

Mobile Preschool Evaluation

Summary Report

Revised October 2013

Acknowledgements

This research was conducted with funding from the National Health and Medical Research Council (NHMRC 545224) and in-kind support from the Northern Territory Department of Education, and the Department of Health and Families.

This report was prepared by Georgie Nutton, Johanna Bell and Julie Fraser with editorial review by Prof Sven Silburn, Prof Jonathon Carapetis and Prof Alison Elliot.

Chief Investigators (NHMRC Grant 545224)

A: Professor Jonathan Carapetis (Menzies School of Health Research)

B: Professor Alison Elliott (Charles Darwin University)

C: Associate Professor Garth Alperstein (University of Notre Dame)

D: Associate Professor Ross Andrews (Menzies School of Health Research)

E: Professor William Loudon (University of Western Australia)

F: Mrs Georgie Nutton (Menzies School of Health Research)

Associate Investigators

1: Associate Professor Tess Lea (Charles Darwin University)

2: Dr Gurmeet Singh (Menzies School of Health Research)

3: Associate Professor Peter Morris (Menzies School of Health Research)

Study Staff

Coordinator: Johanna Bell

Research Assistants: Julie Fraser and Jim Smith

Collaborating Institutions

Northern Territory Departments of Education and Health and Families.

The study team acknowledges the support of the Department of Education's Early Childhood Policy and Regulation Division, specifically Ms Anna King and Ms Karen Modoo.

We would like to especially acknowledge Mobile Preschool Program Manager, Ms Beverley Liddy, for the vital role she played in enabling the successful implementation of the Mobile Preschool Program and its evaluation.

Recommended citation: Nutton, G., Bell, J. and Fraser, J. (2013). Mobile Preschool Evaluation: Summary Report. Darwin: Centre for Child Development and Education.

ISBN: 978-978-192-210-7 (online)

This work was supported by the National Health and Medical Research Council (NHMRC), Grant ID: 545224. The views expressed in this presentation are those of the authors and do not reflect the views of NHMRC.

Contents

Acknowledgements	i
List of Tables and Figures	iii
List of Statistical Terms	v
Executive summary	
1. Introduction	1
2. Mobile Preschool Program delivery in the NT	4
3. Methodology	9
4. Findings	27
4.1 General study outcomes	27
4.2 Understanding the Mobile Preschool Program as implemented	29
4.3 Primary research questions on the effectiveness of Mobile Preschool	38
4.4 Multi-variate and multi-level models	48
5. Discussion	52
5.1 Findings addressing the primary research questions	52
5.2 Program design assumptions and fidelity	55
5.3 Methodological issues	62
6. Conclusion and recommendations	65
Appendix A List of Mobile preschool Sites	70
Appendix B Analysis plan	72
Appendix C Stepwise regression model output	73
Endnote	74

List of Tables

Table 1.	Sample size for availability cohort comparisons
Table 2	Analysis components and data sources
Table 3	Non-typical enrolment and attendance data and treatment for analysis
Table 4	Summary of outcome and predictor variables, types and tests used in addressing the primary research questions
Table 5	Developmental vulnerability total Mobile preschool study sample compared with other NT population groups
Table 6	Correlations between four program quality variables and the program quality index
Table 7	Association between two <u>availability</u> cohorts and developmental vulnerability on two or more Australian Early Development Index domains
Table 8	Comparison of Australian Early Development Index domains for <u>availability</u> cohorts
Table 9	Mobile preschool binary attendance categories by availability categories
Table 10	Median scores and inter-quartile range for Australian Early Development ^{**} Index domains between two attendance cohorts
Table 11	Association between preschool program quality categories and developmental vulnerability on two or more domains
Table 12	Developmental domain medians for program quality index groups
Table 13	Logistic regression results for four program quality index variables, index itself and teacher visits

List of Figures

Figure 1	Mobile Preschool Program logic
Figure 2	Map of mobile preschool evaluation study sites
Figure 3	Distribution of mobile preschool availability (days)
Figure 4a	Histogram of raw days attended for mobile preschool study cohorts
Figure 4b	Histogram of attendance as proportion of mobile preschool availability
Figure 5	Consort Diagram
Figure 6	Comparison of mobile preschool teacher visit rates in 2008 and 2009 between group schools (red line indicates the expected rate)
Figure 7	Comparison of mobile preschool days available to children who are developmentally vulnerable on two or more domains and those not vulnerable
Figure 8	Australian Early Development Index domain scores for children in the two <u>availability</u> cohorts
Figure 9	Comparison of attendance (days) for children developmentally vulnerable on two or more domains or not

Figure 10 Distribution of Australian Early Development Index domain scores for children in two attendance cohorts

Figure 11 Comparison of developmental domain scores for children in high and low program quality cohorts

List of Statistical Terms

ANOVA	Analysis of Variance
$B(SE)$	Power of the test sample standard error
CI	Confidence interval
IQR	Inter-quartile range
N	Sample size
Med	Median
OR	Odds ratio, that is the odds of an event happening over it not happening for groups A divided by the odds of the event not happening over it happening for group B
p	Probability
R^2	r- square, multiple correlation coefficient
r^2	Spearman Rho correlation
SD	Standard deviation
t	Student t test of distribution
χ^2	Chi-squared test
z	Standard normal distribution z score

Executive Summary

The Mobile Preschool Evaluation is a cohort comparison study of an alternative preschool service delivery model (Mobile Preschool Program) provided by the Northern Territory Department of Education. The findings from the National Health and Medical Research Council funded Mobile Preschool Study provide some of the first systematic data of their kind regarding implementation and efficacy of preschool programs for Indigenous children living in very remote Northern Territory communities, where there are currently few early childhood services. The study includes 28 randomly selected NT communities from seven service delivery clusters for both the intervention and control groups.

The three-year study was designed to evaluate the extent to which children's participation in the innovative Mobile Preschool Program, developed by the Northern Territory Department of Education, would improve school readiness outcomes in comparison with children who did not participate in the program or who had had limited exposure to it. The Mobile Preschool Program was piloted in 2000-5 under the Australian Government's *National Indigenous Literacy and Numeracy Strategy 17* (NIELNS). Pilot program sites were adopted for core funding in 2005 and then expanded under Closing-the-Gap funding in 2008.

The study specifically aimed to quantify the impact of program availability, attendance and quality had on follow-up measures of developmental health and school readiness using the Australian Early Development Index .

Some of the main findings presented in this report include:

1. Children with 192 days or more of mobile preschool available were 6.5 times more likely to not be developmentally vulnerable on two or more Australian Early Development Index domains than children who had no or less than 192 days of mobile preschool available, $OR^1=6.5$ (95%CI: 2.76-15.58).
2. We observed a strong and significant effect when comparing children who attended the mobile preschool program frequently with those who didn't. Children attending 80 days or more of mobile preschool were 3.6 times more likely to not be developmentally vulnerable on two or more Australian Early Development Index domains than children who attended less than 80 days of mobile preschool, $OR\ 3.6$ (95%CI: 1.56- 8.29).

When controlling for mothers smoking during pregnancy, children attending 80 days or more preschool were 4.9 times more likely to not be developmentally vulnerable on two or more

¹ OR is the odds ratio, that is the odds of an event happening over it not happening for group A divided by the odds of the event happening over it not happening for group B.

domains than children attending less than 80 days, *OR* = 4.9 (95% CI: 1.72 - 13.95).

3. We did not find a statistically significant association between the program quality index developed for this study and subsequent developmental vulnerability on two or more Australian Early Development Index domains. However, children attending programs with assistant teachers with high quality ratings were 6.2 times more likely to not be developmentally vulnerable on two or more domains than children with assistant teachers with low ratings, *OR* 6.2 (95%CI: 1.19-32.33).

4. Finally, we established that there was a strong association was between attendance and program quality. Children who attended high quality programs were 3.7 times more likely to have low attendance compared to children in low quality programs, *OR*=3.7 (95%CI: 1.55-8.94).

The quality, consistency and comprehensive nature of the data recorded in the study provides a solid baseline for understanding the socio-demographic and health characteristics of this very remote and highly disadvantaged Indigenous preschool population. It is of particular note that the prevalence of these potentially confounding factors was essentially similar between the Mobile Preschool group and the comparison group.

The major limitation of the study was the relative small sample size available for analysis. This meant that some sizeable differences observed came close, but did not reach statistical significance at the $p=.05$ level. The limited number of study subjects for whom the Australian Early Development Index data was returned ($n=105$) was a major factor in a reduced sample size available for analysis. There was no systematic explanation for the absence of Australian Early Development Index data available for analysis.

The main conclusions from the study are that:

- Children who have a full school year of preschool available in the year before Transition experience a substantial and positive difference to their developmental outcomes and readiness for school learning. In practical terms, this effect size indicates that for every term (approximately 50 days) of mobile preschool attended children were 70% more likely to not be developmentally vulnerable on two or more domains.
- Significant improvements in children's developmental outcomes can be achieved by firstly ensuring children attend preschool for over 80 days in the year prior to Transition.

- The need to support all Mobile Preschool Program staff, particularly assistant teachers with early childhood professional learning opportunities in curriculum, pedagogy and assessment practices is required in parallel with improving attendance.

1. Introduction

In the past, funding formulas and policies have created some challenge to providing standard preschool services in very remote Northern Territory communities. For example, a standard or stand-alone preschool program would not have been provided for a community with only ten eligible children due to an official requirement for a minimum of twelve children to receive an allocation of teaching staff.

The Mobile Preschool Program was developed to provide a model of service provision that could overcome such barriers. Mobile Preschool Program was initially piloted by the Northern Territory Department of Education through funding from the Australian Government's *National Indigenous Literacy and Numeracy Strategy 17* (2000-2004). The pilot program was implemented in a staged roll out to fifteen sites, clustered in three hubs. The program was expanded under the Northern Territory Closing-the-Gap initiatives in response to the *Board of Inquiry into Child Sexual Abuse and Protection Report*¹ and is now implemented by the Northern Territory Department of Education which provides ongoing core funding in over forty sites.

The Mobile Preschool Program is distinct from other mainstream and urban pre-school services. Its intended delivery design was unique at the time of establishment, and it was to focus on providing a comprehensive set of services needed to actively engage families and build the local resources to optimise children's health, developmental and learning outcomes. For these reasons, Department of Education's decision to continue the provision of this service model has clearly been seen to be desirable. However, this brought with it a requirement to ensure that the efficacy and effectiveness of the program was rigorously evaluated, and for the systematic identification of essential improvements which could be made to its design, delivery and sustainable on-going implementation.

There is a significant research base supporting the importance of education and early experiences as social determinants of health and well-being outcomes across the life course^{2,3,4,5,6,7,8,9,10,11,12,13,14}. Early childhood research provides clear evidence of the effectiveness of high quality interventions to support early life experiences to reach their full potential and optimize human capability or life outcomes, particularly for children living in disadvantage. The most effective intervention for the improvement of educational and life outcomes, particularly for more disadvantaged populations is a minimum of two years of high quality preschool^{15,16,17,18,19,20} (See Box 1 for further summary). There is a wide range of programs that are defined as preschool and the elements of each one's success are relevant to particular populations, in particular contexts to achieve particular outcomes. However, little is known about the impact of the Mobile Preschool Program as an alternative model of preschool. This evaluation was designed to help address this knowledge gap by exploring the relationship

between Mobile Preschool Program availability, attendance and program quality characteristics and increased school readiness in smaller communities where standard and stand-alone preschools were not logistically or financially feasible.

Box 1

The concept of school readiness and its relationship with the importance of addressing social inequality through early childhood education and care interventions which have strong and widely accepted evidence base were reviewed in a literature review²¹ and available separate to this report. This literature review of the contemporary educational debate about appropriate and acceptable definitions and measures of “school readiness” underpinned critical considerations for the Mobile Preschool Program evaluation design, analysis and interpretation of findings.

To date there is a paucity of evidence for establishing baselines for the most remote Australian Indigenous population and limited evidence about the effectiveness of universal programs such as preschool. Therefore, this study provided an exploratory analysis of data collected for important contextual and study sample descriptions of those factors identified in the literature as most relevant to school readiness. Two challenges were highlighted by this study for monitoring the impact of policy and programs on social, health and educational outcomes in the very remote Indigenous contexts. One was the availability of reliable and disaggregated health and socio-demographic data for remote and very remote populations. The other was the lack of rigorous and published program evaluations including implementation science and mixed methodologies in the Australian early childhood education and care context.

This evaluation quantified the effectiveness of mobile preschools in improving the school readiness of very remote and disadvantaged children through a focus on the following hypothesis and research questions:

Hypothesis: Participation in the Mobile Preschool Program improves the developmental health and school readiness outcomes of children in the short and medium term.

Key research questions:

1. Is the availability of a Mobile Preschool Program within a remote Northern Territory community associated with improved indicators of school readiness?
2. Is regular attendance at a Mobile Preschool Program associated with improved indicators of school readiness?
3. Is higher program quality in the Mobile Preschool Program associated with improved indicators for school readiness?

Section 2 describes the Mobile Preschool Program logic with attention to the key features that were assumed to underpin its effectiveness. The methodology and data collection tools are described in Section 3. The significance and relevance of this study lies in the direct measure of: i) the impact of mobile preschool on developmental, health and learning outcomes as measures of “school readiness” and ii) the specific quality features of the Mobile Preschool Program as an intervention in the very remote context. The findings addressing the primary research questions are outlined in Section 4. The implications for the effectiveness of children’s exposure and the program design are discussed in Section 5. Also discussed in Section 5 are the methodological considerations for conducting a rigorous study design in a complex context and the research transference potential to improve program design. Section 6 presents the conclusions and recommendations for instructional leaders, program managers and policy-makers based on the findings.

2. Mobile Preschool Program delivery in the Northern Territory

The key design elements of the Mobile Preschool Program pilot (2000-2005) aimed to maximise access to preschool experiences with active family engagement and inclusion with children from three years of age (urban preschool provision is from four years of age) although, younger children were not excluded. The Mobile Preschool Program continues to be a service design that addresses the challenge of delivering preschool in very remote Indigenous community contexts. Mobile Preschool Program is characterised by a 'hub and spoke' model whereby a visiting (or mobile) preschool teacher supports local assistant teachers to deliver a daily preschool program to children aged three to five years.

Mobile Preschool Program content was based on evidence that early language development, and learning school routines, behaviours and culture is greatly improved through preschool experiences in first language and scaffolded oral Standard Australian English. Mobile preschool hubs in the pilot phase were promoted as an access point for health, development, nutrition and parenting information and activities²².

The assistant teachers (sometimes more than one) coordinated the daily sessions with an average of 10 to 15 hours per week. This person was expected to participate in an accredited certificate course in either education support or children's services through Batchelor Institute for Indigenous Tertiary Education (although many did not fulfil this requirement) with support from the travelling early childhood teacher for an average of half a day per week. Typically, each teacher supports four or five sites situated between 70 and 670 kilometres from a service centre. This support changed to one day per fortnight in 2008.

The visiting teacher was expected to hold a four year degree in teacher education, although there were no requirements for early childhood specific qualifications. The teacher had responsibility for training local staff, programming, planning and assessment across five sites which reduced to four sites in 2011. The recommended curriculum was the *Northern Territory Curriculum Framework*, supported by an early childhood guide and professional learning modules produced by Northern Territory Department of Education, *Strong Beginnings*²³. During the evaluation the National Quality Framework was introduced with a requirement for teachers to use the Early Years Learning Framework in 2009. The mobile preschool sites display a wide variety of resourcing levels for infrastructure and equipment (See Box 2 for snapshots of four study sites).

Box 2 Snapshot of four mobile preschools



Community O. 205km from nearest regional service centre. Estimated population: 50. Classified as a minor community. Visiting health services by Remote Health. Preschool commenced in 2008 with access to the early year's classroom.

Community L. 320km from regional service centre. Estimated population: 100. Classified as a Family Outstation. Twice weekly visiting Remote Health services. Preschool commenced in 2008 and operated in the crèche till moved to outdoor space in school grounds.



Community I. 340km from nearest regional service centre. Estimated population: 200. Classified as a minor community. Aboriginal Medical Service clinic with visiting doctor. Preschool commenced in 2002.

Community W. 120km from regional service centre. Estimated population 110. Classified as a major community. Remote Health clinic with visiting doctor. Preschool commenced 2008 and operates in dedicated preschool room.



The conditions for mobile preschool teachers' travel vary between regions and seasons.



In 2006, there was an average of 167 three to four year old children enrolled in the Mobile Preschool Program, across 15 sites. The 2008 expansion of Mobile Preschool was recommended as a systemic “intervention” to reduce the disadvantage of low school attendance and subsequent life outcomes such as criminal activity, poverty, unemployment, homelessness, violence and sexual abuse¹. The implementation in this phase of Closing-the-Gap funded mobile preschools did not require community consultation or negotiation. The Closing-the-Gap funded phase was expected to expand the Mobile Preschool Program to an additional six hubs or clusters with up to 30 sites in total (Appendix A). The process evaluation included measures of program fidelity which are presented in Section 4 with other findings.

2.1 Program Logic

Measuring program impact is dependent on understanding the program intention and the reality of program implementation against the intended design²⁴. The Menzies evaluation team developed a program logic model for the Mobile Preschool Program (Figure 1). This model was developed through document review and qualitative interviews with Mobile Preschool Program management and staff. The program logic model illustrates the outcomes that Department of Education staff expected to see where key program resources and activities were delivered.

The Challenge of Measuring Program Fidelity

As with most multi-site programs, we expected some localised variations to program content or delivery. Once data collection commenced it became clear that there were some marked differences across sites in regards to infrastructure and resourcing, class size, teacher visitation patterns, supervision arrangements, program content and the number of classroom coordinators.

The major benefit to developing program logic and accompanying indicators of program fidelity early in the evaluation of multi-site programs is to identify where programs have ‘drifted’ from their original intent and treat outcomes data accordingly. In addition, where outcomes or implementation failure is observed, program logic models can help identify how the ‘drift’ occurred²⁵.

Figure 1 Mobile Preschool Program logic diagram

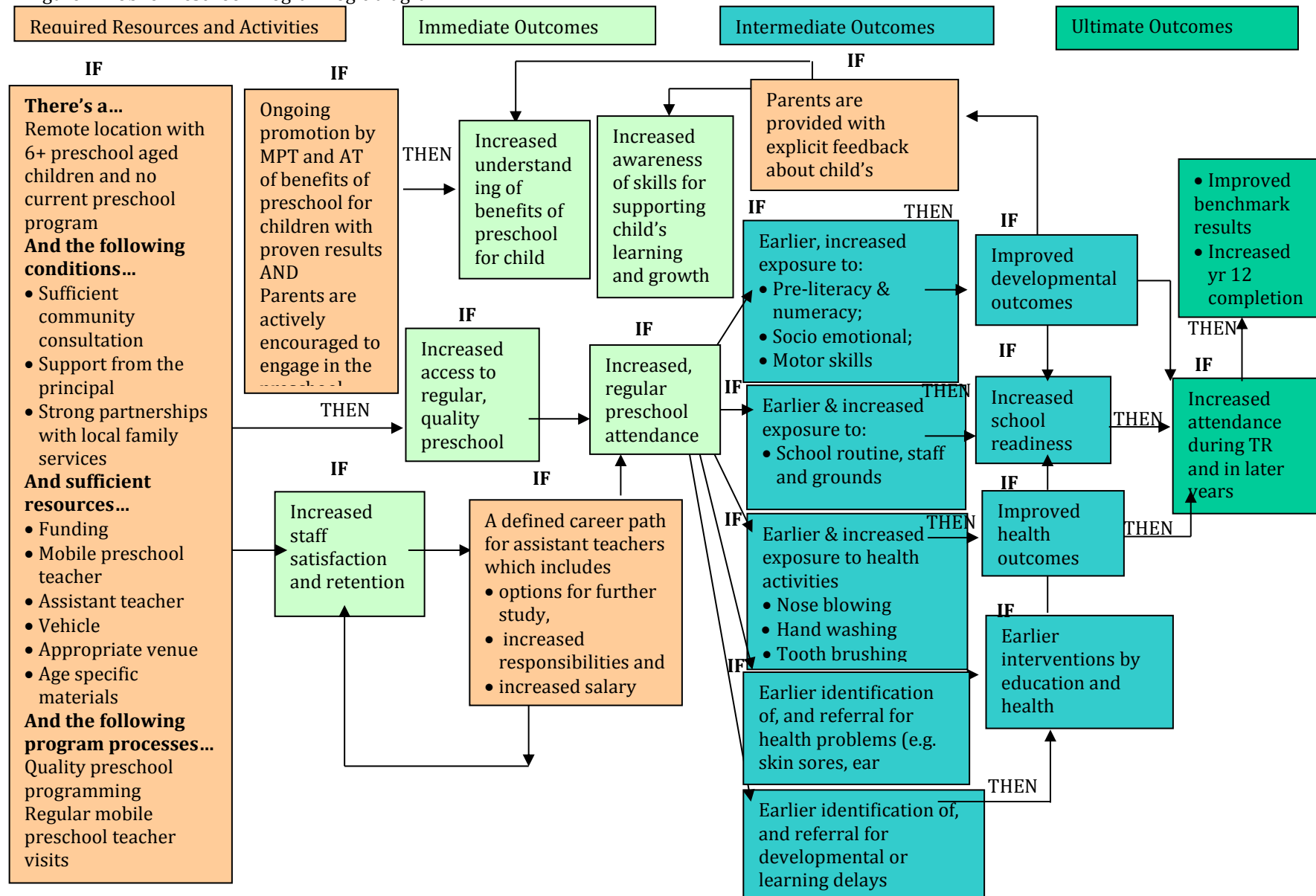


Figure 1 Mobile preschool program logic continued

PROGRAM PARAMETRES	UNDERLYING ASSUMPTIONS
<p>KEY CHARACTERISTICS</p> <ul style="list-style-type: none"> • Model employs a roaming, tertiary qualified preschool teacher who is based in a regional centre and travels regularly to 5 preschool sites • Each MPT is responsible for establishing and coordinating preschool in 5 sites • Preschool is delivered for 2.5 – 3 hours a day by a local assistant teacher who is typically an Aboriginal woman from the preschool community • The preschool teacher visits each site at least once every 4 weeks to provide support and on-the-job training to the assistant teacher, and to introduce new resources and program content • The daily preschool program is based on recommendations from Strong Beginnings, the Northern Territory's early years framework and focuses on relationships, active learning and language development • Day-to-day supervision of the assistant teacher is usually provided by the principal or the early years teacher • On-the-job training is supplemented by opportunities to complete professional development workshops and formal training in early childhood studies (e.g. Cert IV in Early Childhood through Batchelor Institute of Indigenous Tertiary Education) <p>TARGET POPULATION 3.5 – 5 year old Indigenous children living in remote communities who would otherwise not have access to a preschool program</p> <p>TARGET LOCATIONS 6 hubs, each with 5 preschool sites = 30 sites in total Lasseter, Tanami, Barkly, Katherine, Top End and Arnhem</p> <p>TIMING Funding is for 4 years from 2008 – 2012 Roll out is staged over 2 years with all sites in Hubs 1 – 5 to be operational by end of Term 2, 2009 All sites in Hub 6 to be operational by end of Term 2, 2010</p>	<ul style="list-style-type: none"> • Increased participation in preschool has significant benefits for Indigenous children from remote communities • Indigenous children in remote communities have a right to access preschool that is comparable to that available in non-remote locations • Running a static preschool in remote communities where there is <12 preschool aged children is not feasible • The Mobile Preschool Program provides a viable alternative to standard and stand-alone preschool • Access to regular preschool is a priority as opposed to delivering preschool in blocks (e.g. via a mobile preschool bus) • On-the-job training is an effective way to build assistant teachers' knowledge, skills and teaching capacity • Preschool is under-valued by parents/carers of Indigenous children in remote communities • Community consultation is an effective method of identifying an appropriate location and staff for the preschool • There are enough interested, suitable and available people to fill all assistant teacher positions • Assistant teachers want to progress their skills, knowledge and careers • If the accessibility and quality of preschool is increased, increases in preschool attendance will result • Increased exposure to preschool leads to increased positive impacts for the child (i.e. the higher the 'dose' of preschool, the better the outcomes) • Increased school readiness leads to increased attendance and learning readiness <p>INFLUENCING FACTORS</p> <p>INTERNAL FACTORS There is a risk that....</p> <ul style="list-style-type: none"> • Insufficient time to consult with communities to secure support of principals will compromise set up and running of preschool • Assistant teachers could be used for other teaching duties, drawing them away from the preschool • Assistant teachers will not adhere to preschool program content, and as a result, children will not be exposed to key program components • Assistant teachers will not receive sufficient support from teacher due to irregular visits, weak working relationships or inexperience • The MPP will be undervalued by principals and there will be insufficient support to achieve intended outcomes • Opportunities to take part in formal training will not eventuate, staff may have limited opportunities to progress skills or knowledge • Recruiting only one assistant teacher per location could lead to preschool closure when the assistant teacher is ill or on leave • Preschool aged children are inappropriately enrolled to boost school Transition enrolments • Increased parental participation in the classroom will make it more difficult for assistant teachers to discipline children and manage classroom dynamics/learning without appropriate strategies • Assistant teachers may find it difficult to cope with larger class sizes <p>EXTERNAL FACTORS There is a risk that...</p> <ul style="list-style-type: none"> • Recruiting suitable teachers will be difficult and may cause a delay in the roll out of the program • In some locations, there will be fluctuations in the number of preschool aged children from year to year which may lead to inconsistent service over time • In some locations, there won't be suitable or available people to fill AT positions • Inadequate venue for preschool resulting in factors such as exposure to extreme weather conditions reducing attendance • Cultural practices, such as sorry business and ceremonies will reduce the number of days the preschool is open • Some children will not attend the preschool because of family or cultural conflict with selection of Assistant teachers

3. Methodology

3.1 Evaluation aims and research questions

The primary aim of this evaluation was to establish the effectiveness of Mobile Preschool Program availability, attendance and quality in improving children's school readiness. This study included exploratory analysis of baseline data for demographic characteristics of the study sample of children and families in very remote Northern Territory communities. The evaluation documented characteristics of Mobile Preschool Program children were actually experiencing. The study also sought to identify possible design elements that would improve the program by maximising access and participation, with the overall objective of improving the school learning and psycho-social outcomes for this unique cohort of Northern Territory children.

Hypothesis: Participation in the Mobile Preschool Program improves the developmental health and school readiness outcomes of children in the short and medium term.

Key research questions:

4. Is the availability of a Mobile Preschool Program within a remote Northern Territory community associated with improved indicators of school readiness?
5. Is regular attendance at a Mobile Preschool Program associated with improved indicators of school readiness?
6. Is higher program quality in the Mobile Preschool Program associated with improved indicators for school readiness?

3.2 Study design and sampling

This is a clustered randomised control study. The estimated sample size of 480 children was determined in 2008 and was based on the Australian Bureau of Statistics Census 2006 and mobile preschool enrolment figures for 2007.

Site Selection

All Northern Territory communities receiving Mobile Preschool Program prior to 2008 or scheduled to receive a service during 2008 – 2009, as advised by Department of Education in early 2008 were clustered by service delivery hubs, called group schools.

Three communities with mobile preschool programs from each of six hubs and two communities from a seventh and smaller hub, as listed in Appendix A, were randomly selected by a numbered ballot. The random selection of a subset of sites rather than inclusion of all intervention sites was necessary on the basis of budgetary and operational limitations. For the control arm of the study, ten communities were randomly selected from 15 other comparable Northern Territory

communities without an existing preschool service. These 15 communities were similar in population, size and distance from regional centres. One to one matching was not feasible due to the smaller number of communities not receiving a preschool or comparable service. On the basis of the proportion of communities with mobile preschool service to those without, 10 was proportionally representative of those communities of comparable size not receiving preschool services.

Alternative study sites were selected at the same time as a contingency in the event that communities needed to be excluded. This was in recognition that ethics approval was based on study participation being agreed to by the relevant local governance groups and service providers (as represented by the school Principals). Two instances of community exclusion occurred. Alternative sites were included in their place. The two communities were excluded as there were no children of eligible age present at the time of recruitment.

Sampling

Determining a denominator has been a long-standing problem in Northern Territory research and program delivery design^{26,27,28}. In the Mobile Preschool Study the initial prediction of sample size was based on the Australian Bureau of Statistics Census 2006 and the estimated distribution of preschool aged children. By the time the project commenced it was evident that many communities selected in the study had experienced considerable change in the number of preschool aged children in residence. Furthermore, in depth examinations of the birth rate data between Australian Bureau of Statistics and Perinatal collections data in the Northern Territory vary considerably and remain unresolved²⁵.

Of the 28 communities with eligible children consented to the study, two communities had no population data in any of the three sources for population estimates. The Immunisation register provided estimates for 14 communities; Australian Bureau of Statistics²⁹ provided 13 communities' estimates, whilst Northern Territory Treasury³⁰ provided estimates for nine communities.

All children of eligible preschool or transition age were approached for recruitment including those believed to be of eligible age but not attending or enrolled in either program. The estimated population and sample size for comparison cohorts presented in Table 1 was based Immunisation register data available for the selected study sites and the expected implementation schedule of Mobile preschool program. For two communities with no population estimate in the Immunisation Register, a maximum of five children was used based on this being the Department of Education's stated minimum requirement for mobile preschool service provision. Attendance of children in their Transition year when the Australian Early Development Index as outcome measure was collected, was estimated at 60 percent of the

population and then consent was expected for 80 percent of these children. A local cultural consultant and school staff were used to identify all children of eligible preschool or transition age. Study staff approached all parents or carers of those children believed to be of eligible age for recruitment, whether enrolled and attending or not in either Transition or preschool programs.

Table 1 Sample size for availability cohort comparisons

Availability comparison cohorts		Estimated population ¹	Estimated sample size ²
Group A	Mobile Preschool available	147	70
Group B	No preschool available	110	53
Total		257	123

¹ Based on Immunisation Register at 2009 for cohort of children aged 3.5 to 5.5 years of age

² Based on 60 percent of children attending Transition when Australian Early Development Index collected and 80 percent consent rate for those children

Figure 2 Map of mobile preschool evaluation study sites



3.3 Key Measures and Data Collection

The quantitative data included in this report are largely descriptive and draw on both primary and secondary sources summarised in Table 2. The study also collected extensive qualitative data in relation to program implementation and perceptions of program impact.

Table 2 Analysis components and data sources

Analysis Component	Data Source
Program Logic	Review of Department of Education Mobile Preschool Program (MPP) documents and consultation with program manager by Menzies research team
Denominator for sample at community level	The Northern Territory Immunisation Register
Program distribution, location and operation	Department of Education documents and Bushtel (www.bushtel.nt.gov.au) Provided by preschool teachers and program management. Where official commencement data was unknown, the assistant teachers' commencement data was used as an alternative indicator.
Enrolment and attendance	Customised tables generated by Department of Education (Northern Territory Department of Education and Training, 2009b)
Australian Early Development Index	Centre for Community Child Health and Australian Council for Educational Research via Department of Employment, Education and Workplace Relations
Program Qualities	Staffing data provided by Department of Education program management Visit schedules provided by mobile preschool teachers Programming materials supplied by Department of Education program management and mobile preschool teachers Program qualities experienced by child direct observation by Menzies research team Quality and quantity of professional development materials supplied by program management and mobile preschool teachers, interviews and questionnaires with mobile preschool teachers and assistant teachers
Child Health	Northern Territory Immunisation Register, Department of Health Hospitalisation Records, Patient Care Information System, Clinic records, Parent interview for Strengths and Difficulties Questionnaire
Parent Socio-Demographics Community Environment	Parent / Carer interview Bushtel, Community Housing Infrastructure Needs Survey

3.3.1 Exposure variables: Enrolment and attendance

The enrolment and attendance data for consented and eligible children in their Transition year were available in the official Department of Education attendance dataset. Thorough treatment of the data for matching and removal of duplications was undertaken and checked.

Treating non typical enrolment and attendance data

There were five commonly occurring scenarios where children had non-typical enrolment history. These are identified in Table 3 with a description of the process used to treat each of these exceptions.

Table 3 Non-typical enrolment and attendance data and treatment for analysis

Non-typical data	Process for treating data
Skipped Transition	(n=9) assigned to the eligible group to ensure their inclusion in the Australian Early Development Index data linkage request.
No 2010 enrolment record	(n=4) were treated as ineligible and their demographic and enrolment/attendance data was not imported.
Enrolled in Transition for 2 consecutive years or enrolled in two different years simultaneously	(n=8) were treated by looking at each individual child's enrolment history and assigning a year group according to the likelihood of getting Australian Early Development Index data and the closeness to their correct enrolment history.
Enrolled for >10 weeks in a single term (maximum term length 10 weeks)	(n=95) were identified in the database. For these cases, the week's enrolled data was examined and a systematic pattern was identified. A formula was applied to correct.
Enrolled for 0 weeks but attended for more than 1 day	(n=5) were treated as data entry errors. Child was simultaneously enrolled at another school (n=3) and deleted. Number of weeks enrolled was increased to reflect the number of days each child (n=2) attended.

Determining preschool availability

The Department of Education was unable to provide a school-by-school denominator for the number of days each preschool was open each term. A formula was used to calculate the number of days mobile preschool was available based on the maximum number of school days in each term of 50 days, minus pupil free days and public holidays. This was then multiplied by the number of weeks each child was enrolled. The generic multiplier was based on an assumption that preschools operated 5 days per week, so the days enrolled variable does not account for some preschools that ran for four days per week only or those that had closures due to cultural business. This had minimal effect on analysis of attendance in this study. All children were categorised for preschool availability individually to account for whether their community of residence or enrolment received a mobile preschool service in the year of their preschool eligibility and complex enrolment histories due to mobility.

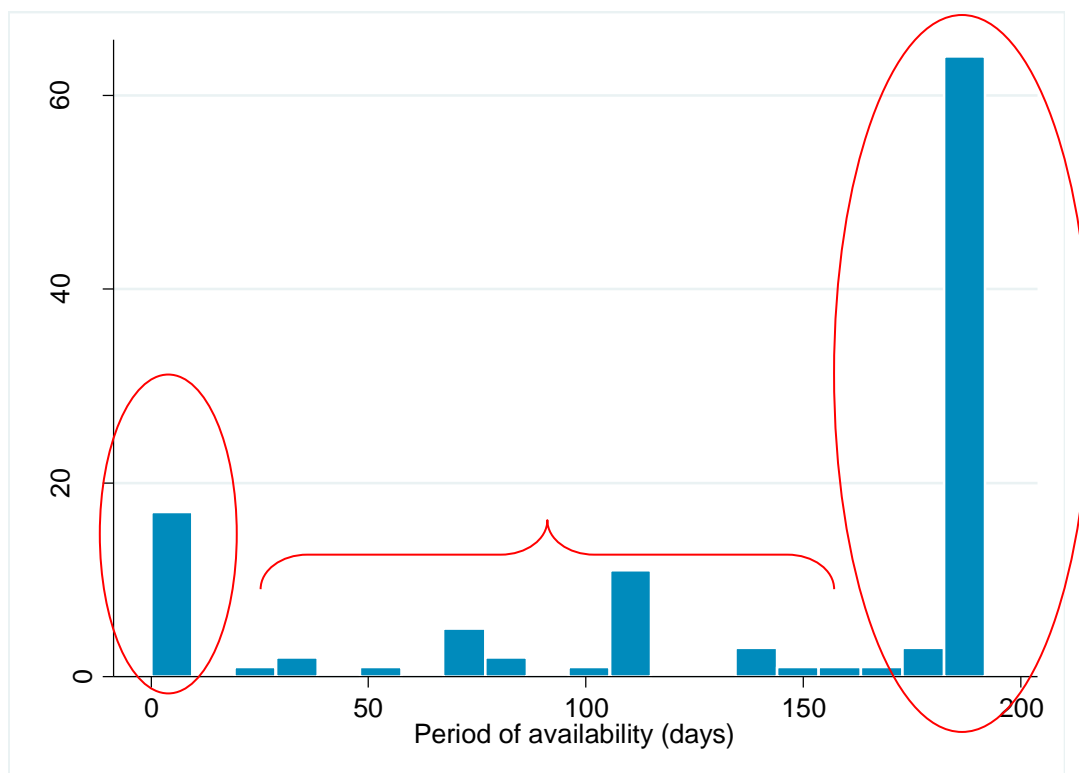
Children who had more than 30 days exposure to preschool programs other than mobile preschool were categorised appropriately but excluded from the primary analyses. Children were categorised for availability of preschool firstly by the commencement of the mobile preschool program in their community of residence and the occurrence of enrolment in other preschool types in other communities where they may have had temporary residence. Secondly, their date of birth was used to determine the date at which they were eligible to be enrolled. This was necessary as some communities changed from the control arm to treatment arm between study commencement in 2008 and end of 2009.

Criteria for the categories of preschool availability were determined once the distribution of preschool starting dates was identified. After excluding children who were exposed to more than 30 days of “other” preschool type, there were three distinct groupings of children for availability of preschool as illustrated in Figure 3. The ‘no availability’ category, our control group included those children consented with no attendance or enrolment record for any preschool program within the Northern Territory. Generally, most children from the control sites had ‘no availability’ of preschool programs during 2008 or 2009.

The children who attended 30 or more days of a preschool program type other than the mobile preschool program were excluded from the primary analysis. Children with mobile preschool available and not exposed to ‘other’ types of preschool had a median of 192 days. The categories for availability were determined by the median number of days mobile preschools were available across the study sample. The three categories of availability include:

- a. children with ‘no availability’
- b. children with limited availability of 191 days or less
- c. children with full availability of 192 days or more

Figure 3 Distribution of mobile preschool availability (days)



Determining attendance

The raw data provided by Department of Education included the number of ‘periods’ each child was enrolled and attending mobile preschool. We had expected that for each child, the number of periods attended would equal the number of days attended given that preschool only ran for two to three hours each day, or a single period (Note that there are usually two periods at primary school, before lunch and after lunch). However, the ‘periods attended’ data had not been entered into the central records system, *Student Administration and Monitoring System*, consistently across sites with some schools using a 1 day:1 period ratio, others using a 1 day:2 periods ratio, and others an unrecognisable ratio. For the purposes of determining ‘dosage’ or exposure we used the total number of days that each child attended preschool in the year before they entered Transition.

The raw number of days the study sample children attended preschool had a bimodal distribution as illustrated in Figure 4a with a mean of 90 days, $SD = 60$ days and median 92 days. The distribution of preschool attendance as raw days is possibly the result of the variation in availability which also has a bimodal distribution. The distribution of preschool attendance as a proportion of that available to children, was significantly and positively skewed as illustrated in

Figure 4b. The preschool attendance as a proportion of that available to children, had a mean of 65 percent, $SD = 24$ percent and median 73 percent.

Figure 4a Histogram of raw days attended for mobile preschool study cohorts

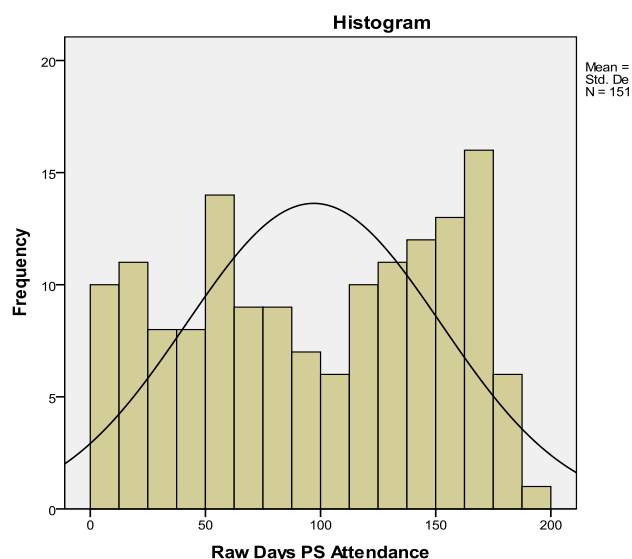
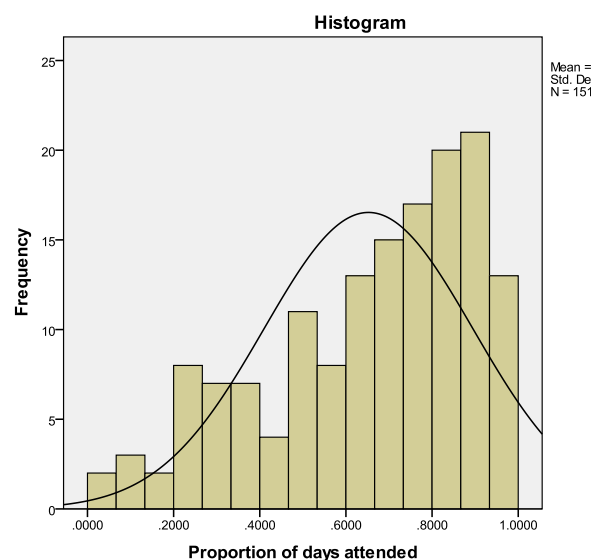


Figure 4b Histogram of attendance as proportion of mobile preschool availability



However, when the attendance for only the children with a valid outcome measure (the Australian Early Development Index), 64 percent of the consented children had a raw day attendance mean of 85 days, $SD = 61$ and median 79 days. This provided the cut point for the high and low attendance categories.

3.3.2 School readiness outcome measures

Children attending the first year of formal schooling (Transition year Year 1 minus one) in 2009 and 2010 were compared using two outcome measures: i) developmentally vulnerable on two or more domains on the Australian Early Development Index and ii) the five domain scores achieved on the Australian Early Development Index. The comparisons of outcomes were made for each of the three predictor variables:

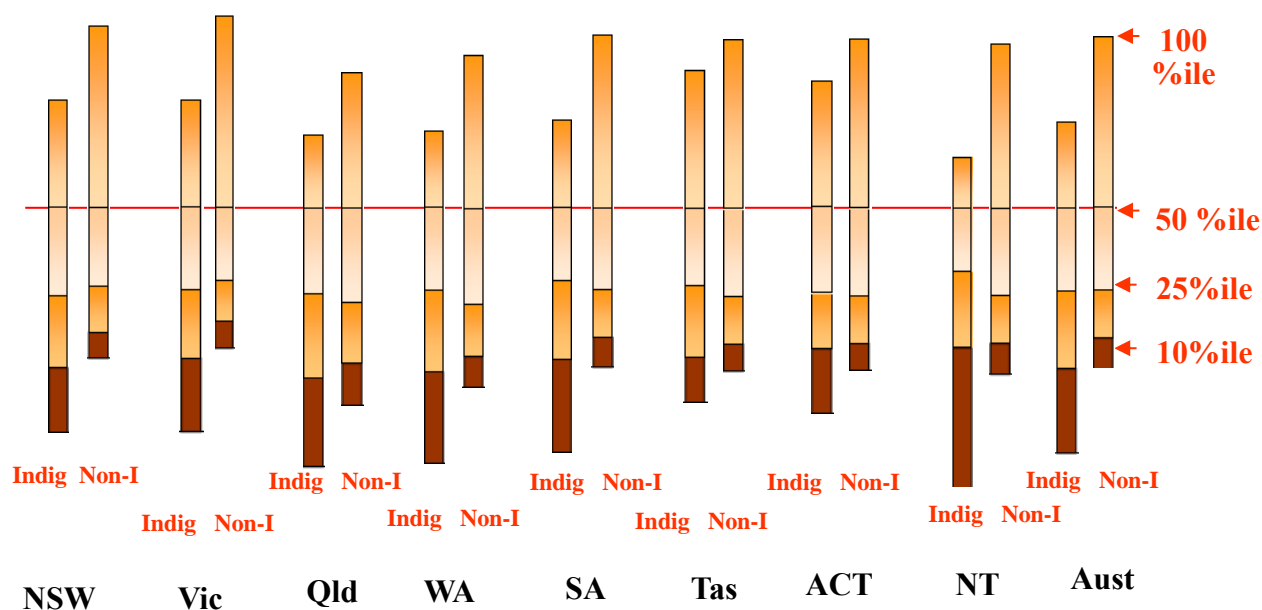
- Categories of high and low mobile preschool availability in the year prior to Transition, 2008 and 2009 respectively
- Categories of high and low mobile preschool attendance in the year prior to Transition, 2008 and 2009 respectively
- Categories of high and low mobile preschool program quality experienced in the year prior to Transition, 2008 and 2009 respectively

Australian Early Development Index

The original study design included the Assessment of Student Competencies as the primary outcome measure. Due to very low rates of return on the Assessment of Student Competencies in 2009 (only 15 students across all study sites), the Australian Early Development Index was chosen. This tool was identified as the most suitable alternative outcome measure because of the following characteristics in common with the Assessment of Student Competencies: it is based on teacher judgement; covers the Assessment of Student Competencies domains of development more comprehensively; it is collected as early as possible in the child's first year of formal schooling (Transition); and it has been adapted and calibrated for its culturally inclusive use with urban, rural and remote Indigenous children^{31,32}. The Mobile Preschool Evaluation was the first Australian study to have been granted approval for individual record linkage of Australian Early Development Index data for research purposes under the conditions of the national Australian Early Development Index data-linkage protocol.³³

The Australian Early Development Index serves as an indicator of the sum of early childhood experiences evident on entry to formal schooling. A longer tail of vulnerability across combined domains of development was evident for children of Indigenous status in all Australian jurisdictions in the 2009 cohort as illustrated in Figure 5. One quarter of all Northern Territory five year olds were considered to be developmentally vulnerable on two or more developmental domains. The rate of developmental vulnerability for Indigenous children residing in very remote Northern Territory communities was 53.8 percent. This was twice the rate of 25.1 percent for Indigenous children living in outer regional areas, which incorporated provincial size towns³⁴. For the individual child, this level of vulnerability indicates that the child may need specific and targeted support in school.

Figure 5 Distribution of Australian Early Development Index total scores (Australian national percentiles) by jurisdiction and Indigenous status 2009 (Silburn, 2010)



Strengths and Difficulties Questionnaire (SDQ)³⁶ (Goodman, 1997)

This questionnaire consists of 25 behavioural indicators across five psycho-social domains: emotional symptoms; conduct problems; hyperactivity or inattention; peer relationships and pro-social behaviours.³⁵ It is suitable for assessing psycho-social behaviours in children aged 3-16 years and can be conducted with teachers or parents. In this study, the Strengths and Difficulties Questionnaire was conducted in interviews with parents and featured some language adaptations.

3.3.3 Effect Modifiers – Program Qualities

Determining Program Qualities

Four program quality related variables were considered critical influences on the overall quality of program experienced by children. These variables included the qualifications and experience of the teacher and assistant teacher; a direct observation of literacy instruction skills (Classroom Literacy Observation Schedule); and a checklist of standards from the Quality Improvement and Accreditation System principles and were combined into a single overall program quality index. This is an original index developed for this study by the principle investigator for the purpose of simplifying the overall program quality exposure comparison between community level data and different years of the program. A critical feature of the program logic was the level of support by mobile preschool teachers to the local assistant teachers. The median score for overall quality was used to categorise the sample into high-moderate and low program quality exposure.

Two comparison groups for mobile preschool program quality consisted of those attending preschools that scored i) below the median, low and ii) above the median, high-moderate, on the program quality index for 2008 (.6).

Mobile Preschool Teacher qualifications and experience

Teacher qualifications are a key factor contributing to the quality of the Mobile Preschool Program. We ranked qualifications according to diploma or degree and relevant early childhood qualifications or general education disciplines. Similarly, length and type of experience are expected to contribute to the level of program quality and were ranked for treatment.

Qualification rankings:

- 1= Diploma of education
- 2= three year education qualification
- 3= three year early childhood qualification
- 4= four year education qualification
- 5= four year early childhood qualification.

Experience rankings:

- 1= three or less years of early childhood experience
- 2= four to ten years of early childhood experience
- 3= more than ten years of early childhood experience.

A teacher quality score was determined by a sum of qualification and experience rank.

Assistant Teacher qualifications and experience

We also ranked the qualifications and experience of Mobile Preschool Program assistant teachers, taking into account completion status, relevance to education and experience in working in early childhood.

Qualifications rankings:

- 0= none
- 1= any certificate commenced
- 2= any certificate completed
- 3= education certificate commenced
- 4= education certificate completed.

Experience rankings:

0= no experience prior

1= some experience in education settings

2= experience in early childhood settings

3= more than four years experience in early childhood settings.

An assistant teacher quality score was determined by a sum of qualification and experience rank.

Classroom Literacy Observation Schedule (CLOS)³⁶

There are a total of 27 variables in the Classroom Literacy Observation Schedule³⁷. They are grouped into five domains of skill or knowledge required for successful literacy instruction. These domains include: respect; knowledge; orchestration; support and differentiation. The domains are not of equal weighting and range in number of variables from three to eight. In order to identify the relative strengths of assistant teachers across the domains, scores within each domain have been converted to a ratio of total skills required. Domain scores as a proportion of the total score was used as an overall program qualities index.

Quality Improvement and Accreditation System Principles checklist³⁷

The peak body for standards and accreditation in early learning and care settings at the time of the study design was the National Childcare Accreditation Council³⁸. Their Quality Improvement and Accreditation System Principles provided the framework for assessing quality standards in childcare and children's services. There are seven principle areas of quality: staff relationships with children and peers; partnerships with families; programming and evaluation; children's experiences and learning; protective care and safety; health, nutrition and wellbeing, and managing to support quality. A total of 33 variables were assessed as 'satisfactory', 'not satisfactory' or 'not known' through observation on site and collection of artefacts. The qualities at a satisfactory standard were used to calculate ratios for each principle area and identify relative strengths across the quality principles for preschool sites. An overall ratio from the total Quality Improvement and Accreditation System score was used in the overall program qualities index.

Visitation Rates

Each Mobile Preschool Program teacher provided a term-by-term travel schedule. These schedules indicated the days spent visiting the Mobile Preschool Program sites and assistant teachers. The accuracy and reliability of the schedules was treated on face value, with the exception of three group school teachers who provided an annotated schedule with amended travel.

The qualitative interviews with school staff identified that fortnightly visits by the qualified teacher were considered a minimum for adequate support and opportunity to coach the local Mobile Preschool Program assistant teacher. The expected number of teacher visits in the year was determined by the number of school terms (10 weeks each) each preschool site was operational in a year multiplied by five for the number of fortnights in each term. The number of expected days is calculated on one full day support per visit. This does not include travel time and is a minimum expectation. Variables for visitations were treated separately for children in the 2008 and 2009 cohorts. The overall trend for visits was determined by averaging the visitation rate for 2008 and 2009. This is indicative only, as this study occurred in very early implementation phase of the program in the majority of study sites.

Qualitative interviews with Mobile Preschool Teachers and other key informants

We conducted semi-structured interviews with eight of the nine teachers employed to deliver mobile preschool in the Northern Territory between 2008 and 2010. Interviewees were invited to share their perspectives on the characteristics of successful preschool sites, the factors that underpin success, potential challenges and strategies for addressing these challenges.

The data from these interviews were analysed using thematic content analysis³⁸ whereby reoccurring themes were identified and sorted into preset and emergent categories. Preset categories were based on broad program quality indicators identified in a literature scan, while emergent categories were derived from themes raised by the teachers. We used a process of data reduction and sub categorisation to establish the relative importance of each emergent category, with the main reoccurring themes included in the findings section of this report. To maintain confidentiality of teachers, all direct quotes and any references to individuals or communities have been de-identified.

3.3.4 Confounding Factors

We collected socio-demographic and health factors from interviews, and with parental consent, from information provided by access to a range of health data sets. The data analysis plan included an exploration of potential confounders in the outcome analysis. The key confounding factors drawn from the literature included are: gender; age of child at entry to Transition; birth weight; timely immunisations (as a proxy for recommended health care utilisation – Diphtheria Tetanus and Polio at 7 months and 4 years; Measles Mumps and Rubella 13 months and 4 years); growth-for-age status; anaemia; hospitalisations; carer education; employment and income; main language spoken at home; distance from a regional centre and the remoteness index of the community of residence.

3.4 Statistical analysis

The analysis plan was revised once the consistency and completeness of data were established. The primary aim of the analysis plan was to test the hypothesis that, *Mobile Preschool Program participation improves the developmental and learning outcomes of children in the short and medium term.*

The analysis plan focused on addressing this hypothesis through the three primary research questions. The research questions were based on two variables important to how children participate, that is how much mobile preschool they had available, and how much did they attend or the dose effect. The third research question was based on the importance of exposure to high quality programs. Comparisons of children with different levels of: availability, attendance and exposure to program qualities as shown in the analysis plan in Appendix B the following outcome measures were used:

1. developmental vulnerability on two or more Australian Early Development Index domains (yes/no)
2. the five individual Australian Early Development Index domain scores (Physical health and development; Emotional maturity, Social competence, Language & Cognitive development, and Communication skills and general knowledge).

All statistical analyses were conducted with Stata/IC 12.1. Table 4 provides a summary of statistical analyses used.

Table 4 Summary of outcome and predictor variables, types and tests used in addressing the primary research questions

Outcomes	<u>Predictor and type of variables</u>			Tests
	Availability	Attendance	Program Quality Index	
Primary analyses: Dv2 (binary)	Continuous (days)	Continuous (days)	Continuous (ratio) Continuous (ratio) for individual variables comprising index: Mobile Preschool Teacher rating; Assistant Teacher rating; CLOS score QIAS score Visits by teacher	Mann-Whitney <i>U</i> -test
	Binary categories (median split)	Binary categories (median split)	Binary categories (median split)	Chi2
Secondary analyses: Domain scores (continuous)	Binary categories (median split)	Binary categories (median split)	Binary categories (median split)	Mann-Whitney <i>U</i> -test

Exploratory analysis of health and demographic data for confounding factors included analyses of distributions for continuous data (child's age starting formal schooling, birth weights, number of hospitalisations, remoteness index scores and household size) between availability and attendance cohorts with Mann-Whitney U tests. Categorical health and demographic data were analysed with Pearson Chi-Squared tests using Fishers Exact statistic for uneven and small sample size.

Two additional treatments were considered in the analysis plan to i) adjust for clustering and ii) post hoc treatment using a Bonferroni correction. However, when reviewing the analysis plan and in the light of data inspection these were judged as unnecessary. Outliers in the data presented in figures in Section 4 have been deliberately included to best represent the very small sample and variation.

Due to the small sample size a main effects model was applied and data were found to meet the assumption that the effect of one predictor on the outcome did not depend on the value of another. The hierarchical structure of the data was accounted for in the multilevel mixed effects models whilst controlling for those potential confounding factors with significant associations in the bivariate analyses.

For the multivariate logistic regressions with three predictors (availability, attendance and program quality) using Stata/IC 12.1 the expected statistical power is .80.

3.5 Methodological Considerations

Focus on Menzies Evaluation Study Sites

This report focuses on those Mobile Preschool Program sites in the Menzies evaluation study and school readiness outcomes for children when they are in their first year of formal, full time school, or Transition. We investigated predictors including Mobile preschool availability, attendance and program quality experienced by very remote Northern Territory children in the year prior to Transition.

Point in time analysis

The Mobile Preschool Program implementation processes changed over the course of this evaluation study, which was expected as with other large scale, multi-site programs. The findings in this report related to individual children's experiences are based on measures of program quality and conditions in the period of preschool enrolment for each child. The general program descriptions and program quality measures relate to the program as it stood at the close of 2010, including field observations collected throughout 2009.

Missing Data

While data for Closing-the-Gap funded sites were readily available from a single point in the Department of Education data system, it was more difficult to access data about core funded sites where data are held only at the school level and therefore not consistently gathered or monitored. Every effort has been made to address gaps in data availability. Unfortunately, no service provision data was available for one of the group school hubs at the request of the regional manager.³⁹ And so data for these children were removed.

Six eligible children had enrolment and attendance data missing for their Transition year. These children did not have an Australian Early Development Index return either and were therefore considered lost to the study cohort.

Information on the primary outcome measure, the Australian Early Development Index, was available for 124 (64%) of the 194 consented and eligible children. However, only 114 of these

Australian Early Development Index records were valid with sufficient assessment items completed. Nine Australian Early Development Index records were for children excluded from the primary analysis on the basis of exposure to preschool other than mobile preschool. Only 63 (60%) of the children with a full school year of mobile preschool available had a valid Australian Early Development Index. Whilst 26 (62%) children with up to 191 days available, and 16 (59%) children with no mobile preschool available had an Australian Early Development Index collected. This resulted in a total of 105 children included in the primary analysis of the impact of mobile preschool availability on development and learning outcomes as measured by the Australian Early Development Index I.

Accuracy of Immunisation Registry population figures

Predicting the number of preschool eligible children at each Mobile Preschool Program location was challenging due to the limited availability of site-specific population figures and the mobility of some remote Indigenous populations⁴⁰. To get a clearer picture of the size of the eligible preschool population, Menzies collated data from the Northern Territory Immunisation Register⁴¹. We acknowledge that the accuracy of these data, like all datasets in the NT, is limited by population movement. In this report, we have given preference to the use of Immunisation Register data as they are available for most sites and are updated whenever a child is vaccinated. This means that the child's place of residence is recorded at scheduled intervals of 0, 2, 4, 6 and 18 months and 4 years.

4. Findings

4.1 General study outcomes

Consent rates

A total of 267 children were successfully recruited across the 28 study sites. This number of consented children exceeded those eligible. To ensure children would be in Transition in either 2009 or 2010 eligibility for inclusion children were aged between 43 and 82 months at the time of consent in 2009. There were 194 eligible children that met this criterion. Many carers were not able to furnish accurate information about children's ages or stage of school at the time of consent and consequently many children recruited were subsequently discovered to be too old or too young or within age range but already enrolled in Year 1 at school. Hence these children were not included in the outcome assessment, the Australian Early Development Index.

The children recruited in the 28 study sites represent 64-83% of the estimated total population of eligible children^{42 29}, according to immunisation records.

Inclusions and exclusions

All children aged between 43 and 82 months in the selected communities were eligible for study inclusion. The majority of children excluded (n=65) were either too old or too young for eligibility in the target cohort (Figure 4). Another 23 children recruited were excluded due to preschool attendance in other locations for periods of more than 30 days.

A total of 105 children had data available for the primary analysis of the impact of mobile preschool program availability on school readiness outcomes:

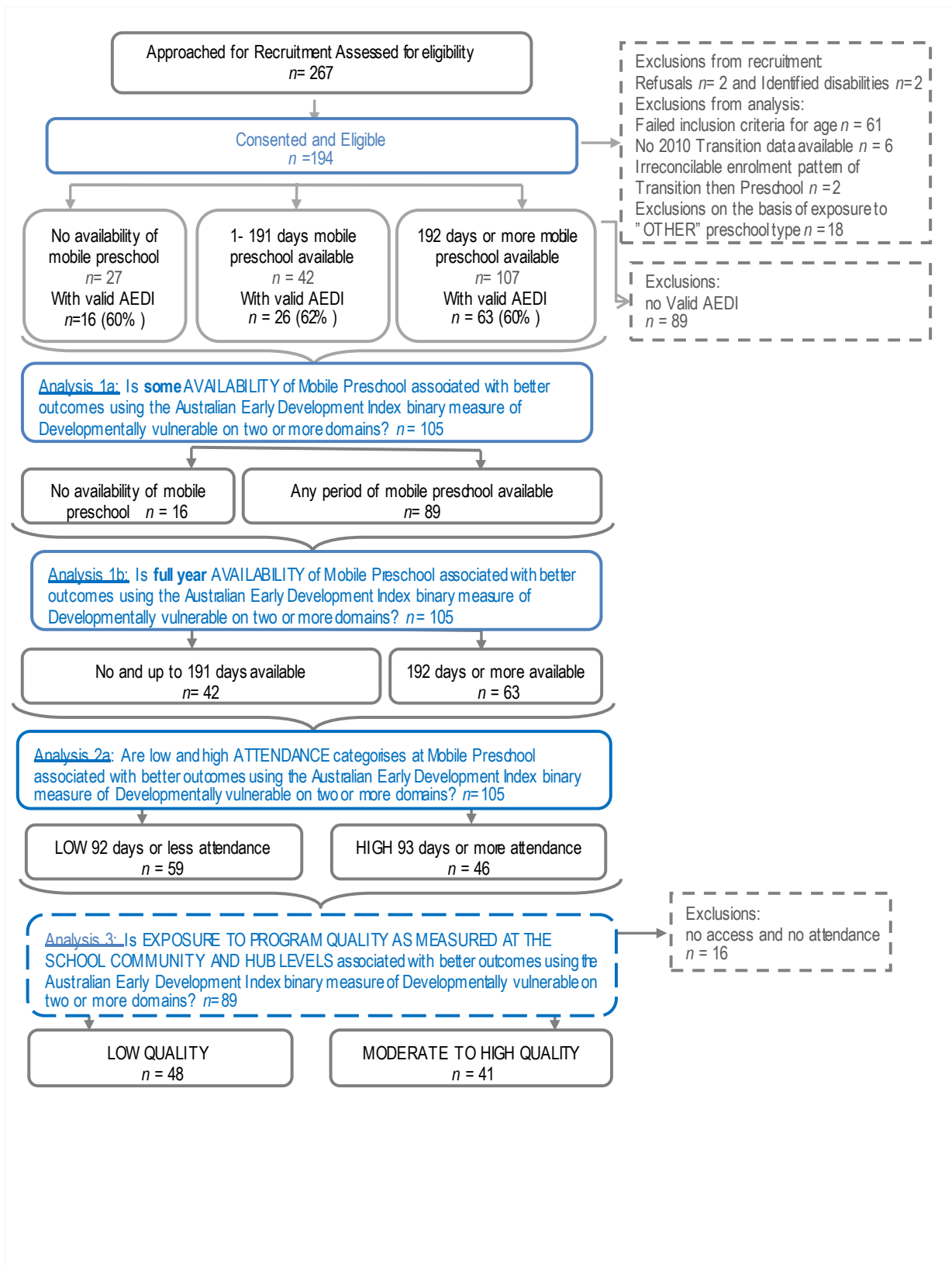
- 66 children (54%) of the children in the '6-12 months access' to preschool had valid Australian Early Development Index domain data returned.
- 15 children (62.5%) of the 'no access' group had valid Australian Early Development Index domain data returned.
- 20 children (83%) of children with 'less than 6 months access' had valid Australian Early Development Index domain data returned.

There is no systematic explanation for why outcome data was not returned for some children. Although, not statistically significant, the difference in the attendance of the two groups may be a feasible explanation, whereby children with lower attendance may have reduced opportunities for the teacher to collect Australian Early Development Index information.

Figure 6, the consort diagram illustrates categorisations and exclusions of study participants for the analysis plan. The availability and attendance categories are based on the distributions of these predictor variables and using medians for cut points as outlined in Section 3. Not shown in

the consort diagram were the analyses of the effect of the continuous availability, attendance and preschool quality variables on children's outcomes on the Australian Early Development Index.

Figure 6 Consort Diagram



Overall level of Australian Early Development Index developmental vulnerability

Australian Early Development Index domain scores at or below the 10th percentile of the national Australian Early Development Index population are considered to indicate 'developmental vulnerability'. Analyses in this study focused on the 'developmentally vulnerable on two or more domains' which is the primary measure reported in the jurisdictional and national use of the Australian Early Development Index. The proportion of Northern Territory Indigenous children developmentally vulnerable on two or more domains was higher at 46.1 percent than 41.7 percent of the Mobile preschool study sample vulnerable on two or more domains as shown in Table 5. This difference was not statistically significant when tested with a Fisher exact test $\chi^2 (1) = 0.57, p = 0.45$. The non-Indigenous population had only 9.6 percent of children developmentally vulnerable on two or more domains. This difference was statistically significant $\chi^2 (1) = 109.66, p = 0.000$.

Table 5 Developmental vulnerability total Mobile preschool study sample compared with other Northern Territory population groups

Sub population groups	<i>n</i>	Developmentally vulnerable on 1 or more domains (%)	Developmentally vulnerable on 2 or more domains (%)
Non-Indigenous Northern Territory *	1,786	22.6	9.6
Indigenous - Northern Territory *	1,063	65.1	46.8
Study sample from very remote Indigenous population	115	68.7	41.7

*Source: Northern Territory AEDI URF and AEDI National Report 2009 cited in Silburn, McKenzie and Moss (2010)

4.2 Understanding the mobile preschool program as implemented

In order to better understand the impact of program quality on children's school readiness, this part of the report presents a detailed description of the findings related to the observed characteristics and implementation of the Mobile Preschool Program in the study sites. The community and group school structure represented by these data are accounted for in the analysis of impact on children's outcomes for school readiness in Part B.

Each of the variables that comprise the program quality index generated for this study are described. The between group school variation in these descriptors were compared with one way ANOVA tests and the strength of correlations between descriptors were tested with Spearman Rho. A number of findings in this section relate directly to the program logic or design and the policy environment as explained in Section 1. These were the key characteristics that were expected to impact on school readiness outcomes for children, which are presented in Part B.

The key program features and program qualities data available for analysis were almost complete with the exception of the researcher observations for Classroom Observation Literacy Schedule. The researchers made a number of return visits to preschool sites in order to complete these data collections. Typically, the reasons for not completing these observations on the visitation days included very low attendance (often one child in attendance), preschool or school not open or assistant teacher refusal to be video-taped.

Funding and implementation consistencies

Of the 18 operational Mobile Preschool Program sites in the study, nine were funded through the Closing-the-Gap initiative and the remainder received core funding from Department of Education. The core-funded sites had been running for four or more years. In comparison, the Closing-the-Gap funded sites were initiated in 2008 and 2009 and had, for the most part, been operational for 10 to 18 months. A number of sites experienced intermittent stoppages due to teacher recruitment difficulties.

The standard staffing structure in both Department of Education core and Closing-the-Gap funded mobile preschool sites consisted of one qualified teacher (4 year qualification and registered with the NT Teacher Registration Board) to service four to five sites and one assistant teacher in each site (no prerequisite skills and employed at the Assistant Teacher level 1 or 2 or Administrative officer level 2 for 0.41 Full Time Equivalent). There were a number of sites which varied from this standard. These variations largely reflect the preferences of principals to provide additional support from group school resources. An example of this group school level resourcing was that four sites were provided with additional assistant teachers and another site continued to receive Mobile preschool teacher visits whilst not officially in operation due to lack of enrolments. Professional support for preschool teaching staff in non-Mobile preschool sites was provided by the visiting Mobile Preschool Teacher under Closing-the-Gap funding.

Personnel Recruitment and Retention

The key recruitment and retention of staff factors that varied between group school hubs included duration of contracts, types of contracts and the length of time in the position.

Recruitment to Closing-the-Gap funded hubs varied from the anticipated schedule⁴³. Two hubs varied in teacher commencement date, one six months earlier and one six months later than anticipated. The most outstanding feature of the two Department of Education core funded hubs for which data were available was that they had retained long term staff appointments, that is staff had been employed for more than two years in the same position. Secondly, four of the five Closing-the-Gap funded hubs had retained the same mobile preschool teacher from roll out to December 2009. Also of note was the more short term nature of initial employment contracts in some hubs.

Of the 19 Closing-the-Gap mobile preschool sites, 15 had the same assistant teachers since commencement. The ten core funded sites for which data were available appear to have quite stable staffing, with only one whose assistant teacher had a placement for less than one year. Although data were incomplete, there was an indication that despite a pattern of fairly stable employment retention, contracts were typically short in length, ranging from one term to 12 months.

Qualifications and teaching experience for Mobile preschool staff

Of the seven mobile preschool teachers with data available, five had a teaching degree. Two of these five had early childhood specific degrees, and one teacher had diploma level qualifications specific to early childhood. It was expected that the mobile preschool teachers with over 10 years' experience and those with 4-10 years' experience may be considered "Competent Teachers" as described by Teacher Standards⁴⁴.

The distribution of teacher ratings experienced by children in the study sample had a mean rating of qualifications and experience of .69, SD = .22 and median of .73. Approximately one third of children in preschool programs were supported by a teacher with a three year qualification or with a four year qualification in primary or adult education.

The majority of assistant teachers were not registered in the Vocational Education Training (VET) tracking system which had been established to monitor and track the VET contracts² for staff and their progress toward their qualification. This was a relatively new system and it is anticipated that the quality and quantity of data on staff qualifications will improve over time. The most consistent data available on assistant teacher qualifications were the self reported

² VET contract was the agreement between DET and employees for provision of Vocational Education Training

levels and status of qualifications. It was anticipated that there were more qualifications held than recorded on the system given the majority of assistant teachers had been retained in their positions for considerable periods of time. Only two assistant teachers appeared to have had VET contracts, one for Diploma Early Education and Care (status inactive) and the other Certificate III Aboriginal Education Worker (status unknown). However, from assistant teacher interviews data were missing for five of the assistant teachers and seven had no qualifications. The remaining third had commenced or completed a VET certificate. Two of these assistant teachers had commenced an education certificate, being the Diploma and Certificate students mentioned above. In Core funded mobile preschool sites there has previously been an expectation that all assistant teachers be enrolled in or have completed a Certificate III in Children's Services or Education Support Work.

When the period of employment in the mobile preschool sites was used as a proxy indicator of current length of experience, five assistant teachers had over two years' experience, twelve assistant teachers had between 1-2 years' experience and nine assistant teachers had less than 1 year of experience. In other words, nearly half the study sites had assistant teachers with no prior experience in early childhood settings. There were two outliers in the 'over two years' experience group' with six and eight years' experience having been with the mobile preschool since it commenced in their community.

These combined qualifications and experience profiles resulted in children in the study sample being exposed to assistant teacher qualities which ranged from .19 to .86, with a mean of .43, *SD* = .27 and median .57.

Both teacher and assistant teacher ratings of qualifications and experience were significantly different between the group school hubs whilst the amount of variation within each hub was equivalent. The importance of the community and group school hub level structure of the data was acknowledged in the analyses of outcomes.

Site Visits

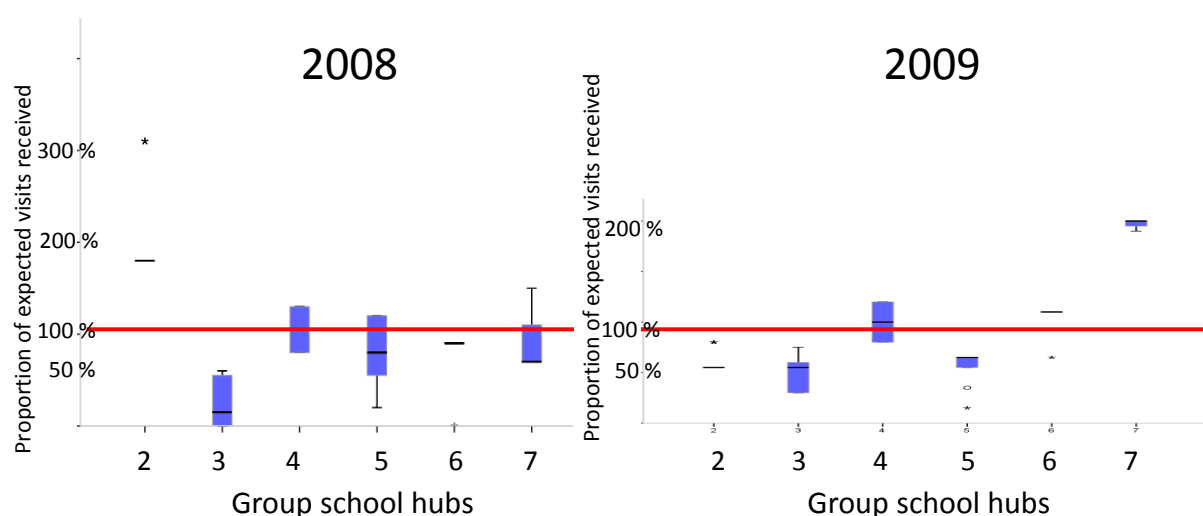
There was a significant difference between visitation rates in 2008 and 2009. The analysis included here was based on the actual number of visits to each preschool site as a proportion of those expected in the program logic and documentation, that was, one day per fortnight (20 per year). We did not collect data on the specific activities during each visit.

The proportion of days (of the expected number) mobile preschool teachers visited assistant teachers on site in 2008 ranged from 15 percent to 310 percent with mean 87 percent, *SD*= 68 percent of those expected. This would suggest that at the community level, teachers were making choices about which preschool sites to visit much more frequently (up to three time

more than the expected visits) at the expense of other communities not receiving visits. By comparison the range for 2009 visits was 15 percent to 195 percent with mean of 78 percent, $SD = 47$ percent of those expected. There appears to be no general explanation for the difference in distribution of visits between 2008 and 2009 and further these were not statistically significantly different, $t(5) = 1.11, p = .268$. Several exploratory analyses were conducted based on proximity to regional centre; length of operation or stage of implementation; number of children attending and funding stream, but no clear rationale was identified.

The variation between teachers' visits in 2008 and 2009, at the group school hub level, particularly for hubs 2 and 7 was visually discernible as shown in Figure 7. As with the analysis of differences between mobile preschool teacher visits across the whole cohort of mobile preschool sites, no pattern to explain this variation emerged from the analyses of potential factors. These differences between group schools for mobile preschool teacher visit rates were statistically significant in 2008 and 2009. For both years the within group variation was equal.

Figure 7 Comparison of mobile preschool teacher visit rates in 2008 and 2009 between group schools (red line indicates the expected rate)



Speculation about some communities, children or staff having greater need and therefore receiving more visits was supported by a strong correlation between the assistant teachers' rating and the visits received, $r_s = -.66, p = <.000$. Given this variation and no systematic explanation for the variation between 2008 and 2009, an average visit rate across both 2008 and 2009 was calculated. The average visit rate by mobile preschool teachers used in outcomes analysis had a range of 18% to 195% with a mean of 83%, $SD = 45\%$ and a median of 86%.

Programming for Curriculum, Pedagogy and Assessment

Curriculum, pedagogy and assessment were expected to be pivotal in shaping the quality of program content and delivery. These features are important in being able to accurately describe

the intended experiences and outcomes for children, and also benchmark the program fidelity. The evidence for curriculum, pedagogy and assessment features was drawn from document analyses, classroom observations and interviews.

Approaches to program content and assessment procedures varied between group schools and evidence of programming features were not always available. Some of the group school approaches to curricula were directly related to, or reflect the principles of the Northern Territory endorsed curriculum and support materials of the time.

Professional Development

We expected formal professional development opportunities would be hosted at group school or system level to support capacity building for quality program delivery. It was expected that the professional learning accessed by the mobile preschool teachers would be reflected in their coaching and support of the assistant teachers, as well as in their role of leading and managing change in the group school hub and each individual preschool site. Overall, this expectation was supported and evident in the teacher and assistant teacher interviews.

Classroom Literacy Observation Schedule (CLOS)

The Classroom Literacy Observation Schedule was used to provide a standardised and directly observable measure of the critical knowledge and skills required to support children's early literacy development. Researcher observations of the assistant teacher conducting a literacy activity, typically 'mat time', shared big book session or similar, were conducted in 10 preschool sites. Missing data were imputed from Quality Improvement and Accreditation System Principles Checklist; assistant teacher qualifications and experience; and mobile preschool teacher qualifications and experience.

The 'respect' domain, which includes demonstrations of rapport with children by assistant teachers, was the highest scoring overall (83%). Skills required for orchestration of effective lessons, such as managing the environment and transitioning children between activities were distributed across a wide range, .0-1.0, but achieved the next highest mean (55%). The demonstrated 'support' domain skills including scaffolding, responsiveness and feedback achieved a mean of 40 percent, whilst the assistant teachers' ability to provide differentiated instruction and meet individual children's needs achieved a mean of 30 percent. The knowledge domain had the lowest mean score, 26 percent. Skills not evident in assistant teachers' knowledge domain in the Classroom Literacy Observation Schedule included being explicit about reading and writing purposes and having the metalanguage to explain structure of written English. It was necessary to take all Classroom Literacy Observation Schedule results on face value based on the actual observed behaviours at the time of data collection. Whilst the group

school hubs were significantly different in the Classroom Literacy Observation Schedule scores from each other, the variation within each of the group school hubs was equal.

Quality Improvement and Accreditation System Principles Checklist (QIAS)

At the time of commencing the study the Quality Improvement and Accreditation Principles Checklist was the endorsed observation tool for children's services in Australia and included interactions between staff and children and parents; occupational health and safety; programming and reporting to parents, and staff access to manualised procedures and policies.

The overall results for Quality Improvement and Accreditation Principles Checklist indicated that many sites met the principles at a satisfactory level. The distribution of scores in most domains had a ceiling effect. The high scores are in part due to a small number of items in each domain (three to six items), and importantly many items require very basic and minimum standards to be rated satisfactory. Quality principles that were rated highly included safety (95%), programming (93%) and child experiences (93%).

Variation between group school hub means for total Quality Improvement and Accreditation Principles Checklist scores were statistically significant. The variance within groups was equal. Variation between Quality Improvement and Accreditation Principles Checklist and Classroom Literacy Observation Schedule scores for group schools seven and six may be indicative of the stage of implementation or priorities set by the teacher at the time of data collection.

Venue of mobile preschool

Data on mobile preschool venues were collected to provide further detail on the context in which some aspects of quality were being achieved. As an example, where preschool was operating from a garden shed or breezeway the provision of safety measures, let alone aesthetics such as space to display children's artefacts was expected to be challenging.

Preschool facilities for the Mobile Preschool Program vary greatly from purpose built preschool classrooms, to shared space such as a library, or in a withdrawal room. The data do not allow an analysis at this point of the impact on educational outcomes of such facilities. Typically, mobile preschool sites were located on school grounds. The small proportion of sites situated off school grounds at the time of the data collection either had no suitable space at the school or had a more appropriate space available. For example, several sites operated (albeit in one case only temporarily) from shared facilities with crèche.

Investigating the performance of the program quality index

As outlined in Section 3, four related variables for program quality: mobile preschool teacher rating; assistant teacher rating; Classroom Literacy Observation Schedule and Quality Improvement and Accreditation System scores were considered critical influences on the overall

quality of program experienced by children. These variables were combined into a single overall program quality index. This is an original index developed for this study for the purpose of simplifying the analyses of overall program quality exposure and children's outcomes. Due to staffing changes and operational variations children in the same community were not necessarily exposed to the same program quality depending on what year they attended the preschool. So whilst the program quality index is measured at the community (and year) level, each child was assigned the program quality index to which they were exposed.

The relationships between the main factors that comprise quality are important to the discussion about the assumptions in the program logic and design elements of how the mobile preschool program works as a service delivery model in Section 5.

The difference between group school hub means was statistically significant whilst the within group variances were equal. These results indicate the mean program quality indices for preschool sites in this study were moderate to low, with some group school hubs doing better than others but all being equally varied.

The correlations between the four individual variables (mobile preschool teacher, assistant teacher Classroom Literacy Observation Schedule and Quality Improvement and Accreditation System scores) and the combined program quality index supported the expected importance of assistant teacher and teacher ratings (Table 6). The assistant teacher ratings were strongly correlated with the program quality index, $r_s = .88, p = .000$. That is to say, the assistant teacher ratings explain 88% of the change in the ranking of the program quality index suggesting a very strong relationship between these two variables. Although not as strong as the assistant teacher relationship with program quality index, the teacher ratings were also strongly correlated with the quality index, $r_s = .73, p = .000$. Quality Improvement and Accreditation System score was the next strongest correlation, $r_s = .58, p = .000$ followed by Classroom Literacy Observation Schedule with a moderate correlation, $r_s = .51, p = .000$.

As expected there was a strong correlation between the mobile preschool teacher and assistant teacher ratings, $r_s = .63, p = .000$. The relationship between the assistant teacher ratings and the Quality Improvement and Accreditation System score and Classroom Literacy Observation Schedule were moderate to strong, $r_s = .47, p = .000$ and $r_s = .38, p = .000$, respectively. These results were consistent with the program logic assumptions of the influence of the mobile preschool teacher on the assistant teachers' skills and knowledge. The assistant teachers' skills and knowledge had most direct relationship with managing the day to day experiences and environment measured by the Classroom Literacy Observation Schedule and Quality Improvement and Accreditation System score, for the children largely in the absence of the teacher. The relationship between the mobile preschool teacher ratings and the Classroom

Literacy Observation Schedule however, was low to moderate, $r_s=.28$, $p = .004$. This may be explained by following the logic that the mobile preschool teacher was not observed for the Classroom Literacy Observation Schedule, rather the direct observations were of the assistant teacher only.

Table 6 Correlations between four program quality variables and the program quality index

		Preschool program quality index	Mobile preschool teacher rating	Assistant teacher rating	Classroom Literacy Observation Schedule
Preschool program quality index	Corr. Coefficient <i>P value</i>	1.000			
Mobile preschool teacher rating	Corr. Coefficient <i>P value</i>	.73** .000	1.000 .		
Assistant teacher rating	Corr. Coefficient <i>P value</i>	.88** .000	.63** .000	1.000 .	
Classroom Literacy Observation Schedule	Corr. Coefficient <i>P value</i>	.51** .000	.28** .004	.38** .000	1.000 .
Quality Improvement and Accreditation Schedule Score	Corr. Coefficient <i>P value</i>	.58** .000	.12 .25	.47** .000	.39** .000

** significant at .01 level

These factors were important to understanding how the preschool program as experience by children might modify the effect of exposure to preschool and the resulting outcomes for children. However, it is important to acknowledge that these data were collected at the community and group school hub levels hence the importance of acknowledging the community and group school hub level structure of the data in the analyses of outcomes.

4.3 Primary research questions on the effectiveness of Mobile preschool

The exploratory analysis for associations between the categories of mobile preschool availability and attendance and the socio-demographic factors at the child, family and community levels indicated that there were differences between these cohorts in the directions expected on many of the factors examined. However, these differences were not systematically or statistically significant enough to suggest the cohorts represented different populations. There were some program quality factors which did not have the associations expected and this may be a result of stage of preschool implementation.

The primary research questions addressed by the primary and secondary analyses were:

1. Is the availability of a Mobile Preschool Program within very remote Northern Territory (Australia) communities associated with better school readiness?
2. Is regular attendance at a Mobile Preschool Program associated with better school readiness?
3. Is higher program quality associated with better school readiness?

4.2.1 Impact of mobile preschool availability on school readiness

Three analyses were used to address the primary research question:

Is the availability of a Mobile Preschool Program within very remote Northern Territory (Australia) communities associated with better school readiness?

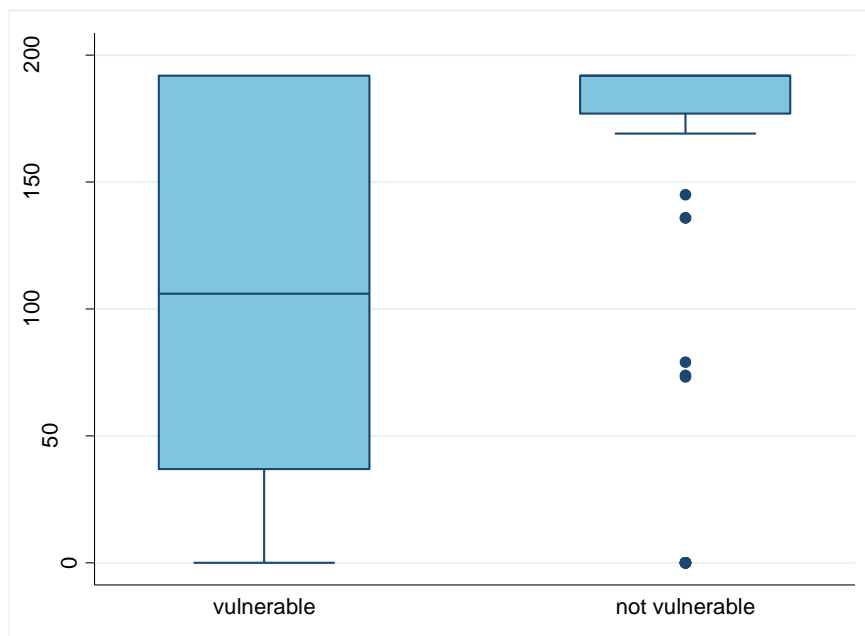
The small control group ($n=16$) resulted in a preferred analysis which pooled the control group with children ($n=26$) who had less than the median number of days available of mobile preschool (192 days) for the low availability category. These children were compared with the high availability category, comprised of children with 192 days or more ($n=63$) mobile preschool available.

Firstly, the number of preschool days available to children were compared between the children developmentally vulnerable on two or more domains or not. Secondly, the proportions of children either developmentally vulnerable on two or more domains or not were compared between the high and low availability cohorts. Thirdly, we tested associations between children in low and high preschool availability categories and their scores on five domains of development.

Children who were developmentally vulnerable on two or more domains had a median of 106 days mobile preschool available compared to children not developmentally vulnerable on two or more domains having a median of 192 days mobile preschool available. Using the Mann-Whitney

U-test this difference was statistically significant, $z = -3.78$, $p = .0002$. The distinct distributions of availability by days between the developmental vulnerability groups are shown in Figure 9.

Figure 8 Comparison of mobile preschool days available to children who are developmentally vulnerable on two or more domains and those not vulnerable



The small control group ($n=16$) resulted in a preferred analysis which pooled them with the children ($n=26$) who had less than the median number of days available of mobile preschool (192 days) for the low availability category. These children were compared with the high availability category, comprised of children with 192 days or more ($n=63$) mobile preschool available which is also considered to be a full school year of preschool.

The 'low availability' group had a higher proportion of developmentally vulnerable children (69%) than the 'high availability' group (25%) as shown in Table 7. This was a statistically significant difference in the proportion of developmentally vulnerable children between the two availability groups, $\chi^2(1) = 20.04$, $p = .000$. Children with 192 days or more of mobile preschool available were more likely to not be developmentally vulnerable on two or more domains than the children with 191 days or less, $OR = 6.5$ (95%CI: 2.76 – 15.58).

Table 7 Association between two availability cohorts and developmental vulnerability on two or more Australian Early Development Index domains

Availability Cohorts	Not vulnerable		Vulnerable		Total	The Aust ralia n Early Deve
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	
Low availability (191 days or less)	13	31	29	69	42	
High availability (192 days or more)	47	75	16	25	63	

lopment Index developmental domains are: Physical health and well-being; Social Competence; Emotional maturity; Cognition and language skills, and General knowledge and communication. Some variation in the impact of the mobile preschool between these domains was expected. The Cognition and language skills were expected to be positively impacted by appropriate scaffolding and exposure to oral English with greater availability of mobile preschool activities. Similarly, the Social competence and Emotional maturity domains were expected to benefit from supported development of routines and 'school behaviours' at mobile preschool.

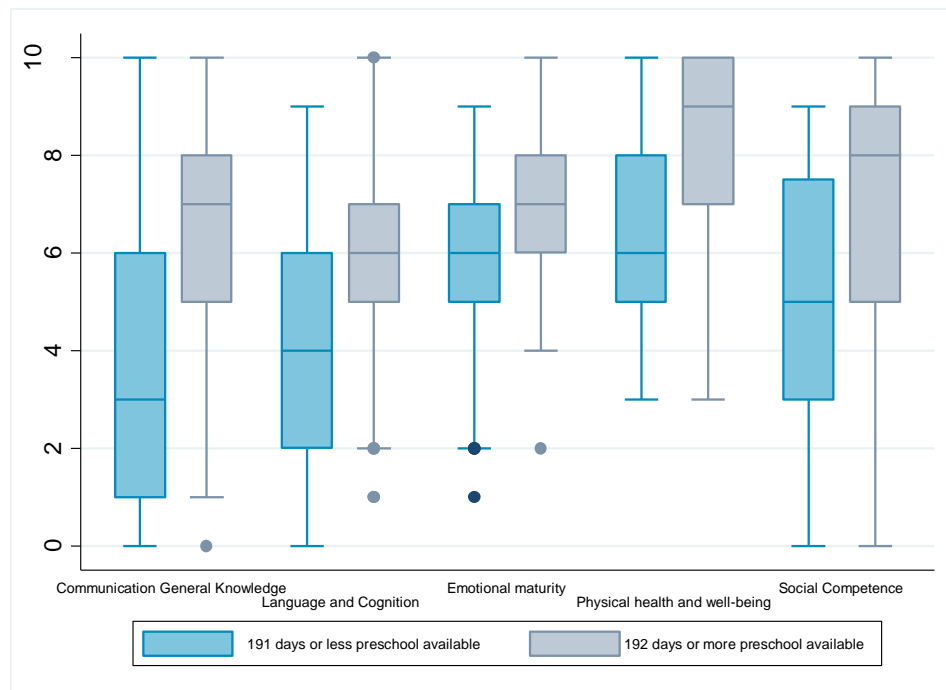
Table 8 summarises the differences in median scores for developmental domains and the inter-quartile ranges between the two availability cohorts. The differences were in the expected direction of a positive relationship between higher availability and higher achievement of school readiness. The differences between the availability cohorts on each of the domain scores were statistically significant when tested with a Mann-Whitney *U*-test.

Table 8 Comparison of Australian Early Development Index domains for availability cohorts

	Low availability of preschool		High availability of preschool		<i>z</i>	<i>p</i>
	Median	IQR	Median	IQR		
Language and cognition skills	4	2-6	6	5-7	-3.195	**. <i>.001</i>
Emotional maturity	6	5-7	7	6-8	-3.012	**. <i>.003</i>
Communication and general knowledge	3	1-6	7	5-8	-4.647	**. <i>.000</i>
Physical health and well-being	6	5-8	9	7-10	-4.254	**. <i>.000</i>

As illustrated by Figure 9, least impact of availability was demonstrated in the Emotional maturity domain. The coloured boxes in these plots indicate the median and inter-quartile range. The whiskers are the upper and lower-most scores for 1.5 times the inter-quartile range for each Australian Early Developmental Index domain.

Figure 9 Australian Early Developmental Index domain scores for children in the two availability cohorts



Summary

Is the availability of a Mobile Preschool Program within very remote Northern Territory (Australia) communities associated with better school readiness?

We can conclude that the availability of a full year of mobile preschool is significantly associated with likelihood of not being developmentally vulnerable on two or more domains on the Australian Early Developmental Index. Further, all domains of development were strongly and positively association with a full year of mobile preschool being available. This association between a full year of preschool availability and improved school readiness is strong and indicates that implementing or preparing preschools for receiving students at the beginning of the school year is likely to be a means for improving the effectiveness of mobile preschool.

4.2.2 Impact of attendance at Mobile Preschool Program on school readiness

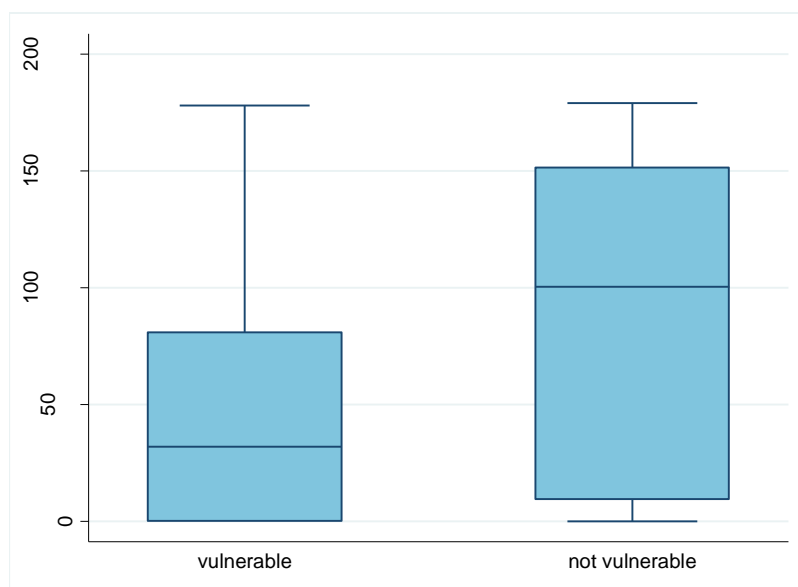
Three analyses were used to address the primary research question:

Is regular attendance at a Mobile Preschool Program within very remote Northern Territory (Australia) communities associated with better school readiness?

The distribution of days attended was compared between the children developmentally vulnerable on two or more domains and not vulnerable. Children developmentally vulnerable on two or more domains attended for a median of 32 days compared with children not developmentally vulnerable who attended for a median of 101 days. A difference of 68.5 days in medians is a substantial amount of the school year which on average has a maximum of 192 days. The medians were compared using a Mann-Whitney *U* test and confirmed a positive and statistically significant difference in days attendance at mobile preschool between children developmentally vulnerable on two or more domains or not, $z = -2.92, p = .004$.

Figure 10 illustrates the significantly different distribution of days attended between children developmentally vulnerable (0-81 days) and those not developmentally vulnerable (10-152 days) emphasising the strong relationship developmental vulnerability and days attended in this study sample.

Figure 10 Comparison of attendance (days) for children developmentally vulnerable on two or more domains or not



The comparison of low (70 days or less) and high (80 days or more) attendance categories for associations with the proportion of children developmentally vulnerable on two or more domains is summarised in Table 9. The high attendance group had 26 percent of children developmentally vulnerable on two or more domains compared with 56 percent of children in

the low attendance group. Using Fishers exact test, the difference in proportions of developmentally vulnerable children between the two attendance groups was statistically significant, $\chi^2(1) = 9.65, p=.003$.

Table 9 Mobile preschool binary attendance categories by availability categories

Attendance categories	Australian Early Developmental Index				Total
	Developmentally		Not		
	vulnerable on two or		developmentally		
	more domains		vulnerable		
	<i>n</i>	%	<i>n</i>	%	
Low attendance 79 days or less	24	56	19	44	43
High attendance 80 days or more	12	26	34	74	46
Total	36		53		89

Children who attended mobile preschool for 80 days or more were more likely to not be vulnerable on two or more domains than children who attended less than 80 days of mobile preschool, *OR* 3.6 (95%CI: 1.56 – 8.29). Attendance makes a difference to developmental vulnerability. In relation to a school year of 192 days, this means that attending just more than one and half school terms of preschool would increase the likelihood of not being developmentally vulnerable on two or more domains significantly. Further, for every term (50 days) children attend mobile preschool the odds of not being developmentally vulnerable on two or more domains improve by 70% (95%CI: 1.17-2.5) more than being vulnerable.

The impact of low and high attendance was examined for associations with the scores in the five developmental domains: Physical health and well-being; Social Competence; Emotional maturity; Cognition and Language skills, and General knowledge and communication. As with the availability categories some variation in the impact of mobile preschool attendance was expected for each of these domains. Figure 11 illustrates the ceiling effect of the scores in each domain for both attendance categories. This may be a function of the indicators being based around minimal skills in each domain. Some examples of these include basic self care and toileting, communicating needs, following simple routines. The low attendance group tended to have wider inter-quartile ranges compared to the high attendance group. Despite the possible scores ranging from only 0 to 10 Physical health and well-being and Emotional maturity domains were more narrowly distributed than Social competence, Communication and general knowledge, and Language and cognition domains.

Figure 11 Distribution of Australian Early Developmental Index domain scores for children in two attendance cohorts

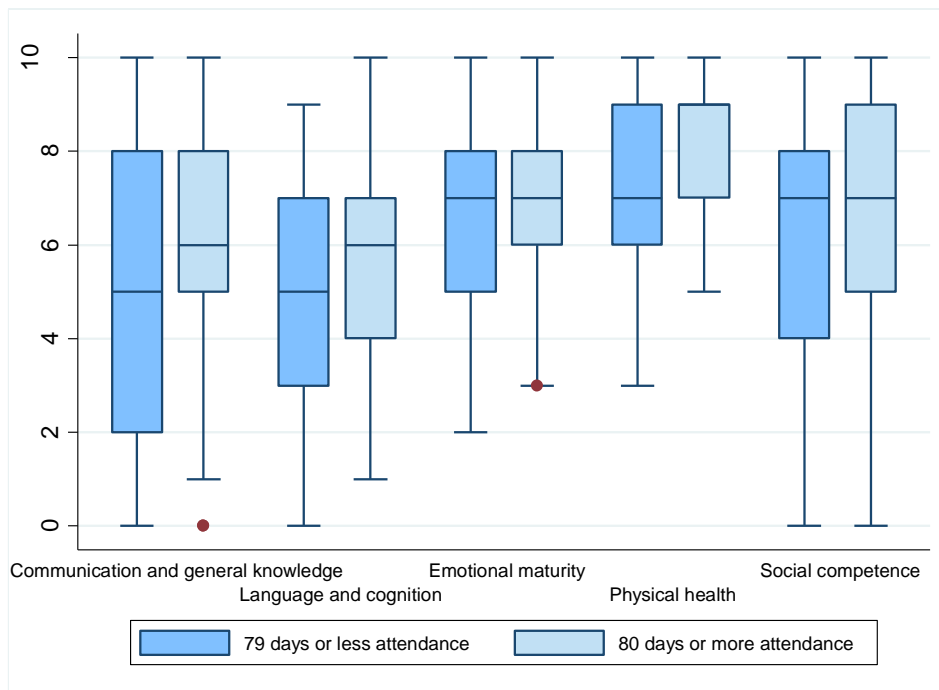


Table 10 further highlights the similarities in median scores for most domains across the two attendance categories with the exception of the median of 9 in Physical health and well-being for the high attendance group. No comparisons of domain score medians revealed statistically significant differences between the low and high attendance categories. Two developmental domain's scores varied significantly between the high and low attendance categories. These domains were Communication and general knowledge skills, $z = -3.030$, $p = .002$ and Physical health and well-being, $z = -2.536$, $p = .011$.

Table 10 Median scores and inter-quartile range for Australian Early Developmental Index domains between two attendance cohorts

	79days or less		80days or more		<i>z</i>	<i>p</i>
	Median	IQR	Median	IQR		
Language and cognition skills	5	3-7	6	4-7	-1.419	0.156
Emotional maturity	7	5-8	7	6-8	-0.824	0.410
Communication and general knowledge	5	2-8	6	5-8	-3.030	**0.002
Physical health and well-being	7	6-9	9	7-9	-2.536	**0.011
Social competence	7	4-8	7	5-9	-1.588	0.112

**significant at the <.05 level

Parent and carer perspectives on attendance

A thematic analysis of the qualitative data from the parent and carer interviews covered a very wide range of discussion points. Those responses related to parents and carers attitudes or behaviours that may have influenced attendance of children (and themselves) in mobile preschools are summarised.

Of the 168 carers who responded to the question, “how important is preschool for your children?” 89 percent said that preschool was “very important”, 6 percent said it was “important” and 5 percent said it was “not important”. Interestingly, six of the children whose parents said that preschool was “not important” were in the high attendance group. Children of parents who said preschool was “very important” or “important” were approximately evenly distributed between low and high attendance groups.

When it came to identifying barriers to attendance the majority of parents and carers (76%) said that children were kept home when sick. A small number of these cases also mentioned extreme cold weather being a reason to keep children home. The next most common barrier identified was service issues (8%), such as preschool closure or the program not being run properly, and inadequate transport to preschool. Teasing, bullying and children not wanting to go to school each accounted for less than 4% of barriers identified. Very small proportions of parents identified community safety issues and tiredness as barriers (less than 4% combined) and 5 percent of parents could not identify any barriers to children attending.

Summary

Is regular attendance at a Mobile Preschool Program within very remote Northern Territory (Australia) communities associated with better school readiness?

We can conclude that regular attendance of 80 days or more at a mobile preschool is associated with improved school readiness, as measured by reduced likelihood of being developmentally vulnerable on two or more domains for the Australian Early Developmental Index.

4.2.3 Impact of Mobile Preschool Program quality on school readiness

Three analyses were used to address the primary research question:

Is Mobile Preschool Program quality in very remote Northern Territory (Australia) communities associated with better school readiness?

Firstly, the distribution of the program quality index was compared between the children developmentally vulnerable on two or more domains or not. Secondly, the proportion of children developmentally vulnerable on two or more domains or not were compared between

the low and high program quality index groups. Finally, scores for the five developmental domains were compared between low and high quality index groups.

Children who were developmentally vulnerable on two or more domains experienced preschool program quality indices with a median of .58 compared to children not vulnerable experiencing program quality indices with a median of .62. There was only a small and no-significant difference of 4 index points in the direction expected between the medians for the outcome groups, $z = -1.57, p = .116$.

It was expected that high quality programs would have a positive association with increased proportion of children not vulnerable on two or more domains. Table 11 shows that in low quality programs the proportion of children not vulnerable on two or more domains was 48 percent while for high quality programs only 32 percent of children were identified as vulnerable on two or more domains. This difference was not statistically significant, ($\chi^2 (1) = 2.43, p = .135$).

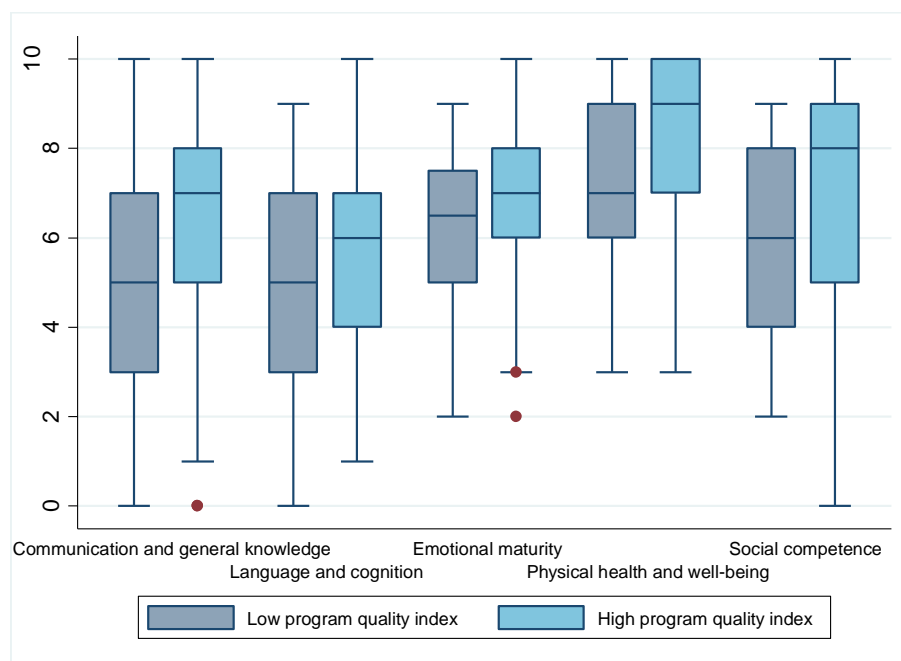
Table 11 Association between preschool program quality categories and developmental vulnerability on two or more domains

Program quality index	Australian Early Developmental Index				Total
	Developmentally vulnerable on two or more domains		Not developmentally vulnerable		
	<i>n</i>	%	<i>n</i>	%	
Low quality	23	48	25	52	48
High quality	13	32	28	68	41
Total	36		53		89

Low and high program quality index categories were examined for association with the five developmental domains: Physical health and well-being; Social Competence; Emotional maturity; Cognition and Language skills, and General knowledge and communication. As with the attendance and availability comparisons, mobile preschool program quality was expected to have some positive association with each of these domains.

Figure 12 illustrates the expected positive direction of better outcomes in all domains for the higher program quality group and illustrates the ceiling effect of the scores in each domain, except the low quality groups for Language and cognition skills and Emotional maturity domains. Both of these domains had smaller differences in medians and inter-quartile ranges between low and high quality groups.

Figure 12 Comparison of developmental domain scores for children in high and low program quality cohorts



Differences between the medians for quality groups on all domains showed an improvement in domain scores with higher quality ratings. These differences were tested with a Mann-Whitney *U* test and these statistics are presented in Table 14. Statistically significant differences were found for Physical health and well-being, $z = -2.789$, $p = .004$, Social competence, $z = -2.429$, $p = .015$ and Communication and general knowledge, $z = -2.036$, $p = .042$.

Table 14 Developmental domain medians for program quality index groups

	Low program quality index		High program quality index		<i>z</i>	<i>p</i>
	Median	IQR	Median	IQR		
Language and cognition skills	5	3-7	6	4-7	-1.321	0.186
Emotional maturity	6.5	5-7.5	7	6-8	-1.142	0.254
Communication and general knowledge	5	3-7	7	5-8	-2.036	**0.042
Physical health and well-being	7	6-9	9	7-10	-2.879	**0.004
Social competence	6	4-8	8	5-9	-2.429	**0.015

**significant at the <.05 level

Summary

Is Mobile Preschool Program quality in very remote Northern Territory (Australia) communities associated with better school readiness?

We can conclude that the program quality index experienced by children was not associated with improved school readiness, as measured by reduced likelihood of being developmentally vulnerable on two or more domains for the Australian Early Development Index. The comparison of low and high quality cohorts by the median scores on developmental domains showed a significant and positive association for Physical health and well-being, $p = .004$, Social competence, $p = .015$ and Communication and general knowledge, $p = .042$.

4.4 Multi-variate and multi-level models

In the previous section the associations between the three primary predictors were presented in a range of bi-variate displays and tests. The association between each of the four variables for the program quality index, as well as the index itself and the outcome variable (developmentally vulnerable on two or more domains) were examined in simple logistic regression models (Table 15) for $n=89$ children who attended mobile preschool. None of these associations were statistically significant (each $p>0.05$). Two of the individual variables in the program quality index were found to be statistically significant in predicting children's developmental vulnerability on two or more domains of the Australian Early Development Index. The assistant teacher rating was in the expected positive direction with higher assistant teacher ratings associated with less vulnerability, $R^2 = .041$ Model $\chi^2(1) = 4.89$, $p = .027$. However, a negative association was found for teacher visits with more teacher visits to preschool sites associated with more vulnerability, $R^2 = .084$ Model $\chi^2(1) = 10.10$, $p = .001$. Program quality index, mobile preschool teacher rating, Classroom Literacy Observation Schedule and Quality Improvement and Accreditation System variables were excluded from further analyses.

The multi-level structure of the data consisting of children clustered in communities which were nested in group schools was examined in a mixed effects model. The variation between hubs and between communities was found to be negligible, and so the structure of the data could be safely ignored in the analysis and presentation of the data. Further, the predictor variables for availability, attendance and quality were tested for interactions. No significant interactions were evident.

Table 15 Logistic regression results for four program quality index variables, index itself and teacher visits

Included	β (SE)	95% CI for Odds Ratio		
		Lower	OR	Upper
Constant	.299	.078	.374	1.794
Program quality index	13.862	.774	10.448	140.871
$R^2 = .027$ Model $\chi^2(1) = 3.23, p = .072$				
Constant	.282	.325	.709	1.545
Assistant teacher rating	5.226	1.192	6.207	32.329
$R^2 = .041$ Model $\chi^2(1) = 4.89, p = .027$				
Constant	.851	.349	1.283	4.714
Teacher rating	1.205	.183	1.237	8.346
$R^2 = .0004$ Model $\chi^2(1) = .05, p = .827$				
Constant	.380	.158	.576	2.098
Classroom literacy observation schedule score	8.890	.543	6.868	86.814
$R^2 = .019$ Model $\chi^2(1) = 2.32, p = .128$				
Constant	.185	.009	.133	2.022
Quality improvement and accreditation system score	22.632	.729	14.751	298.400
$R^2 = .027$ Model $\chi^2(1) = 3.25, p = .071$				
Constant	3.101	2.097	5.887	16.531
Teacher on-site visit rate	.108	.070	.201	.578
$R^2 = .084$ Model $\chi^2(1) = 10.10, p = .001$				

As summarised in Table 16, the statistically significant associations for assistant teacher ratings, teacher visits to preschool sites and mothers smoking during pregnancy were examined for the multiple regression model of predictors of developmental vulnerability. The only negative, statistically significant variable included was the teacher visits to preschool sites.

A forward stepwise approach to model building was used to examine the predictability of the primary child outcome using developmental vulnerability on two or more domains on the Australian Early Development Index. The availability variable acts as a proxy for attendance. The attendance variable is a better measure to address the hypothesis regarding the effect of mobile preschool exposure on developmental vulnerability. The availability variable was excluded from multivariable models. The preschool attendance variable entered the model first (Appendix C). A number of factors such as intrauterine assaults (low birth weight, smoking and alcohol consumption in pregnancy), remoteness and access to spoken English showed statistically significant associations with the outcome variable.

Table 16 Summary of significant associations between predictor variables and school readiness outcomes using the Australian Early Developmental Index

Outcomes	Preschool Availability	Preschool Attendance	Preschool Program Quality Index	Assistant teacher rating	Teacher visits to sites	Mothers smoking in pregnancy
Developmentally Vulnerable on two or more domains	**<.001	** .004	.135	*.03	** .006	*.041
Language and cognition skills	** .001	.156	.186			
Emotional maturity	** .003	.410	.254			
Communication and general knowledge	**<.001	** .002	*.042			
Physical health and well-being	**<.001	*.011	** .004			
Social competence	**<.001	.112	*.015			

* Significant at .05 level **Significant at .01 level

The number of days children attend mobile preschool is a strong predictor of them not being developmentally vulnerable on two or more domains of the Australian Early Development Index. Only the variable for mothers smoking during pregnancy made a contribution to the model once attendance was adjusted for mothers smoking during pregnancy was the only other factor to contribute to the predictability of children's outcomes on the Australian Early Development Index. In summary, when controlling for mothers smoking during pregnancy, children attending 80 days or more preschool were more likely to not be vulnerable on two or more domains than children attending 80 days or less preschool, *OR* = 4.9 (95% CI: 1.72 - 13.95). These findings are discussed further in Section 5.

Conclusions

HYPOTHESIS: Mobile Preschool Program participation improves the health, developmental and learning outcomes of children in the short and medium term.

The analyses presented in the previous sections examined associations between children's outcome variables and three primary predictor variables for preschool availability, attendance and program quality. The results demonstrated that increasing days of availability and attendance at mobile preschool were significantly associated with improved school readiness. This leads us to rejecting the null hypothesis that there is no improvement in school readiness

outcomes associated with higher attendance and availability of mobile preschool. Associations with the five developmental domains were in a positive direction for increasing levels of availability and attendance. Significant associations were observed between availability and all domains whilst attendance was significantly associated with Communications and general knowledge, and Physical health and well-being domains.

There was a positive association between increasing program quality and reduced developmental vulnerability on two or more domains. Improved scores for each of the five developmental domains were positively associated with higher quality ratings. Significant associations were found between program quality and Physical health and well-being, Social competence and Communications and general knowledge.

Unexpected results were found for two effect modifiers that were considered to be necessary conditions in the assumptions about the success of the mobile preschool program. The mobile preschool teacher ratings and the proportion of expected visits made to community to support the assistant teacher were negatively associated with reduced developmental vulnerability. It may be that the assumptions are fit for a fully implemented model and that our point in time data collection was in the establishment phase. Alternatively, there may be inherent factors at the child, family or community level that required more support from the mobile preschool teacher.

The possible implications for the differences between developmental domain's associations with preschool attendance and program quality index are discussed further in Section 5. In particular, neither attendance nor program quality had a significant association with children's outcomes on the Language and cognition or Emotional maturity domains.

5. Discussion

This discussion first addresses the key implications of the significant associations between children's outcomes for developmental vulnerability on two or more domains and the five discrete developmental domains, and preschool availability, attendance and program quality. Secondly, the concept of program fidelity is discussed and whether the findings are instructive about the assumptions in the program logic and the functionality of some elements of the service delivery model. Finally, the methodological considerations are discussed including population denominator estimates, low assessment returns and appropriateness of the Australian Early Development Index as a school readiness measure.

5.1 Findings addressing the primary research questions

5.1.1 Availability

As an observational study to evaluate a public program, the study design was at the mercy of unplanned or unforeseen changes in implementation, roll out or sites or other operational modifications. The planned analysis of a control group with no mobile preschool available was not feasible due the low number of children recruited to the study meeting this criterion. In order to address the primary question (restated below) of availability of mobile preschool a more nuanced examination of preschool commencement dates throughout the year was necessary.

Is the availability of a Mobile Preschool Program within very remote Northern Territory (Australia) communities associated with better school readiness?

The simple models testing the association of number of days preschool was available on developmental vulnerability suggests the importance of commencing preschools as early in the school year as possible. The concept of the preschool teachers and programs being 'mobile' was to address shifting cohorts of preschool aged children. The program design may therefore require a new strategy of demographic monitoring to allow for resource allocation and pre-planning for preschools to commence service at the beginning of the school year.

5.1.2 Attendance

The analysis strategy to examine the primary question of the association between attendance and outcomes (restated below) was to first identify what regular attendance in remote preschools looked like.

Is regular attendance at a Mobile Preschool Program within very remote Northern Territory (Australia) communities associated with better school readiness?

Attendance of 80 days in the school year is equivalent to attending 66 percent of the school year. These results suggest developing clear and coherent messages for parents, staff and key stakeholders in community to consider targets of increasing attendance of preschoolers to more than 66 percent may lead to better outcomes. The Department of Education define regular attendance as 80 percent, whilst the National Partnership funding agreement sets a target of 90 percent.

5.1.3 Program qualities

In order to address the primary question (restated below) of what children's exposure to quality programs meant, a detailed description of the program elements or conditions was undertaken.

Is Mobile Preschool Program quality in very remote Northern Territory (Australia) communities associated with better school readiness?

The complexity of meeting conditions for quality programs in the mobile preschool model has some similarity with early childhood and care services in which often an appropriately qualified professional is not the person working most directly with the children for a substantial period of time. The mobile preschool model is unlike a standard classroom in which children are under the direct supervision of a three to four year trained and qualified teacher. Rather, the model is based on the conditions of the qualified teacher travelling to each site to train and coach the assistant teacher in skills and knowledge for quality instruction and classroom management.

The program quality analysis was impacted by small numbers ($n=89$) and the results are interpreted with that caveat. The only variable of the four included in the program quality index developed for this study to have a strong positive association with reduced developmental vulnerability was the assistant teacher ratings. The Classroom Literacy Observation Schedule medians were positively associated with reduced developmental vulnerability but not significantly. The Quality Improvement and Accreditation System score had equivalent and high medians between the two groups of children developmental vulnerability or not and reflects the achievement in most preschool sites of these most fundamental and minimalist standards.

Both the Classroom Literacy Observation Schedule and Quality Improvement and Accreditation System score variables are quite complex with a number of indicators within domains comprising the overall scores. These indicators also relate to a range of factors and levels of skill or knowledge required of the assistant teacher and mobile preschool teacher. For example the Classroom Literacy Observation Schedule includes indicators such as building rapport with children; understanding the individual child's learning needs, and being responsive with differentiated explicit instructional strategies to meet those needs. The Quality Improvement

and Accreditation System score includes very diverse indicators across health and safety requirements, family and child interactions to well supported staff management processes.

The importance of the four variables included in the program quality index are all supported by the literature and focus on processes which are more predictive of child outcomes than the structural measures such as staff child ratios and group size⁴⁵. However, the complexity of the Classroom Literacy Observation Schedule and Quality Improvement and Accreditation System score measuring very disparate factors, combined with the staff qualifications and experience ratings may have rendered the index with no internal validity. A commonly used instrument for early childhood environmental ratings in the research literature is the Early Childhood Environmental Rating Scale (1980) and Early Childhood Environmental Rating Scale-Revised (1998)⁴⁶. It is similar to the Quality Improvement and Accreditation System score as a global measure of quality comprised of seven subscales also. It was used in the Effective Provision of Preschool Education⁴⁷. The Early Childhood Environmental Rating Scale-Revised is reported to have had a similar “wash out” of effects compared with effects demonstrated by individual factors and sub-scales⁴⁸.

A number of subscale scores across the mobile preschool sites suggest that there are particular elements of high quality curriculum, pedagogy and child assessment that require further scaffolding and professional learning such as the explicit knowledge and appropriate pedagogy for pre-literacy skills. This is elaborated on in the next Section and Section 5.2.2.

5.1.4 Importance of the assistant teacher

The assumed importance of the assistant teacher in the program logic was supported by the strong positive association between higher assistant teacher ratings on qualifications and experience, and lower proportion of developmental vulnerability. Further, assistant teacher ratings significantly predicted three individual developmental domain scores, Physical health and well-being; Social competence, and Communication and general knowledge. The Classroom Literacy Observation Schedule was measured by direct observation of the assistant teachers and the best results were in the ‘respect’ domain followed by the ‘orchestration’ domain which incorporates the transitioning children between activities and routines for typical literacy focussed activities such as turn taking, questioning and active listening. Further exploration of the specific sub-scales in the Classroom Literacy Observation Schedule may be instructive of the specific skills and knowledge required by Assistant teachers. These findings suggest that mobile preschool program improvement to achieve better child outcomes would be amenable with a focus on the specific professional learning for Assistant teachers. Overall, the positive and strong associations found indicate the Assistant teachers’ key role in achieving program quality outcomes.

5.1.5 Unexpected relationships

The negative relationships between higher proportions of developmental vulnerability and the mobile preschool teacher ratings and mobile preschool teacher visit rates were contrary to the expected relationships and assumptions in the program logic. Perhaps teacher qualifications and experience did not have a direct association with child outcomes in the way the program logic assumed, or these indicators of teacher quality, were poorly calibrated. The specific skills and knowledge of the teachers were not measured directly and this is a flaw in the study design which future studies would need to accommodate.

Similarly, the direct observation and measure of what interactions occur during a teacher visit to support the assistant teacher on site were not built in to the data collection. It is therefore difficult to thoroughly understand the negative relationship between the number of site visits and children's outcomes. One explanation may be that the mobile preschool teachers identify the more challenging communities and work more intensely in those communities. Further investigation is required as to the function of site visits by teachers and how these might have a more positive effect on the child level outcomes.

5.2 Program design assumptions and fidelity

5.2.1 Program Fidelity

There were two purposes to conducting such detailed descriptions and analyses of the program quality. Firstly to understand what children were actually experiencing as mobile preschool program and how varied that was between sites and group schools. Secondly, we wanted to confirm how well these characteristics were represented in the program logic developed by study staff from Department of Education documents, preschool staff and managers.

The observational, quantitative data on program qualities are consistent with qualitative data collected from a range of staff and managers involved in the delivery of the Mobile Preschool Program. The data suggest strongly that explicit and consistent expectations of curricula, pedagogies and assessment practices were not present across the group school hubs. This impacted the ability of teachers to be clear and consistent in their training of assistant teachers. In turn, assistant teachers were then under resourced to access the level of programming and responsiveness to literacy sessions (and possibly other more general activities), contribute to assessment or engage parents in discussions about the importance of preschool and the outcomes for children.

5.2.2 Design and Implementation issues

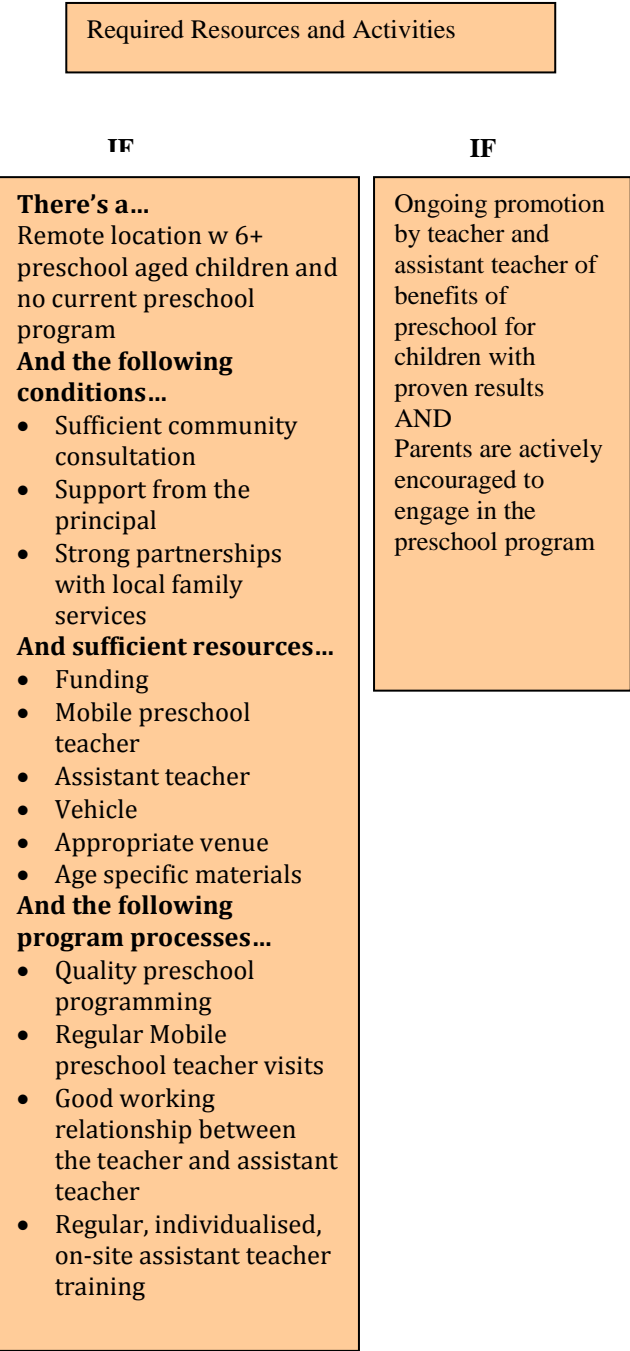
A number of assumptions in the program logic for how the Mobile Preschool Program was expected to work have been challenged. What remains unclear is how program implementation

and variations from the program logic may have impacted effectiveness, individually or cumulatively.

Systemic policy and procedures

Qualitative data from mobile preschool teachers’ interviews highlight the importance of developing a strong policy framework, continuous quality monitoring of program logic and accompanying implementation guidelines as a mechanism for avoiding barriers to program success. Many of the challenges experienced by mobile preschool teachers stemmed from the

Figure 13 Fundamental conditions identified in the program logic



lack of upfront clarification about program parameters, goals and timeframes. Figure 5.13 highlights the program logic elements identifying fundamental conditions considered important in implementing mobile preschools as described in departmental documentation and interviews with program managers. The qualitative data analyses suggested that there is not a strong understanding of the importance of preschool programs, particularly in contexts of greater socio-economic disadvantage across different levels of management in the Department of Education. The limited understandings evident included what constituted appropriate curriculum and pedagogy; minimum operational parameters for age appropriate safe and stimulating environments, and the level of resourcing for effective professional learning.

Unlike the stronger emphasis on community ownership and engagement in the pilot phase of the Mobile Preschool Program, the

Closing-the-Gap Mobile Preschools (since 2008) had a far greater emphasis on system and school imperatives to meet enrolment and attendance accountabilities.

Parent and care-giver participation

The NT Department of Education's Mobile Preschool Program Project Brief (2008) identifies parents as stakeholders who may impact upon the preschool program by "Actively participat[ing] and encourage[ing] children to attend", or be impacted by the preschool program in "Increased knowledge of education for children and improve own literacy/numeracy skills". Qualitative interviews with parents and primary carers did not indicate regular or active participation in the preschool programs.

Current Australian and Northern Territory government initiatives and policies reflect a broad range of needs and circumstances distinctive to Indigenous Australians who experience extreme disadvantage and significantly poorer health, educational and social outcomes than the general Australian population as articulated most recently in the Council of Australian Governments Closing-the-Gap reform agenda. The national policy environment for the mobile preschool pilots was strongly influenced by a long standing recognition of the value of early childhood education and care, parenting, and emerging evidence base in the Australian context such as the Key Indicators for Overcoming Indigenous Disadvantage (2003)⁴⁹. Hence, the Ministerial Council for Employment, Education, Training and Youth Affairs in 2006 placed an emphasis on system accountability to report on actions that "provided opportunities for Indigenous parents and caregivers to develop skills to support their children's literacy acquisition and enhance their capacity to become active participants in their children's education"⁵⁰.

The thematic analysis of qualitative data from the parent and carer interviews covered a range of discussion points to achieve insight into parents' and carers' attitudes or behaviours that may have influenced attendance of children and themselves at mobile preschool. Data on parents' participation do not adequately describe the nature of interactions with preschool staff or perceptions of benefit to parents and carers by their participation. Such data would better inform the effectiveness of parent participation and any necessary modifications to this design aspect of the Mobile Preschool Program or ways in which these could be improved.

Building the teacher and assistant teacher workforce capacity

The findings indicated low levels of formal and relevant education or children's services qualifications among the assistant teachers in the mobile preschool study sites. Two factors may have contributed to this finding. Firstly, the qualitative interviews and quantitative data on enrolments and status of qualifications indicate that this aspect of the program model was not a priority. Secondly for some mobile preschool sites in early stages of implementation, it may not

have been feasible to have commenced staff on formal study. The quantitative data certainly points to the pivotal role of the assistant teachers in delivering quality programs on a routine basis, as discussed previously and this is an aspect of the program seems to be highly amenable to improvements which would then potentially improves student outcomes.

Adult literacy is a fundamental area of concern to workforce development in remote and Indigenous contexts and requires urgent redress. This should not preclude providing access to the very necessary instructional knowledge required. In qualitative interviews it was suggested that content for basic literacy instruction has not been developed in assistant teachers through any of the assumed means, visiting teachers or groups school professional learning opportunities. A possible barrier to assistant teachers acquiring the depth of knowledge for intentional teaching, particularly for literacy and numeracy may be their own literacy levels. There were some indications in the data that teacher qualifications and teaching experience would be enhanced by specific and targeted professional learning if they are to more effectively deliver the necessary learning to assistant teachers.

Skills required for orchestration of effective lessons as measure by the Classroom Literacy Observation Schedule were demonstrated by assistant teachers perhaps because these skills can be modelled and taught across a range of teaching opportunities not just literacy sessions. It stands to reasons that if the basic literacy knowledge content such as teaching the concepts of alphabet, words and sentences, has not been developed, then more complex teaching strategies for supporting or scaffolding acquisition of these literacy skills and differentiating instruction to learner needs would not be evident. Strategies to support and differentiate instruction can be modelled and coached by mobile preschool teachers for assistant teachers to some effect. However, the effective application of these skills and responsiveness to student needs is understood to require some understanding of the theoretical underpinnings of appropriate literacy knowledge at the text, sentence and word levels.

Teacher qualitative data identified the lack of a tailored and accredited professional development programs or approaches for assistant teachers as a key program challenge. Teachers reported the following impediments to building the capacity of local assistant teachers: confusion about the specific skills and attributes required of assistant teachers; an inability to extend experienced staff through on-the-job modelling alone; some doubt about their own skills in adult education, and frustration with delays developing a system for formally accrediting assistant teachers. The results evident in the qualitative and quantitative data were varying workforce development arrangements across regions and a lack of formal qualifications being undertaken.

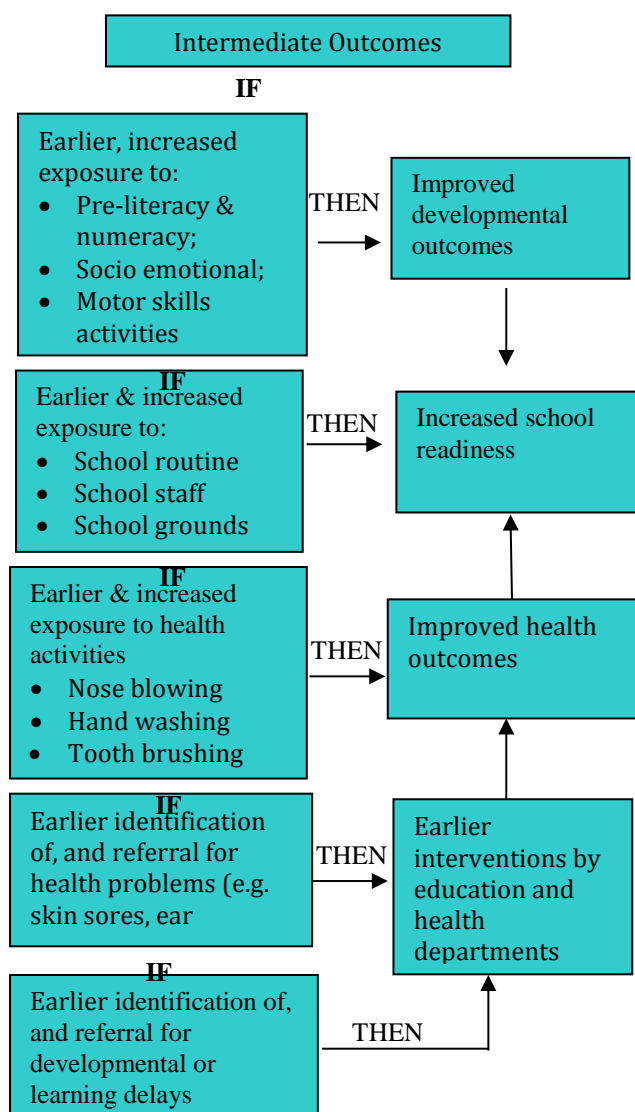
Curriculum and pedagogy and assessment routines

The period of this study also overlapped with national reform to early year's curriculum and pedagogy, and therefore there was some uncertainty around mandated documents and requirements. Many group schools had moved to provide continuity through adopting commercial or "off the shelf" early learning programs. Clear and comprehensive knowledge about the methods used were not explicitly demonstrated. The application of learning and teaching activities, including adaptations to new resources or the range of student needs, was contingent on this underpinning knowledge. The pressing issue of assessment literacy appears to be a general issue in early childhood generally. Data analyses beyond the scope of this study such as systematic patterns of items in the Australian Early Development Index not completed by teachers may assist in identifying the areas of greatest need for professional learning in addition to better understanding of how current and potential assessment tools are applied.

The Early Years Learning Framework and the National Quality Framework now offer an overarching set of expectations for high quality and appropriate curriculum, pedagogy and child assessment. The need for ongoing professional learning and progress toward formal qualifications requires a targeted and relentless system of support as indicated by the length of time with sporadic support some assistant teachers had been enrolled. Since completion of data collection for this study a number of initiatives have been undertaken by the Department of Education which have proven successful in increasing formal qualification completions⁵¹.

Figure 14 is an extract of the program logic elements that best describe the assumed or intended content of the mobile preschool program. Teachers' responses to questions about their programming approaches, preferred curriculum and pedagogical approaches demonstrated a wide range of approaches and standards. While the opportunity to adapt program components in response to site-specific needs is a characteristic of a quality preschool program⁵², adaption needs to take place within a universal, system-level framework or else the program is at risk of reinventing itself and veering away from its original intent.

Figure 14 Program logic extract describing the intended program content for mobile preschool



5.2.3 Quality assurance and improvement, monitoring and management

The critical relationship between centralised policy and operational success (as well as program quality more generally) is well supported in the literature⁵³. Some benefits associated with good quality program frameworks include increased ability by teachers to monitor and regulate implementation processes, evaluate their own practice, and provide feedback to staff they manage as well as senior management⁵⁴. Additional benefits in the very remote context may also be to better support more mobile students. Strategies such as a formal process for continual quality improvement in curriculum and pedagogy approaches may be instructive and supportive of program quality improvement at the local and systemic levels ^{48,49}.

The data systems including mechanisms for monitoring and tracking quality improvement may also require review. Implementation science⁵⁵ indicates that such systemic practices may take

two to four years to embed when well supported by explicit expectations for the minimum data collection and reporting.

Box 2 Summary of mobile preschool teachers' perceptions of support and challenge for program success from qualitative interviews Teachers suggested that the Mobile Preschool Program would be strengthened by ensuring that the following conditions were in place:

- a clear, well-developed policy and supporting documents to guide implementation of the program, providing targets and timeframes against which staff can monitor their progress
- genuine support for the program at all levels of school leadership, particularly by the school principal
- adequate resources and timeframes were given to facilitate a holistic community engagement (care givers, the school, early education and child health services, community leaders) process prior to the preschool being established
- strategies for engaging care givers in the preschool program, providing feedback about children's development and sharing strategies for improving developmental outcomes
- a dedicated preschool space and where this was not possible, a timeframe for transitioning to a dedicated space should be made available
- regular teacher visits to each preschool site, with clear guidelines outlining the minimum and maximum number of visits required
- paired staffing structure, whereby two assistant teachers were employed in each location so as to provide peer support, address duty-of-care issues and help address staff absenteeism
- recruitment processes to include the key skills and attributes of an assistant teacher and involve a range of community stakeholders to help identify suitable staff
- clear, well-resourced workforce development strategy, which is responsive to assistant teachers' diverse skill levels (including entry English literacy and numeracy) and qualifications, and provides supported options for achieving formal qualifications
- adult education training was included in teachers' professional development plans, in order to increase their capacity to deliver effective on-the-job training with remuneration to acknowledge training duties conducted by the teachers.

5.3 Methodological issues

A number of methodological challenges for this study serve as lessons in designing and conducting other rigorous research in the very remote and Indigenous early childhood context. These include the difficulty of determining population denominators in small communities, low returns for assessments, and selecting the right measures for the intended purpose.

5.3.1 Determining Sample Denominator

In order to understand the sample size in the Mobile Preschool Study we sought to establish a population denominator for the Northern Territory very remote communities. The difficulties in doing this were highlighted in Section 3. Of the 28 communities with eligible children consented to the study, two communities had no population data in any of the three sources (Northern Territory Treasury, 2009; Immunisation Register, 2009; Australian Bureau of Statistics, 2006). The Immunisation register provided estimates for 14 communities whilst Northern Territory Treasury³⁰ provided estimates for 9 communities. Furthermore, the denominator data from each source differed by as much 2 children to 14 children. Establishing a reliable denominator of population is a major challenge for researchers, public policy and program administrators in the Northern Territory^{15,40}. The Australian population census has long acknowledged the error rate due to mobility and the transient nature of the Northern Territory population¹⁶. This has been reiterated in educational participation studies⁵⁶.

The implications of these inconsistencies and gaps in denominator population figures impact on the transference or application of this study's findings. For example, program modifications about influential socio-demographic characteristics may not be appropriate should the prevalence or relative importance of such characteristics be over-generalised to the wider population group.

5.3.2 Completion of children's outcome data

One of the first concerning results in this study was the low return rate in 2009 (16 of 98 children in the 2009 cohort) for the Department of Education's assessment tool, the Assessment of Student Competencies. The explanation provided at the time for such low participation was that teachers had to prioritise their effort and the system requirement to conduct the national census, the Australian Early Development Index over the Assessment of Student Competencies. This highlighted the limited understanding of different assessment tools for different purposes among the early childhood staff in schools and at program and school management levels through the department.

The Australian Early Development Index return rate of 64 percent for children recruited to this study during 2009 and 2010 compares poorly with the overall Northern Territory returns of 93.5 percent of estimated five year old children and 97.5 percent of Australia's five year olds. Ten of the 124 children with Australian Early Development Index information returned only had demographics filled in but no assessment against the developmental indicators. No systematic explanation for this result was found. Two of the group school hubs returned less than 50% of the study participants' Australian Early Development Index results.

5.3.3 Measuring school readiness with the Australian Early Development Index

The theoretical basis of the preferred approach to school readiness applied in this study is the Human Ecological Development Theory⁵⁷. This life course view of the influences from a range of factors within the child, family, community and service environments is complex. The Australian Early Development Index is potentially a very detailed outcome measurement tool for school readiness. The binary outcome measure of 'developmentally vulnerable on two or more domains' used in the primary analysis is a global and general application of the rich data available in the index. This variable was chosen because of the utility in the wider community and public reporting of community and school level results for the Australian Early Development Index. It is salient to remember that 43 percent of the study sample ($n=105$) were developmentally vulnerable on two or more domains, that is they scored in the bottom 10 percent of the population.

It may be argued that the indicators in the Australian Early Development Index do not accurately reflect the intended outcomes of the Mobile Preschool Program. As a global assessment of the environments, resources and experiences provided to children prior to school, the Australian Early Development Index does match the program logic developed retrospectively for the Mobile Preschool Program. The difficulty arises with the reality of program implementation and fidelity as discussed previously.

The five developmental domain variables from the Australian Early Development Index data provided more detailed and specific analyses of whether the predictors had positive associations with particular domains. Only the Social competence and Physical health and well-being domains were consistently associated with all three predictors (preschool availability, attendance and program quality). Preschool availability and attendance were also associated with Communication and general knowledge. Only the preschool availability predictor was associated also with Language and cognition, and Emotional maturity domain scores. This is consistent with larger studies in other contexts for children in disadvantaged communities, such as the Effective Provision of Preschool Education⁵⁸ and Study of Early Child Care and Youth Development⁵⁹ where the benefits of preschool were derived from the higher quality processes (curriculum and pedagogy). Further analyses of the Mobile preschool study data may address hypotheses generated about the relationships between alternative curriculum and pedagogy approaches that directly impact the specific developmental domains.

The top line recommendations drawn from this discussion and the interpretation of findings are presented in Section 6.

6. Conclusion and Recommendations

The Mobile Preschool Evaluation has produced the first systematic data of their kind regarding this population and efficacy of preschool programs in these contexts where there are currently very few early childhood services. The most significant finding being that when controlling for mothers smoking during pregnancy, children attending 80 days or more preschool were 4.9 times more likely to be not vulnerable than children attending less than 80 days, $OR = 4.9$ (95% CI: 1.72 - 13.95).

This rigorous cohort comparison study of the Mobile Preschool Program as an alternative preschool service delivery model and its effectiveness in achieving improved developmental and educational outcomes for very remote Indigenous children in the Northern Territory offers other important findings that are instructive on potential program quality improvements. The findings support the important role of the mobile preschool assistant teachers with a positive association between the ratings for assistant teachers and reduced developmental vulnerability.

Based on the findings presented in Section 4 and as discussed in Section 5 we reject in part the null hypothesis that *Mobile Preschool Program participation improves the health, developmental and learning outcomes of children in the short and medium term*. A conservative analysis of the medium term effect might be to examine the national benchmark testing at Year three for the study participants.

The quantitative data complemented by qualitative information on the implementation processes and parent perceptions accurately described the program as experienced by children and families. The high levels of evidence regarding socio-demographic and health characteristics require further analyses for a number of important hypotheses generated from the findings.

Recommendations are made from the study findings in four key areas for action, research and development to potentially improve the effectiveness of the mobile preschool program to maximise gains in child health, development and learning outcomes. These are presented in association with the three main predictors used and the socio-demographic characteristics associated with outcomes.

6.1 Availability of mobile preschool

Analyses including the control group were treated with caution because of the small numbers with a valid Australian Early Development Index ($n=16$). There was no evidence to suggest that the children with limited (1 to 191 days) preschool available benefited compared to the control. The odds of children with a full school year (192 or more days) of mobile preschool available not being developmentally vulnerable on two or more domains was 6.5 times the likelihood of

children with less than 192 days preschool available being vulnerable, *OR* 6.5 (95%CI: 2.76-15.58).

Recommendation 1

Provide a full school year preschool program. The program design may require a new strategy of demographic monitoring to allow for resource allocation and pre-planning for preschools to commence service at the beginning of the school year. The 'mobile' aspect of the program design could reflect the education system being more responsive to demographic changes such as mobility or birth cohorts of preschool aged children.

6.2 Attendance mobile preschool

Children attending 80 days or more of mobile preschool in the school year (or just 66%) were 3.6 times more likely to not be developmentally vulnerable on two or more domains than children who attended less than 80 days, *OR* 3.6 (95%CI:1.47 – 8.73).

Recommendation 2

We would recommend that clear and coherent messages for parents, staff and key stakeholders in community to consider targets of increasing attendance of preschoolers to more than 66 percent may lead to better outcomes. This recommendation does not diminish the enormity of the task in light of many previous attendance campaigns. There are potentially social, health or well-being issues that will have to be addressed to achieve this target. Qualitative data from parent interviews may be instructive in the expectations and needs of parents to better engage with and support children's participation in preschool.

6.3 Mobile preschool quality

We can conclude that program quality measures of assistant teacher ratings and Classroom Literacy Observation Schedule had positive associations with children's outcomes. Further detailed analysis of the sub-scales in the quality measures of Classroom Literacy Observation Schedule and the Quality Improvement and Accreditation System checklist could be instructive on more precisely identifying training and education needs of assistant teachers and mobile preschool teachers. Such analysis would also quantify the need for clear system level expectations, standards and professional learning to support appropriate early childhood curriculum and pedagogy were identified in the qualitative data.

Recommendation 3

We recommend a systematic program of professional learning and support in curriculum, pedagogy and assessment practices to all mobile preschool staff, including the achievement of

formal qualifications as supported by the current level of analysis. This recommendation could be well informed by further analysis of the available data.

The Quality Improvement and Accreditation System principles and indicators of quality were compared with the indicators in the new National Quality Framework which was made effective in 2011 after data collection for this study was complete. Whilst the Quality Improvement and Accreditation System principles utilised in this study have now been superseded by the new National Quality Framework under the auspice of the Australian Children's Education and Care Quality Authority as the new peak national body, there is considerable overlap between the principles in both documents which will support the application of these recommendations at least for initial reflection and forward planning. Quality areas in the new framework are listed in Table 16 and aligned with the Quality Improvement and Accreditation System principles used in this study with comments on variation.

Table 16 Comparison of new national quality framework components and the previous quality improvement and accreditation principles as used in this study

New National Quality Framework Quality areas:	NCAC Quality Improvement and Accreditation System Principles:	Comments:
<ul style="list-style-type: none"> • Educational program and practice 	<ul style="list-style-type: none"> • Programming and evaluation • Children's experiences and learning 	New standards made more explicit through use of Early Years Learning Framework
<ul style="list-style-type: none"> • Children's health and safety • Physical environment 	<ul style="list-style-type: none"> • Protective care and safety • Health, nutrition and wellbeing 	Standards more explicit and revised – now inclusive of more settings
<ul style="list-style-type: none"> • Staffing arrangements 		
<ul style="list-style-type: none"> • Relationships with children 	<ul style="list-style-type: none"> • Staff relationships with children and peers 	Also more explicitly supported by EYLF
<ul style="list-style-type: none"> • Collaborative partnerships with families and communities 	<ul style="list-style-type: none"> • Partnerships with families 	Parallel
<ul style="list-style-type: none"> • Leadership and service management. 	<ul style="list-style-type: none"> • Managing to support quality 	Parallel

Socio-demographic characteristics and the associations with outcomes

The significant association of mothers smoking in pregnancy with the prediction of developmental vulnerability is a very important finding on the basis of the strong evidence in the literature for the potential impact on cognitive and behavioural outcomes for children.

Further analyses are required to explore the relationship of mothers smoking during pregnancy to the specific developmental domains in the Australian Early Development Index but also other data collected. A number of hypotheses might be generated based on the trends and associations for other socio-demographic with the child outcome variables but are not included in this report. Whilst a number of the child, family and community level factors such as low birth weight, remoteness and access to spoken English showed statistically significant associations with the outcome variable they did not contribute to the predictability of the outcome after controlling for attendance. None-the-less, highly effective and proven early years' programs with full and comprehensive services to support families in the early years could be examined for appropriateness for improving health behaviours, health status and demographic factors. Some examples of these include low birth weight, smoking in pregnancy, anaemia, immunisation and exposure to oral English.

Recommendation 4

Support program effectiveness by adopting a continuous quality improvement approach with the support of improved data systems including those that provide critical information on the health and developmental characteristics of the children and families served. Data systems and feedback loops are particularly relevant for identifying relative or comparative effects of program delivery across the range of contexts in the NT. This mobile preschool evaluation study provides a solid baseline for future research and development work.

Implications for other EY programs and policy development

There is limited understanding about the relative effectiveness of other forms of early years programs in the very remote and remote contexts. Many of the findings around program design and fidelity may be applicable to the context of larger remote Northern Territory communities and the early childhood programs operating.

The significant associations observed in this study between reduced developmental vulnerability on two or more domains of the Australian Early Development Index and i) program availability for 192 days and over in the year before Transition; ii) attendance for more than 80 days; ii) higher assistant teacher qualifications and experience ratings, and iv) better classroom literacy instruction have policy and program implications which may be relevant for other types of preschool programs in the Northern Territory.

The significant association between mothers smoking during pregnancy and school readiness outcomes found in this study, as well as other associations, generate a number of questions for further investigation about program design. More rigorous studies of the causal relationships and appropriate interventions to ameliorate the potential impact on children's outcomes in the very remote context are needed before policy and program design might be improved in the period before children arrive at preschool.

APPENDIX A

List of all Mobile Preschool Program Sites (NT) as at December 2009

MPP Site	School group	Commence- ment date	Length of Operation (as at 12/09)	Funding Source	Km from regional centre (km)
Baniyala/Yilpara	Yirrkala HL	07/2002	89 months	Core	206
Birany Birany	Yirrkala HL	07/2002	89 months	Core	*190
Dhalinbuy	Yirrkala HL	07/2002	89 months	Core	98
Gan Gan	Yirrkala HL	07/2002	89 months	Core	224
Ganyangara	Yirrkala HL	07/2002	89 months	Core	13
Epenarra	Barkly	10/06/2008	18 months	CTG	210
Murray Downs	Barkly	28/05/2008	19 months	CTG	207
Neutral Junction	Barkly	na	na	na	220
Newcastle Waters	Barkly	5/10/2008	14 months	Core	290
Bulla Camp	Katherine Core	07/2002	89 months	Core	340
Mataranka	Katherine Core	07/2002	89 months	Core	110
Pigeon Hole	Katherine Core	06/2003	78 months	Core	300
Timber Creek	Katherine Core	07/2002	89 months	Core	265
Urapunga	Katherine Core	07/2002	89 months	Core	250
Barunga	Katherine CTG	16/02/2009	10 months	CTG	80
Bulman #	Katherine CTG	16/02/2009	10 months	CTG	312
Pine Creek/Kybrook	Katherine CTG	27/01/2009	11 months	CTG	90
Yarralin #	Katherine CTG	27/01/2009	11 months	CTG	380
Areyonga	Lasseter	10/06/2008	18 months	CTG	240
Docker River	Lasseter	26/08/2008	16 months	CTG	670
Finke	Lasseter	27/10/2008	14 months	CTG	434
Titjikala	Lasseter	17/09/2008	15 months	CTG	130
Wallace Rockhole	Lasseter	29/04/2008	20 months	CTG	120
Alcoota or Engawala	Sandover	1/02/2004	70 months	Core	208
Bonya	Sandover	1/07/2006	41 months	Core	208
Harts Range or Atitjere	Sandover	1/02/2004	70 months	Core	215
Mulga Bore (08 only)	Sandover	1/02/2004	70 months	Core	300
Soapy Bore (09 only)	Sandover	1/05/2004	70 months	Core	300
Haasts Bluff	Tanami	4/11/2008	13 months	CTG	250

MPP Site	School group	Commence-	Length of	Funding	Km from
----------	--------------	-----------	-----------	---------	---------

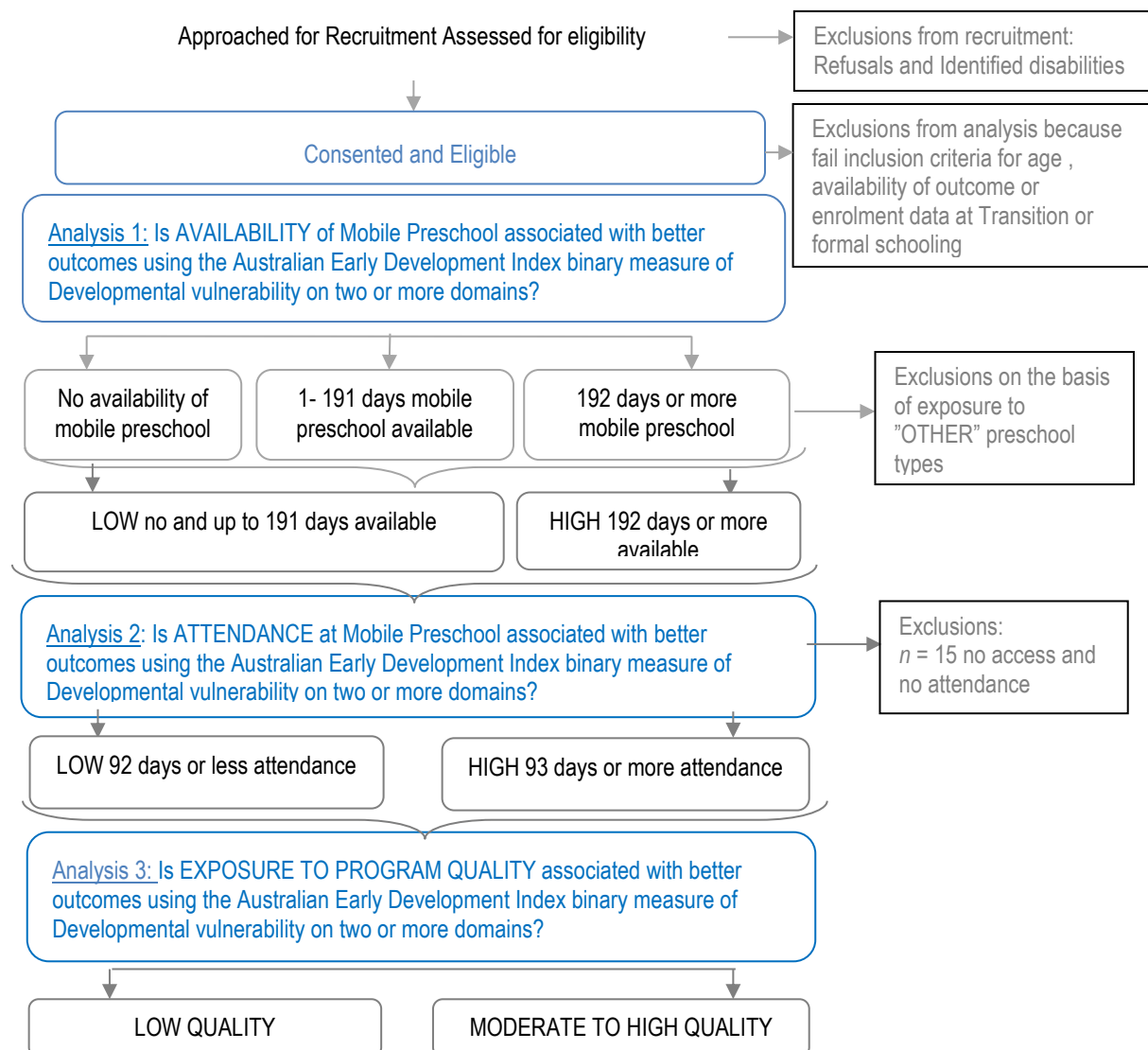
		ment date	Operation (as at 12/09)	Source	regional centre (km)
Nyirripi	Tanami	na	na	CTG	440
Watiyawanu	Tanami	10/11/2008	13 months	CTG	325
Willowra	Tanami	28/04/2008	20 months	CTG	300
Acacia Larrakia	Top End	na	na	CTG	90
Belyuen	Top End	27/01/2009	11 months	CTG	128
Emu Point	Top End	23/10/2008	14 months	CTG	360
Mamaruni	Top End	27/01/2009	11 months	CTG	Island 230
Peppimenarti	Top End	na	na	CTG	320

Na = not available

**Estimated distance*

Previous sites for Mobile Preschool under the 2002-5 Pilots and then in initial Core funded hubs (Northern Territory Government, 2004)

APPENDIX B Analysis Plan



APPENDIX C Stepwise regression output

The following Stata output is for the forward stepwise logistic regression including those variables that were found to have strong associations $p < .05$ with children developmentally vulnerable on two or more domains. These factors included mother smoked during pregnancy, English was not the main language spoken at home and children had a low birth weight (<2500g).

```
use "C:\Users\Georgie\Documents\PhD master\Mobile Preschool Study(33)\12.0 DATABASE  
MANAGEMENT AND ANALYSIS\12.12 STATAfiles\MOBILEPRE_STATA\MPP_final_120803 -  
PhDedit.dta", clear
```

```
. sw logistic NewDVuln2 AEDIonly_DOSAGE Notsmoke_preg ENGMAINATHOME_split HI_LO_BW,  
pe(.05) pr(.1) forward
```

```
begin with empty model  
p = 0.0109 < 0.0500 adding AEDIonly_DOSAGE  
p = 0.0070 < 0.0500 adding Notsmoke_preg
```

```
Logistic regression                Number of obs   =           83  
                                LR chi2(2)        =          15.03  
                                Prob > chi2        =          0.0005  
Log likelihood = -49.72027          Pseudo R2       =          0.1313
```

```
-----+-----  
NewDVuln2 | Odds Ratio   Std. Err.    z    P>|z|    [95% Conf. Interval]  
-----+-----  
AEDIonly_DOSAGE | 4.896976    2.614938    2.97  0.003    1.71947    13.94638  
Notsmoke_preg | 4.944914    2.931398    2.70  0.007    1.547238   15.80375  
_cons | .182654    .1116939   -2.78  0.005    .0550954   .6055409  
-----+-----
```


Endnotes

- 1 Wild, R. & Anderson, P. (2007). Ampe Akelyernemane Meke Mekarle “Little Children are Sacred” Report of the Northern Territory Board of Inquiry into the Protection of Aboriginal Children from Sexual Abuse. Darwin: Northern Territory Government.
- 2 Carson, B., Dunbar, T., Chenhall, R and Baillie, R. (2007). Social determinants of Indigenous health. Sydney: Allen and Unwin.
- 3 Devitt, J., Hall, G., & Tsey, K. (2001). An introduction to the social determinants of health in relation to the Northern Territory Indigenous population Casuarina: Cooperative Research Centre for Aboriginal and Tropical Health.
- 4 Johnston, V., Lea, T., & Carapetis, J. (2009). Joining the dots: The links between education and health and implications for Indigenous children. *Journal of Paediatrics & Child Health*, 45, 692-697.
- 5 Low, M. D., Low, B. J., Baumler, E. R., & Huynh, P. T. (2005). Can education policy be health policy? Implications of research on the social determinants of health. *Journal of Health Politics Policy and Law*, 30(6), 1131-1162.
- 6 McCain, M. N. & Mustard, J F. (2002). The Early Years Study Three Years Later. From Early Child Development to Human Development: Enabling Communities. Toronto: The Founders' Institution.
- 7 McCain, M., Mustard, FJ and Shanker, S. (2007). Early Years Study 2: Putting Science into Action. Toronto: Council for Early Child Development.
- 8 Mustard, J. F. (2006). Experience-based brain development: Scientific underpinnings of the importance of early child development in a global world. *Paediatric Child Health*, 11(9), 571-572.
- 9 Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century (Vol. 15, pp. 259-267).
- 10 Pulver, L. J., & Harris, E. (2007). Australia and New Zealand. In C. Nettleton, D. A. Napolitano & C. Stephens (Eds.), An overview of current knowledge of the social determinants of Indigenous health. London: London School of Hygiene and Tropical Medicine.
- 11 Shonkoff, J. P. (2004). Science, Policy, and the Young Developing Child: Closing the Gap Between What We Know and What We Do. [Electronic version] Ounce of Prevention Fund.
- 12 Shonkoff, J. P. (2005). The Science of Early Childhood Development: Closing the Gap Between What We Know and What We Do. Washington, D.C.: National Academy Press.
- 13 Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). From Neurons to Neighbourhoods: The Science of Early Childhood Development. Committee on Integrating the Science of Early Childhood Development, National Research Council and Institute of Medicine. Washington, D.C.: National Academy Press.
- 14 Shore, R. (1997). Rethinking the brain: new insights into early development. New York: Families and Work Institute.
- 15 Epstein, J.L. and Sheldon, S.B. (2006). Moving Forward: Ideas for Research on School, Family, and Community Partnerships. In C. F. a. S. Conrad, R. (Ed.), *SAGE Handbook for research in education: Engaging ideas and enriching inquiry* (Vol. Chapter 7, pp. 117-138).

-
- 16 Hattie, J. (2003). *Teachers make a difference: What is the research evidence? Keynote address*. Paper presented at the ACER Research Conference.
- 17 National Institute of Child Health and Human Development. (2002). Early child care and children's development prior to school entry. Results of the NICHD study of early child care. *American Education Research Journal*, 39(1), 133-164.
- 18 Schweinhart, LJ (2006) The High/Scope Perry preschool study through age 40: summary, conclusions and frequently asked questions. Ypsilanti: High/Scope Educational Research Foundation.
- 19 Rimm-Kauffman, S, LaParo, K, Downer, J, and Pianta, R (2005) The contribution of classroom setting and quality of instruction to children's behaviour in Kindergarten classrooms. *Elementary School Journal*, 105(4), 377-395.
- 20 Barnett, WS, Lamy, C, and Jung, K (2005) The Effects of State Prekindergarten Programs on Young Children's School Readiness in Five States. The National Institute for Early Education Research, Rutgers University: New Jersey.
- 21 McTurk, N., Nutton, G., Lea, T., Robinson, G., Carapetis, J. (2008). The School Readiness of Australian Indigenous Children: A Review of the Literature. Darwin: Menzies School of Health Research and School for Social and Policy Research, Charles Darwin University.
- 22 DEST (2006) National Report to Parliament on Indigenous Education and Training, Department of Education, Science and Training, Canberra.
- 23 Department of Education and Training (DET), Strong Beginnings. An explicit guide to quality practice in the early-years. (2006) Northern Territory Government.
http://www.det.nt.gov.au/teachers-educators/curriculum-ntbos/support-materials/strong-beginnings?SQ_DESIGN_NAME=printer_friendly Accessed November 2010.
- 24 Birckmayer, J. H. W., C. (2000). Theory-Based Evaluation in Practice : What Do We Learn? *Evaluation Review*, 24, 407.
- 25 Rogers, P. (2007). Theory-Based Evaluation: Reflections Ten Years On. *New Directions for Evaluation*, 114(Summer).
- 26 Johnstone, K. (2009). Indigenous birth rates - how reliable are they? *People and Place*, 17(4), 29-39.
- 27; Taylor, J. (2004a). Transformations of the Indigenous Population: Recent and future trends. Canberra: Centre for Aboriginal Economic and Policy Research.
- 28 Taylor, A. & Carson., D. (2009). Indigenous mobility and the Northern Territory Emergency Response. *People and Place*, 17(1), 29-38.
- 29 Australian Bureau of Statistics. (2007). 2006 Census Community Profile Series. Indigenous Profile. Northern Territory. Catalogue No. 2002.0. Canberra: Australian Bureau of Statistics.
- 30 Northern Territory Treasury. (2009). Northern Territory Population Projections. Northern Territory 2006-36 Northern Territory Statistical Reporting Regions 2006, 2011, 2016, 2021. Darwin: NT Government.
- 31 Brinkman, S.A., Silburn, S.R., Lawrence, D., Goldfeld, S., Sayers, M., & Oberklaid, F. (2007). Construct and concurrent validity of the Australian Early Development Index. *Early Education and Development*, Vol. 18, No. 3: pages 427-451.

-
- 32 Silburn S, Brinkman S, Ferguson-Hill S, Styles I, Walker R, and Shepherd C. 2009 *The Australian Early Development Index (AEDI) Indigenous Adaptation Study*. Perth: Curtin University of Technology and Telethon Institute for Child Health Research.
- 33 Australian Early Development Index (2009) 2009-2011 National Implementation Data Protocol, *September 2009*, Australian Government.
- 34 Silburn, S., McKenzie, J., & Moss, B. (2010). Northern Territory results for the Australian Early Development Index 2009. Darwin: Menzies School of Health Research and Northern Territory Department of Education and Training.
- 35 Goodman R (1997) The Strengths and Difficulties Questionnaire: A Research Note. *Journal of Child Psychology and Psychiatry*, 38, 581-586.
- 36 Loudon, W., Wildy, H., Rohl, M., Barratt-Pugh, C., Brown, C., Cairney, T., Elderfield, J., House, H., Meiers, M., Rivalland, J. and Rowe, K. (2005). In Teachers' Hands: Effective Literacy Teaching Practices in the Early Years of Schooling. A Special Edition of the Australian Journal of Language and Literacy, 28(3), 169-253.
- 37 National Childcare Accreditation Council Incorporated. (2006). Quality improvement and accreditation system handbook. Surrey Hills: Australian Government.
- 38 Taylor-Powell, Ellen and Renner Marcus. (2003). *Analysing Qualitative Data. Program Development and Evaluation*. University of Wisconsin-Extension Cooperative, Wisconsin.
- 39 Hayes, H (2008) personal email communication regarding choice of principals in Arnhem Region not to be involved in Mobile Preschool Study
- 40 Elliott, Fasoli, & Nutton. (2009). *Northern Territory Early Childhood Audit*.
- 41 O'Grady, K. (2009). Immunisation Coverage in Australian Indigenous Children: Time to move the goalposts. *Vaccine* 27(307-312).
- 42 Department of Health, Immunisation Register, customised report for all consented children (November 2010).
- 43 Northern Territory Department of Education. (2008). DET Education Service Provision Policy. Retrieved from www.det.nt.gov.au.
- 44 Teacher Registration Board of the Northern Territory, 2006 Competent Teacher Standards Retrieved from <http://www.trb.nt.gov.au/professional-standards-and-ethics>
- 45 Whitebook, 1989 cited in Clifford, R. M., Reszka, S.S. and Rossbach, H. (2010). Reliability and Validity of the Early Childhood Environment Rating Scale: University of North Carolina at Chapel Hill, USA and University of Bamberg, Germany
- 46 Harms, T., Clifford, R.M., Cryer, D. (1998) Early Childhood Environment Rating Scale—Revised Edition. New York: Teachers Press.
- 47 Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2004). The Effective Provision of Pre-School Education (EPPE) Project: Final Report. London: Institute of Education.
- 48 Hall, J. E., Sammons, P., Sylva, K., Melhuish, E., Taggart, B., Siraj-Baltchford, I. and Smees, R. (2010). Measuring the combined risk to young children's cognitive development: An alternative to cumulative indices. *British Journal of Developmental Psychology*, 28, 219-238.
- 49 Steering Committee for the Review of Government Service Provision. (2009). Overcoming Indigenous Disadvantage Key Indicators 2009: Overview.

-
- 50 MCEETYA Australian Education Systems Officials Committee Senior Officials Working Party on Indigenous Education Directions in Indigenous Education. (2006) Australian Direction in Indigenous Education 2005-2008. Carlton South: MCEETYA.
- 51 Nutton, G., Moss, B., Fraser, J., McKenzie, J. and Silburn, S. (2012). Recruitment, Retention and development of quality educators in very remote NT Schools. Darwin: Menzies School of Health Research.
- 52 Secretariat of National Aboriginal and Islander Child Care. (2011). Growing up our way: Aboriginal and Torres Strait Islander child rearing practices matrix. Retrieved from <http://www.snaicc.asn.au/projects/>
- 53 Friendly, M., Doherty, G., & Beach, J. Quality by design: What do we know about quality in early learning and child care, and what do we think? A literature review. Toronto: Childcare Resource and Research Unit, University of Toronto.
- 54 Siraj-Blatchford, I. and Woodhead, M. (eds) (2009) Effective Early Childhood Programmes. Early Childhood in Focus. Milton Keynes: Open University.
- 55 Fixsen, D., Naoom, S., Blase, D., Friedman, R. and Wallace, F. (2005). Implementation Research: A Synthesis of the Literature. Florida: University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network.
- 56 Dunn, B. (2009). Student Movement – 2007 and 2008 – NT Government Schools Darwin: Charles Darwin University.
- 57 Bronfenbrenner, U. (1979). The ecology of human development: Experiments by nature and design. Cambridge: Harvard University Press.
- 58 Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., Taggart, B. (2005). Effective Pre-School and Primary Education Project 3-11 (EPPE 3-11): The effectiveness of Primary School in England in Key Stage 2 for 2002, 2003 and 2004. London: Institute of Education.
- 59 National Institute of Child Health and Development. (2006). The NICDH study of early child care and youth development: National Institutes of Health.