children from CALD backgrounds increased (OR=0.994; p<.05). This appears to be mostly related to satisfaction with promotional and informational material and consent forms targeting parent/carers. As the percentage of children with disability increases, services were significantly less likely to agree as strongly that the information they are given about StEPS is appropriate for most of their families (OR=0.978; p<.05). Outer regional or remote preschools were less satisfied than preschool in major cities to with the overall communication they received about StEPS (OR=0.706; p<.05). However, inner regional preschools reported similar levels of agreement compared to those in major cities. The number of eligible children enrolled, the proportion of

Aboriginal children enrolled and the most recent rating according to the National Quality Standard[12] were not significantly associated with satisfaction.

Table 10: Relative impacts of preschool and childcare facility characteristics on satisfaction with the information and communication provided by StEPS

	Proportional odds ratio						
	Number of four year-olds	% Aboriginal children	% children from a CALD background	% children with a disability	Inner regional c.f. major city	Outer regional/ remote c.f. major city	Meeting/ exceeding National Quality Standard c.f. working towards
The information we are given to inform parents/carers about StEPS is appropriate for most of the families of our children	1.005	0.998	**0.988****	0.978*	0.758	0.960	0.981
We are given enough information to understand how StEPS will run on the day of screening	1.010	0.994	0.997	0.990	0.889	**0.601***	1.035
It is easy to contact the right person if we have any questions or an issue with the StEPS program	1.009	0.996	0.996	0.999	0.761	0.976	1.011
The information and consent forms provided are easy for all of the families of our children to understand	1.004	0.992	**0.990****	0.989	0.877	0.782	1.006
We are given enough information to be able to answer any questions our families have about StEPS	1.006	0.991	0.995	0.996	0.779	**0.613***	1.032
We are given enough notice to plan for our participation in StEPS	1.000	0.995	0.995	0.999	0.651	**0.611***	1.006
The promotional materials we are given are sufficient for us to promote StEPS to the families of our children	1.012	0.994	**0.992****	0.996	0.765	**0.681***	1.101
Overall we are satisfied with the communication we receive about StEPS	1.002	0.994	**0.994***	1.003	0.781	**0.706***	1.035

*Note: * indicates that the parameter estimate is statistically significant at the 5% significance level.*

StEPS operation in preschools and childcare facilities

Rating of service operation

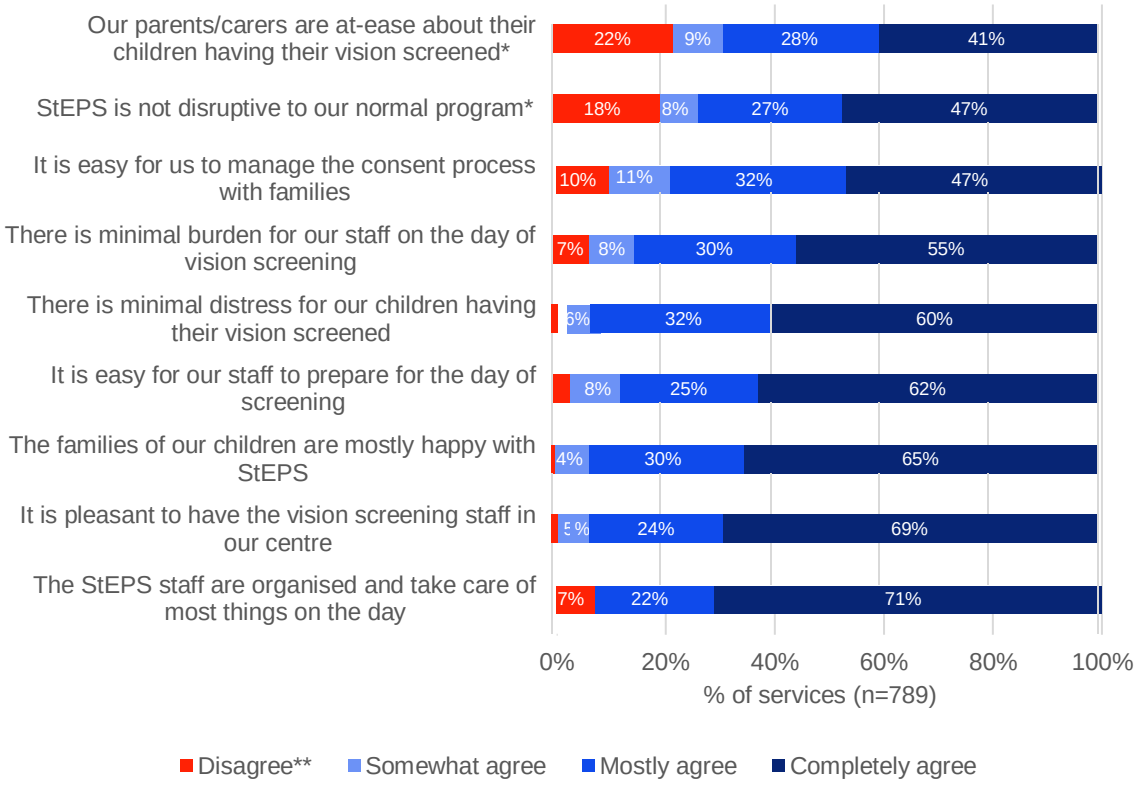
Preschool and childcare facility directors rated the operation of StEPS very highly (Figure 12), with high agreement that screeners are organised and pleasant to host. While, there was overall agreement that StEPS is of minimal burden to staff and not disruptive, there was a slightly

[12] Australian Children's Education and Care Quality Authority (ACECQA) NQF Snapshot Q4 2017.

higher rate of disagreement to these statements (7% and 18%, respectively). However, some level of disruption would be inevitable as staff are needed to support screeners on the day.

The majority of responding directors mostly or completely agreed (74%) that the consent process it is easy to manage with families, with only 10% disagreeing with this statement. Importantly, there was high agreement that there is minimal distress for children having their vision screened and that families are mostly happy with StEPS. This is despite lower agreement that parents/carers are at ease about their children having their vision screened, with 22% of respondents disagreeing with this statement. This is testament to the skill of vision screeners working with children.

Figure 12: Agreement with statements about how StEPS operates in preschool and childcare facilities



* *Item reverse coded.*

** *Due to low numbers of responses the completely disagree, mostly disagree and somewhat disagree categories have been collapsed into a single disagree category.*

Those who disagreed with any statement were invited to comment further. A total of 136 reasons across all nine survey items were given. The majority (n=41) were related to the consent process and the burden on preschools in 'chasing' parents/carers for consent and explaining StEPS to them. The latter mirrors the comments about the desire for simpler information and consent forms in a range of languages.

General comments about the operation of StEPS were also invited. There were 398 positive comments including 162 praising the benefits of StEPS. A further 172 comments praised the

professionalism of StEPS staff and how easily StEPS fits into their program. There were 99 negative comments which reiterated the challenges highlighted above.

Characteristics impacting satisfaction with StEPS operation

Survey responses were analysed using ordered logistic regression to identify preschool and childcare facility characteristics associated with the level of agreement to specific statements about how StEPS operates in their facility (more detail of the model can be found in Appendix C). The results of this analysis are shown in Table 11.

Table 11: Relative impacts of preschool and childcare facility characteristics on satisfaction with StEPS operation

	Proportional odds ratio						
	Number of four year-olds	% Aboriginal children	% children from a CALD background	% children with a disability	Inner regional c.f. major city	Outer regional/ remote c.f. major city	Meeting/ exceeding National Quality Standard c.f. working towards
It is easy for us to manage the consent process with families	1.004	0.990	**0.985***	0.998	0.952	0.933	1.002
StEPS is not disruptive to the normal program for our children	0.997	1.002	1.004	0.999	1.082	0.904	1.103
Most of our parents/carers are at-ease about their children having their vision screened	1.001	0.999	0.998	0.986	0.855	0.953	0.965
There is minimal burden for our staff on the day of vision screening	0.994	1.004	**0.994***	0.996	0.716	0.793	1.010
It is easy for our staff to prepare for the day of screening	1.002	1.014	0.997	0.996	0.679	0.766	1.103
StEPS staff are organised and take care of most things on the day	0.992	1.010	0.995	0.991	0.796	0.713	0.986
It is pleasant to have the vision screening staff in our centre	0.999	1.011	0.996	0.996	0.829	0.756	0.972
There is minimal distress for our children having their vision screened	1.002	1.002	**0.994***	0.989	**0.648***	0.674	1.003
The families of our children are mostly happy with StEPS	1.002	1.004	**0.993***	0.988	**0.543***	0.776	1.036

*Note: * indicates that the parameter estimate is statistically significant at the 5% significance level.*

Having a higher proportion of children from CALD backgrounds had a number of implications for satisfaction with StEPS operation including; increasing difficulty in managing consent processes (OR=0.985; p<.05), placing additional burden on preschool staff on the day of screening (OR=0.994; p<.05), significantly increasing the distress of children (OR=0.994; p<.05) and reduced satisfaction amongst parents/carers (OR=0.993; p<.05). This supports findings

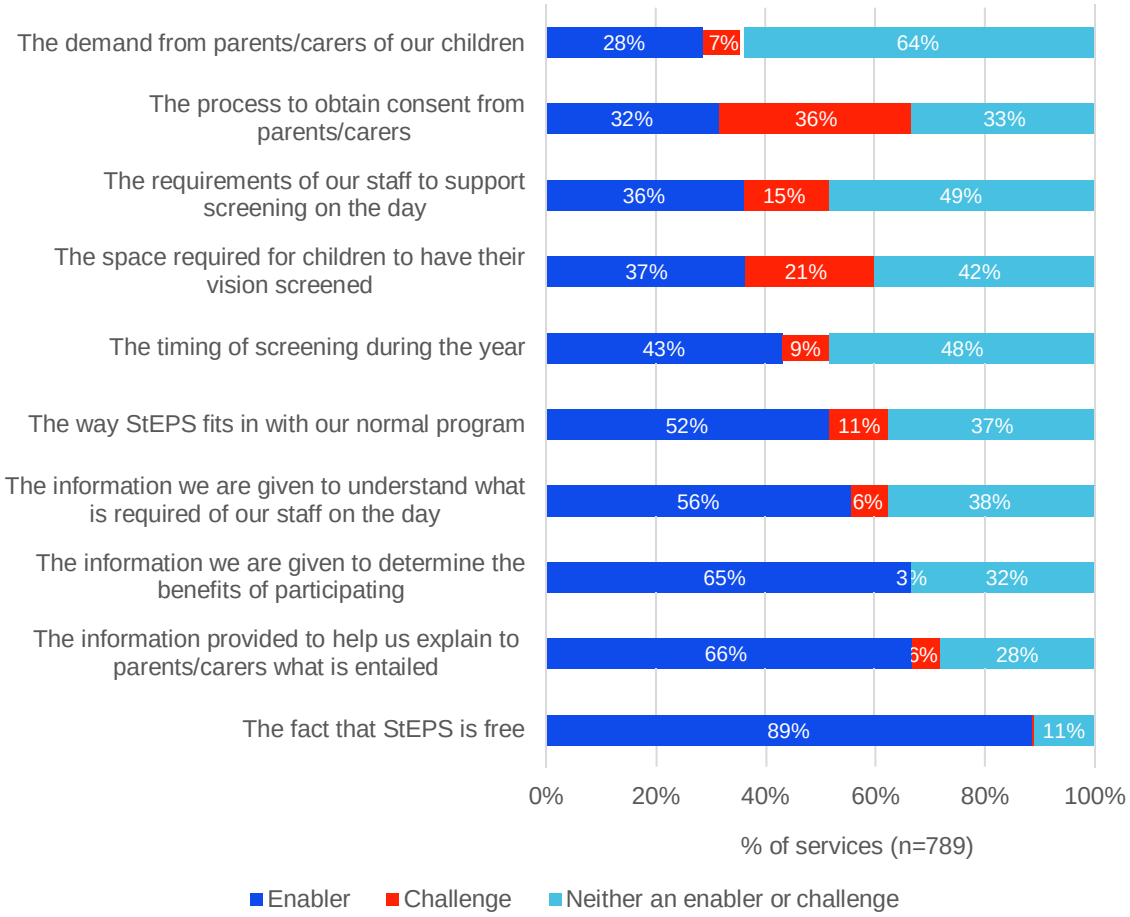
regarding information and communication, and suggests it is more difficult for preschools to engage CALD parents/carers with StEPS.

Inner regional preschools were less likely to agree that there is minimal distress for children having their vision screened (OR=0.648; p<.05) and less likely to agree that parents/carers are mostly happy with StEPS (OR=0.543; p<.05). The reasons are unclear but could relate to demographic factors associated with the areas serviced by the responding inner regional preschools. Other characteristics were not found to impact satisfaction with StEPS operation.

Challenges and enablers for preschools to participate in StEPS

A series of statements based on key features of StEPS, were rated as challenges or enablers for preschool and childcare facilities to participate in the program (Figure 13).

Figure 13: Enablers and challenges for preschools to participate in StEPS



Note: percentages might not add up to 100% due to rounding.

The most commonly reported enabler was that StEPS is a free program (89%). Although some marginal concern was raised with informational material (see section above), the provision of this information was seen as an enabler by more than half of respondents. The most common challenge identified was the process to obtain consent from parents (36%), which was the only service element where challenge was the most commonly selected response. Other challenges

identified were the space required for screening (21%), the requirements of staff to support screening on the day (15%) and the way StEPS fits into the normal service program (11%). These challenges are unavoidable and the fact that considerably more respondents identified these factors as either enablers or neither an enabler nor challenge is further evidence that the screening process has a low burden on services.

Respondents were next asked to rank the enablers and challenges they identified by importance or impact (Figure 14 & Figure 15). The top ranked enabler was overwhelmingly how StEPS fits into a preschool's normal program. Information for preschools and parents/carers, and the space required for children to have their vision screened were ranked next. The process for obtaining consent from parents/carers was the biggest challenge for preschools to participate in StEPS. Interestingly, although the space required for screening was commonly ranked in the top three enablers, it was the second ranked challenge for preschools to participate in StEPS. This likely reflects the diverse settings that preschools operate in. Information for preschools and parents/carers were more commonly selected in the top three enablers than in the top three challenges. This further confirms that information and communication as part of StEPS meets the needs of most services and families.

Figure 14: Top three enablers for services to participate in StEPS

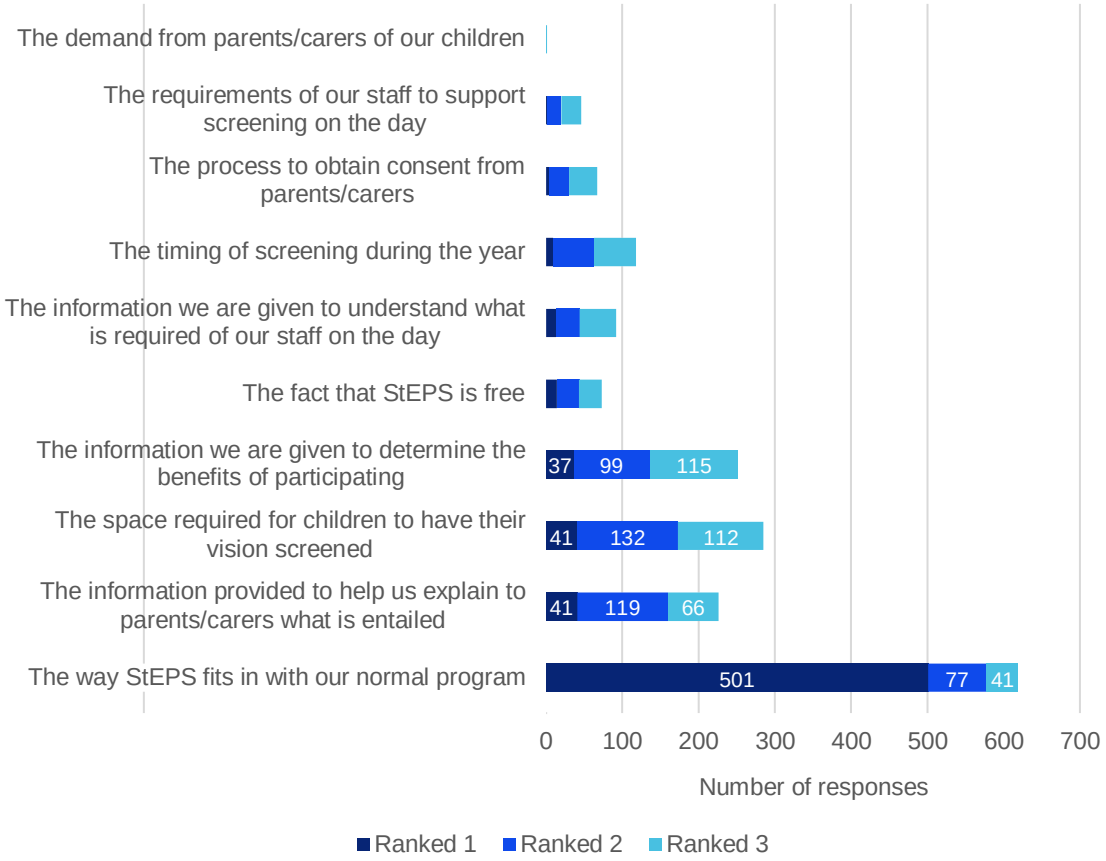
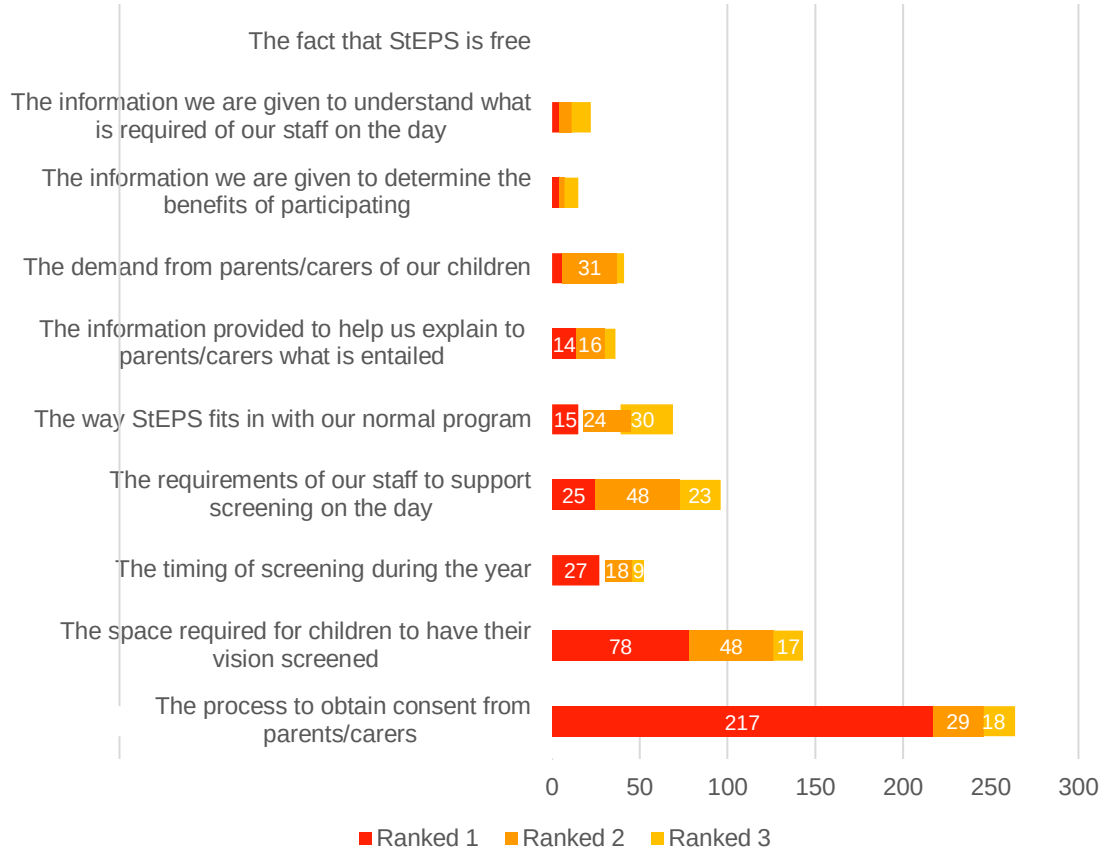


Figure 15: Top three challenges for services to participate in StEPS



Preschool characteristics impacting StEPS features being reported as a challenge

Although most features of StEPS were more commonly identified by preschools as enablers rather than challenges, binary logistic regression was undertaken to identify if any characteristics of preschools change the odds of reporting a challenge. The 'enabler' and 'neither an enabler nor challenge' categories were combined and compared to the 'challenge' category (more details of the model specification can be found in Appendix C).

The analysis found the following two significant associations:

- As the percentage of children from non-English speaking backgrounds increases, the odds significantly increase that the information provided for parents was reported as a challenge (OR=1.021; p<.001).
- The odds of reporting that the information provided for parents/carers is a challenge is significantly higher for outer regional and remote preschools compared to those in major cities (OR=2.86; p<.001).

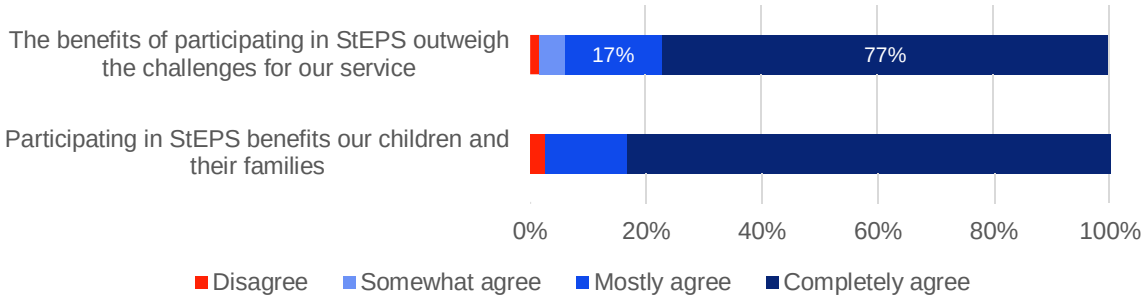
This can be interpreted that the odds of a preschool reporting that information for parents/carers is a challenge increases by 2.1% for every 1% increase in the percentage of children from non-English speaking backgrounds, and there was almost three times the odds if a service is located in an outer regional or remote location as a opposed to a major city. There were no

other significant associations between preschool characteristics and the odds of reporting any StEPS features as a challenge (data not shown).

Overall satisfaction of preschools with StEPS

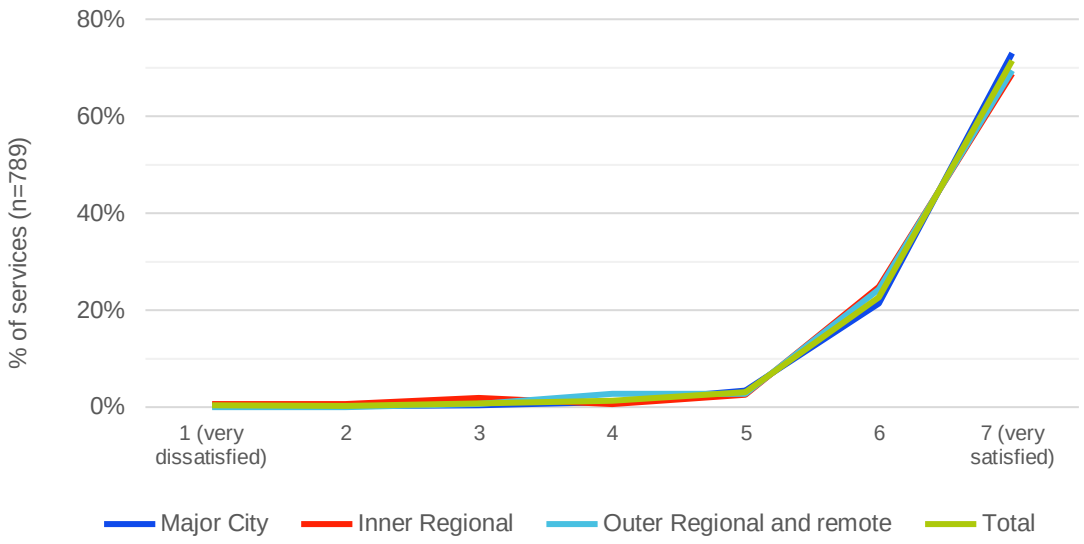
Figure 16 shows that despite the challenges, preschools overwhelmingly see the benefits of participating in StEPS and that these benefits outweigh the challenges. This confirms that StEPS is highly valued service by preschools.

Figure 16: Preschool perceptions on the benefits of StEPS



Respondents were asked to rate their overall satisfaction with StEPS on a scale from one (very dissatisfied) to seven (very satisfied) and 97% rated their satisfaction at five or above (Figure 17). This pattern was consistent across major city, inner regional and outer regional and remote locations. Ordered logistic regression indicated that as the percentage of children with a disability increases, a preschool's overall satisfaction with StEPS significantly decreases (OR=0.979; p<.05). This could reflect the additional support required from preschool staff. However, it is important to interpret this finding in the context that overall services are highly satisfied with StEPS. There was no association between overall satisfaction with StEPS and other preschool characteristics (data not shown).

Figure 17: Preschool ratings of overall satisfaction with StEPS



Interviews with preschool and childcare facility directors

Twenty telephone interviews were conducted between May and June 2018 with directors of preschool and childcare facilities who had previously participated in StEPS. Interviewees were from facilities located across 12 LHDs state-wide. Seven participants were located in metropolitan Sydney, across four LHDs. The remaining 13 participants had facilities located in major city, inner regional and outer regional LHDs, ranging from Northern NSW to Albury and to Western NSW.

The number of four year-old children enrolled in the facilities that the interviewees managed ranged from eight to 78 children, with an average of 38.7 and with seven having 25 children or less. Four facilities had no children from CALD backgrounds, while those that were Sydney-based generally had the highest proportions. Six reported having no children with disabilities. The majority (90%) of facilities had been participating in StEPS for five years or more and 35% had participated for 10 years.

Interviewed preschool and childcare facility directors were overwhelmingly positive about the StEPS program. When asked about their reasons for participating in StEPS, comments reiterated those from the survey responses, that StEPS is an important and valuable program. A number of interviewees highlighted the importance of early detection for eye conditions prior to school and that the administration of the program through preschool and childcare facilities is ideal for time poor parents, who may not otherwise have their children's vision tested. Some interviewees emphasised the importance of StEPS particularly for children with socioeconomic disadvantage, Aboriginal children and children who are temporary Australian residents without access to Medicare.

> "It is important for children to have [their] sight tested. There are not many local health services here. They [StEPS] come to day care and parents don't always have time to go to the optometrist"
> *– Preschool/ Childcare Director*

Management of the consent process

Although most interviewees were happy with the existing consent process, consistent with the survey findings, obtaining parental consent was the largest area of burden on preschool and childcare facility staff. The majority managed this process by sending the consent forms along with letters and informational material home with parents prior to the pre-booked screening day. However, all reported that 'chasing-up' of consent forms with multiple reminders for parents was often necessary, with several interviewees suggesting that this consumed scarce resources.

> "[The consent process is] simple and easy. We are very used to it and I can't think of any problems we have had."
> *– Preschool/ Childcare Director*
>
> "In the past with more children we have had to chase parents. We have to remind parents of things all the time."
> *– Preschool/ Childcare Director*

The majority suggested that a significant proportion of consent was still required to be obtained on the day of screening. One facility with a high proportion of Aboriginal children found the written consent form did not work and that they had to obtain consent face-to-face with parents. Two suggested that translation of material into other languages was needed. Three interviewees suggested that moving the consent online would help simplify the process. For some however, the population at the preschool of childcare facility would not make this feasible.

The day of screening

The consensus from interviewees was that the StEPS screening was run smoothly with little or no disruption. Comments indicated that the more experienced the staff were at running the screening, the better it was conducted. A number of interviewees praised the StEPS staff. Where challenges were noted, these were predominantly related to the availability of appropriate space. When space was available for screening away from other areas, the screening process was less disruptive. Timing of the visit and the preference for screeners to attend earlier in the day was mentioned by a small number of interviewees. Interviewees were largely happy with the information provided to allow them to prepare for the day. Some suggested that a kit to practice the test might be helpful for preparing children prior to screening.

> "It works very well. We are used to it and not much space is required for it. Experience helps and the StEPS staff are good."
> *– Preschool/ Childcare Director*

Acceptance of parents and children

Most reported that children responded well to the screening process and found it fun and exciting to participate as it was treated as a game and could be rewarded with a sticker or other prize for participating. While there were children that were shy or had special needs that could experience difficulties, this was rare. Some children responded better when they were permitted to observe other children being tested. All interviewees indicated that parents are happy with the program and willing to participate.

> "One family had severe issues and they were grateful for the program. It's especially good for parents who have little time."
> *– Preschool/ Childcare Director*
>
> "Sometimes some children don't understand, don't like having an eye covered. There is a good approach from StEPS staff with our staff alongside them. Children get a sticker to participate."
> *– Preschool/ Childcare Director*

> "It's a brilliant program and greatly appreciated. Great government initiative."
> *– Preschool/ Childcare Director*
>
> "Excellent. It should be extended to hearing and teeth."
> *– Preschool/ Childcare Director*

Concluding remarks

Overall, the preschool and childcare facility directors that were interviewed were very supportive of the program and felt it was valuable for both children and families. There were few suggestions for improvement to the processes and generally those interviewed were very happy with StEPS. The success of the program was such that some directors considered that it could service as a model for hearing and dental screening.

5.5.3 Parents and carers of preschool children

Twenty telephone interviews were undertaken with parents between May and July 2018 whose child had participated in and was referred for further examination from StEPS, no more than three years previously. The median age of the children whose experience was discussed in the interviews was five years, but ranged from four to eight years old. The parents were put in contact with interviewers through StEPS staff and eye care professionals who were providing ongoing treatment for any eye conditions identified. Two males and 18 females were interviewed from 10 LHDs state-wide.

Satisfaction with StEPS

All parents interviewed were extremely positive about the program and emphasised that early discovery of vision issues by StEPS had allowed earlier intervention and in turn had improved potential outcomes for their child. A number of parents highlighted the importance and benefits of the program and their hope that StEPS will continue into the future.

All parents reported being satisfied with the program. Comments such as "*100% satisfied*" and "*10 out of 10*" were common with one parent rating the program 15 out of 10. Other comments from parents included that StEPS is *'a great asset to the community'* and '*a very helpful program'*.

"Wouldn't have known otherwise. We found a problem and I hope can fix it before school." – *Parent*

"Would love it to continue. It has led to a course of treatment that has been greatly beneficial." – *Parent*

"Thank goodness they do it." – *Parent*

"It's a very helpful program and benefits many families. Other people tell me their experiences and they really appreciate the program." – *Parent*

"I'm very happy with the care. There was an incredible level of communication first from the StEPS screener and then the orthoptist." – *Parent*

"It's a wonderful program and I hope it continues." – *Parent*

"Sometimes vision issues aren't obvious so this program is great." – *Parent*

Prior vision screening and knowledge of eye conditions

All but one of the parents interviewed were unaware of a vision problem prior to their child being screened by StEPS, having not noted any signs of reduced vision. The majority of parents suggested that they would have never considered a vision test for their child as they didn't suspect there was anything wrong. In general, parents commented that "*It [eye testing] would never have crossed my mind*" or "*I never thought about it*". Two parents had thought there might have been an issue with their child's sight but had not thought it serious enough to act on. Only two parents thought they would have had their child's eyes tested if StEPS was not offered.

One parent who had taken their child to an optometrist and had been prescribed glasses prior to screening by StEPS, was found to have normal vision by StEPS. This was subsequently verified by a paediatric optometrist recommended by StEPS and it was determined that the glasses were prescribed unnecessarily. This parent was very grateful for the program; *"They said she didn't need glasses but suggested a further test with a pediatric optometrist… Happy and grateful for StEPS"*. Another child had been screened prior to StEPS by their GP but, their vision problem had not been identified.

"We are really lucky to have the program. It picks up vision issues early. I'm busy everyday so it is easy to miss testing your child's vision." – *Parent*

"No idea at all. We found he was legally blind in one eye." – *Parent*

"No nothing was obvious. Appeared to have normal eyesight but father has poor vision." – *Parent*

Children's and parent's acceptance of screening

Most parents did not report any apprehension about their child having their vision screened. While two reported feeling worried that the screening might reveal an eyesight issue due to a family history of the same, there was no apprehension reported about the screening process itself. Only one parent reported sitting in on a test and thought that his presence had helped with communication, while another thought their presence could be a distraction. The overall lack of apprehension at having their child's vision screened meant that parents generally felt their presence was not required. Parents felt the communication about what was involved in the screening was adequate. However, one parent commented that the information was not enough to understand the importance of vision screening, which could lead to some parents not returning consent.

Comments from parents suggested that children were accepting of the screening test and often feedback from childcare centre staff indicated that their child had been okay with the screening. This aligns with the experiences of preschool and childcare centre directors. There were some reports of children not being happy especially in later tests when eye drops might have been used, however parents are always present when follow-up tests are conducted with an orthoptist, optometrist or ophthalmologist.

"[Child] was fine and reported back that the screening was a 'game', suggests that she was very comfortable." – *Parent*

"Yes he was extremely nervous. He is a shy and withdrawn sort of boy. It helped for me to be there." – *Parent*

"Can't comment about the preschool screen as I wasn't there, but they [child] were fine in the secondary screen. Treated it like a game and was very relaxed." – *Parent*

Referral for further assessment

The procedure for referral was that a results notification letter was left for parents at the preschool. StEPS usually followed up directly with a phone call on the same or next day to explain the results and offer recommendations for the next steps to be taken. One parent was disappointed that she had no follow-up call from StEPS and felt left without assistance to find treatment for her child, with no previous experience of eye conditions. Another parent found the results letter difficult to interpret and reported being quite anxious and overwhelmed which was increased after receiving incorrect information from their GP. Once this parent was contacted by StEPS, they received better information and direction. In seven instances StEPS organised a follow-up appointment, which were generally for high priority referrals, and in most cases to attend a POOC. Three had attended secondary screening prior to further referral. In the majority of instances, parents were given recommendations and organised their own appointments with an optometrist, ophthalmologist or orthoptist. Two parents went to a private ophthalmologist despite a recommendation to see an optometrist. They both only knew the difference between ophthalmologists and optometrists through experience with a previous child. One of these parents strongly suggested that there should be more information highlighting the differences in care provided by optometrists and ophthalmologists so that parents are better informed to decide which health professional should be sought for further treatment.

"Extremely satisfied – really liked the follow up from the StEPS coordinator to see how [my child] was going with their treatment." – *Parent*

"Received a results notification left at the childcare centre that had medical terminology for the results. No one from StEPS phoned to explain what that meant or to discuss treatment options." – *Parent*

"Very clear explanation of the problem and what I needed to do next." – *Parent*

Six parents who attended a POOC for further treatment, reported a wait of between six weeks and two months for an appointment. Three parents commented that despite a recommendation to attend a POOC clinic, the substantial waiting time was a barrier and they instead had opted to attend a private ophthalmologist (n=2) or optometrist (n=1). Waiting time for private ophthalmology appointments was reported to be between one and six weeks. In total six parents opted to be followed up by a private ophthalmologist. Seven parents took their child to an optometrist, all based on the recommendation from StEPS. The majority reported no wait time for optometry appointments, with some reporting up to a two week wait. One parent was awaiting a secondary screening appointment at the time of the interview.

Eye conditions and treatment

Parents reported that a variety of ocular conditions were identified by StEPS. These were predominantly refractive errors (astigmatism, anisometropia, myopia and hyperopia) and were often present in combination with amblyopia and in three cases, also strabismus. All parents whose children had commenced treatment (95%), reported that their child had been prescribed glasses. In one case, glasses were prescribed by an optometrist prior to StEPS screening in error and were subsequently not required. Another parent had taken her child to an optometrist and they had been prescribed glasses while awaiting a POOC appointment. Once they had attended the POOC visit, it was determined that the prescription was incorrect and new glasses were obtained. A number of children (n=9) were additionally undergoing patching treatment for amblyopia and five additional parents had been informed that further patching treatment may be required if vision is not improved by glasses.

> "Patching was an issue at first and the one time use ones were expensive. He fought it at first." – *Parent*
>
> "Getting the treatment was fine, but the glasses were very expensive as they need to be very robust for a child. He then scratched the lenses which were another $198 to replace. Some of this was covered by private health insurance but there was still large out of pocket expense." – *Parent*

Based on parental reports, their children had accepted glasses well and enjoyed wearing them with comments indicating that they *"love"* or are *"proud"* to wear their glasses. Half of the parents interviewed discussed the expense of glasses as being a barrier to accessing appropriate treatment. In two cases, parents had been unable to obtain the glasses that had been prescribed, for one this was related to financial pressures. Six parents discussed that private health insurance was helpful in covering the expense of glasses, however, one parent still considered the out-of-pocket expenses too high. Some parents discussed that their child's glasses had or could potentially be broken or damaged and require replacement which would pose an additional cost. Parents who were attending POOC appointments described the cost and convenience of parking and the need to take time off work to attend as barriers. Two parents reported that patching treatment was not "popular" with their child and that single use patches could be expensive.

Benefits of detection and treatment

Six parents had noticed a positive behavioural change in their child as a result of their treatment including, being more engaged with learning activities and being more active and confident, with one parent noting that "*Early detection before school means the child enters as a confident learner*". Early diagnosis and resulting early intervention especially before children started school was the most frequently (80%) mentioned benefit of StEPS, with one comment suggesting that "*Picking up the issue and the early intervention. I probably wouldn't have picked up anything until much later".* A number of parents reiterated that they would not have detected any eyesight problems prior to their child attending school, in the absence of StEPS.

"There has been considerable improvement in [child's name] engagement with learning activities. He was behind for his age which is why he was held back from kindergarten for a year. But he has taken well to school and has caught up. Concentration has improved and is reading and writing more than he used to." – *Parent*

"[Child's name] has been much more inquisitive and his depth perception has improved. He is more active, draws more and using his hands to sense and move objects much more than he used to. Showing much more interest in engaging in developmental activities than he used to." – *Parent*

Further comments

The majority of parents interviewed did not consider any improvements to the program necessary and were very happy with StEPS. Three parents discussed a need for further promotion of the program, indicating that they and their friends were not aware of StEPS or the importance of early vision screening. They expressed concern that parents may not consent to screening as they don't understand the value of screening. Regular health checks and at the time of vaccination appointments were identified as possible avenues where StEPS screening could be promoted to parents.

Parent Survey

To obtain the opinions of a broader range of parents whose children may or may not have been referred from StEPS, an electronic survey was developed. The survey was advertised through the Facebook platform, targeting women aged 25-44 years old who were parents. Although, the survey was accessed 1,144 times, this only resulted in 62 complete surveys. Fifty survey completions were from parents of children who were born in our target years (2011-2013). Although the survey was designed with the intention of performing quantitative analysis, given the response rate, the results were not considered sufficiently powered and instead the results are qualitatively described[13].

Participation in StEPS screening

Of the 50 respondents, 37 (60%) reported that their children had been screened by StEPS, 12 (19%) had not had screening and one parent was unsure. Of those that had not participated in StEPS or were unsure, the most common reason was that the program had not been offered to them, either because it is not offered or StEPS had not yet attended their child's preschool or childcare facility (Table 12). One parent indicated that the booking for their daycare centre was cancelled and three reported that they or the childcare centre are not aware of the program.

[13] It is important to note that given the low response rate to the survey and the non-purposive sampling method used, the results are unlikely to have captured the range of views held by the target population and the results are not likely to be generalisable to the broader target population. Thus, the findings reflect the views and experiences of the sample of respondents only.

While, two respondents indicated that they did not participate in StEPS screening because their child was already under care elsewhere, a further two who had not participated for other reasons also indicated their child had been screened elsewhere. Two children were under the care of an ophthalmologist, one was examined at a public hospital and one by an optometrist.

Table 12: Parental reasons for not participating in StEPS

Reason	Number	%
Not offered at my child's preschool or childcare facility	6	46%
StEPS has not yet attended my child's preschool or childcare facility	3	23%
My child was already under the care of an eye health professional	2	15%
Uncertain	2	15%

Supporting the results of parent interviews and responses of preschool and childcare facility directors, overall, respondents were satisfied with the communication they received about the StEPS program with 26 responses indicating they were mostly or very satisfied. Two expressed dissatisfaction and a total of seven did not remember receiving any information.

Referral for further assessment

Of those whose children were screened, 13 (35%) were referred for further assessment and 85% of these were satisfied with the information they were given about the screening results. Two expressed some dissatisfaction, one reported that they were not contacted to explain the results and the other was not certain of the accuracy of the results.

Ten of the parents of children referred for further assessment, took their child to an optometrist. Two in this group also consulted an ophthalmologist. Another consulted a GP, who referred them to an optometrist and who subsequently referred them to an ophthalmologist. One respondent reported that they took their child to the community health centre. Another indicated that they did not take their child for further testing as they was not sure where to go and couldn't take time off work to go to an appointment. 'Advice from StEPS staff' was the most frequently chosen reason for why parents chose to access a particular type of health professional for further treatment (Figure 18). This was a multiple response question, so answers reflect the number of options selected.

Six of those who were referred stated that their child had been prescribed glasses, three had also been given patching treatment, one eye drops and one required surgery. Four required ongoing monitoring appointments, one who had reduced vision due to pathology. One parent reported that nothing was wrong with their child's vision. Two parents indicated that they had been given a referral to a paediatric ophthalmologist but were still awaiting an appointment.

The majority (83%) of those who had accessed further treatment rated that they found this relatively easy, which aligns with the findings of the parent interviews. Challenges reported in accessing treatment were most commonly the cost of glasses and appointments (n=6). While three specifically stated there were no challenges, two thought it was difficult to get an appointment. In particular, one parent indicated a 12 week wait for an appointment in the Moorebank/Liverpool area. One further respondent indicated distance to travel and getting time off work were challenges.

Figure 18: Range of responses to the question: "Do any of the following reflect reasons why you took your child where you did for further vision testing or treatment?"

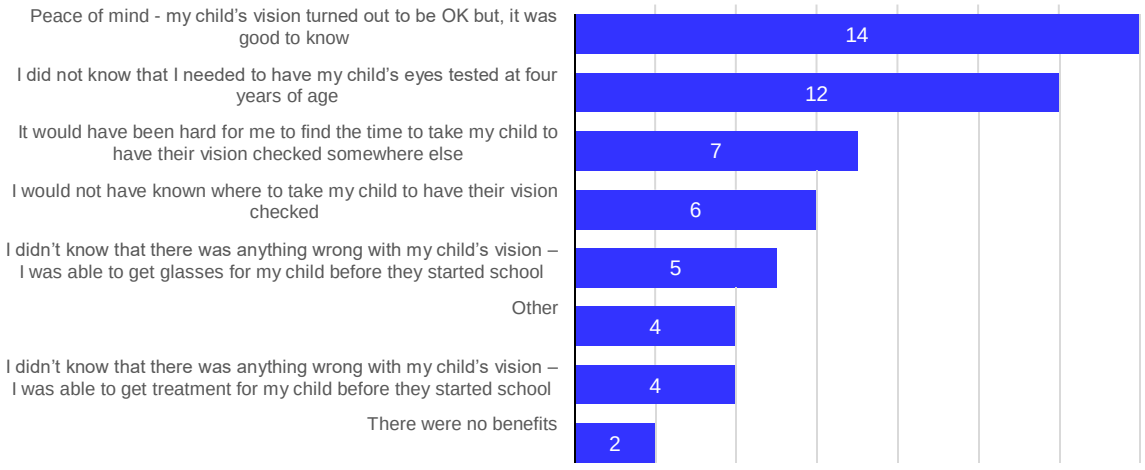
Improvements

The question relating to the three things that would make it easier to seek further vision testing or treatment received no responses.

Benefits of StEPS

The survey also asked parents to nominate the benefits of having their child's vision checked at their childcare centre. Peace of mind, knowing their child's vision was good was the most common response (n=14), followed by a lack of knowledge that their child's vision needed testing at four years old (n=12). The results of this are shown below in Figure 19.

Figure 19: Range of responses to the question: "Which of the following were benefits of having your child's vision checked at their preschool or childcare centre?"



General comments

Survey respondents were also asked to comment on the program overall, and provide any additional comments. Thirteen comments were provided. Some respondents had criticisms of the short time taken to test eyes and some felt this potentially gave rise to missing certain vision issues. There were six comments that indicated that parents would appreciate further information about the importance of screening, what is involved and what the results mean. Another respondent's child had missed screening due to illness and when the parent had tried to follow up via email, no response was received. There were some further comments indicating the benefits of the program.

> "My son had shown no signs that there was anything wrong with his vision. Without this test I may have never found out there was a problem." – *Parent*
>
> "Was great that they phoned a couple of days/weeks later to check how everything was going and to find out the results and advice from the optometrist. Great service!!!!" – *Parent*

5.5.4 Eye Health Care Professional Interviews

Community Eye Care Professionals

A total of 15 telephone interviews were conducted with eye care professionals who had experience with the StEPS program. Three interviewees were paediatric ophthalmologists who see children referred from StEPS in both private practice and in public hospitals. Eleven interviewees were optometrists and one was an orthoptist working in an optometry practice. Nine eye care professionals worked in a metropolitan area, including all three ophthalmologists, and 6 worked in regional or rural areas.

Referral information from StEPS

When asked about the adequacy of information contained in StEPS referral letters, the majority (87%) suggested that the information that was provided was adequate, accurate and valuable as a starting point for further examination. One eye care professional suggested that they would like to know the chart type used by different screeners, the other indicated that visual acuity results alone may not be accurate but, did not feel any further information was required. Most felt that visual acuity results were sufficient and the most appropriate information to provide from a vision screening program. Suggestions for further information that could be included were; comments on level of concentration during screening, any comments from teachers about visual concern, eye muscle examination and refraction results.

> "It has everything I need as to see why they've raised concern. So it's what I expect from a screening program." – *Optometrist*
>
> "I think that the simplicity of the program, as in you either pass the vision or you don't, is how it should remain. Doing anything more gets complicated and you have to train people up. If they don't pass the vision test then leave it up to the Ophthalmologist to sort out." – *Ophthalmologist*

Accuracy of referrals

All three ophthalmologists interviewed praised the accuracy of the screening results from StEPS. Eye care professionals based in optometry practices similarly reported that the referral results were highly accurate, with only one reporting that they were moderately accurate. All eye care professionals interviewed reported some false positive referrals, however, for the majority (n=13) these were indicated to be very infrequent and not at a level that they would consider inappropriate from a screening program. Some suggested that they would prefer there be some false positive referrals rather than false negative screening results and missed referrals. Two optometrists from rural/regional areas reported higher rates of false positive referral; one reported approximately 50% and the other 33% of referrals. Reasons offered for why children may be false positively referred included; autism, developmental delay and learning issues (n=3), malingering or behavioural issues (n=4), shyness and lack of confidence (n=3) or failure to understand the test (n=2). Two were unsure of any particular reason and one suggested children with mild refractive error that doesn't require treatment are sometimes referred. In general, eye care professionals felt that these referrals were still appropriate with one optometrist remarking; *"In saying that, it's also up to us to discern if there is an issue with behaviour or whether there is an actual medical issue or an issue with vision"*.

"Yeah, it's not often that we get false positives, it's not often where I don't find pathology. Very occasionally do I find that the child performs better, because it's their second or third test. But usually the results that I get are in keeping with what the initial referral suggests." – *Ophthalmologist*

"I think there is good accuracy for that context, in that it's a trained screener who has fairly specific training. And as I said before some kids just perform better in the consultation room rather than at school. I don't think I've had any that did any worse in the consultation room than in the screening, so that's a positive in that you don't have false negatives, if a kid has lower vision in one eye its going to be picked up by StEPS." –*Optometrist*

"Autism, developmental delay probably make up the majority of these [false positives] and they usually are the ones who get discharged after a single visit. Otherwise it's not common." – *Ophthalmologist*

"I think it would generally be a confidence issue, like a shy kid that is just intimidated by the screening itself and it's just a matter of them settling down and relaxing a bit. At that age group I don't usually get malingerers." –*Optometrist*

Eye conditions detected

Both ophthalmologists and optometrists reported that refractive errors are the most common condition detected by StEPS. Amblyopia was also commonly detected. Strabismus was reported by both ophthalmologists and optometrists as being seen only occasionally. Some optometrists suggested that strabismus may have been detected at a younger age, especially if of a substantial size. Two optometrists mentioned convergence and accommodative problems.

Optometrists were asked the frequency and by which criteria that they would usually refer children on to an ophthalmologist. Overall, the frequency of onward referral was reported as being low by the majority of optometrists, in both metropolitan (67%) and rural/regional (100%) areas. Two metropolitan based optometrists reported a higher frequency of onward referral. Most optometrists suggested that they would refer any child with strabismus (n=8) and a number also would refer children with amblyopia that was non-responsive to treatment (n=5) or if they were unable to examine the child or determine the cause of reduced vision (n=2). Pathology was commonly reported as requiring onward referral but was considered very rare. Two optometrists also reported that they would refer children with high or otherwise complex refractive error.

Reporting of outcomes to StEPS

Overall, the eye health professionals interviewed stated that wherever possible, they report the outcomes back to StEPS. All ophthalmologists commented that they prefer to send a detailed report to StEPS at the same time as reporting to the child's GP, rather than to return the StEPS results notification form. This was described as in keeping with their standard practice. Two ophthalmologists commented that in the public hospital the reporting of outcomes to StEPS was by the orthoptist. In private practice, the ophthalmologists who were interviewed reported that they rarely see the results notification form from StEPS but, when available they always endeavour to send a report of outcomes. The reason attributed to absence of forms was that parents forget to bring the form or misplace it and additionally that children are referred to private ophthalmologists via a GP or optometrist. This posed a barrier to the reporting of outcomes, as often ophthalmologists were unaware if a child had been referred by StEPS or did not have access to which LHD the screening occurred in and therefore the correspondence address to report back to StEPS.

> "Unless we ask the parent if they are a StEPS referral, most parents don't bring that form with them." – *Optometrist*
>
> "Parents don't always remember to bring it along. I find this more to be the case in private practice than in public." – *Ophthalmologist*
>
> "I'll always copy in StEPS if the patient brings that StEPS report. If they don't, I suppose I don't know enough about the different StEPS centres to know where to send it." – *Ophthalmologist*
>
> "From what I've seen, most parents don't even bring in the form. They just call up to say that their child needs an eye test. But I would prefer to fill in the form to let you know that the patient has been seen." – *Optometrist*

Optometrists similarly reported that they are infrequently provided with the StEPS referral letter and that often parents call and request an appointment without identifying that they have come through the StEPS program. However, optometrists on the whole preferred to fill out the form (83%), with only two indicating that they would rather send their own detailed report. When asked if they liked the results notification form, a number of interviewees indicated that they couldn't recall what it looked like as they don't see them often enough. Those that were able to comment indicated that they liked that it was *"quick"* and *"easy"* to complete. Two optometrists reported that they usually provide the form to parents and rely on them to pass the outcome information back to StEPS while, all others endevoured to return any outcome notification forms they received directly to StEPS.

Interviewees were asked if there is anything that would make reporting back to StEPS easier. Although some, felt the form was appropriate and relatively easy to complete and return, the barrier remained that parents often do not bring the form with them to their appointment, as reiterated by one optometrist; *"If parents aren't bringing in the form, it's not an easy thing to fix… I think if we get the form it's a very easy thing to get that information back to you but it's just getting the form in the first place."* A number of interviewees suggested that being able to identify whether a child had come from StEPS and where to send outcome information would improve the ability of eye health professionals to report back. Five eye health professionals suggested that an online platform to submit results notifications would be helpful.

Benefits of StEPS for children and families

All eye health professionals interviewed strongly emphasised the importance of the program and how beneficial StEPS is to children and their families. The main benefits highlighted were the detection of eye conditions at an age when they could be treated and in children who would have otherwise gone undetected and whose parents may not have been aware of the importance of early screening. Some eye health professionals highlighted the advantage of the program being universal with access available to all children and that this is especially important for disadvantaged families.

"I really don't think the importance of it should be underestimated, it's really key in terms of you are definitely picking up children who would otherwise have been undiagnosed at a time during the development of vision where you can make an impact, it's very rare that you get a kid from any referral that you can't do something to impact their vision for the rest of their lives." – *Ophthalmologist*

"The main benefit is that we are diagnosing treatable and preventable vision impairment at an appropriate age. I also think it's been a well-designed program, I think pre-school age is the right age to do it and the reason I say that is that there is a very low rate of false positives so I don't think there's much waste in the system, not many kids are being sent onto secondary and tertiary screening unnecessarily. It gives kids good vision for their lifetime. " – *Ophthalmologist*

"Who needs a lifetime of amblyopia when it can be avoided? Dealing with a very old practice as we are, we see plenty of stuff that happens at the other end of life, and if you are amblyopic it just, knocks your chances off. And invariably, if something goes wrong, it happens to the good eye. Anybody being amblyopic, it affects your whole life." – *Optometrist*

"The idea of preschool screening is brilliant, because I know my kids went to a preschool where they didn't do any screening and I think it's a great community service because it does pick up amblyopia at an early age and it gives the kids an opportunity for improved vision if it's required, so I think it's fantastic." – *Optometrist*

"I think it's great because it is picking up kids that just otherwise wouldn't have been picked up until they got to primary school, so it's getting to those problems before they start school which is crucial so I think it's a great program." – *Optometrist*

All health professionals unanimously affirmed the success of the StEPS program. Comments reiterated the importance of the program continuing;

"I think it's a fantastic program and I hope the government continues to fund it, because the lower socio-economic children fall through the cracks"

"I'm all for it, I think it's a really positive thing. I think that if it's the funding that's in question that it should be maintained for it. It's a very, very important way to make sure that the kids are school ready".

"The only thing I'd say is when I get a StEPS referral, I do a little fist pump because I actually love seeing StEPS kids because there's usually something wrong where it's a problem I can usually fix. I'm a very strong advocate. And if I've seen a one or two year-old that's been discharged without a problem, I'd actually actively mention the StEPS program and encourage them to participate in it."

StEPS Paediatric Ophthalmic Outpatients Clinics (POOCs)

Paediatric Ophthalmic Outpatients Clinics (POOCs) were established and funded as part of the StEPS program to refer children who fail screening into public ophthalmology care. POOCs are based in existing public hospital eye clinics across metropolitan Sydney. There are five POOCs clinics and two satellite clinics that take StEPS referrals, however, not all public hospital eye clinics in Sydney are run as POOCs. There are no POOCs located outside the Sydney area. The initial establishment of these clinics was through the orthoptic department at each hospital, with orthoptists taking responsibility for configuring the POOCs within their hospital eye clinic and administering the service. Ophthalmologists involved in the POOCs are visiting consultant ophthalmologists who attend scheduled POOCs clinics but do not necessarily run a regular outpatient clinic at the hospital. As a key stakeholder in the StEPS program, POOCs clinic staff were invited to be interviewed to determine their opinions on the program and to establish the configuration, effectiveness and efficiency of POOCs clinics in managing children referred through StEPS.

Staffing and configuration of dedicated StEPS clinics

The staffing configuration and the number of dedicated StEPS clinics run at each POOC varied substantially (Table 13). StEPS in most POOCs funded a consultant paediatric ophthalmologist and one or more orthoptic staff. Other staff who may have been involved in the running of dedicated StEPS clinics such as ophthalmology registrars, nursing staff or administrative staff were in most cases not funded by StEPS.

Table 13: Staffing configuration and number of dedicated StEPS clinics run within POOCs

	Ophthalmology FTE	Orthoptics FTE	n Orthoptic only clinics	n Orthoptic & Ophthalmology clinics
POOC 1	0.3	1.8	8 per month	2 per month
Satellite A			1 per month	1 per month
Satellite B			1 per month	1 per month
POOC 2	0.025	0.1	4 per month	1 per month
POOC 3	0.019	0.038	-	0.75 per month
POOC 4	0.019	0.019	-	0.75 per month
POOC 5	0.063	0.19	-	1.25 per month

The majority of POOCs have dedicated StEPS clinics which includes orthoptists and an ophthalmologist, and are run at least once per month, with a range of between nine and 24 being run across the year. While, StEPS clinics are generally run by one visiting ophthalmologist, the number of orthoptists varied from one to three.

Follow-up within StEPS clinics

The model of care within two of the POOCs clinics and two satellite clinics included ongoing follow-up within the dedicated StEPS clinic. Orthoptic-led follow-up clinics were configured similarly in both POOCs, with an initial visit and annual visits in a combined clinic with an ophthalmologist and orthoptist and interim visits conducted by the orthoptist only in an orthoptic-led clinic. At follow-up visits, the orthoptists managed monitoring and amblyopia treatment. In contrast, other POOCs reported that after the initial consultation and diagnosis, children referred from StEPS were moved into general paediatric clinics within the hospital.

Both POOCs using a model of follow-up within the StEPS clinic stated that the reason for doing so was to ensure a continuum of care, practice patient-centred care in collaboration with families and reduce the potential for loss to follow-up. The poor availability of paediatric ophthalmologists was a further reason cited for the need for orthoptic-led clinics.

Another POOC provided limited follow-up within the dedicated StEPS clinic for children. In most cases, this was restricted to one follow-up visit before being referred into a general paediatric clinic. However, some children who had complicated pathology or required additional investigation may be followed up for longer within the StEPS clinic, some examples given were retinal dystrophy requiring an electroretinogram (ERG), cataract and corneal issues.

The final two POOCs were structured to refer StEPS children into a general paediatric clinic following their first diagnostic visit. A challenge of this model was that it was difficult to track outcomes for children referred from StEPS, *"And that's the hard thing too about having our clinic structured how we do. It is hard then to track them after that first visit"*.

Initial Orthoptic Appointments

For some children an orthoptic-only appointment was booked prior to the initial appointment with the orthoptist and ophthalmologist. These appointments were typically offered to children who had special needs, including autism and developmental delay, or who had been unable to be assessed by StEPS screeners or in some cases had not received secondary screening. In one POOC, children with strabismus who required orthoptic measurements were also given an initial orthoptic-only appointment. The reasons given for an orthoptic-only appointments at initial visit were to; obtain a vision for triaging, provide an appropriate amount of time for the assessment of a challenging or complex patient, assist with transition into the service, prepare children with special needs for visits with the ophthalmologist and to take orthoptic measurements.

Incoming Referrals

The distribution of referrals between the POOCs varied substantially with a mean number of referrals per month of between three and nine. POOCs with the greatest volume of referrals reported as high as 14-16 new each month during peak screening times (Table 14). The number of referrals to POOC clinics varied throughout the year according to the screening cycle within the LHDs. Referrals tend to be lower early in the year and increase throughout the year. One POOC felt that referrals reached their maximum sometime in the middle of the year through to approximately October before again tapering off. Whereas, another POOC suggested that November through to December was the peak time for their referrals.

Another factor reportedly influencing the volume of incoming referrals were changes to StEPS staff within LHDs, particularly a lack of access to secondary orthoptic screening which increased referrals to POOCs or changes in screening staff, StEPS coordinators or

"There was a health district that didn't actually have an orthoptist, so historically there was a period of time where we were seeing more children referred because they didn't have the opportunity to have a secondary screen, so they came straight from failing StEPS and into our program. But that health district now has a position so we don't see them now" – *POOCs Staff*

"Having the orthoptist position at [LHD] recruited to because we were getting 15 referrals a month all from [LHD] and even though they were appropriate referrals it was that level of care we were struggling to provide. It was just difficult for us to have them seen in a timely manner so, having the orthoptist in that role has been fantastic." – *POOCs Staff*

available admin support. It was also reported by POOC staff that having orthoptic secondary screening was an advantage to managing incoming referrals as they were able to direct the child into the most appropriate referral pathway.

> "Secondary screeners, our community orthoptists are very good at working in partnership with the family to see the pathway that would suit that child, bearing in mind that there is more than one option, private optometric care or ophthalmology in a public hospital. So, they are very good at helping, I would say it's a partnership."– *POOCs Staff*
>
> "They have to offer them all the options but then they are there to, I suppose, based on their clinical expertise and also just because they know the waiting times and that kind of thing so, they can advise the parents but, the parents make the decision on what is going to suit them and their child." – *POOCs Staff*

One POOC discussed the importance of the role of the orthoptic secondary screeners in educating screening staff as a way of ensuring accuracy of referrals. They stated, *"The orthoptist in that role also does education of those nurses as well so, they're not just doing the secondary screening they are supporting the other staff involved in the StEPS program so their role is multifaceted really and a very valuable one"*.

All POOCs reported receiving referrals from a variety of LHDs, with referrals from different LHDs fluctuating significantly over time. Referrals predominantly came from the Sydney metropolitan area, with only one POOC reporting to have ever received a referral from outside Sydney. There were no overall trends observed in the volume of referral over time by any of the POOCs, any changes were restricted to individual LHDs. However, one POOC suggested that their referrals may have reduced slightly and attributed this to an increase in waiting time.

Priority of referrals

Information obtained from StEPS coordinators during service mapping, almost uniformly indicated that the majority of children referred to POOCs are high priority referrals. However, the majority of POOCs clinics (80%) reported accepting both routine and high priority referrals. The acceptance of both high priority and general referrals by POOCs did not appear to impact waiting times, with children with both high priority and routine referrals being able to be booked in at the next available clinic and only one reporting a longer waiting time. For this POOC, the waiting time is more likely reflective of the incorporation of follow-up appointments within the dedicated StEPS clinic, rather than the acceptance of routine referrals in addition to high priority referrals.

Triaging of referrals

For three of the five POOC clinics, triaging of referrals was not conducted as all referrals were able to be booked for an appointment at the next available dedicated StEPS clinic, in most cases within a month, with high priority referrals given preference. The other two POOCs triaged all incoming referrals to determine the urgency of the appointment, with some children being given an appointment within a shorter timeframe than the typical wait time. Triaging was based on visual acuity and the suspected seriousness of the cause of any vision loss.

> "If there are any children of specific concern to the orthoptist clinically, we may get a phone call discussion about prioritising them in to the clinic. We are able to accommodate that" – *POOCs Staff*
>
> "If the screeners are really worried about a child they can call and we can see them that day." – *POOCs Staff*

POOCs clinic staff also discussed that they often communicate with StEPS orthoptists, screeners and coordinators about children who are of particular concern and ensure these children are seen urgently.

Table 14: Number and types of referrals, wait time and appointments

	Average new referrals/ month	Type of Referral	Wait time	Follow-ups in clinic	N new seen per month	N follow-up per month
POOC 1	5-7 (off peak) 14+ (peak) Average 9*	High priority	2.5 months	Yes	10	36
Satellite A	Not currently accepting new referrals	High priority	3-3.5 months	Yes	1	16
Satellite B	Not currently accepting new referrals	High priority	2.5 months	Yes	3	7
POOC 2	3	All referrals	5 months	Yes	3	15
POOC 3	6	All referrals (high priority only from some LHDs)	<6 weeks	No	12	0
POOC 4	6 (off-peak) 13 (peak) Average 8	All referrals	<6 weeks for HP and <3 months for general	No	8	0
POOC 5	8 (off peak) 16 (peak) Average 9*	All referrals	<1 month	Yes- limited to one follow-up appointment	8	8

**Estimated mean per month based on report of peak and off peak times and number of referrals during each*

Booking of Appointments and Capacity

All POOCs were able to book an appointment for children referred from StEPS within the six months following the receipt of their referral and for most POOCs, bookings were made at the next available clinic, usually within four to six weeks. It should be noted that the two POOCs who routinely provide ongoing follow-up of children within their dedicated StEPS clinics, were also those with a limited capacity to take new referrals. Both of these clinics had significantly longer waiting times for children referred from StEPS to receive an initial appointment. In the POOC with the highest number of referrals per month, the highest frequency of clinics throughout the year and highest staffing level, the waiting time was reported by staff to be between eight to 10 weeks. The two satellite clinics linked with this POOC were no longer able to take new referrals with any referrals directed through the main clinic. The other POOC with ongoing follow-up had much lower staffing levels, number of clinics run and number of referrals but, had a waiting time of approximately five months.

Although the wait time for POOCs without a model of ongoing follow-up was less, staff at these clinics expressed that general paediatric ophthalmology clinics were overcrowded with extensive wait times, potentially contributed to by referring StEPS children into general clinics

for treatment and follow-up. For POOCs without ongoing follow-up within the clinic, the biggest factor impacting the wait time for newly referred children was the frequency that dedicated StEPS clinics were available.

The number of children booked in to each dedicated StEPS clinic within the POOCs varied from seven to 16, with one POOC reportedly booking 22 children into one of their StEPS clinics. The capacity of each dedicated StEPS clinic, within each POOC, was reported to be related to staffing levels and space availability. Most had a specified number of children who were booked into each clinic but, also expressed that this number was exceeded when necessary to see children on time and deal with urgent cases. Additionally, staff from one POOC with a high volume of referrals and substantial waiting time discussed running additional clinics to cope with demand and ensure the waiting times do not become unreasonable.

Accuracy of referrals

All POOCs staff expressed that referrals were very accurate on the whole from the program, with nil or very few false positive referrals. This included both high priority and general referrals in those POOCs who accepted both. The screening staff were praised for their accuracy. Some POOC staff discussed that referrals were less accurate early in the program and have increased in accuracy over time as screeners have become more experienced. Staff at one POOC suggested that it took approximately a year for the screening to become accurate.

"Initially children were false positive because the screeners were not accurate, so the orthoptist would check the vision prior to the child seeing the ophthalmologist. Now the screeners are very accurate and they see both the orthoptist and the ophthalmologist on the first visit." – *POOCs Staff*

"I can't say categorically that if a screener got 6/24 vision that I am going to necessarily get 6/24 vision but, I am definitely still going to get a failed *[sic]*. So, it may not align, but the referral is very appropriate." – *POOCs Staff*

"And we're also seeing a lot of children who have additional needs so, they are a 'false positive' because they need to be assessed in a tertiary environment. They are an appropriate referral to an ophthalmologist, they cannot be screened appropriately in the community but we often discharge them because they've got nothing else going on." – *POOCs Staff*

"I believe that the StEPS test is a really good screening tool for developmental delay and autism because some parents don't know their child has autism or developmental delay and they come into a preschool setting, the child is 4 and they actually can't cognitively do a test and then they get referred to an eye specialist before they get referred to a paediatrician." – *POOCs Staff*

Where false positive referrals were noted in POOCs those referrals were generally for children who were 'unable to assess' at primary screening. These children were frequently observed to have autism or global developmental delay, often not previously diagnosed. Despite having normal vision and no ocular abnormalities, POOCs staff were clear that these children were not inappropriate referrals because through the program and referral to the POOCs they were able to be referred on for appropriate care. The other reason cited for children to be a false positive referral, was if they were difficult to assess due to shyness.

Change to HOTV LogMAR chart for screening

The majority of POOCs had not noticed a change in the number or pattern of their referrals as a result of the change to the HOTV LogMAR chart. However, they anticipated that there would be a change once this was implemented fully. There were anecdotal observations that vision was approximately one line better when examined with HOTV LogMAR chart compared to Sheridan Gardiner. There was some concern that this would change referral patterns between high priority and routine referral. As previously noted, it was felt this might be compounded by the introduction of a 6/15 line on HOTV LogMAR chart (between the 6/12 and 6/18 lines) that was not previously available in the Sheridan Gardiner test. The impact of this change could be, that children who achieved 6/18 using the Sheridan Gardiner yet achieved 6/15 on the HOTV LogMAR chart would change from being a high priority referral to routine. The impact of this has yet to be determined.

Another issue for one of the POOCs with a process of triaging referrals was that the largest line on the HOTV LogMAR chart is 6/24 making it difficult to triage based on visual acuity. They suggested that changing the testing distance could allow screeners to quantify the visual acuity more finely, however, this would require further training for screeners.

Discharge and onward referral

All POOCs clinics reported very low rates of discharge, for both children who were followed-up in the dedicated StEPS clinic and those who were followed-up in general paediatric clinics. Most frequently, it was reported that discharge was not until over the age of 7-8 years and only if vision was at a normal level and stable. The average number of children discharged per month ranged from one to three. In all cases, the number of incoming referrals exceeded the number discharged. One POOCs clinic reported that myopic children who would have previously been discharged earlier are now undergoing atropine treatment to slow their myopia progression and thus, will not be discharged.

Onward referral was rarely or never made outside of the hospital system. Referral within the hospital system was usually for further investigation such as, medical resonance imaging or electroretinograms (ERGs), or in some cases to a paediatrician for autism or developmental delay. POOCs that had ongoing orthoptic-led follow-up within the StEPS clinic, sometimes referred children into the general paediatric clinic for specific treatment or investigation, after which, they were returned into the StEPS clinic. Potential reasons for this included, atropine refraction, surgical consult and pathology that needed more urgent treatment.

Challenges and suggestions for improvement of StEPS

The main challenge reported by the majority of POOCs was limited funding to resource the service. The reported need for additional funding varied between POOCs, from additional staff or additional dedicated clinics to cope with demand, support staff including nurses and registrars who were not considered in initial funding and funding to facilitate follow-up and treatment within the dedicated StEPS clinic. A further issue raised by half of the POOCs was limited availability of paediatric ophthalmology services, with one POOC explaining that if their ophthalmologist was to leave, they would not be able to replace them and continue to deliver dedicated StEPS clinics. One POOC discussed inequity between POOCs with some able to support treatment and follow-up within the clinic and disparity in the number of staff as compared to the number of children booked.

Benefits and strengths of StEPS

All POOCs staff were extremely positive and supportive of the StEPS program. When asked about the main benefits of the program, they highlighted the importance of screening to detect eye conditions, some of which were serious and life-threatening as well as sight-threatening, and would not have been otherwise detected. One POOCs staff member explained that parents are frequently unaware of their child's vision problem and would not have considered taking them to have their vision tested, if it weren't for the availability of StEPS which aligns with the results of parent interviews. The importance of early detection as facilitated by StEPS to ensure conditions are treated when most effective during the developmental period was also discussed.

> "The strength of the program is that it caters for children who aren't in metropolitan areas and children who are in rural areas, that there is equitable access to the service... I think the current model that we have and the current set-up of the tertiary clinics it's great, I think the children are very well cared for. That it is not just the identification and discharge, it is identification, good continuum of management and then discharge when safe and I really think that is a strength." – *POOCs Staff*
>
> "Early intervention, improved access to tertiary paediatric eye services in public hospitals, improved access for preschool children with special needs."– *POOCs Staff*

Other strengths of the StEPS program included, increased access to tertiary paediatric ophthalmology services through POOCs and that the program provides equal access to screening for children from both metropolitan and rural and regional areas.

5.6 Economic Evaluation

This section focuses specifically on Objective 6 of the StEPS program evaluation:

Objective 6: To investigate the costs of implementing StEPS and undertake an economic evaluation of StEPS

Currently in Australia there is limited evidence on the impact of vision screening programs. International studies have tended to focus on short-term outcomes of screening such as cost per case detected (Konig et al. 2000), the potential to identify cases outside of the screening program (Schlichtherle et al. 2000), or the treatment of false positives. There is limited evidence to determine the most cost-effective screening methodology for preschool children.

This analysis expands on the previous evaluation (Blows et al. 2014) and previously published literature by using sophisticated and robust economic evaluation methods to *measure long-term cost-effectiveness* and consider the outcomes associated with *the various models of implementation* with extensive consultation of key stakeholders to determine *optimal models of care*.

Appendix D contains additional detail of the economic evaluation, the associated literature reviews and other related material.

5.6.1 The costs of the StEPS program

This section focuses on the costs of delivering the StEPS program in the 2016/2017 financial year. Costs are reported at an aggregate level[14] across four main areas: LHD costs included; (i) staffing costs, (ii) clinical operating costs, (iii) administration and, (iv) goods and services. NSW Health costs included; (i) staffing and (ii) administration.

Budget summaries were provided by LHDs from metropolitan, regional and remote areas. NSW Health costs were also provided. Based on these data it was possible to calculate the total annual cost of running StEPS (LHD and state-wide) and the cost per screened population. The total cost of running StEPS was $3,961,948 in 2016/2017.

The average cost per screened child was calculated as the mean LHD 2016/2017 financial year cost divided by the mean LHD screening population (as at 2017[15]). It was assumed that 100% of eligible children would be eligible to be screened[16]. Under this assumption the cost per screened child was calculated as $38.63. The cost per screened child, assuming that 78.5% of eligible children were screened (the program screening rate), was calculated as $49.21.

Based on population projections, the cost per screened child reduced over time (Table 15). By 2020, it was forecast that the total cost of running StEPS was $4,204,451, which equates to $37.37 per screened child (100% screening rate).

[14] The review committee guaranteed that no identification, either direct or indirect would occur for any LHD. Therefore, only results in aggregate and the results from the regression line are presented.
[15] Population projections provided by the NSW Ministry of Health.
[16] The population of interest is the population of those who could be potentially screened.

Table 15: Average cost of implementing StEPS by eligible screened child

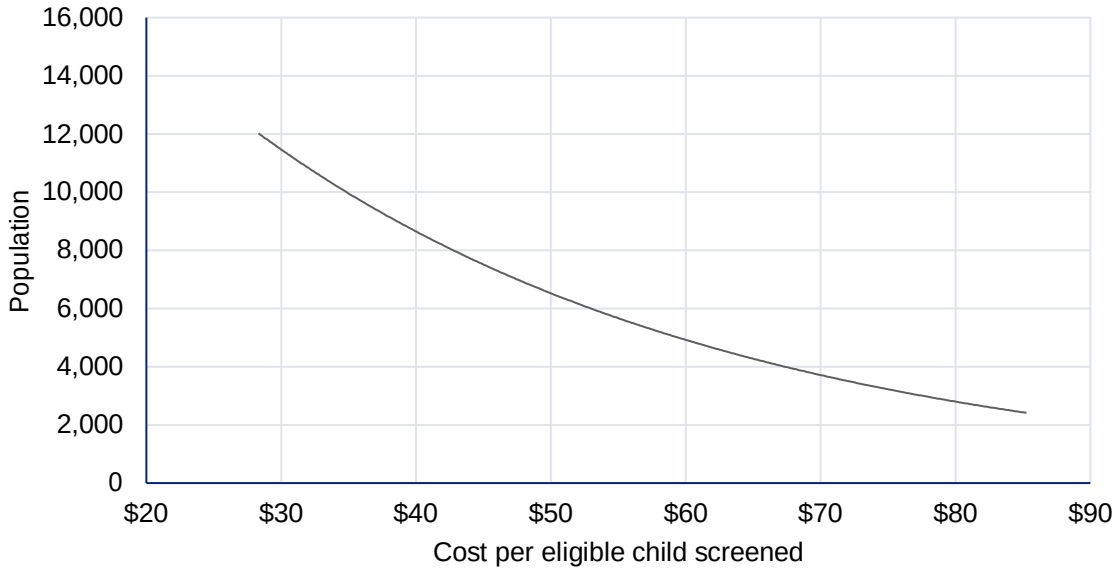
	Current Year 2016/2017	Projections [f] 2017/2018	2018/2019	2019/2020
LHD Level: Staffing, clinical operating, administration, good and services costs	$304,876	$310,974	$317,193	$323,537
Department of Health: administration costs per LHD[a]	$17,857	$18,214	$18,579	$18,950
Total annual cost of running StEPS (LHD level)[b]	$322,733	$329,188	$335,772	$342,487
Total annual cost of running StEPS (state-wide)[c]	$3,961,948	$4,041,187	$4,122,010	$4,204,451
Cost per screened population (eligible population)[d]	**$38.63**	**$38.20**	**$37.78**	**$37.37**
Cost per screened population (78.5% screening rate)[e]	**$49.21**	**$48.66**	**$48.13**	**$47.61**

Staffing includes: salary and wages, staffing on-costs (leave, superannuation and salary packaging); Clinical operating includes; education and training, motor vehicle and travel; Goods & Services include: building and equipment

*a. Average costs based on six LHDs b.Annual cost per LHD= LHD level cost+ DOH cost c.Total cost of running StEPS= Annual cost per LHD*14 LHDs d. Cost per screened population = LHD 2016/2017 total cost (LHD+ DOH)/ LHD eligible population. Weighted cost = sum(LHD eligible population/ Total eligible population* cost per screened population per LHD) e. average program screening rate = 78.5% f. projections assume CPI of 2%, per person projections data sourced from HealthStats NSW with adjustments by Centre for Epidemiology and Evidence, Ministry of Health, NSW.*

Figure 20 presents the cost per screened population by LHD, represented by a 'line of best fit'. The results showed, unsurprisingly, that there were economies of scale. That is, the cost per eligible child generally decreases as LHD's increase in size and as the fixed costs are spread out across a larger population.

Figure 20: Cost per eligible child screened by LHD (line of best fit)



5.6.2 Economic Evaluation

Base-case cost-utility model

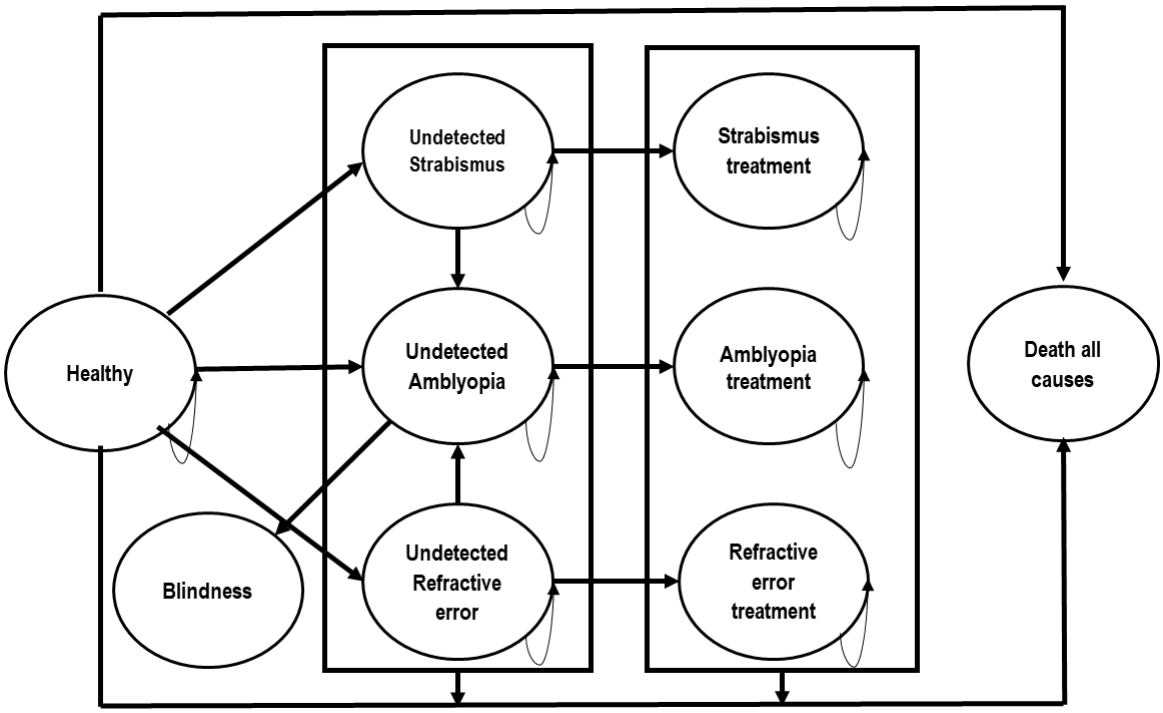
The base-case cost-utility model focuses on the cost-effectiveness of the StEPS program. A Markov model was used to investigate a hypothetical cohort of four year-olds undergoing vision screening (Figure 21), using decision analysis software (TreeAge Pro Suite 2014, TreeAge Software Inc, Williamstown, Mass).

Eligible individuals are invited to participate in the screening program via preschools, child-care centres and other children's services or directly via the parents in screening clinics. Participants choose to participate and are screened.

Following a positive screening result, the individual will either be referred to a POOCs clinic, outpatient clinic, private ophthalmologist or private optometrist for further testing. The tree assumes that a proportion of children who are referred do not attend for further testing. It is then assumed that confirmatory testing will successfully identify a proportion of children who have ocular conditions causing visual impairment (amblyopia, refractive error, strabismus and other eye diseases).

Once successfully identified, each child exits the screening pathway for treatment depending on the condition diagnosed. Individuals who do not attend the referral appointment or are not identified successfully will receive no immediate treatment. The model allows unscreened and undetected children to present with symptomatic visual problems, outside of screening cycle, up until 18 years of age. Participants cycle through the Markov model annually.

Figure 21: Markov model- Natural history of major childhood eye conditions[17]



[17] Other eye conditions were considered in the model, Legal blindness (a vision in the best eye of less than 6/60) (Foreman et al. 2016; Save Sight Institute 2016), refractive error and strabismus were the only eye diseases that directly impacted on the QALYs in the base case. Amblyopia increased the rate of blindness in the base case and was assumed to be associated with a QALY loss in one of the scenarios.

The key assumptions underpinning the model follow:

1. The base case screening rate was assumed to be 78.5% (average screening rate identified in 2012-2016). Referral rates were 9.4%, with 10.45% of these children who had been screened positive, not-attending referral appointments.
2. The proportion of the cohort entering each health state was determined using four year-old prevalence of eye diseases from Pai et al. (2012).
3. Participants with borderline testing results were assumed to have been unscreened.
4. Refractive error and strabismus are potential causes of amblyopia (Jonas et al. 2017a). It was assumed that refractive error, strabismus and amblyopia are separate conditions, with amblyopia having increased severity (i.e. higher costs and increased risk of blindness) (Chua & Mitchell 2004). Children could develop amblyopia from refractive error or strabismus up until the age of eight years (at a rate of 1% per year).
5. The natural history of refractive error was defined such that patients with undiagnosed visual problems had an annual rate of detection, up until 18 years of age.
6. The sensitivity of screening for refractive error, strabismus and amblyopia were determined from the referral and outcome data of the StEPS program. The sensitivity was assumed to be common to all conditions. The specificity of screening for refractive error, strabismus and amblyopia were determined by the presence of pathology results from the StEPS program and the assumed rates of pathology in the population.
7. Each year the cohort cycled through the model they gained one year of life, which was adjusted by the utility weight (quality of life), according to their health state and age.
8. Once diagnosed, children were allocated a first line treatment cost. A proportion of children fail both first and second line treatment. Treatment costs for detected visual problems were dependent on the condition and line of treatment. Ongoing treatment during childhood (up to the age of 18 was assumed).
9. There were no mortality implications assumed for eye disease. Mortality was calculated using probabilities determined from Australian life tables (ABS, 2017).
10. Participants were followed up until the age of 100 years or until death.

Competing strategies

The base-case decision model compared two alternative strategies: screening using StEPS and no screening. Estimates from the process evaluation and data analysis of the report (screening, referral, compliance, sensitivity and specificity of detection) were incorporated to inform the model. Clinical probability estimates were obtained from the literature to determine the prevalence, natural history, diagnosis and management of eye diseases (

Table 16).

Costs and utilities

All estimates for costs and utilities used in the model are provided in Table 17. Costs in the base-case are limited to direct health care costs and exclude non-health care related costs borne by society. Societal costs relating to lost productivity are considered in a sensitivity analysis. All costs were converted into 2017 estimates by using health care inflation (Australian Institute of Health and Welfare 2017).[18] To calculate QALYs, we used a range of relevant health state utilities derived from the published literature (Table 17). All costs and utilities were discounted at 5%.

Outcomes

The primary outcome was the incremental cost effectiveness ratio (ICER) between the two competing alternative strategies (screening with the StEPS program and no screening). The ICER is calculated as the difference in costs between two strategies divided by the difference in QALYs.

Alternative scenarios and perspectives

Four alternative implementation scenarios and one alternative perspective was also considered. The approach used was consistent with the base-case model, where each of these scenarios compared screening using StEPS with no screening. The key assumptions were:

1. The additional benefits of catch-up clinics – which increased costs by 4.5% and screening rates by 8%[19].
2. The use of secondary screening by orthoptists – which 1) increased sensitivity of the testing and 2) increased the proportion of participants who screened positive and were referred to optometrists.
3. The availability of nursing vs non-nursing staff – which increased the acceptance of screening[20].
4. Follow up of those who screened positive – which reduced the proportion of participants who did not attend follow-up referral appointment[21].
5. Societal perspective – which included the reduction in productivity (rate of employment and average wage[22]) that occurred with untreated refractive error and blindness.

Sensitivity Analyses

A univariate sensitivity analysis was conducted in which all of the base-case probability estimates were varied. The ranges used in this study were based on the published literature. All variables were assumed to be independent.

A probabilistic sensitivity analysis (PSA) was also conducted. PSA allows for input parameters in a model to be specified as full probability distributions, rather than point estimates, allowing

[18] Any missing values for medical inflation was assumed to be the same as the previous year.
[19] Based on results from panel regression contained in Section 5.2.4
[20] The model considered a reduction in per person cost by using non-nurses. This cost savings was offset by the additional costs incurred due to clinical advisory by orthoptists.
[21] Assumption
[22] Australian Bureau of Statistics data collections (Australian Bureau of Statistics 2012, 2018).

for an estimate of uncertainty surrounding their values. Distributions were selected to reflect the natural bounds implicit to the parameter (e.g. costs have to be non-negative). The model then randomly draws from these distributions 10,000 times, a technique called a Monte Carlo micro-simulation (Drummond et al. 2015).

Table 16: Inputs in the Economic evaluation

Input variable	Value	Lower range used in sensitivity analysis	Upper range used in sensitivity analysis	Reference
Prevalence [a]				
Prevalence of amblyopia	0.025	0.0	0.05	(Pai et al. 2012)
Prevalence of other disease	0.01	0.01	0.01	(Pai et al. 2012)
Prevalence of refractive error	0.0885	0.02	0.14	(Pai et al. 2012)
Prevalence of strabismus	0.0049	0.00	0.02	(Pai et al. 2012)
Screening performance				
Sensitivity of screening for amblyopia	0.76	0.5	1.0	a.
Sensitivity of screening for refractive error	0.76	0.5	1.0	a.
Sensitivity of screening for strabismus	0.76	0.5	1.0	a.
Specificity of screening for amblyopia	0.95	0.5	1.0	a.
Specificity of screening for refractive error	0.95	0.5	1.0	a.
Specificity of screening for strabismus	0.95	0.5	1.0	a.
Probabilities				
Probability of adherence	0.8955	0.85	0.94	Section 5.3.2
Probability of screening	0.785	0.2	1.0	Section 5.2.2 (result for 2016)
Probability of having surgery for amblyopia given failed glasses and patching	0.185	0.1	0.4	(Pai et al. 2012)
Probability of cure for amblyopia with glasses	0.3	0.3	0.5	(Chen & Cotter 2016; Tailor et al. 2016)
Probability of cure of patching for amblyopia given failed glasses	0.7	0.5	0.9	(Holmes et al. 2003)
Probability of cure of amblyopia with surgery	0.82	0.7	0.9	(Hatt & Gnanaraj 2013)
Probability of cure for refractive error (glasses)	0.9999	0.8	1	(Chen & Cotter 2016; Tailor et al. 2016)
Probability of cure for myopia	0.9999	0.8	1	Assumption
Probability of curative treatment for strabismus	0.8	0.6	1	Assumption
Probability of detecting amblyopia without screening	0.0345	0.0	0.0	(Pai et al. 2012)
Probability of detecting refractive error	0.17864	0.0	0.0	(Foreman et al. 2016)
Probability of detecting strabismus without screening	0	0.0	0.0	Assumption
Probability of moving from refractive error to amblyopia	0.01	0.00	0.03	Assumption
Probability of moving from strabismus to amblyopia	0.01	0.00	0.03	Assumption
Probability of using an ophthalmologist for RE	0.244	0.1	0.5	Main report[b]
Probability that RE is myopic	0.29	0.2	0.4	(Pai et al. 2012)
Other characteristics				
Relative risk of blindness with amblyopia	2.21	1.5	3	(Chua & Mitchell 2004)
Number of years for which amblyopia can be detected and treated	3	0	5	(Pai et al. 2012)

Abbreviations: RE= refractive error.

Notes a. Sourced from main program evaluation. b. Initially calculated as 0.244, based on high priority versus regular referral

Table 17: Cost and utility inputs in the economic evaluation

Input variable	Value	Lower range	Upper range	Reference
Costs				
Cost of screening	$38.63	30	120	a.
Cost of review of positively screened children	$298.52	60	500	b
Cost of review for refractive error of positively screened children	$148.63	60	300	c
Cost of glasses	$170	40	700	d.
Cost of optometrist in initial year, based on a long and a short review	$100.25	66.8	133.6	e.
Cost of optometrist subsequent years	$66.8	33.2	100.2	e.
Cost of ophthalmologist follow-up	$72.05	72.05	372.05	f.
Cost of blindness	$30,260	10000	40000	(Meads et al. 2003)
Cost of treating amblyopia with glasses h	3 follow-up and a pair of glasses	500	2500	(Opthalmologists 2012)
Cost of patching amblyopia at the age	4 follow-ups	500	2500	(Holmes et al. 2003)
Cost of treating amblyopia with surgery	$3,878.90	1200	5000	i.
Cost of treating refractive error	Refractive error follow-up and glasses	300	800	assumption
Cost of treating myopic patients	Refractive error follow-up and glasses	300	800	assumption
Cost of treating strabismus	2 follow-ups and glasses	500	1000	assumption
Utility values				
Utility of normal vision	Age based utility values based on SF-6D	0.8	1	(Norman et al. 2013)
Utility of amblyopia	The same utility as the population without eye disease	0.6	1	(Norman et al. 2013)
Utility of refractive error after successful treatment	dependent on life tables, assumed to be the same as normal vision	0.9	1	(Norman et al. 2013)
Utility of untreated refractive error	The utility of the population without eye disease was decreased by 0.25	0.6	1	(Norman et al. 2013)
Utility of myopia	The same utility as the population without eye disease	0.6	1	(Norman et al. 2013)
Utility of strabismus after successful treatment	The same utility as the population without eye disease	0.9	1	(Norman et al. 2013)
Utility of untreated strabismus	The utility of the population without eye disease was decreased by 0.25	0.6	1	(Norman et al. 2013)
Utility of blindness	The utility of the population without eye disease was decreased by 0.25	0.5	0.8	(Yang et al. 2015)

Notes: a. From evaluation, b. Based on assumed outpatient visit or ophthalmologist c. Weighted average of ophthalmologist and optometrist d. Based on Specsavers Costs $99 to $199 for single prescription lenses at Specsavers (accessed 27/07/2018). A higher cost was assumed because a substantial number of prescriptions will require different lenses for each eye. e. Based on long and short consultation (item number 10912) f. Based on item 104 - subsequent consultation g. Based on severe sensory or speech disability h. Assumption of treatment course based on guidelines, i. C10Z (Strabismus procedures) with a cost-weight of 0.79.

5.6.3 The cost-effectiveness of StEPS

The impact of StEPS visual screening program on the on the NSW population of four year-olds using a health services perspective was to increase the cost and the benefit compared to the strategy of no screening. The incremental cost was $130 per child which included the costs of the screening, costs of referral, ongoing treatment costs and the costs associated with blindness. The incremental benefit was on average 0.009 QALY gained per child.

In terms of cost-effectiveness, the incremental cost effectiveness was $14,386 per QALY compared with the strategy of no screening. Including productivity costs lowered the cost-effectiveness ratio, suggesting that the screening alternative was more cost-effective when productivity was included. When productivity effects for both the visual impairment of blindness and refractive error were included, the StEPS visual screening program was welfare producing without considering the health benefits. That is the total benefit of increased productivity was greater than the increase in health system related costs.

Table 18: Cost-effectiveness of StEPS screening vs. no screening

Perspective and strategy	Cost	Benefit (QALY)	ICER (Cost/QALY)
Health services perspective – base case			
No screening alternative	$903.45	15.42488	$14,386
Screening alternative	$1,033.58	15.43392	
Societal perspective including productivity changes associated with blindness			
No screening alternative	$1,369.74	15.4249	$13,942
Screening alternative	$1,495.86	15.4339	
Societal perspective including productivity changes associated with blindness and refractive error			
No screening alternative	$3,087.24	15.4249	The gains in productivity exceed the health costs
Screening alternative	$2,770.86	15.4339	

Abbreviation: ICER=incremental cost-effectiveness ratio; QALY=quality adjusted life year
Increasing the services or intensifying the services offered increased the effectiveness and the costs associated with screening. Using nurses rather than lay screeners was the least cost-effective addition.

Increasing the services or intensifying the services offered increased the effectiveness and the costs associated with screening. Using nurses rather than lay screeners was the least cost-effective model of implementation.

Table 19: Cost-effectiveness of alternative implementation models

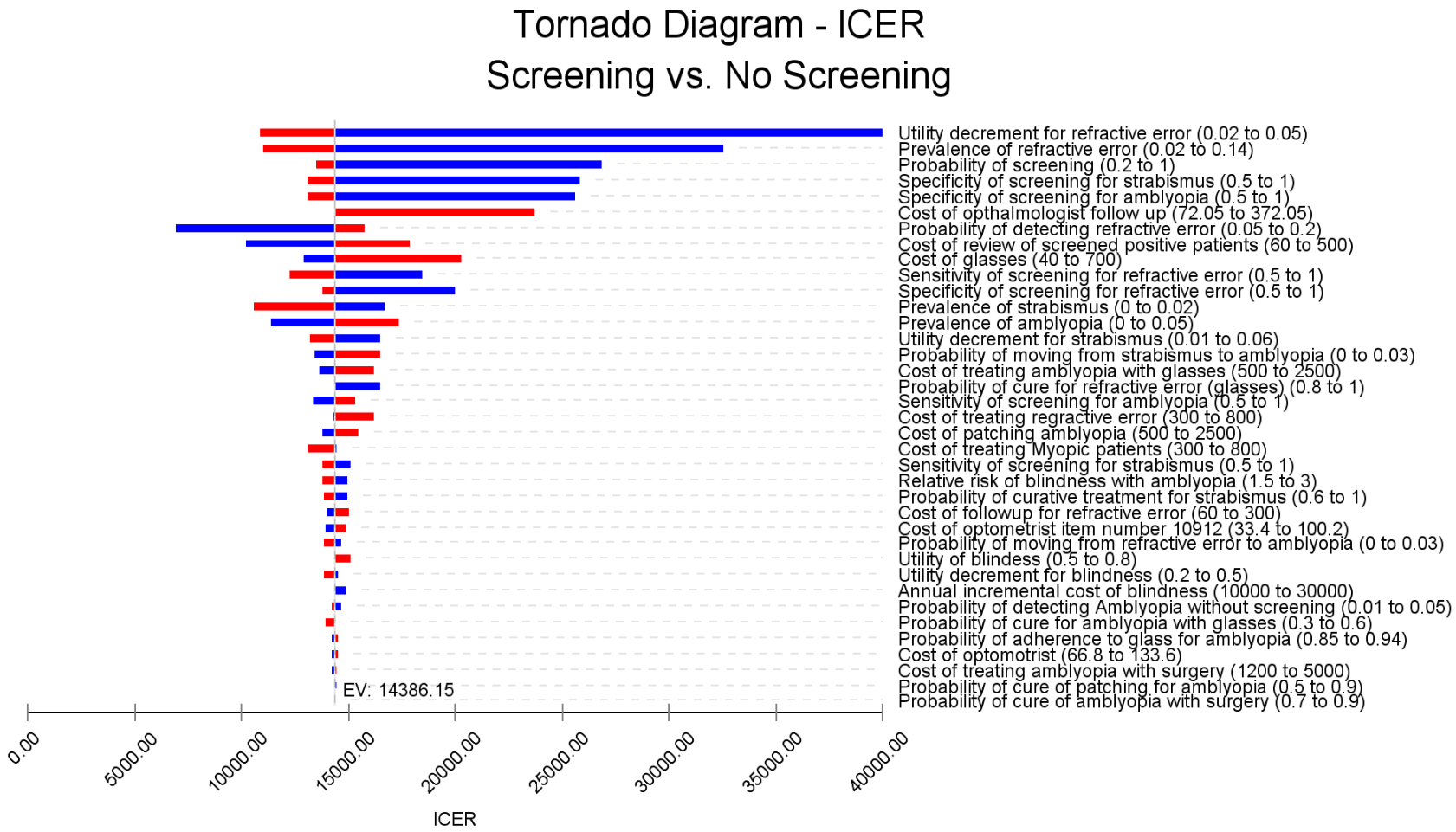
Strategy	Cost/Incremental cost	Benefit (QALY)/Incremental benefit	ICER
Base case			
No screening	$903.45	15.4249	$14,386
Screening	$1,033.58	15.4339	
Catch-up clinics			
Catch-up clinics	**$1,044.73**	**15.4348**	
Increment between no screening and catch-up clinics	$141.28	0.0099677	$14,174
Increment between screening and catch-up clinics	$11.15	0.0009219	$12,095
Secondary screening			
Secondary screening	**$1,035.05**	**15.4340**	
Increment between no screening and secondary screening	$131.60	0.0091648	$14,359
Increment between screening and secondary screening	$1.46	0.000119	$12,289
Nurses rather lay screeners			
Nurses rather than lay screeners	**$1,051.01**	**15.4344**	
Increment between no screening and screening exclusively with nurses	$147.56	0.0094837	$15,560
Increment between screening and screening exclusively with nurses	$17.43	0.0004379	$39,804
Increased follow-up			
Increased follow-up	**$1.035.53**	**15.4343**	
Increment between no screening and screening with increased follow-up	$132.08	0.0094579	$13,965
Increment between screening and screening with increased follow-up	$1.95	0.0004121	$4,727

Abbreviation: ICER=incremental cost-effectiveness ratio; QALY=quality adjusted life year

The results from the univariate sensitivity analysis of the base case analysis are presented in the Tornado diagram in Figure 22. The base-case values are represented by the midline. An increase in the variable is represented by the red bar and a decrease in the variable is represented by the blue bar.

The prevalence of the detected eye conditions, screening rates, the assumed utility loss with refractive error, and the sensitivity and specificity detection of eye conditions were important drivers of the model. However, based on a cost effectiveness threshold of $50,000/QALY, all parameters remained below the threshold, indicating that the conclusion that screening is cost-effective and is robust to variation in the model parameters.

Figure 22: Tornado diagram for one way sensitivity analysis



Abbreviation: ICER: incremental cost-effectiveness ratio

5.6.4 Interpretation of economic evaluation findings

This economic evaluation is the first to estimate the costs and cost-effectiveness of a preschool vision screening program for detection of eye conditions in Australia. The analysis showed that the overall cost of running StEPS was $3,961,948 per year. The cost effectiveness of the StEPS program was $14,386 per QALY. Based on an assumed upper threshold for acceptable cost effectiveness in Australia ($50,000 per QALY) this analysis demonstrates the StEPS program is a good use of resources and is cost-effective.

Once different models of implementation were considered, the results showed that improving the screening rate in combination with improvements in attendance at referral appointments, had the largest, albeit moderate impact on cost effectiveness. There was little evidence to support the use of non-nursing staff in terms of cost-effectiveness. However, the modelling of the different models of implementation is taken from the limited number of LHDs with increased numbers of assumptions and the results should be treated with caution.

It is evident from the model that the prevalence of eye conditions was an important driver of costs and benefits. While the initial screening program cost $38.63 per child, the overall strategy costs $130 per child indicating significant flow-on effects that resulted in overall higher costs of early detection and treatment. That is, the majority of the increased costs come from the investigation and treatment of disease.

The main benefit of screening is the increased quality of life associated with early treatment of refractive error and amblyopia, which reduces the risk of blindness in the long term. Discounting reduced the present day value of cost saving and health benefit associated with a reduction in blindness, so the main driver of the results was the improvement in refractive error associated with treatment. The results were sensitive to the utility improvements in refractive error associated with earlier treatment.

The model takes a health services perspective which is common in this type of analysis. In addition, there are likely to be non-health benefits associated with improvement in vision, specifically improvements in education attainment and employment that are not considered in the base-case model. To test this assumption, a societal perspective was considered by including a conservative assumption of reduced labour force participation due to refractive error and blindness. While there is some uncertainty associated with any long-term assumptions around productivity (as it can be influenced by many factors), the model demonstrated that the screening program is consistently cost effective.

The model is subject to several limitations. First, there is uncertainty in the sensitivity and specificity of the StEPS program for the diagnosis of eye conditions. The results from the current evaluation combined with assumptions about the prevalence of eye diseases were required to generate the specificity and sensitivity of screening. However, using results for sensitivity and specificity from the literature also suggested that screening was cost-effective.

Second, the model assumes that all participants who received borderline results, entered the unscreened population and follow the natural history of the condition, which could underestimate costs and detection rates. Assuming that the borderline results had an improved detection rate in the subsequent year marginally improved the cost effectiveness.

Only blindness was assumed to be the long-term result of untreated amblyopia, low and moderate vision loss was not included. This may bias against the screening program. To test these uncertainties, we undertook rigorous probability sensitivity analysis (PSA) to explore the extent of uncertainty around the ICER and therefore improve the robustness of our model.

Detection of eye conditions and treatment will occur in the absence of a screening program. Estimates of detection were included in the model, without these the ICER for screening was less than $5,000/QALY.

A value of $50,000-$75,000 per life year saved is generally regarded as an upper threshold for acceptable cost-effectiveness in Australia and up to $100,000 internationally. Based on these thresholds the StEPS screening program supports the existing literature that it offers a feasible cost-effective strategy.

In conclusion, the StEPS screening program is a cost-effective intervention for promotion of eye health. Improvement in data processes, follow up of referral outcomes and implementation of catch-up clinics would further increase the confidence of the cost effectiveness of the program.

6 Evaluation Implications

6.1 Discussion of overall findings

The current evaluation has conducted a widespread exploration of many aspects of the StEPS program including implementation, access, screening procedures, referrals, outcomes, costs and stakeholder experiences and perspectives. This permits consideration of the appropriateness, effectiveness and efficiency of the program, as well as its impact in reducing childhood visual impairment in NSW based on multiple perspectives and data sources. Triangulation of the data by both the variety of evaluation methods and the perspectives of different stakeholders in the program adds validity to the current findings.

There was consistency in the perspectives of all stakeholders surveyed and interviewed including' StEPS staff, preschool and childcare facility directors, parents and eye health professionals who stated that the StEPS program is important, valuable and beneficial for children and families and that overall the program has been very successfully implemented across NSW. The major benefits echoed by stakeholders were the detection of eye conditions at a young age, which is critical for effective treatment and prevention of visual impairment into adulthood, the ability of StEPS to allow for restoration of vision prior to school enrolment and give children the best chance of good educational outcomes and crucially, the fact that the most eye conditions detected would have gone undiagnosed without a universal screening program such as StEPS.

Overall, stakeholders were passionate about the program and the positive impact on children's eye health. A number of stakeholders expressed that they felt it was an essential service that should be continued. The benefits of universal screening at preschool age are supported by current international guidelines, based on high quality systematic reviews ('UK National Screening Committee. Screening for vision defects in children aged 4 to 5: recommendation summary' 2013; 'U. S. Preventive Services Task Force. Vision Screening in Children Aged 6 Months to five Years: US Preventive Services Task Force Recommendation Statement' 2017; Jonas et al. 2017b; Solebo & Rahi 2013).

The analysis of activity and referral data from StEPS and the economic evaluation add further evidentiary support to the positive views of stakeholders. The StEPS program has offered vision screening to 96.4% of all four year-olds within NSW and has screened 75.6% of all eligible children between 2009 and 2016. The screening rate increased over this period and was close to 80% of the four year-old population between 2013 and 2015. These high screening rates suggest that the implementation of the program through preschools provides effective access for the majority of children in the population. The implementation of the StEPS program is internationally unique, in providing screening for preschool-aged children through preschool and childcare services rather than in the community. In comparison to published rates of screening uptake, StEPS matches or exceeds the highest screening rates reported for other international programs targeting preschool-aged children (Buckley & Perkins 2010; de Koning et al. 2013; Dent & Fieldsend 2015; Thorburn & Roland 2000).

A further strength of the StEPS program described by stakeholders is the universality of the program across NSW and the ability to provide access to disadvantaged populations. Previous research has shown that access to tertiary eye care services is low in socioeconomically disadvantaged and other vulnerable groups (Castanes 2003; Kelaher, Ferdinand & Taylor 2012; Majeed et al. 2008; Turner et al. 2011). Screening programs, such as StEPS, which provide

systematic and widespread access have been shown to improve the screening rate in disadvantaged groups (Smith, Thompson & Woodruff 1995). This highlights the value of universal screening in providing access to children within vulnerable populations, who may otherwise not have access to appropriate eye care. The number of Aboriginal children screened by StEPS doubled between the program implementation and 2016, suggesting that StEPS is effectively and increasingly reaching these children. This, coupled with the overall high rate of screening within the population across NSW and the especially high screening rates in rural and regional areas (>80% from 2012-2016) demonstrates that StEPS is providing good access to those within the population who are most at need.

Since 2009, StEPS has detected reduced vision and subsequently referred a total of 108,419 children for further investigation and treatment. Of these, 13,246 had more severely reduced vision (<6/18 in one or both eyes) and were classified as high priority referrals. This represents a substantial number of children who have been identified and provided access to necessary eye care through the StEPS program since its inception. Based on StEPS referral outcome data, the predominant condition detected by StEPS is refractive error, followed in order of frequency by; amblyopia, strabismus and other pathology. This finding aligns well with reports from community-based eye health professionals and staff from public hospital POOCs clinics, regarding the conditions most frequently diagnosed. The referral rate from the StEPS program based on a criteria of <6/9 visual acuity in one or both eyes, resulted in an overall referral rate of 19.2%. The referral rate was 9.4%, if borderline passes (children with 6/9-1 or 6/9-2 visual acuity) were not included. This rate is within the range reported in the literature for orthoptic-delivered or closely-led vision screening programs, with high accuracy (Garretty 2017; Hu et al. 2012; Toufeeq & Oram 2014).

Current guidelines suggest a referral criteria of <6/9.5 to provide the highest positive predictive value and negative predictive value from screening programs, which aligns well with the referral criteria used in StEPS. Evidence has shown that the majority of children with a visual acuity of ≤6/12 are true positive referrals (Garretty 2017; Hård et al. 2002). A referral criteria of ≤6/12 increases the positive predictive value, but the overall referral rate and negative predictive value is reduced compared to a referral criteria of <6/9 (Langeslag-Smith et al. 2015; Lim et al. 2000). Based on this evidence, the referral criteria used for StEPS should provide a good degree of accuracy in referrals and minimise the number of both false positive and false negative referrals. However, the rate of false positive referral suggested by the StEPS outcome data was higher than anticipated (27.2%), with wide variation between LHDs. This was inconsistent with the reports from eye health professionals and POOCs clinic staff that suggested a very low rate of false positive referral. There are two potential explanations. StEPS staff indicated that a number of outcomes are provided by verbal parental report rather than written report from eye health professionals and suggested that when followed-up by coordinators, parents may opt to report a normal outcome, rather than that they had not acted on the referral or were unsure of the outcome. Eye health professionals who were interviewed suggested that where false positive referrals were detected, they were frequently children with autism and/or developmental delay, or were children with behavioural issues or who were particularly shy. None of the eye health professionals felt that these referrals were inappropriate and for those children with undiagnosed autism and developmental delay, detection by the program should be considered of added value, as it was indicated that many of these children were subsequently and appropriately referred to other services.

The current evaluation has shown the total cost of running StEPS to be $3,961,948 in 2016/2017 with the estimated cost of screening to be $49.21 per child. Based on population projections this cost would reduce to $37.37 per child in 2020. Estimated costs increased to

$130 per child when post-referral investigation and treatment of eye disease was considered. Overall, StEPS was found to be a cost-effective intervention that had the potential to improve eye health outcomes for children, reduce long-term visual impairment through early intervention and increase quality of life.

6.2 Confidence in the findings

Overall, we are confident in the findings of this evaluation when drawing on data from across sources and in consideration of evidence from the literature. However, there are some limitations to the evaluation methodology and the data available for this evaluation. The implications following, should be considered in light of these limitations as outlined below.

Data on access to StEPS:

- The data used was the StEPS activity data reported quarterly by StEPS coordinators from 2009 to 2016 and provided by the NSW Ministry of Health. Data from 2008 was excluded, as only six months of StEPS activity data was available. Data for 2017 was not available for this evaluation.
- Access rates were estimated based on projections of the number of four year-olds in NSW, provided by the NSW Ministry of Health, rather than actuals of the population. The accuracy of population projections by LHD are not known and as such, these figures need to be treated cautiously.
- Population projections for Aboriginal children were not available and thus, we were unable to determine the rate of access for Aboriginal children. Children from CALD backgrounds were not identified in activity data or population projections and we were unable to determine their rate of screening.
- The analysis classified Hunter-New England LHD as a rural/regional LHD. This is misrepresentative of the geographical distribution of the majority of the LHDs population, and as this LHD had a particularly high screening rate, this may have inflated the overall screening rates for rural and regional LHDs and reduced the rate in metropolitan LHDs.

Data and analysis of StEPS referrals and outcomes:

- There are large gaps in StEPS referral activity data with 11.3% of children lost to follow-up. This rate ranges from 1.9% to 23.5% depending on the LHD. The high rate of loss to follow-up limits the ability to draw conclusions about both the effectiveness of StEPS to initiate treatment pathways for children, and the accuracy of StEPS screening. It is also unknown whether children reported as lost to follow-up did not access follow-up vision testing and treatment, whether results were not returned to StEPS by eye health professionals or if parents were not able to be contacted. Therefore, although these children were lost to follow-up by StEPS, they may be under tertiary care and the true rate of loss to follow-up rate cannot be determined.
- Only quarterly collated StEPS activity and referral outcomes data was available for analysis. Individual child level data was not available which limited the power of statistical analyses to identify factors that are significantly associated with the effectiveness and accuracy of StEPS screening due to large standard errors.
- It is unclear from the data and the StEPS policy directive whether screening results are modified following secondary screening and prior to reporting. Additionally, there were a limited number of LHDs with secondary screening access and the use of secondary

screening was variable amongst these LHDs. This introduces some question as to the accuracy of analysis related to secondary screening. Also, the small number of LHDs contained within each category of secondary screening in the analysis may have produced spurious findings. This makes it difficult to conclusively determine the impact of secondary screening. Further research should track individual children through screening and secondary screening to provide more definitive conclusions.

- The categories used for the purpose of reporting outcomes of referrals from the StEPS program contain substantial overlap and thus, children may fall into multiple categories with variation in reporting methods likely between health professionals and POOC clinics. This is compounded by the fact that there are no definitions by which different conditions should be reported. The result of this is that the prevalence rates of conditions detected by StEPS are potentially not reflective of true rates within the population. This limits the capacity of the evaluation to draw conclusions about the rate of ocular conditions detected by the StEPS program.
- StEPS activity and referral outcomes data is manually reported by StEPS Coordinators creating a risk of inaccurate data entry. This risk appears to be highest with the entry of StEPS referral outcomes data where the complexity of diagnosis categories was reported to make the primary diagnosis difficult to determine in some cases.
- No comparison of pre-StEPS activity and referral outcomes data was available, meaning that the causal impact of StEPS on diagnosis and the prevalence of eye conditions amongst children cannot be established. Therefore, conclusions about the effectiveness of StEPS are based on comparison to population prevalence, rates reported in the literature, anecdotal evidence from stakeholders and assumptions about likely outcomes in the absence of StEPS.
- Based on the data available, we were unable to determine the rate of false and true negatives from screening and thus, cannot determine the specificity of StEPS screening. The rate of false positives (children with outcomes suggesting no abnormality detected) may not be accurate given a high proportion of outcomes are parent-reported.

Data on experiences and perspectives:

- This section of the evaluation used mixed and qualitative research methods and analyses including surveys and one-one-one interviews. While there are strengths of this approach in terms of understanding local experiences, there are limitations in the generalisability of findings.
- Although a large number of preschool and childcare facility directors responded to our survey (n=801), the participation rate was low (21%).
- Due to the small samples used in interviews, the findings may not be generalisable to the broader target population, and are therefore reflective of the views and experiences of the sample only.
- While appropriate measures were employed to reduce bias in the qualitative research, there remains a risk that the information gathered has been biased in some way.
- With particular consideration to the survey of parents, the low response rate combined with the sampling approach used (i.e. non-purposive), means it is unlikely that the analysis captured the range of views held by the target population. It is unlikely that we will have achieved saturation of themes. Given that this component of the evaluation was originally

designed as a quantitative survey, the responses lack the depth that would be achieved through using a truly qualitative method, such as, in-depth interviews.

Data used in the economic evaluation:

- The results of the economic evaluation were sensitive to the assumptions about sensitivity, specificity, prevalence of refractive error and the health related utility of untreated refractive error. Increased confidence in the estimation of these parameters would have improved the confidence in the estimation of the cost-effectiveness.

6.3 Key Implications

Drawing on the findings of the current evaluation, the following key implications were identified which may assist to increase program efficiency, reach and uptake; ensure ongoing monitoring of the StEPS program; and improve referral outcomes and reporting (Objective 7 of the StEPS program evaluation).

Encouraging and improving access and engagement

1. **Availability of information in common languages other than English**

   The survey of preschool and childcare facility directors indicated that overall, directors were positive about the program and satisfied with the adequacy of promotional and consent information provided by StEPS. However, satisfaction with this information declined as the proportion of children from CALD backgrounds that were enrolled increased. The number of children from CALD backgrounds also increased difficulty in managing the consent process in these centres. Interviews supported these findings, with some directors indicating the need for more accessible translated materials. Both of these findings suggest that it is more difficult for preschool and childcare facilities to engage CALD families with StEPS, which has the potential to reduce access to StEPS by children from CALD backgrounds.

   To increase the engagement of families from CALD backgrounds in the program, it is proposed that consent forms, information related to the program and where possible results of screening be made available in the most commonly-spoken community languages, particularly Vietnamese, Mandarin and Arabic.

2. **Simplify the process of parental consent**

   The consent process poses a large burden on parents, preschools and StEPS staff. From the perspective of StEPS staff, there is substantial administration process involved with distributing consent forms, collecting completed forms and scanning forms to attach to electronic medical records. Preschool and childcare facility directors overwhelmingly rated the consent process as the biggest challenge to their participation in the StEPS program in both their survey and interview responses. Further to this, a significant proportion of consent is often sought on the day of screening, reducing the efficiency of screening substantially and increasing the burden and disruption of screening on preschool and childcare facility staff.

   We suggest that options to reduce administrative burden and increase access and rates of screening be explored. A potential method may be to build StEPS consent into preschool enrolment, which would reduce administration processes related to the distribution and collection of consent forms and minimise burden on preschool and childcare centres.

3. **Further participation of preschools and childcare centres in StEPS**

   StEPS staff on the whole reported that the majority of preschools and childcare centres are very supportive of StEPS. This was affirmed by directors of these facilities who were interviewed or responded to the survey. Nevertheless, a consistently reported challenge to improving access to the program for children across all LHDs was lack of engagement of a small number of preschools and childcare centres. StEPS staff reported that this sometimes occurred when there was a new centre, or a new director in the preschool.

   To work towards universal access, it is advised that methods to foster and encourage involvement of all preschools in StEPS be explored further. Increasing awareness of the StEPS program and the importance of preschool vision screening may improve participation of new centres and centres under new management.

4. **Increase public awareness of the StEPS program**

   While overall screening rates for StEPS were high (75.6%), 13.3% of parents/carers did not return the consent form, contributing a large proportion of children not screened. Rate of returned consent was, as expected, found to influence overall screening rates within LHDs. Parents reported lack of awareness of both the StEPS program and the importance of early screening for visual defects when interviewed. Some parents expressed concern that parents/carers may not consent to screening due to a lack of understanding and awareness and suggested that greater marketing for the program.

   To increase screening rates within preschools and childcare centres visited by StEPS and facilitate participation by children in family day care or those who are cared for at home, it is suggested that there should be increased promotion of the program. This could include information advising how parents might directly access screening for their children.

5. **Guidelines and resourcing to embed the delivery of catch-up clinics**

   Catch-up clinics provide an opportunity for children who were absent from preschool or childcare on the day of screening, or who are not enrolled in a preschool or childcare centres visited by StEPS, to be screened in the community. These are primarily run by StEPS screeners and are the only feature of StEPS that increases the screening rate (19% increase). It is encouraging that catch-up clinics are now a feature within all LHDs indicating that they are already considered to be an important part of StEPS, given their association with 19% higher screening rates. This positive development should be supported in program guidelines, and where needed, resourced to ensure that these are further developed and sustained. Guidelines should further promote consistency in the way catch-up clinics are utilised and promoted to have the greatest impact.

Maintaining quality and consistency of screening

6. **Ensure use of the HOTV LogMAR chart for screening across the program**

   HOTV LogMAR visual acuity charts are considered gold-standard for the assessment of visual acuity and form the basis of current recommendations for vision screening. A direct comparison of the screening results using HOTV LogMAR chart and the Sheridan Gardiner test has not be carried out. However, available evidence suggests that there is high testability of the HOTV LogMAR chart in preschool-aged children ('Vision in Preschoolers Study Group. Preschool visual acuity screening with HOTV and Lea symbols: testability and between-test agreement' 2004; Hered, Murphy & Clancy 1997; Kvarnstrom & Jakobsson 2005; Leone et al. 2012). HOTV LogMAR chart has also been shown to be

valid for the detection of amblyopia, strabismus and refractive error ('Vision in Preschoolers Study Group. Effect of age using Lea Symbols or HOTV for preschool vision screening' 2010; Bušić et al. 2016; Chui et al. 2004; Omar, Hussin & Knight 2012).

Thus, it is encouraging the majority of LHDs have transitioned recently to the HOTV LogMAR visual acuity chart. For those that have not, this should be strongly encouraged. Although data to examine the impact of this change on referral patterns is not yet available, the evidence suggests that the HOTV LogMAR chart is a more valid and appropriate test for screening.

7. **Further research of referral criteria and changes in referral patterns**

   With the transition to the HOTV LogMAR chart within StEPS, it is recommended that further research is conducted to examine any consequent changes in referral patterns and whether current referral criteria remains appropriate or requires revision. This includes the visual acuity cut-offs for referral, the priority of referral and accordingly the most appropriate referral pathway.

8. **Ongoing training and other support for screeners**

   The evaluation has demonstrated that the program benefits from well-trained, experienced screeners. This was especially evident in the lower rates of routine and unable to screen referrals in LHDs where permanent, rather than casual screening staff are employed, suggesting increased accuracy of screening by more experienced permanent screening staff. Preschool and childcare facility directors and eye health professionals further indicated that experience of StEPS staff is important.

   In light of this, it is advised that there is an ongoing and strengthened focus on training and development (including refresher training) for screeners. This may also support their retention, particularly in areas where frequent turnover of staff creates a greater level of referral. It would be appropriate for this to be implemented by StEPS orthoptic staff within LHDs according to a state-wide directive.

9. **Extend the availability of secondary screening where there are gaps**

   The evidence suggests that secondary screening reduces false-positive referrals to hospital eye services and is able to provide appropriate care to children who fail vision screening within the community (Garretty 2017). The value of secondary screening as part of a routine vision screening program is also supported by studies that highlight the accuracy of orthoptic screening over vision screening by other health professionals or lay screeners. This includes detecting anisometropic amblyopia and strabismus (Bolger et al. 1991; Bray et al. 1996; Jarvis et al. 1991; Robinson et al. 1999; Thorburn & Roland 2000).

   The current evaluation has shown that access to secondary orthoptic screening reduces the number of high priority referrals and may detect false positive referrals, despite some limitations of the available data. There is also some indication that the presence of secondary screening services within the LHD may improve the accuracy of primary screening. In addition, it was commented by a number of Sydney-based StEPS Coordinators that there are long waiting times for many children to access POOCs. Therefore, more accurate orthoptic screening should reduce unnecessary referrals. This should also have a flow on effect of reducing wait times for referrals. It is proposed that the availability and scope of secondary screening be extended and used more consistently throughout the StEPS program.

Strengthening referral pathways

10. Explore strategies to improve uptake of post-referral services

Of those children who were referred from StEPS to an eye health professional, 10.2% of parents/carers did not act on this referral. This was lower for high priority referrals (6.6%) than routine referrals (17.2%), likely because StEPS coordinators report additional effort devoted to following up high priority referrals. Concerningly, for high priority referrals, more than double the proportion (10.9%) were not acted on by parents/carers in rural and regional LHDs compared to 4.9% in metropolitan LHDs. Similar disparity was noted in the rate of routine referrals not actioned by parents/carers. As reported by StEPS staff, it is possible that this relates to a lack of access to public ophthalmology services in these locations and that optometrists in some rural and regional areas charge out of pocket expenses above the Medicare rate. Barriers to follow-up care are often financial or related to convenience and/or access (Mark & Mark 1999; Slingsby, Mallory & Spencer 2017; Su et al. 2013; Williams et al. 2013). Importantly, financial and time constraints are likely to limit the ability of rural/ regional families to access specialist treatment more so than metropolitan families. Reports from StEPS staff and parents also suggest that the cost of glasses can be a barrier.

To encourage parents to access services and improve post-referral follow-up rates, it is suggested that innovative strategies to increase follow-up care are explored and trialled. For example, co-location of secondary orthoptic screening with optometry and/or optical dispensing may provide greater convenience for families. While, subsidies for the purchase of glasses may reduce the financial burden for those with the greatest need.

11. Consider better ways to manage referral of children

Given the high rate (11.3%) of loss to follow-up (when no outcome was received and/or parents were unable to be contacted) and parents/carers who did not act on StEPS referrals (10.2%), it is warranted to consider the referral pathways into care and how continuum of care may be enhanced through the program. There are often a number of steps required, prior to being seen by the most appropriate eye health professional, such as, the necessity to see an optometrist or GP prior to referral to a private ophthalmologist. This can introduce barriers to pursuing further examination.

There may be benefit in investigating the feasibility and implications of expanding the role of secondary screeners to provide a more supported triage service for children apparently eligible or borderline for high priority or general referral after primary screening. This may assist referrals to be more appropriately targeted to the most relevant service, whether that be optometric services, private or public paediatric ophthalmology or POOCs. This may also improve continuity of care, reduce the likelihood of loss to follow-up and prevent inappropriate referral to POOCs. It is also likely to ensure that urgent cases receive timely and appropriate care.

12. Continue to focus on post-screening parent engagement

It is suggested that clearer information about local post-screening referral pathways be provided to parents coupled with an emphasis on compliance with referral to ensure best outcomes for their child. If the role of orthoptic secondary screeners were to be expanded to include triage (see key implication 11), it would be appropriate for secondary screeners to promote compliance through parental education. This may also reduce the rate of non-follow-up. This is of particular importance in rural and regional areas, and for Aboriginal

children and families. For some Aboriginal families, this work may be supported through engagement with Aboriginal community health organisations.

13. **Advocacy for timely management of eye conditions**

    StEPS staff are unable to refer children directly to individual eye care practitioners. While optometric services are the most widely distributed eye care service, particularly in rural and regional areas, StEPS staff report that some optometrists decline to manage children. This can be a significant barrier to initial and on-going care. This is exacerbated by the lack of POOCs outside the Sydney metropolitan area and likely contributes to more than double the rate of non-follow-up for high priority referrals in rural and regional LHDs compared to metropolitan LHDs. Incentives for optometrists in rural and regional areas could be used to strengthen StEPS referral pathways. However, not all eye care and medical practitioners are confident in assessing young children's vision. Additional training on the assessment of paediatric vision could be provided to optometrists and general practitioners to support their roles in the care and on-going management of children referred from StEPS.

Improving data quality and reporting

14. **Explore options to improve data entry and limit administrative burden**

    The process of entering screening results from paper-based forms completed at the time of screening means that there is double-handling of data and potential for errors through this process. Additionally, the administrative burden of entering results into electronic medical records could be reduced if screeners were able to directly enter results at the time of screening. Options to facilitate this could be explored and though they may represent an initial cost, in the longer term it may be possible to provide a saving.

15. **Classification of ocular conditions for reporting of outcomes**

    StEPS staff indicated that the number of categories for the reporting of ocular outcomes is overly complex and makes determination of which category a child fits in to difficult, especially when interpreting a medical report from an eye health professional. These categories further posed a challenge for the current evaluation impacting the accuracy of calculated prevalence rates and likely contributing to considerable missing data. The acceptance of parental reports of outcomes which StEPS staff typically described as vague and lacking specific detail may also impact the accuracy of the data.

    It is advised that the current categories used for the reporting of outcomes by eye health practitioners be simplified and incorporate specific definitions for each classified eye condition in order to improve consistency and accuracy of reporting and data management. A further proposal is to collect data on the source of reported outcomes and whether or not treatment has been implemented as a result of a StEPS referral.

16. **Electronic reporting of outcomes by eye health professionals**

    A proportion of those lost to follow-up are likely due to non-return of referral outcome information by eye health professionals. However, it is unclear from the data what proportion these account for. Optometrists and ophthalmologists who were interviewed suggested that they are rarely provided with the referral outcome form by parents and at times, are not aware of whether a child has come from the StEPS program. It is also important to note that the return of paper outcome forms to StEPS then requires the entry of these outcomes into electronic medical records and databases for the purposes of

reporting to the NSW Ministry of Health. This double-handling of data has the potential to introduce data entry errors.

It was suggested that the efficiency of StEPS, and the quality of data regarding referral outcomes would be increased with the development of an electronic portal for recording screening, referral and treatment information. This would assist the process for reporting outcomes by eye health professionals and remove the requirement for parents to bring a paper-based form to their eye practitioner appointment. This may also reduce the administrative burden on StEPS coordinators related to following up referral outcomes and manually entering these into electronic medical records.

17. **Reporting requirements for POOCs**

    Interviews with POOCs clinic staff revealed differences in implementation of these services. Currently, POOCs are required to collect data and report outcomes to the NSW Ministry of Health, however, there is limited availability of complete data. This is a barrier to evaluating the effectiveness and efficiency of POOC clinics and the overall success of the StEPS program in treating ocular conditions and improving vision or preventing further vision loss. We recommend that reporting requirements to the NSW Ministry of Health are implemented and process and guidelines are developed for data-keeping.

6.4 Conclusion

The findings of the evaluation indicated that StEPS is an appropriate early childhood vision screening program which is effective in its screening reach, detects a number of children with ocular disorders at an appropriate age for intervention, is widely accepted and supported by key stakeholders and is a cost effective intervention. The success of the StEPS program within NSW cannot be underestimated and similar programs could be implemented in other states of Australia. Thus, we recommend that the StEPS program within NSW is continued.

While there is scope to further enhance the screening access in all LHDs, the greatest potential for making improvements that promote the program's ultimate outcomes lies in strengthening post-screening referral pathways and increasingly the likelihood of subsequent treatment for children.

Consequently, there is warrant to maintain and strengthen the StEPS program with a focus on enhancing its local integration with eye health care professionals. Ongoing refinement to the program would be best supported if there are improvements to data capture, handling and reporting.

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