Extreme Preschool: Mobile Preschool in Australia’s Northern Territory
Georgie Nutton, Johanna Bell, Julie Fraser, Alison Elliott, Ross Andrews, William Louden, Jonathan Carapeti

Abstract:
The health of the population is distributed by socio-economic status and this relationship is greatest in those populations of greater inequity in early childhood experience, education, income and housing. Despite improvements in some health and education outcomes for Indigenous Australians, knowledge has not yet translated from public health and education policy and programs into equality across the Australian population. Despite the extensive body of scientific evidence internationally to support the impact of early learning and care on health and well-being in the life course, very little high calibre research has been conducted with Australian Indigenous populations to establish the effectiveness of early childhood interventions. This study examines the effectiveness of a unique preschool delivery model to address the need of small and very remote Indigenous populations. The key features of the intended program design include training local, Indigenous community members to deliver preschool programs under the support and supervision of regularly visiting, qualified and registered early childhood teachers from the nearest regional centre. This is a comparative, cohort study of ‘school readiness’ and health outcomes for 180 very remote Australian Indigenous children. It offers excellent descriptive epidemiological baselines, and a unique mix of methodologies for addressing a complex study of intervention effectiveness. In this paper we focus on the complex, social and political context of very remote and Indigenous communities across the Northern Territory of Australia and the challenges of educational service delivery to improve not only educational but also health and life outcomes.

Keywords: preschool; school readiness; Aboriginal; Indigenous; remote;

INTRODUCTION
This cohort comparison study investigates the effectiveness of an alternative preschool service delivery model (Mobile Preschool Program) in achieving developmental and educational outcomes for very remote Indigenous children in the Northern Territory, Australia (National Health and Medical Research Council Project 545224). The study has drawn on high levels of evidence regarding health, education and developmental measures and study design. It includes 28 randomly selected communities from 7 service delivery hubs or clusters. The study expects to generate a number of important hypotheses from an exploration of confounding factors and anticipated associations between health, demographic and educational outcomes. The objectives of this study are to address the following primary research questions:
1. Is the availability of a Mobile Preschool Program within remote Northern Territory (Australia) communities associated with improved indicators for school readiness and better health?
2. Is regular attendance at a Mobile Preschool Program associated with improved indicators for school readiness and better health?

Although this paper is in advance of primary outcome measures, statistical analyses and substantive findings, the first 18 months of this study offers important considerations for instructional leaders, program managers or policy-makers: i) the rationale for seeking school effectiveness and improvement through early childhood education investment such as preschool programs; ii) for whom and in what contexts this study has relevance, and iii) methodological considerations for conducting a
rigorous study in a complex context and the research transference potential to improve program design.

**Rationale for seeking school effectiveness and improvement through early childhood education investment**

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 outcomes (Low, Low, Baumler, & Huynh, 2005; Devitt, Hall & Tsey, 2001; Johnston, Lea & Carapetis 2009; Nutbeam, 2000; Pulver & Harris, 2007; SCRGSP Australia, 2007; McCain, Mustard & Shanker, 2007; McCain & Mustard, 2002; Mustard, 2006; Shonkoff & Phillips, 2000; Shore, 1997; (Carson, 2007). Early childhood research provides clear evidence of the effectiveness of high quality interventions to support early life experiences for children to reach their full potential and optimize human capability or life outcomes. Empirical research has long promoted the essential elements of educational experiences such as quality of teaching, attendance and family engagement (Epstein, 2006; Hattie, 2003; National Institute of Child Health and Development, 2005; National Institute of Child Health and Human Development, 2002; Rimm-Kaufman, 2005; Schweinhart, 2006). Research shows that the gradient of this relationship is strongest where inequalities in early childhood experiences, education, income, and housing quality are greatest (Commission on Social Determinants of Health, 2008).

Hattie’s (2003) extensive meta-analysis indicates that whilst teaching quality accounts for 30% of students’ outcomes, the students themselves bring to school a range of skills, competencies and experiences that account for 50% of their outcomes. When the impact of home and peers is combined with these student determinants, 60-70% of the influence on outcomes are derived from experiences prior to or outside of realm of schooling. In more recent times countries and provinces have attempted to improve the potential for schools and quality teaching to make an impact by investing in early childhood programs (Ball, 2001a; Health Canada, 2001) and aligning services through integration or comprehensive service provision (Rutter, 2006; Sylva, 2005; Tunstill, 2005).

The most effective intervention for the improvement of educational and life outcomes, particularly for more disadvantaged population is two years of high quality preschool. There is a wide range of programs that are defined as preschool and the elements of each ones success are relevant to particular populations, in particular contexts to achieve particular outcomes. The Organisation for Economic Co-operation and Development demonstrated through their Program for International Student Assessment with 15 year olds that those who had experienced more than a year of preschool achieved significantly better than those students who did not (Organisation for Economic Co-operation and Development, 2004). The high quality components of proven programs such as Highscope (Schweinhart, 2006), Abecedarian (Ramey et al., 2000) and Chicago Child-Parent Center (Reynolds, Temple, Robertson, & Mann, 2001), not only provide a reference point for the study of preschools in the Northern Territory, but may also directly inform future controlled trials of re-designed programs.

There is a paucity of research investigating causal pathways and relationships between complex contributing factors or effective interventions to ameliorate specific challenges of translating good theory and research into sustainable practice in the context of very remote Indigenous populations. Subsequently, there is limited
empirical evidence on the impact and relative effectiveness of policy and program approaches that promote early childhood development in this context.

**Northern Territory population demographics**

For Northern Territory Indigenous population significant levels of inequality and disempowerment prevail (Devitt, Hall, & Tsey, 2001). Literature highlights the implications of the historical and cultural context of the Northern Territory Indigenous population which include colonisation and subsequent displacement and dispossession of land (Devitt, et al., 2001). Despite some improvements in outcomes, educational achievement and health status disparities between remote Indigenous children and their urban non-Indigenous peers persist. The Northern Territory has a much greater proportion of Indigenous children and families living in the more extreme geographical isolation, poverty and related disadvantage than other Australian jurisdictions posing considerable challenge to service delivery systems in both health and education.

The Northern Territory’s large geographical area 1,352,176 square kilometres and small population base of 211,000 people has provided a considerable challenge to limited health and education services to be accessed by people living in very remote areas. Of the Northern Territory population 30.4% are Indigenous, of whom 64% live in very remote areas (Australian Bureau of Statistics, 2006). The limited opportunity for economic participation in these regions and long history of service delivery challenge contribute to considerably higher levels of disadvantage for this group and the opportunities for children living in more remote areas (Figure 1). This is a long standing issue identified in Northern Territory Government Submissions to the Productivity Commission (Australian Government) over many years in relation to securing grants for basic service provision. The influence of the socio-demographics of the Northern Territory on the policy and program context is considered further below.

**FIGURE 1: COMPARISON OF PERCENTAGE OF NORTHERN TERRITORY AND AUSTRALIAN CHILDREN AT SCHOOL ENTRY 2009 BY AUSTRALIAN STANDARD GEOGRAPHICAL CLASSIFICATION (CCCH & TICHR, 2010)**

[Graph showing percentage of Northern Territory and Australian children at school entry by geographical classification]

Geographical remoteness has been demonstrated throughout the literature to be a significant influence on health and outcomes such as maternal health, birth weight, chronic disease(Graham et al., 2007; NT Perinatal Information Management Group, 2002; Reichman, 2005; Tursan d'Espaignet, Measey, Carnegie, & Mackerras,
More recently a census of children on entering school, the Australian Early Development Index, revealed that the rate of developmental vulnerability for Indigenous children residing in very remote communities is 53.8%. This is twice the rate of that of 25.1% for Indigenous children living in outer regional areas, which incorporate provincial size towns (Silburn, Robinson, Arney, Johnstone, & McGuinness, 2010).

The age distribution of the Northern Territory Indigenous population is distinctly different to the non-Indigenous population (Figure 2). A much younger Indigenous population impacts the adult carer to child ratio and thereby diminishing care and supervision. In the Western Australian Child Health Survey (Zubrick et al., 2004) the ratio of mature adults to children was found to be compounded by rates of poor health, mental health and early mortality rates. At birth the life expectancy for Indigenous men is 62.6 years for men and 68.5 years for women compared with non-Indigenous men at 79.5 years and 84.1 years for women (Northern Territory Treasury, 2009b).

FIGURE 2: POPULATION AGE STRUCTURE BY INDIGENOUS STATUS, NORTHERN TERRITORY, 2006 (Northern Territory Treasury, 2009b)

Young remote and Indigenous children have lower rates of school readiness, enrolment and participation; lower subscription to child care and preschool education; environmental impediments to learning and development such as infectious diseases, hunger, hearing problems, sleep deficits, and high mobility. Understanding of these socio-demographic and health profiles is limited, and less is known about effective interventions in this context. Importantly, the literature on intervention effectiveness and efficacy is derived from studies of Western cultural contexts, urban based populations, some analogous populations but is quite limited for remote Australian Indigenous communities in which families have a very different asset base including:
usually traditional Indigenous languages, more traditional lifestyles, very limited English language exposure and limited access to print based materials.

Hearing loss in Northern Territory Indigenous children is associated with very early infection (first months of life) and high prevalence of Otitis Media. The direct impact of hearing loss on early literacy acquisition is not well understood although some significant studies with children of primary school age have clearly demonstrated a significant loss of learning time due to intermittent hearing loss and related behavioural disruptions (Howard, 2007). There is limited knowledge of the impact of hearing loss for children who have the additional challenge of learning English literacy through English as an additional language, which is the circumstance of the majority of the Northern Territory’s Indigenous children (Figure 3).

**FIGURE 3: PROPORTION OF INDIGENOUS AND NON-INDIGENOUS CHILDREN WITH LANGUAGE BACKGROUNDS OTHER THAN ENGLISH AT SCHOOL ENTRY 2009 (CCCH & TICHR, 2010)**

National benchmark testing in literacy and numeracy are the most consistent measures of educational achievement over time. For Indigenous children in Year 3, the Australian National Benchmark results show a continuing disparity in reading (Figure 4), with evidence of minimal improvement to 2009 NAPLAN results (ACARA, 2009) over the last 10 years.
A census of all Australian children in their first year of formal school, the Australian Early Development Index, provides a population level measure of vulnerability across five developmental domains (see methods section for further detail). This tool identifies how well communities provide for healthy developmental experiences for 0-5 year olds or school readiness. The sum of experiences children have prior to entering school including birth weight, nutrition, primary health care, nurturing or early learning experiences are evident on entry to formal schooling with a long tail of vulnerability across all domains of development (Figure 5). One quarter of all Northern Territory 5 year olds are considered to be developmentally vulnerable on two or more developmental domains. However, more than 50% of remote and very remote Indigenous children in the Northern Territory are considered to be developmentally vulnerable on two or more developmental domains. This level of vulnerability would usually suggest children may need specific and targeted support in school.

FIGURE 5: DISTRIBUTION OF AEDI TOTAL SCORES (AUSTRALIAN NATIONAL PERCENTILES) BY JURISDICTION AND INDIGENOUS STATUS 2009 (S. Silburn, 2010)

A significant concern for the schooling system is that this long tail of vulnerability remains into the primary school years with minimal impact from
educational interventions. Although data for the same cohort over time are not available, the statistics below demonstrate this gap in outcomes is evident in the Year 3 Reading score distributions for National Assessment Program for Literacy and Numeracy with 69% of Northern Territory Indigenous children scoring below the national minimum standards in the Year 3 Reading national testing (Figure 6). Significantly lower participation and achievement rates prevail throughout the years of schooling resulting in lower retention and completion rates for Indigenous students.

**FIGURE 6: DISTRIBUTION OF YEAR THREE READING SCORES FOR 10TH TO 90TH PERCENTILES BY JURISDICTION AND INDIGENOUS STATUS 2009 (ACARA, 2009)**

<table>
<thead>
<tr>
<th>Achievement scores</th>
<th>Indigenous Status</th>
<th>Jurisdiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Northern Territory Policy and Program Context**

The cumulative or compounding effects of demographic factors discussed previously, including geographic isolation are exacerbated by difficulties in quality services delivery. In addition, the socio-cultural and language contexts of the very remote population pose particular logistical and pedagogical challenges for a large proportion of the children and families in the Northern Territory. These factors render most mainstream research, programs and policies of limited value.

The Northern Territory Government has provided a high level of preschool services for over 30 years which operate on a voluntary fee paying basis, unlike most Australian jurisdictions. Northern Territory education funding formulas and policies for service provision are often based on minimum population base, for example, a standard preschool program would not be provided for a community that only has 10 eligible children because the funding policy on staffing allocation requirement is for minimum of 12 children. At the time of introducing the expanded Mobile Preschool program in 2008, 41.7% of Indigenous children aged 3 and 4 years (1,269 of 3,105) were accessing a preschool service compared to the non-Indigenous participation rate for 4 year olds of 83.5% (Northern Territory Treasury, 2008).

Prior to publication of *Learning Lessons: An Independent Inquiry into Aboriginal Education in the Northern Territory* (1999) small scale projects had explored the concept and delivery design of mobile preschools. This resulted in recommendations for mobile preschools to provide an interim measure to meet the service gap for remote Indigenous communities. The current political and social context for this study is framed by significant government reform agendas to close the gap in health and education outcomes between Indigenous and non-Indigenous
children, including National funding and policy agreements and a Northern Territory Emergency Response (NTER Review Board, 2008).

The significant expansion of the Mobile Preschool Program in 2008 to an additional 30 communities with a budget of $9 million is one program in a range of political responses to unacceptable rates of non-participation (non-attendance) and poor educational outcomes for Indigenous children announced in the 2007 Northern Territory Government’s Closing the Gap initiative in response to the “Little Children are Sacred Report” (Wild & Anderson, 2007). This provided a timely opportunity to address the question of current preschool effectiveness in very remote communities which pose a considerable challenge to service delivery models due to cost and difficulties of staff recruitment.

The continuation of the mobile preschool program reflects Northern Territory Department of Education and Training’s desire to improve enrolment and attendance in preschool for very small communities where traditional or standard service delivery models are not sustainable or financially feasible. The fiscal and pragmatic issues of delivering all necessary, separate services and resources; recruiting suitable and qualified staff; population transience; and single purpose infrastructure are prohibitive. The mobile preschool program is distinctive from mainstream and urban services in design and intention to provide comprehensive services needed to actively engage families and facilitate resources to optimise children’s health, developmental and learning outcomes. For these reasons the retention of this service delivery model is desirable but makes imperative the need to ensure its effectiveness is evaluated and that improvements to augment known areas of vulnerability are rigorously studied.

**Mobile Preschool Program Description**

The key design elements of the mobile preschool program aim to maximise access to preschool experiences for children from three to five years of age in very remote communities whilst urban provision is from four years of age. Program content is based on evidence that early language and social development for school routines, behaviours and culture is greatly improved through preschool experiences in first language and exposure to Standard Australian English. A nominated local community member (sometimes more than one) coordinates the daily sessions, typically 10-15 hours per week. This coordinator is expected to participate in an accredited certificate course in either education or children’s services through a local registered training organisation (Batchelor Institute for Indigenous Tertiary Education). Many of the coordinators have not yet fulfilled this requirement. Coordinators are supported on a weekly or fortnightly basis, typically for 4 hours by a travelling early childhood teacher. The teacher has responsibility for training local staff, programming, planning and assessment across a maximum of 5 sites. The visiting teacher holds a 4 year degree in teacher education, although there are currently no requirements for early childhood specific qualifications. The recommended curriculum is the Northern Territory Curriculum Framework, accompanied by a support document, Strong Beginnings: an Explicit Guide to Curriculum and Pedagogy in the Early Years (DEET, 2006). In 2006 the enrolment of 3 and 4 year olds in the mobile preschool program was 167 children across 15 communities.

The initial Mobile Preschools piloted in 2000-2005 were subsequently adopted by Northern Territory Department of Education core funding on the basis of their success in increasing enrolments. The initial three Mobile Preschool hubs are distinct from the more recent expansion of the program because their implementation was based on consultative processes with community members to identify and reach
agreement on the purpose, location and staffing of the preschool. The initial preschool programs were considered to be an extension of school programs to improve outcomes for children and were expected to have a strong emphasis on the community development aspect of employing and training local staff, parent inclusion and access to comprehensive services (health, nutrition and developmental interventions).

**TABLE 1: MOBILE PRESCHOOLS SNAPSHOT**

<table>
<thead>
<tr>
<th>Number of study sites per region</th>
<th>Kilometres from regional centre</th>
<th>Community Population</th>
<th>School Student enrolment 1</th>
<th>Preschool enrolment s 3+</th>
<th>Number of teacher visits over a 10 week period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top End</strong></td>
<td>12</td>
<td>156 (min) 253 (max)</td>
<td>24 (min) 437 (max)</td>
<td>40 (min) 78 (max)</td>
<td>2 (min) 18 (max) 0 (min) 8 (max)</td>
</tr>
<tr>
<td><strong>Central Australia</strong></td>
<td>16</td>
<td>231 (min) 318 (max)</td>
<td>51 (min) 360 (max)</td>
<td>14 (min) 114 (max)</td>
<td>0 (min) 20 (max) 0 (min) 8 (max)</td>
</tr>
</tbody>
</table>

The second phase of Mobile Preschool implementation however, 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 abuse (Wild & Anderson, 2007). The implementation in this phase did not require community consultation or negotiation. This phase of *Closing the Gap* Mobile Preschools (since 2007) may have a far greater emphasis on system and school imperatives to meet enrolment and attendance accountabilities. It is expected that the process evaluation including aspects of program fidelity will be interrogated through the qualitative data analysis to support program re-design at the system level.

A program logic (Figure 8) was developed retrospectively to assist the evaluation of the Mobile Preschool Program and to understand the elements and processes that were intended to produce quality outcomes. The program logic model has been designed to illustrate the outcomes that the Northern Territory Department of Education and Training expects to see where key program resources and activities are delivered. The ‘IF – THEN’ statements indicate that future outcomes are conditional on earlier stages in the logic being achieved, for example, IF parents are actively encouraged to engage in the preschool program, THEN, we would expect to see an increase in the understanding of the benefits of preschool for children.

**METHODOLOGY**

**Study Design**

This study’s design draws on the national and international literature on health and education intervention effectiveness studies. This is a retrospective study to evaluate the impact of the Mobile Preschool program as implemented by the Northern Territory Department of Education and Training. The cohort comparison design uses an outcome measure, the Australian Early Development Index, collected as near to mid May in the child’s first year of formal full time schooling.

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2 Source: DET, 2009
3 Source: DET, 2009
HYPOTHESIS: Mobile Preschool Program participation improves the health, developmental and learning outcomes of children in the short and medium term.

RESEARCH QUESTIONS:
Is the availability of a Mobile Preschool Program within a remote Northern Territory community associated with improved indicators for school readiness and better health?
Is regular attendance at a Mobile Preschool Program associated with improved indicators for school readiness and better health?

AIMS:
1. Compare indicators of readiness for full time, formal learning (particularly those related to language and literacy, social and emotional well-being) and health status amongst children in remote Indigenous communities attending the Transition year at a Northern Territory Primary School in 2009 and 2010, between these groups:
   a) had regularly attended the Mobile Preschool Program in the previous year;
   b) were from the same school/s as group (a) but had not regularly attended the Mobile Preschool Program in the previous year;
   c) were from communities without access to the Mobile Preschool Program or other formal preschool program.
   *Note: Attendance is analysed in two distinct ways, by raw days (dosage) and proportion of time the child attended of the estimated time they could possibly have attended (referred to as access). The ‘access’ period takes account of the variation in length of operation of the program between sites and child’s age for enrolment eligibility.
2. Compare indicators of the preschool program quality in relation to exposure to highly-trained staff and the amount of time exposed to high-quality teaching for those children attending a Mobile Preschool Program in 2009 and 2010.

Outcome Measures
Outcome measures are determined for three cohorts (ref Table 2) of children attending their first year of formal, full time schooling, also known as Transition year (Year 1 minus one) of schooling in 2009 and 2010.

Data sources
The Australian Early Development Index is a national screening tool introduced in 2009. It collects a comprehensive set of demographic data on each child as well as a 100 item scale across five developmental domains including physical, social, emotional, language and communication and general knowledge. The tool is appropriate to the remote Indigenous population with the adaptation of including a cultural consultant working with the teacher to complete the assessment. The data is collected in Term 2 of the Transition year (first year of full time school or Year 1 minus 1) to enable teachers to get to know the children.
FIGURE 8. PROGRAM LOGIC DIAGRAM

Required Resources and Activities

IF
There’s a ...

THEN
- Funding
- MPT
- AT
- Venue
- Appropriate venue
- Appropriate staff

And the following conditions ...

- Sufficient community consultation
- Support from the principal
- Strong partnerships with local family services

IF
Ongoing promotion by MPT and AT of benefits of preschool for children with proven results AND Parents are actively encouraged to engage in the preschool program

THEN
Increased understanding of benefits of preschool for child

Immediate Outcomes

Increased awareness of skills for supporting child’s learning and growth

Intermediate Outcomes

Parents are provided with explicit feedback about child’s learning and ideas for supporting learning at home

Ultimate Outcomes

IF
Earlier & increased exposure to:
- Pre-literacy & numeracy acts.
- Socioemotional activities.
- Motor skills acts

THEN
Improved developmental outcomes

IF
Increased school readiness

THEN
Increased attendance during TR and in later years

IF
Improved health outcomes

THEN
Earlier intervention by education and health departments

IF
Earlier identification of, and referral for, health problems (e.g., skin acre, ear infections)

THEN
Earlier identification of, and referral for, developmental or learning delays

IF
Increased regular preschool attendance

THEN
Improved benchmarks

Increased attendance during TR and in later years

IF
Increased staff satisfaction and retention

THEN
A defined career path for ATs which includes: • Options for further study; • Increased responsibilities; • Increased salary

IF
Increased access to regular, quality preschool

THEN
Improved benchmarks

Increased attendance during TR and in later years

IF
A defined career path for ATs which includes: • Options for further study; • Increased responsibilities; • Increased salary

THEN
Improved benchmarks

Increased attendance during TR and in later years
Although this tool’s primary purpose is to provide a population level measure, it has the following characteristics rendering it suitable for measuring children’s competencies on entry to schooling: it is based on teacher judgement; covers five domains of development; is collected as early as possible in the child’s first year of formal, full time and non-compulsory schooling (Transition). It is a reliable and valid tool available for the purpose of measuring children’s readiness for schooling and will provide some versatility for later comparisons or longitudinal tracking.

Northern Territory Department of Education data on enrolment and attendance is used in the comparative analysis on exposure or attendance. It was necessary to treat the data collected by the school system to enable comparison between students and groups of students. In addition to the range of collection methods used across schools, there is a high student mobility rate and variation in Mobile Preschool sites commencement dates. Each child has a maximum number of days access which accounts for their age (eligibility to enrol), the start date of the preschool and an integer based on number of days the preschool was expected to open.

A structured interview for family members captured appropriately detailed qualitative and quantitative data to gauge: primary carer educational attainment, employment status and disposable income; level of importance placed on preschool participation; explicit expectations for child’s participation in preschool and school; home based activities to support learning and development; perceptions about improving the early learning experiences for children. Parent interview tools were piloted and reviewed by ethics committees. Revised tools adopted a number of language modifications in the Western Australian Aboriginal Child Health Survey made for similar remote Indigenous language speaking communities. The revised interview tool includes comparable data for the Western Australian Aboriginal Child Health Survey (Zubrick, et al., 2004).

The program quality analysis is based on Classroom Literacy Observation Schedule (Louden, 2005) and the Quality Improvement and Accreditation System (National Childcare Accreditation Council Inc, 2006), teacher and assistant teacher interviews. At the time of study design there was an absence of clearly defined or consistent standards across preschool services and sites. The use of the national child care accreditation tool is expected to provide data that will be comparable to the pending national quality standards framework, incorporating preschool and child care services. The standards and measures in this tool are currently applied to most children’s services for the same age cohort across the Northern Territory. The degree to which children are experiencing early or pre-literacy knowledge and skills is measured by the Classroom Literacy Observation Schedule which is based on an extensive study of highly effective teaching behaviours for improved outcomes in children’s literacy assessment.

**Site Selection**

We randomly selected 20 sites across 7 clusters of school districts offering Mobile Preschool Program. We randomly selected another 10 communities from matched size and remoteness communities for the comparison cohort. All communities were clustered on the basis of population, distance from nearest major centre, level of service provision likeness then randomly selected. Four communities were excluded after commencement on the basis of not meeting criteria for the service delivery model. Two additional communities were included as pragmatic alternatives. Due to changes in the implementation changes of the Department, the final total of site with preschool was 21 and without 7.

**Sample**
For the Preschool and Transition age children in this study, we achieved an 64 -83% consent rate of the known population according to the Northern Territory Population Projections (Northern Territory Treasury, 2009b). All 150 children will be included in the analysis of attendance and 60 children in their Transition year of school will be included in the analysis of achievement or ‘school readiness’.

**TABLE 2 SAMPLE SIZES**

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Mobile Preschool Regular Attenders</td>
<td>n= 53</td>
</tr>
<tr>
<td>Group B</td>
<td>Mobile Preschool Irregular Attenders</td>
<td>N=98</td>
</tr>
<tr>
<td>Group C</td>
<td>No preschool available</td>
<td>n= 35</td>
</tr>
</tbody>
</table>

**Data Analysis**

The primary analysis comparisons are between those with access to Mobile Preschool Program (Group A and B combined) versus those with no access to a preschool service (Group C). We compare “readiness” indicators measured by the Australian Early Development Index amongst children in remote Indigenous communities attending the first year of formal full time schooling at a Northern Territory Primary School in 2009 and 2010. Indicators related to language and literacy, social and emotional well-being and physical health status are compared between those who:

a) regularly attended the Mobile Preschool Program (MPP) in the previous year;

b) attended the same school/s as group (a) but did not regularly attend the MPP in the previous year;

c) were from communities without access to the MPP or other formal preschool program.

Attendance will be analysed by two measures. The first will use quartiles based on ‘dosage’ as raw days attended and the second will be attendance as a proportion of the days the child had access to preschool according to the period the for which the preschool was operational and the child was eligible to enrol.

In addition to the major outcome measures of school readiness and attendance, other factors measured include: gender; age; parent / carer educational and employment status; disposable income; parental health status (including alcohol and tobacco usage); medical history of the child that is expected to impact participation or developmental patterns (growth for age; number and severity of clinic presentations; hospitalisations; anaemia; chronic illness).

**Statistical Analysis**

Although this study identifies and describes confounders and effect modifiers for the two outcome measures in the data analysis plan (Figure 10), it does not have the power to control for these factors. Subgroup comparisons will be exploratory for hypothesis generating purposes only and will include comparison of outcomes between MPP attendance quartiles and non-attenders.

**FIGURE 10: DATA ANALYSIS PLAN**
FINDINGS

Educational importance of this study

An absence of baseline data has limited the understanding of confounding factors considered to be most influential such as attendance and participation (Steering Committee for the Review of Government Service Provision (SCRGSP Australia), 2007), teacher quality (Mellor, 2004; Rowe, 2004), curriculum and physical learning environment (Elliott, 2006; MCEETYA, 2001a, 2001c), parental educational and employment status (MCEETYA, 2001b; Turner, 2007), parental health status (alcohol and tobacco usage), birth weight, nutritional status, illness, evidence of access to health services, evidence of access to social services (Penman, 2006; Steering Committee for the Review of Government Service Provision (SCRGSP Australia), 2007), parental support for literacy and numeracy concepts and skills (Elliott, 2006).

By better understanding the confounding factors and comparing the features of the preschool programs in communities with higher levels of success against those with lower levels of success, we will be able to determine the components that could potentially be included in an enhanced model.

Descriptive epidemiology

A summary of comparisons for some key factors demonstrates the similarity between the Northern Territory Indigenous population and the study sample (Figure 11). While we were not able to separate out the 61% remote Indigenous population from the broader Northern Territory Indigenous population, Appendix 1 includes some demographic descriptors for the remote Indigenous community along with figures for the sample, and the broader Indigenous and non-Indigenous populations.

Strong similarities are evident in gender distribution and the rate of low birth weight between the NT Indigenous population and the study sample. The study sample has similar income to the broader Indigenous population for the Northern Territory with approximately 80% of each earning less than $399 per week.

A key difference which might be expected is the higher proportion of children in the study sample with an Indigenous language as their main language spoken at
home. In very remote communities there are fewer resources and less speakers of English compared with the larger remote towns. Initial expectations may be that immunisation coverage would be lower in very remote communities compared with remote and regional communities. At least anecdotally, the evidence to support higher immunisation rates in very remote communities is that the smaller population groups are much better known to health staff and are easier to track. The benefit of smaller, albeit very remote communities is also suggested by the higher employment rate (53%) in comparison to the broader NT Indigenous population (38%). These employment rates include participation in Community Development Employment Projects (a government sponsored employment scheme tied to welfare), which might help explain the higher proportion of Indigenous people employed in remote communities compared with the broader Indigenous population.

One of the key environmental factors likely to impact the study sample in a negative way when compared to the broader Northern Territory Indigenous Population, and non-Indigenous population is the household occupancy rate. In the study sample, 24% of carers reported occupancy of 10 or more people compared with 9% of the NT Indigenous population and only 0.02% of the non-Indigenous population.

**FIGURE 11. COMPARISON OF KEY DEMOGRAPHICS FOR NT POPULATION GROUPS AND STUDY SAMPLE**

A table comparing these demographics and additional descriptors against the remote Indigenous population, and the NT Indigenous and non-Indigenous populations is available at Appendix 1.

**DISCUSSION AND CONCLUSIONS**

There are four major areas of challenge and learning at this stage of this study. They are presented as methodological considerations and focus on challenges which relate to:

- Conducting a retrospective cohort study in a remote Indigenous context
- Calculating a denominator for population size and sampling
- Measuring program fidelity in the absence of a clear program logic
The politics of change and program improvement

Retrospective cohort study

Several factors have influenced the study design. Firstly, the population of interest is very small, diverse and widely dispersed geographically (see Appendix 2). Secondly, the factors in this study are complex and there is a paucity of high calibre evidence specific to the context. This study’s small sample has very deep layers of data. Finally, this study demands a range of methodological approaches emerging from newer fields of implementation and applied sciences in addition to those traditionally more influential biomedical, behavioural and social sciences.

The cohort study design in an educational setting has resulted in challenges for research staff in managing expectations. There is largely a dichotomy of attitudes related to professional practices of the individual educators or staff directly involved in the study. Many educators and staff have an expectation of being engaged in a reflective and therefore iterative process of practice improvement. On the other hand, educators and staff are reluctant to share their practice due to a culture of privatised practice or a perception of being over scrutinised. Furthermore, Indigenous populations are the subject of numerous health and education studies, and as a result, many communities are ‘research weary’, making data collection difficult or delayed. This ‘research weariness’ has had an impact on the study and the data collected, for example, data on teaching quality was collected for only 50% of the operational preschool sites. Other factors which limited the research team’s ability to observe preschool quality included: distance and limited time on site visiting communities; high absentee rates of children, and interruptions to program during researchers visits to communities.

Sampling and denominator

A major challenge for researchers and public policy and program administrators in the Northern Territory is establishing a reliable denominator of population (Elliott, Fasoli, & Nutton, 2009; Johnstone, 2009). The Australian population census has long acknowledged the error rate due to mobility and the transient nature of the Northern Territory population (Taylor, 2004). This has been reiterated in educational participation studies (Dunn, 2009). In the Mobile Preschool Study the difficulties of establishing a denominator are highlighted by a comparison of three population data sources (Table 3). Of the 28 communities with eligible children consented to the study, two communities had no population data in any of the three sources. The Immunisation register provided estimates for 14 communities whilst Northern Territory Treasury (Northern Territory Treasury, 2009) provided estimates for 9 communities. Furthermore, the denominator data from each source differed by as much as 600%, for example in community A, preschool population estimates ranged from 2 children to 14 children. Using the higher population estimates as a denominator, the study achieved a 64% consent rate, whereas according to the lower estimates, the consent rate was 83%. Table 3 provides a breakdown of the population estimates from three sources: The NT Immunisation Register, the Australian Bureau of Statistics and the Northern Territory Treasury.

| TABLE 3 COMPARISON OF THREE DATA SOURCES FOR POPULATION DENOMINATOR IN MOBILE PRESCHOOL STUDY COMMUNITIES FOR CONSENT RATE |
The Challenge of Measuring Program Fidelity

When the cohort study was designed, it was assumed that the Mobile Preschool Program had some consistencies across sites with respect to curriculum, pedagogy, funding and professional support. As with most multi-site programs some localised variations were expected. However, after the commencement of the evaluation, it became clear that there were differences across sites in regards to infrastructure and resourcing, class size, teacher visitation patterns, supervision arrangements, program content and the number of classroom coordinators. Given that measuring program impact is dependant on understanding the program fidelity, (Birckmayer, 2000; Funnell, 2000; Sidani, 1999), understanding of the program’s original intent was imperative. The intentions underpinning the Mobile Preschool Program, while well understood by program management, had not been formally articulated through the development of a program logic model. Northern Territory

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1 Northern Territory Treasury (2009)
Department of Education and Training personnel and documentation were consulted as the service providers for clarification and retrospectively developing a program logic through. The result was the development of a Mobile Preschool Program Logic Model designed to outline the key characteristics of the program and the causal relationship between activities and outcomes (see figure 8). As an example, the program logic model highlighted the assumption that increased preschool coordinator capacity was dependent on regular, fortnightly teacher visits, which alerted the research team to the importance of collecting data on teacher visitation patterns.

The major lesson for others involved in multi-site education evaluations is to ensure that a program logic model and accompanying indicators of program fidelity are developed early in the evaluation in order 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 at what stage the ‘drift’ occurred (Rogers, 2007).

**Educational policy-making and the politics of change and improvement**

The political imperatives to improve local, Australian evidence in contexts of most disadvantage, and the expansion of the Mobile Preschool Program intervention give this study particular currency and urgency. The socio-economic status of many Indigenous families and communities, and the prevailing gaps in school achievement are significant public health issues. When children start school behind their peers in language and cognitive abilities they are less likely to experience academic success or be retained in the school system.

The importance of high-quality preschool education to a child’s development and health has been increasingly recognised in recent times by the Australian Government with announcements in 2008 that all 4 year old Australian children will have access to such a preschool service for a guaranteed 15 hours per week. The Mobile Preschool Program in the Northern Territory has received wide acknowledgement for its success in improving preschool participation and is popular in communities where it is run. To this end there is a responsibility for the research, policy and programme sectors to develop the evidence base for future decision making.
REFERENCES


Health Canada. (2001). *The population health template: Key elements and actions that define a population health approach*.


APPENDIX 1
Comparison of key demographics for NT population groups and study sample

<table>
<thead>
<tr>
<th></th>
<th>NT SAMPLE</th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Indigenous</td>
<td>Non Indigenous</td>
<td>Remote Indigenous</td>
<td>MPP sample</td>
<td></td>
</tr>
<tr>
<td>GENDER(a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (0-4y)</td>
<td>51.8%</td>
<td>50.8%</td>
<td>N/A</td>
<td>(4-6y)</td>
<td>52.2%</td>
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<tr>
<td>Female (0-4y)</td>
<td>48.2%</td>
<td>49.2%</td>
<td>N/A</td>
<td>(4-6y)</td>
<td>47.8%</td>
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<tr>
<td>BIRTH WEIGHT1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (&lt;2500g)</td>
<td>14.2%</td>
<td>6.7%</td>
<td>14.5%</td>
<td>15.4%</td>
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</tr>
<tr>
<td>Appropriate (&gt;=2500g)</td>
<td>85.8%</td>
<td>93.3%</td>
<td>85.5%</td>
<td>84.6%</td>
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<tr>
<td>Mean</td>
<td>3096g</td>
<td>3336g</td>
<td>3068g</td>
<td>3128g</td>
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<tr>
<td>DTP IMMUNISATION 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Fully immunised by 7m</td>
<td>47.1%</td>
<td>46.9%</td>
<td>39.5%</td>
<td>50.6%</td>
<td></td>
</tr>
<tr>
<td>Fully immunised by 13m</td>
<td>84.9%</td>
<td>85.6%</td>
<td>84.6%</td>
<td>91.6%</td>
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<tr>
<td>MAIN LANGUAGE at home(a)</td>
<td>Indigenous including Kriol</td>
<td>54%</td>
<td>0.1%</td>
<td>N/A</td>
<td>86.5%</td>
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<tr>
<td>English</td>
<td>36%</td>
<td>87%</td>
<td>N/A</td>
<td>13.5%</td>
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<tr>
<td>EDUCATION (a)</td>
<td>&lt;= yr 10</td>
<td>79.2%</td>
<td>35.5%</td>
<td>N/A</td>
<td>69.5%</td>
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<tr>
<td>&gt; Yr 10</td>
<td>20.8%</td>
<td>64.5%</td>
<td>N/A</td>
<td>30.5%</td>
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<tr>
<td>EMPLOYMENT (a,b)</td>
<td>Employed</td>
<td>37.5%</td>
<td>67.9%</td>
<td>N/A</td>
<td>52.7%</td>
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<td>Unemployed/not in workforce</td>
<td>62.46%</td>
<td>32.1%</td>
<td>N/A</td>
<td>47.3%</td>
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<tr>
<td>HOUSEHOLD SIZE (a)</td>
<td>10+ people per house</td>
<td>9.38%</td>
<td>0.02%</td>
<td>N/A</td>
<td>23.7%</td>
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<tr>
<td>Mean Household size</td>
<td>4.5</td>
<td>2.5</td>
<td>N/A</td>
<td>9.2</td>
<td></td>
</tr>
<tr>
<td>Mean per bedroom</td>
<td>1.8</td>
<td>1.1</td>
<td>N/A</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>INDIVIDUAL INCOME (a,b)</td>
<td>$0 - $399</td>
<td>81.8%</td>
<td>40.8%</td>
<td>N/A</td>
<td>82.6%</td>
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<td>$400+</td>
<td>18.3%</td>
<td>59.2%</td>
<td>N/A</td>
<td>17.4%</td>
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</tr>
</tbody>
</table>

(a) Sourced from ABS Census (2007), Indigenous Profile CAT No 2002.0 Commonwealth of Australia
(b) Sourced from ABS Census (2007) Basic Community Profile CAT No. 2001.0 Commonwealth of Australia

¹ (Northern Territory Government, 2004, 2005)
² (O’Grady, 2009)
³ All children in the NT
⁴ All children in the NT
⁵ Note that figures include participants in Community Development Employment Projects (CDEP).
APPENDIX 2.
Location of Northern Territory Mobile Preschool Evaluation Study sites by group school service hub and funding source.