



DATA INSIGHTS

The Positive Deviance Initiative – Summary of Quantitative Findings

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ABSTRACT

The use of large datasets in an early childhood development (ECD) setting has, to date, been limited. Using DataDrive2030's first combined dataset we adopt a Positive Deviance (PD) approach to identify factors associated with young children in lower socioeconomic circumstances who perform on or above par compared to their higher socio-economic peers. The purpose of this report is to document insights emerging from the quantitative analysis that will be explored in the next phase of the project – a qualitative and ethnographic study of positive deviant facilities.

We used a myriad of ways to define PD and contracted multiple teams to investigate the data. In parallel, we engaged in conversations with practitioners working at Early Learning Programmes (ELPs) and ran an open data competition to attract

fresh, new perspectives. A total of 12,719 children across 1,975 ELPs were included in the initial analysis (10,936 after filtering out children in higher socioeconomic bands).

Phase one – the quantitative analyses – identified a range of potential drivers of PD at various levels (child, home, and facility). These include children's socio-emotional functioning, ELP process quality (such as practitioner-child engagement, class grouping during activities and free play), cognition-related and accessible materials and variables associated with good ELP management and governance. In phase two of this project, we validate/invalidate emerging insights and further explore the mechanisms behind these drivers of deviance, through in-depth qualitative research. The qualitative phase is reported separately.

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LIST OF TERMS AND ACRONYMS

Caregiver – adult primarily responsible for the care and guardianship of a child. A caregiver is not necessarily the child’s biological parent; caregivers include grandparents, relatives, and other primary guardians. For the purpose of this report, a caregiver is not a member of ECD staff.

Early Learning Programme (ELP) – a programme of teaching, learning and nurturing care for young children. This can occur within an ECD centre (typically more than 6 children being cared for during the day, in a fixed location away from their primary caregivers) or in a playgroup, toy library or home-based environment.

Early Learning Outcome Measures 4&5 (ELOM 4&5) tool – a tool used to assess children’s early learning and development. The ELOM tool consists of five domain scores (20 points each), which sum to a total ELOM score out of 100. The domains are Gross Motor Development (GMD), Fine Motor Coordination and Visual Motor Integration (FMC-VMI), Emergent Numeracy and Mathematics (ENM), Cognition and Executive Functioning (CEF), and Emergent Literacy and Language (ELL).

Positive Deviance (PD) – an approach to social and behavioural change grounded in the idea that, when confronted with similar challenges, and constraints to their peers, there will be some individuals or entities that emerge as ‘outliers’ because of uncommon practices and strategies that have facilitated their thriving.

Practitioner – a member of ELP teaching staff, sometimes referred to as a ‘teacher’

DSD – Department of Social Development

DoH – Department of Health

DBE – Department of Basic Education

NQF – National Qualifications Framework

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INTRODUCTION

The development and widespread use of the Early Learning Measure (ELOM) suite of tools has, for the first time, made available a large, nationally representative, and continuously growing, preschool child dataset in South Africa. The ELOM 4&5 tool categorises children into those that are On Track for their development, Falling Behind, or Falling Far Behind.¹ This offers exciting opportunities to explore gaps in our early childhood education systems and enable the use of data insights to close them.

An enduring challenge in the South African context has been one of inequality.^[1] While there have been many attempts to quantify these inequalities in school/university education and health systems, the Thrive by Five Index 2021² data presents the first opportunity to quantify early child outcome inequalities by socioeconomic status at a national level.

THE PROBLEM

The socioeconomic gradient (spectrum of outcomes by wealth) we see in child outcomes in South African pre-schoolers aged 50 to 69 months is evidence of persistent inequalities in children's experiences during the first five years of life.

Figure 1 shows the percentage of children in South Africa who are On Track / not On Track for their age (y-axis) across five income bands, using Early Learning Programme (ELP) monthly fee levels as a proxy for socioeconomic status (x-axis).^[2] The green and red lines indicate the percentage of children On Track (meets expected standards) and those not On Track (Falling Behind or Falling Far Behind) for their age. A mere third of children in the lowest fee band (ELPs that charge between R0-R110 per month) are On Track in comparison to the vast majority (81%) of children in the highest fee band (ELPs that charge more than R1,751 per month).

Of particular concern is inadequate performance amongst the poorest children in areas of development that are fundamentally important for foundational phase learning and later school achievement. As an example, the Thrive by Five Index 2021 found that more than a third of children (36%) aged 50 to 59 months in the lowest fee band are Falling Far Behind the expected standard when it comes to Cognition and Executive Functioning (CEF),³ and are unable to do the basic CEF tasks required of children their age.^[2]

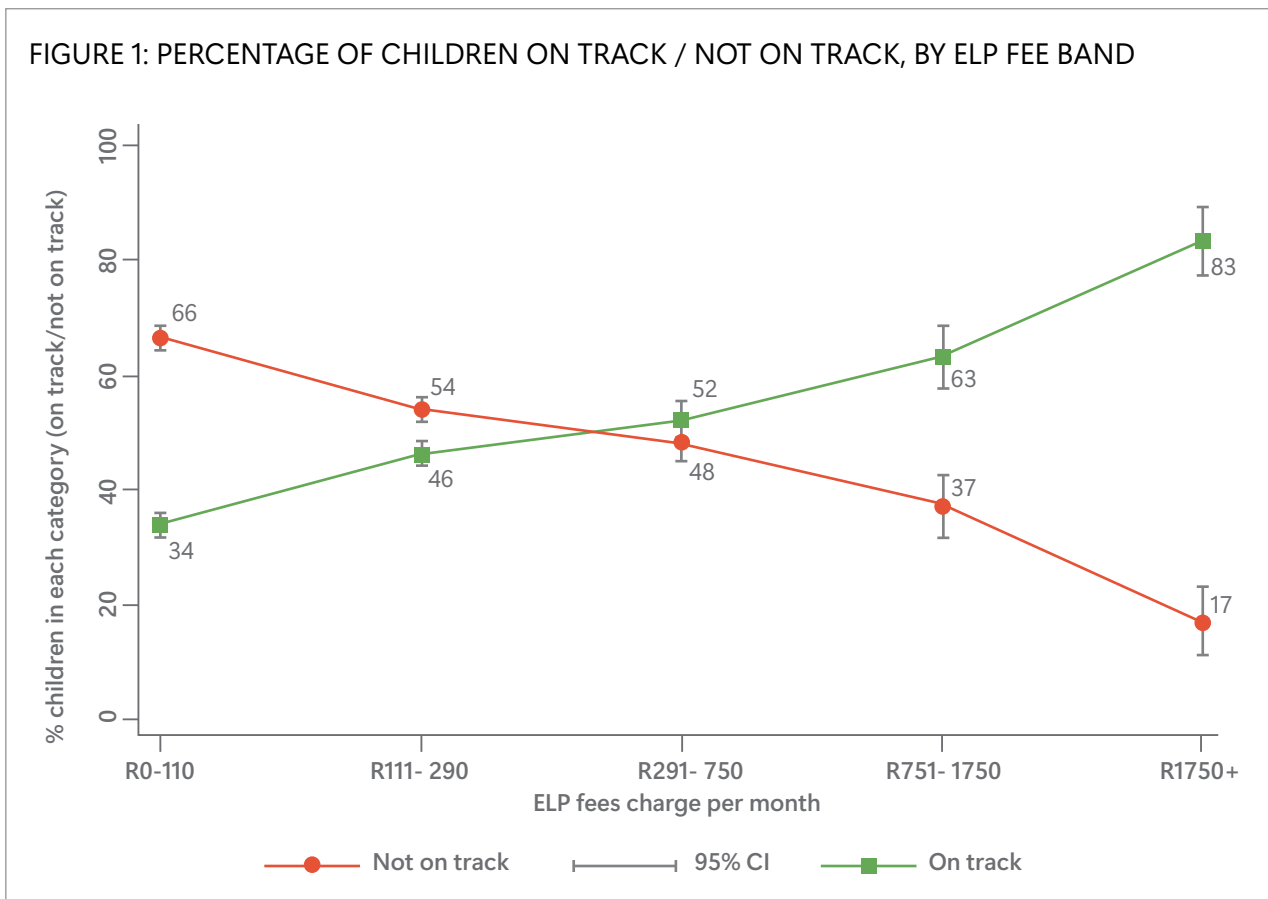
The implications of this are significant. Cognition and Executive Functioning is integral to facilitating learning in children and has been shown to be more important for school readiness than IQ. Additionally, these skills in the pre-primary years are predictive of adult well-being - influencing factors such as career success, physical health, and even social life.^[3-10]

1. The cut-off points for On Track, Falling Behind, and Falling Far Behind on the ELOM 4&5 assessment tool were set empirically and in consultation with key stakeholders (in 2016). Details on cutoff scores can be found in the [ELOM technical manual](#).

2. The Thrive by Five Index 2021 baseline is the first nationally representative survey that will monitor trends over time in the proportion of 4- to 5-year-old children attending ELPs who are On Track for their age in key areas of development.

3. CEF refers to a specific set of mental skills that enable us to pay attention, plan, think creatively, problem solve, and use self-control.

FIGURE 1: PERCENTAGE OF CHILDREN ON TRACK / NOT ON TRACK, BY ELP FEE BAND



SOURCE: [DATADRIVE2030, 2022](#)

AN ASSET BASED APPROACH TO FINDING SOLUTIONS

While eliminating child poverty must remain a national priority, we can simultaneously find ways to level the playing field for young children at the point of entry into school. The current analyses aimed to address this by identifying factors associated with young children who thrive in terms of learning outcomes, despite lower socioeconomic circumstances. We call these children “positive deviants”. Our aim is to leverage these factors in the design of scalable interventions that help close the gap in outcomes across the socioeconomic spectrum.

Positive deviance (PD) is based on the premise that in every community or organisation, a few individuals or groups develop niche practices or behaviours resulting in improved outcomes or solutions to problems relative to their peers, who may face the same challenges and barriers.^[11]

In order to understand the approach better, we explored the existing literature on PD. There were several methodological papers that described an overview of the PD approach, with a focus on

systematic evidence on malnutrition,^[12,13] and a systematic literature review focusing on the role of big data suited to developing country contexts.^[14] In terms of individual studies, the majority of the existing PD literature focuses on maternal and child health^[12,13,15–22] with specific attention on nutrition,^[12,13,15,17–23] and some on middle-late childhood.^[24–26] Only one study focused on PD in an early childhood education setting.^[27]

Positive deviant definitions varied from binary indicators for a particular PD behaviour,^[15,17] characteristic,^[18,20,22,23] residual cut-off (better performance than predicted using multivariate regression)^[16], doing well based on longitudinal profile,^[24,26] or scoring above the 70th percentile^[25] or 90th percentile.^[27] Their methods included both purely qualitative or quantitative approaches as well as mixed methods. Some designs incorporated a Realist Evaluation,^[16] Social-Relational Theory,^[25] longitudinal data for comparative purposes^[17,24] or the inclusion of negative deviants for comparative purposes.^[22] Results from these studies included characteristics of PD^[15] and novel unexpected

mechanisms or findings contrary to the literature.^[16,18,19] From a methodological perspective, purely quantitative studies mentioned the limitation of relying solely on quantitative data and emphasised the importance of including qualitative work^[15,17,18,21] and observational research.^[19] This is because quantitative variables may be unable to adequately explain the mechanisms behind the effect.^[16] Studies also highlighted the importance of context and culture^[24] and the importance of incorporating the community when selecting PD characteristics or using the perceptions of participants to define their outcomes.^[19,28] ^[26] Further limitations included the generalisability and scalability of findings,^[14,18,28] challenges with time and cost burdens, the rarity (~11%) of PDs which limits sample size,^[19] the cross-

sectional nature which prevents an analysis of the dynamics of deviance (i.e. changing contextual conditions), false positives, the risk of Hawthorne effects, and the difficulty of establishing causal relationships.^[14] The use of big data, however, may overcome some of these limitations, by reducing the time and cost and minimising Hawthorne effects.^[14]

In our case, we aim to identify factors/behaviours associated with children in lower socioeconomic facilities who outperform their peers across various outcomes such as the total ELOM score or individual domain scores. Our approach closely follows the framework developed by the Data Powered Positive Deviance (DPPD)⁴ Initiative which comprises 5 stages:

BOX 1: SUMMARY OF STAGES OUTLINED IN THE DATA POWERED POSITIVE DEVIANCE INITIATIVE FRAMEWORK

- 1** **STAGE 1:** Discuss the reason why a PD approach is used (the problem-method fit)
- 2** **STAGE 2:** Define and determine positive deviants
- 3** **STAGE 3:** Uncover the underlying factors associated with positive deviants using both qualitative and quantitative approaches
- 4** **STAGE 4:** Use these findings to design and pilot scalable intervention(s)
- 5** **STAGE 5:** Monitor and evaluate the effectiveness and suitability of the intervention

In this report, we document the suitability of the PD approach and the processes undertaken in the first three stages (quantitative data analysis).

This quantitative piece informed the qualitative work in the next phase (separate report). The fourth and fifth components will be developed in future work.

4. For more information, please see: <https://www.datapoweredpd.org>

ASSESSING THE SUITABILITY OF THE APPROACH

We assess the suitability of the PD approach by looking at the nature of the problem and the likelihood that positive deviants exist.

● THE NATURE OF THE PROBLEM: TARGETING BEHAVIOURAL PRACTICES

There is some literature showing that solutions such as the provision of materials in the early foundation phase are not always effective even though teachers in low-resource contexts may place a high value on materials such as books as pedagogical tools.^[29] Older studies have found positive associations between materials and outcomes in developing countries but use methods that are unable to isolate causal effects. Other evidence shows that the addition of materials only is not enough to improve performance, and may have adverse effects by only catering to the highest-achieving students, or may not be well-designed to cater to the context

(i.e. language) or level of the child.^[30] Typically, the most effective rigorously evaluated interventions point to using a combination of materials and coaching that target *practitioner practices*.^[31] In our intervention, we aim to target the behavioural practices of practitioners, caregivers, or other individuals surrounding a child, to positively impact their learning outcomes. In this report, we document all factors that appear to be associated with PD in young children enrolled in ELPs but will give particular focus to behaviour-related factors that will be explored in the follow-up qualitative work.

● THE LIKELIHOOD OF POSITIVE DEVIANTS: VARIATION IN OUTCOMES

Figure 2 shows the distribution of total ELOM scores for preschool children in the Thrive by Five Index across five ELP fee bands. The ELP fee bands were developed in order to act as a proxy for the socioeconomic status of a child and use the monthly fee charged by the programme.⁵ The figure clearly illustrates how socioeconomic status relates to children's learning outcomes. In addition, the data also highlight considerable variation in performance between individuals within the same income group.

The yellow boxes contain the middle 50 percent of scores (interquartile range). Half of the learners in programmes charging less than R110 per month scored between 35 and 48 (out of a possible 100 points) in their ELOM assessments (see the first yellow box) compared with 50 percent of those in programmes costing over R1,751 who scored between 50 and 68 points. The whiskers (outer lines) provide a sense of the total variation in scores. Learners below the red dashed line were Falling Far Behind the expected standard in their early learning, those between the red and green lines were Falling Behind and those above the green line were On Track .

The white dashed area illustrates the positive outliers - children who had exceptionally high ELOM scores relative to their peers. By investigating variation in performance *within* income groups, we can gain insights into the kinds of behaviours or factors associated with children who outperform their peers. This can inform interventions to close the gap between groups, and ultimately, shift the performance bell curve overall.

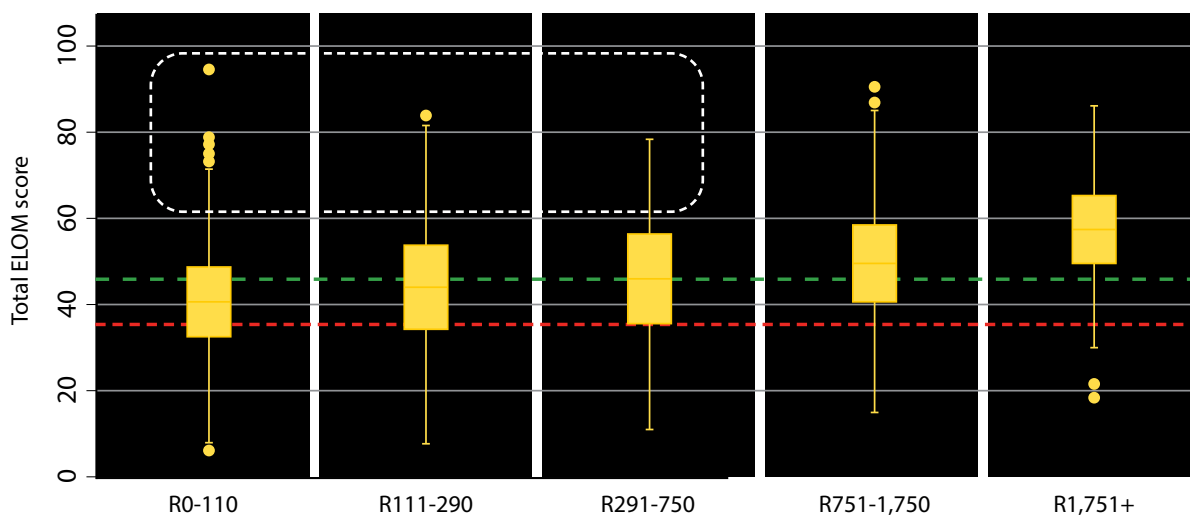
We constrain our analysis to children in programmes charging less than or equal to R750 per month, because these children constitute the majority of the population,⁶ have higher variation in outcomes, and a higher likelihood of PD.

The variation in outcomes within the white dotted box in Figure 2 shows that in our setting, positive deviants are likely to exist. Identifying and scaling their practices could have a significant impact on the disparity in early learning outcomes.

5. For more information on the development of the fee bands, please see [here](#)

6. Of all children enrolled in ELPs in South Africa, over 80% are attending ELPs that charge less than R750 per month. This is according to the South African Department of Basic Education's Early Childhood Development Census 2021.

FIGURE 2: VARIATION IN TOTAL ELOM SCORES BY ELP FEE BAND



Notes: The red dashed line indicates the cut off between those Falling Far Behind and those Falling Behind. The green dashed line indicates the cut off between those that are Falling Behind and those On Track.

SOURCE: [DATADRIVE2030, 2022](#)

DATA AND TOOLS

DATA

The data come from programmes and research studies in South Africa that used the ELOM tools between 2016 and 2022. These data were collated to create a combined dataset that includes 12,719

preschool children aged 50-69 months, across South Africa. We discuss the data sources and assessment tools below.

● CHILD OUTCOME DATA

The child outcome data was collected using the Early Learning Outcomes Measure 4&5 years tool (ELOM 4&5) which comprises five domains, each scored out of 20, summing to a Total ELOM score out of 100. The domains are Gross Motor Development (GMD), Fine Motor Coordination and Visual Motor Integration

(FMC-VMI), Emergent Numeracy and Mathematics (ENM), Cognition and Executive Functioning (CEF), and Emergent Literacy and Language (ELL). For data to be included in the combined dataset, children had to have a complete and valid ELOM 4&5 child outcomes assessment (further described below).⁷

● CONTEXTUAL DATA

In order to help put the outcomes data into perspective, we use contextual data from an amalgamation of studies. However, since data from various studies were collated post hoc, not all

studies and programmes collected the same data using the same tools consistently.⁸ For example, out of the total sample of 12,719 children, 1,948 children do not have height data. This is a combination of

7. ELOM assessments are considered valid when the child is within the 50-69 month age criteria, the child completes the full assessment (the assessment is not exited prematurely), is assessed in their home language, does not score zero on two or more domains and the child does not fail the World Health Organization embedded screening questionnaire (for more information, see the [ELOM 2020 technical manual](#)).

8. It is for this reason that there are large patterns of “missingness” within the data, indicating different uses of various tools and measurements across subgroups.

certain programmes and studies that did not intend to measure child height at all, as well as missing data when programmes do aim to collect information on the variable but the data is missing for unknown reasons. In order to counter this, a “dataset” variable is included in the combined dataset that allows the user to identify subsets of the data. Various

additional tools and measurements were also used in different studies and programmes, including for example the ELOM Learning Programme Quality Assessment tool and Department of Basic Education (DBE) questionnaires used in the [DBE's Baseline Assessment 2022](#). Under each data source, we clarify the sets of tools and measurements used.

● BEHAVIOURAL DATA

In order to understand the link between the contextual and outcome data, behavioural data were collected in the qualitative study. These data help us to better understand why certain children, facilities, or wards are outperforming their peers.

A focus on the behavioural practices of positive deviants is essential to the PD approach – as this is where the identification and deeper understanding of the unique practices and behaviours of positive deviants are surfaced.

Tools

The data used in the PD analyses comes from various data collection efforts that have used the ELOM tools. The ELOM tools included in the data are

- The ELOM 4&5 Years Assessment tool,
- The Socio-Emotional Functioning Rating Scales,
- The Home Learning Environment tool, and
- The Learning Programme Quality Assessment tool.

Additional non-ELOM tools were included in the DBE 2021 Baseline Audit, which is described in its respective data source section

● **The ELOM 4&5 Years Assessment (ELOM 4&5)** tool measures whether preschool children are On Track for their age in key areas of development. It is a standardised tool that measures performance across five key developmental domains for children aged 50 to 59 months and 60 to 69 months. The scoring assesses a child in 23 items, across five domains: gross motor development, fine motor coordination and visual motor integration, emergent numeracy and mathematics, cognition and executive functioning, and emergent literacy and language. These five domains form part of the

direct assessment. The [Technical Manual](#) outlines the rigorous process followed in the development of the ELOM 4&5 tool and describes further psychometrics undertaken since the release of the tool. The tool provides a reliable and fair assessment of children regardless of their socioeconomic and ethnolinguistic backgrounds. Content, construct, age, and concurrent validity (with the WPPSI-IV - Wechsler Preschool & Primary Scale of Intelligence), as well as test-retest reliability, have been established.^[32]

● **The Socio-Emotional Functioning (SEF) Rating Scales** is used in conjunction with the ELOM 4&5 tool. Socio-emotional functioning has been found to be a strong predictor of school performance. This tool is designed to be administered by someone who is familiar with the child, such as a teacher. The SEF Rating Scale have 13 items, across three key areas:

social relations with peers and adults (i.e. the ability to cooperate without prompting and work with peers in group activities), emotional readiness for school (i.e. the ability to express needs and feelings; willingness to do things without help; ability to adjust to new routines; and initiating activities) and self-care (independent toilet use).

● **THE ELOM Home Learning Environment (HLE)**

tool is a short questionnaire designed to measure home aspects associated with early language, numeracy, and cognitive functioning for children aged 2-7 years old. During a 15-minute interview, the primary caregiver is asked questions about themselves and their children. The ELOM HLE Tool assesses the following: early learning resources

in the home (the availability of books or objects used for play), early learning activities (activities conducted with the child at home, including reading, telling stories, singing songs, going out together, playing, naming things, counting, drawing, and painting), and caregiver time with the child (the amount of time a caregiver has spent with the child in the week and during the weekend).

● **THE ELOM Learning Programme Quality Assessment (LPQA)**

tool has been designed to measure the quality of group learning programmes targeting children aged 3-5 years old. Assessors spend 2 hours observing the programme, and score their observations on a three-point scale (inadequate, basic, and good) across five areas: the learning environment (learning materials and

classroom set-up), learning and teaching (session planning and progress monitoring), relationships and interactions (practitioner interactions with children, child interactions, and discipline), curriculum (curriculum content, alignment with the DBE's South African National Curriculum Framework for Children from Birth to 4 and activity plans) and teaching strategies (teaching techniques and actions).

Data Sources

The most prominent source of data include those collected at the end of 2021 for the Thrive by Five Index – a nationally representative survey of preschool children in South Africa.⁹ The data also include open-access data such as the Grade R ELOM Data (2019),¹⁰ the Early Learning Programme Outcomes Study (2018),¹¹ and the ELOM Age Validation study (2016).¹² Additionally, the Grade R

Roots and Shoots^[33] project data is included. The remainder of the data come from various other programme studies and research conducted between 2020 and 2022. This includes the collation of small and medium datasets from anonymised programmes (ranging from 30 to about 600 observations each).

We briefly discuss each of the larger datasets in turn:

● **THE THRIVE BY FIVE INDEX (2021)**

The Index includes child outcomes data on 5,222 children sampled from 1,247 ELPs¹³ nationally. Data were collected between September - November 2021 across a nationally representative sample of preschool children aged 50-59 months (95% confidence interval). In the absence of a complete sampling frame for either children or ELPs, it was decided to cluster ELPs via primary schools for random sampling. In each province, 48 schools

(432 nationwide) were randomly selected to be used as clusters. As many ELPs as possible were then identified within a 5-10km radius around each school, or, the ward in cases where there were too few ELPs. Additionally, the school sample in each province was stratified by socioeconomic quintiles (1 to 5). Child assessments (ELOM 4&5, ELOM SEF Rating Scale, and height for age) were conducted with an average of 4 children at each of 3 randomly selected ELPs per cluster.

9. Please see [here](#) for a link to the data.

10. Please see [here](#) for a link to the data.

11. Please see [here](#) for a link to the data.

12. Please see [here](#) for a link to the data.

13. ECD sites include preschools, Grade R, playgroups, creches, day mother programmes and toy library groups.

● **ECD BASELINE AUDIT (2021)**

Within each cluster of 3 ELPs, 1 ELP was randomly selected to "audit". This involved interviews with the principal and a practitioner (the practitioner working with the 4-year-old children), an assessment of the overall environment and infrastructure plus a 2-hour observation of the quality of the early learning programme using the ELOM LPQA tool. This data is referred to as the ECD Baseline Audit. The Index and Baseline data are combined in the final publicly-available version of the dataset.¹⁴ All data in the audit were collected at the facility level and merged into the child-level Thrive by Five Index data.

Description of non-ELOM tools

Questionnaire for Principals:

Interviews were conducted with the ELP principals and included questions on ELP registration, staff

and volunteers, how the facility was funded, what services the facility offered, and what its operating hours were. There were also questions on the COVID-19 pandemic incorporated into the assessments, as they were run during this time.

Questionnaire for Practitioners:

This section of the assessment incorporated questions on practitioners' qualifications, teaching methods, demographics, and attitudes toward children learning through play.

Facility Observation Questionnaire:

Environment observations documented the facility's infrastructure, outdoor space/play area, teaching materials, and indoor toys. It included questions on subjects like the quality of the materials and toys, the safety of the spaces, and potential hazards.

● **GRADE R ELOM DATA (2019)**

Grade R children (N=1,678) across four provinces (Western Cape, KwaZulu-Natal, Eastern Cape, and North West) were assessed using the ELOM 4&5 tool and SEF Rating Scales.

For this study, a sentinel approach to sampling was used. Two education districts were selected in each of the four participating provinces. These districts cover a range of school quintiles.

Schools were stratified by district and quintile groups and ordered randomly. The first three or four schools in each randomly-ordered district-quintile

stratum list were included in the sample. Learners were sampled on the day of the actual school visit, stratified by gender, with a target of 25 children in each school.

Ideally, data should have been collected in January/February 2019, at the start of the Grade R year and before children are exposed to the Grade R curriculum. However, the final sign-off from the sponsor was only obtained at the end of February 2019. This delayed the start of the data collection process and children who participated in this study had already been exposed to one full term of Grade R. This is likely to have influenced child outcomes.

14. Please see [here](#) for a link to the data.

● THE EARLY LEARNING PROGRAMME OUTCOMES STUDY (2018)

This study includes data on the relative effectiveness of five different early learning programmes that aim to improve learning outcomes of 3-5-year-olds from low-income backgrounds in South Africa. Clusters of sites offered by each programme and within a radius of 60 km from a central point (town or village) were identified, and sites within each cluster were then randomly selected. Age-eligible children were randomly selected within each site, where sites had too few children within the eligible age to randomise, all were enrolled to reach sample targets. The sample was therefore generated through both elements of randomization and convenience sampling. It was not possible to randomly assign children to the different study arms as each programme operated in a different province. Eighty-six percent of caregivers were in receipt of South Africa's Child Support Grant for parents with incomes below the means-tested threshold.

Two centre-development models (each offering 5 sessions per week) were compared with a mobile playgroup model (1 session per week) and a site-based playgroup model (2-3 sessions per week), using a pre-post quasi-experimental design. A third playgroup model was included in descriptive analyses only. Pre-test (pre-programme) assessments were conducted in March 2018 and post-test assessments were conducted in October-November 2018. The final number of children included in the combined dataset was 420 at baseline and 322 children at end-line.

Children were assessed using the ELOM 4&5 tool and the SEF Rating Scales. Early childhood development practitioners were interviewed to gather data about the programme that may affect children's early learning outcomes (i.e. work experience, support, and supervision received). Interviews were also conducted with a subset of children's parents and other caregivers at the end-line, using the ELOM HLE tool.

● ELOM AGE VALIDATION (2016)

The age validation study was conducted as part of the ELOM 4&5 tool development process. The ELOM 4&5 Assessment tool was administered to 1,329 children enrolled in public schools at the commencement of their Grade R year. Data were also collected on children's home language, height

for age and socio-emotional functioning.

The sample was drawn from five income quintiles across three provinces (Kwa-Zulu Natal, North West, and Western Cape). Additional data collected includes information about the school setting (urban/rural) and school quintile.

● ROOTS AND SHOOTS BASELINE

The Roots and Shoots study sample consisted of both Afrikaans and IsiXhosa schools in the Western Cape province.

The Afrikaans sample was part of an existing Funda Wandu/Western Cape Education Department Randomised Control Trial targeted at Foundation phase learners. The intervention has 50 Afrikaans schools in the treatment group and 50 matched, comparison schools. Within each educational district, statistical techniques were used to select the comparison schools such that they matched the treatment schools as closely as possible on performance on Grade 3 systemic assessments from 2017 to 2019.

Grade R learners were assessed in Term 1 of 2022 across 50 Afrikaans schools (half of the schools in the evaluation study). These schools are all located in the four Metro and Cape Winelands educational districts. In total, 587 children were assessed.

The isiXhosa sample was taken from 25 isiXhosa schools in the Western Cape. Schools were stratified in terms of their average Grade 3 Systemic Evaluation performance between 2017 to 2019 and then within each stratum, five schools were randomly selected. The final isiXhosa sample consisted of 199 Grade R children.

● ANONYMISED DATASETS FROM DATADRIVE2030'S DATABASE

The combined dataset also includes anonymised data from smaller studies and programmes. The total number of observations included here is 3,483 children from 26 studies.

Additionally, within this data, the geo-locations for 2,991 children across 316 facilities were captured.

Data from the 2021 ECD Census were merged for 2,150 of these children, enabling an analysis of facility-level factors such as environmental observations and practitioner interviews. The 2021 ECD Census used similar tools to the 2021 Baseline Audit, with the exception of the Learning Programme Quality Assessment.

The final dataset

The final merged dataset consisted of 12,719 children across 1,974 facilities (ELPs or Grade R classrooms). Table 1 below provides a summary of the data included in the combined dataset. The first column indicates the data source and the remainder of the

columns show the different types of tools or data collected and the number of children we have data for across these sets of variables. An “–” indicates where the data were not intended to be collected at all.

TABLE 1: SUMMARY OF DATA INCLUDED IN THE COMBINED DATASET

Source	Type of data collected by the number of children							
	Number of children assessed	Fee level	Social-emotional functioning	Learning Programme Quality	Home Learning Environment	Height for Age	Practitioner or principal interview	Environment Observation
Thrive by Five Index (2021)	5,222	5,009	4,849	2,332	–	5,215	4,992	5,047
Grade R ELOM Data (2019)	1,678	–	1,678	–	–	1,678	–	–
ELPO (2018)	420	193	352	–	294	408	403	–
ELOM Age Validation (2016)	1,329	–	–	–	–	1,329	–	–
Roots & Shoots (2022)	587	587	586	–	–	587	587	587
Other studies (2020-2022)	3,483	2,228	809	–	–	1,548	2,228	2,228
TOTAL	12,719	8,017	8,274	2,332	294	10,765	8,210	7,862

Notes: Practitioner or principal interview data varies across the datasets. Environmental observations largely relate to access to facilities at the programme (i.e. running water, electricity).

Descriptive characteristics of the combined dataset included in analyses

An important foundation of the PD analyses includes limiting the sample to children at facilities that charge R750 per month or less. Data on fee information was available for 8,017 of the 12,719 children. Where fee information was not available, the quintile of the nearest school was assigned as a “proxy” variable for socioeconomic status. All public schools in South Africa are assigned a quintile by the DBE. This ranking is based on the relative poverty levels of the community living within 3km of the school, with quintile 1 (Q1) being the poorest and quintile 5 (Q5) the wealthiest. Assignments are based on the income, education level, and employment status of households in the school catchment area.

After limiting the sample to the first three socioeconomic status (SES) proxies (i.e. fee levels 1 to 3 and quintiles 1 to 3), the final sample consisted of 10,936 children. These children comprised 86% of the total sample. The analytic sample distribution was 36%, 33%, and 31% in SES proxies 1-3, respectively. One major limitation of using both ELP fee levels and quintiles as income proxies is that the two measures are not equivalent. A sensitivity analysis shows that children in the lowest two fee bands are statistically different from children who are in the first two DBE quintiles. Children who

we use the DBE quintiles for tend to be older and perform slightly better (age and exposure to Grade R could be a confounding factor to this). Children in the third DBE quintile and third SES fee band are not statistically different (age, gender, scores, SEF).

Table 2 below displays average child demographics. Approximately half of the sample is female (51%) and the mean age of children is 58 months. The vast majority of children’s caregivers received the Child Support Grant (90%), where this information was available (7,036 children). Less than half (43%) of children were On Track for their early learning development according to their total ELOM score. Children are most likely to be On Track for ELL (51%) out of all the domains, and least likely to be On Track for FMC-VMI (33%) and ENM (35%). At the end of the ELOM assessment, assessors are asked to rate the child according to their concentration, interest, and diligence throughout the assessment (approaches to learning). Each question is rated on a scale from 0-3 where 0 is never, and 3 is always. The total maximum observation score is 12. On average, children score 7.11 points. Finally, 93% of the sample have a normal height for their age according to the 2007 WHO Growth Standards.

TABLE 2: DEMOGRAPHIC CHARACTERISTICS OF CHILDREN INCLUDED IN ANALYSES (SES PROXY BANDS 1-3)

	N (% or SD)
Child sex: Female	5,623 (51%)
Child mean age in months	57.91 (5.26)
Child's primary caretaker receives the Child Support Grant (N=7036)	6,330 (90%)
Percentage On Track for Domain 1: Gross Motor Development	47%
Percentage On Track for Domain 2: Fine Motor Coordination and Visual Motor Integration	33%
Percentage On Track for Domain 3: Emergent Numeracy and Mathematics*	35%
Percentage On Track for Domain 4: Cognition and Executive Function	40%
Percentage On Track for Domain 5: Emergent Literacy and Language	51%
Percentage On Track for Total ELOM	43%
Average score for whether the child paid attention to instructions and demonstrations (score out of 3)	1.93 (0.88)
Average score for whether the child concentrated (score out of 3)	1.79 (0.89)
Average score for whether the child is careful and diligent (score out of 3)	1.67 (0.92)

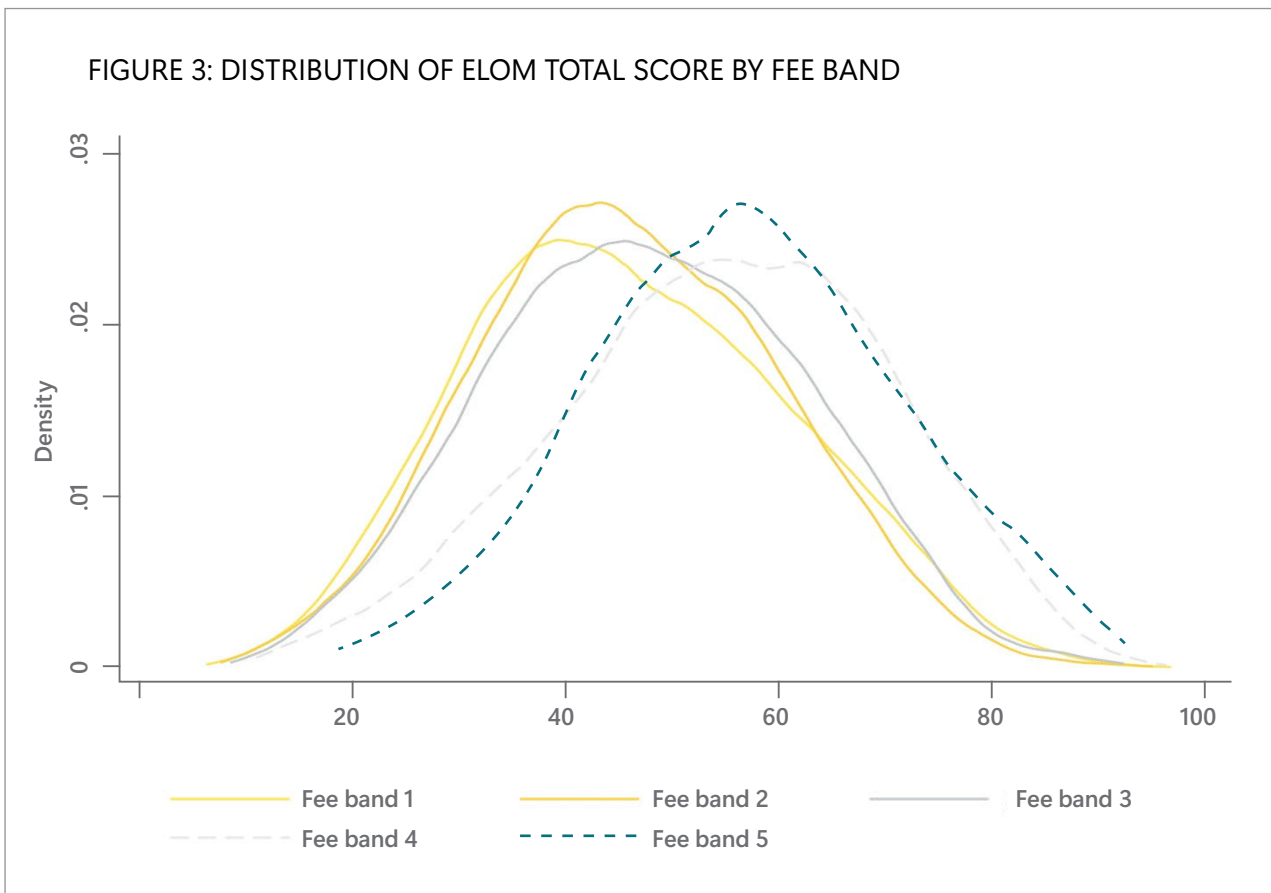
Average score for whether the child is interested and curious (score out of 3)	1.72 (0.95)
Average assessor total score from observing the child during assessments (score out of 12 possible points)	7.11 (3.27)
Stunted indicator (N=9,191)	
Normal growth	8,529 (93%)
Moderately Stunted growth	555 (6%)
Severely stunted growth	107 (1%)
Total observations	10,936

*An error in the coding of one item in domain 3 was uncovered in the data collected post 2020. This error was noted after the PD analysis had already been completed and therefore this report does not account for this error. The actual % children on track for ENM is therefore likely to be slightly higher ($\pm 10\%$) than the 35% presented here. [The Addendum](#) in the Thrive by Five report (page 42) explains the error in more detail.

SOCIOECONOMIC STATUS PROXY DESCRIPTION OF DISTRIBUTION

Figure 3 below shows the distribution of ELOM scores by SES proxy, which further motivates for the focus of the study to be first three bands. We include the fourth and fifth bands for comparative purposes. While the first three bands sit on the left

hand side of the fourth and fifth, there is variation along the distribution with some children performing exceptionally well. We see that the distribution of the first three bands is similar, with the third slightly to the right.

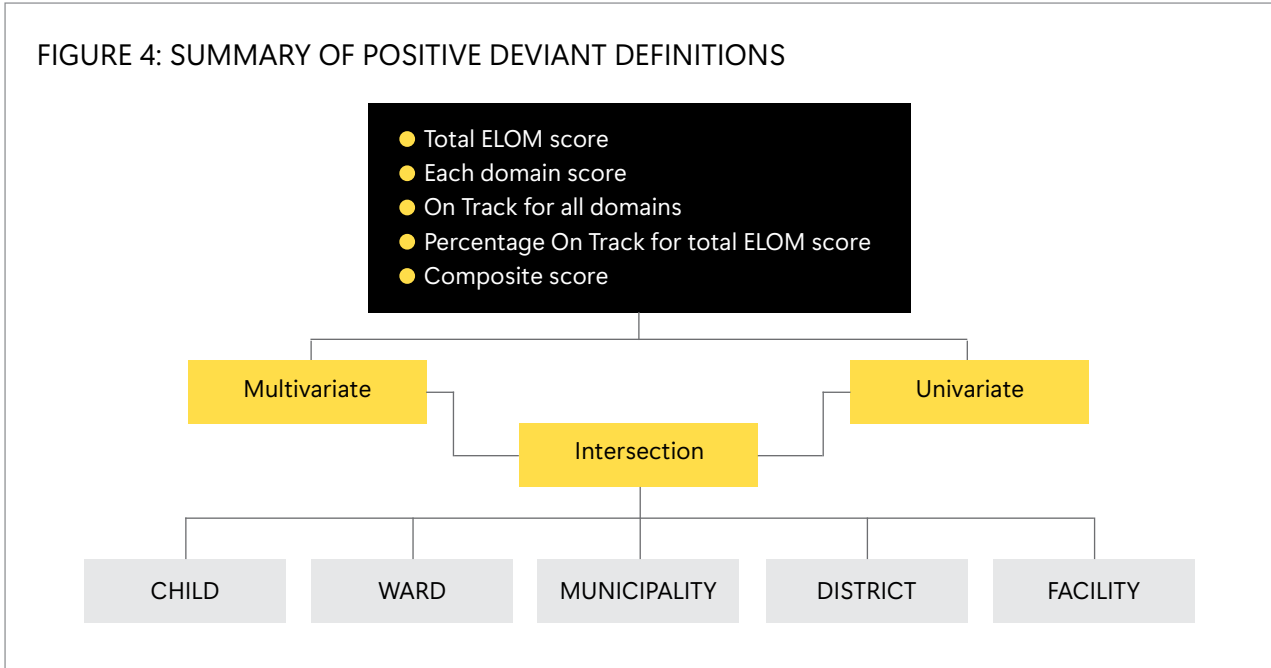


DEFINING POSITIVE DEVIANTS

We employed multiple units of analysis in determining our definitions. Our units of analysis (which refer to the level at which we expect to find positive deviants) include the child, facility, ward,

municipal and district levels. Positive deviants were defined in relation to the full sample (SES fee bands 1-5) but analyses were conducted on a restricted sample that dropped the 4th and 5th SES fee bands.

FIGURE 4: SUMMARY OF POSITIVE DEVIANT DEFINITIONS



Positive deviant definitions are shown in Table 3. Outcome variables included the total ELOM score,¹⁵ each ELOM domain, a composite score, whether a child is On Track for all domains, and the percentage of children assessed who are On Track in the total ELOM score (cluster level). A limitation of these definitions, however, is that positive deviants were not limited to organisations/study data that embedded random sampling into the children assessed.

- **Univariate deviants** were defined as 2 standard deviations (SDs) above the standardised mean where normally distributed and above the 90th percentile where distributions were skewed. All univariate scores were standardised by age group (50-59 months or 60-69 months) and SES. Where fee

information was not available, the quintile of the nearest primary or combined school was used as a proxy of SES.

- **Multivariate deviants** were defined as those with standardised residuals above the expected score by 2 SDs. The regression controlled for age in months, gender, SES fixed effects, year fixed effects, the use of the quintile indicator to proxy for SES, provincial fixed effects, and used robust standard errors clustered at the facility level (stage 1).

Lastly, deviants that intersected in both the univariate and multivariate levels were considered. In consultation with the DPPD network, it was determined that this would be the most appropriate variable to use.

15. The composite score was calculated using a Principal Components Analysis (PCA) on Fine Motor and Visual Motor Integration (Domain 2), Early Literacy (Domain 3), Cognitive Executive Functioning (Domain 4), and Early Numeracy (Domain 5). The first domain (Gross Motor Development) was excluded since the KMO factor test and explained variance was higher without it. This method reduces data to a single component. The first component explained 78% of the variation in scores.

TABLE 3: CRITERIA AND CUTOFFS FOR DEFINING POSITIVE DEVIANTS

			LEVEL		
			Child	Facility	Ward (municipality and district)
			Child level	Facilities where less than 3 children were assessed are excluded	Limited to observations that have information on the location (N=8,800)
Total ELOM score	The total ELOM score at each level (maximum possible score = 100)	Univariate	Scores standardised by age and SES, 2SDs > mean	Average cluster score standardised by age and SES, above the 90th percentile	Average cluster scores standardised by age and SES, above the 90th percentile
		Multivariate	Multiple regression models controlling for age, gender, SES fixed effects (FE), data year FE, use of quintile indicator to proxy for SES, provincial FE, robust SEs clustered at the facility level. Residuals greater than 2SDs above their expected value are taken as PDs.	Multiple regression model controlling for the percentage of children of a particular age, gender, SES, use of quintile indicator to proxy for SES, provincial FE, robust SEs clustered at the facility level. Residuals greater than 2SDs above their expected value are taken as PDs.	Multiple regression controlling for the proportion of children by gender, SES, age group, use of quintile, year, and provincial FE, clustered at the district level, robust SE. Residuals > 1.5SDs above their expected value are taken as PDs.
Domain scores	Each domain score out of 20	Univariate	Scores standardised by age and SES, above the 90th percentile (skewed distributions)	Average cluster score standardised by age and SES, above the 90th percentile	Average cluster scores standardised by age and SES, above the 90th percentile
		Multivariate	Multiple regression models controlling for age, gender, SES fixed effects (FE), data year FE, use of quintile indicator to proxy for SES, provincial FE, robust SEs clustered at the facility level. Residuals greater than 2SDs above their expected value are taken as PDs.	Multiple regression model controlling for a percentage of children of a particular age, gender, SES, use of quintile indicator to proxy for SES, provincial FE, robust SEs clustered at the facility level. Residuals greater than 2SDs above their expected value are taken as PDs.	Multiple regression controlling for the proportion of children by gender, SES, age group, use of quintile, year, and provincial FE, clustered at the district level, robust SE. Residuals > 1.5SDs above their expected value are taken as PDs.
On Track for all domains	Percentage On Track for all domains (cluster); On Track for all domains (child)	Univariate	Any child that is On Track for all domains	Percentage of children On Track for all domains, above the 90th percentile	Percentage of children On Track for all domains standardised by age and SES, above the 90th percentile
		Multivariate	Multiple regression model controlling for age, gender, SES fixed effects (FE), data year FE, use of quintile indicator to proxy for SES, provincial FE, robust SEs clustered at the facility level. Residuals greater than 2SDs above their expected value taken as PDs	Multiple regression model controlling for percentage of children of a particular age, gender, SES, use of quintile indicator to proxy for SES, provincial FE, robust SEs clustered at the facility level. Residuals greater than 2SDs above their expected value are taken as PDs	Multiple regression controlling for the proportion of children by gender, ses, age group, use of quintile, year and provincial FE, clustered at the district level, robust SE. Residuals > 1.5SDs above their expected value are taken as PDs.
Percentage On Track for total ELOM	Percentage On Track for total ELOM score (cluster); Omitted at the child level	Univariate	–	Percentage of children standardised by age and SES, above the 90th percentile	Percentage of children On Track for total ELOM, standardised by age and SES, above the 90th percentile
		Multivariate	–	Multiple regression model controlling for percentage of children of a particular age, gender, SES, use of quintile indicator to proxy for SES, provincial FE, robust SEs clustered at the facility level. Residuals greater than 2SDs above their expected value are taken as PDs	Multiple regression controlling for the proportion of children by gender, SES, age group, use of quintile, year and provincial FE, clustered at the district level, robust SE. Residuals > 1.5SDs above their expected value are taken as PDs.
Composite score	Weighted composite score	Univariate	Scores standardised by age and SES, 2SDs > mean	Average cluster score standardised by age and SES, above the 90th percentile	Average composite score standardised by age and SES, above the 90th percentile
		Multivariate	Multiple regression model controlling for age, gender, SES fixed effects (FE), data year FE, use of quintile indicator to proxy for SES, provincial FE, robust SEs clustered at the facility level. Residuals greater than 2SDs above their expected value taken as PDs.	Multiple regression model controlling for percentage of children of a particular age, gender, SES, use of quintile indicator to proxy for SES, provincial FE, robust SEs clustered at the facility level. Residuals greater than 2SDs above their expected value are taken as PDs	Multiple regression controlling for the proportion of children by gender, SES, age group, use of quintile, year and provincial FE, clustered at the district level, robust SE. Residuals > 1.5SDs above their expected value are taken as PDs.

IDENTIFICATION OF POSITIVE DEVIANTS

The table below gives the number of children identified as positive deviants at each cluster and outcome, using the above definitions. Positive deviants ranged between 81 and 760 children in

their respective definitions, the number of PD facilities ranged from 29-85 and the number of PD wards ranged from 18-40.

TABLE 4: NUMBER OF POSITIVE DEVIANTS PER OUTCOME AND CLUSTER

	Number of PD Children	Number of PD facilities	Number of children attending PD facilities	Number of wards*	Number of children in PD wards
Total ELOM score	163	37	211	40	276
Domain 1	356	49	312	30	265
Domain 2	200	29	243	18	256
Domain 3	282	37	320	21	254
Domain 4	354	46	251	20	176
Domain 5	81	38	279	31	239
Children on track for all domains	760	85	420	37	294
High percentage children on track for total ELOM	–	35	166	35	208
High composite score (4 domains combined, excluding GMD)	208	29	154	22	192

*Limited to data with geolocations

METHODS

Having agreed on the definition of PDs and having quantified the data outliers for each of the predefined categories, independent researchers conducted further analysis in order to identify factors associated with PD children and facilities.

Our approach to analysing the PD data used innovative methods and included competitions,

interviews with key stakeholder groups, and multiple contracted research teams. We adopted this approach in order to encompass the interdisciplinary nature of factors affecting child development, use multiple statistical methods that may reduce the effect of biases embedded in different techniques, incorporate the voices of the many actors in child development and finally, to remain as open-ended as possible.

CONTRACTED TEAMS

Five teams were contracted to perform data analysis on the same dataset. Four teams had a specific research question and one team had an open-ended research question. All analysts were given the freedom to choose their own methodological techniques as well as definitions of PD from the

options provided. The contracted teams and their respective research questions are described below. Additionally, DataDrive2030 conducted its own analysis using all definitions, keeping the research question open-ended.

TABLE 5: TEAMS CONTRACTED TO CONDUCT ANALYSIS OF THE DATA

	Team	Individuals in team	Research Question
A	Wits University, South Africa*	Associate Professor, affiliated with the Wits Developmental Pathways to Health Research Unit	What characteristics (individual, environmental, programme, systemic, etc.) are associated with children from low socioeconomic circumstances who score exceptionally well (positive deviants) in the following domains: Gross Motor Development, Fine Motor Coordination and Visual Motor Integration, and Cognitive and Executive Functioning?
B	Stellenbosch University, South Africa*	Economics PhD student	Q1: What characteristics relating to health and nutrition are associated with stunted children (mild, moderate, and severe) who perform at par with their peers/ outperform their peers, across all domains? Q2: What factors are associated with exceptionally low rates of stunting e.g. the average stunting in the ELP is lower (-1SD or -2SD) than the ward or district average?
C	University of Cape Town, South Africa	Masters students, Psychology	What characteristics of ELPs or the home, or combinations thereof, are associated with children who outperform their peers, across all child outcomes?
D	Percept Management Consultants, South Africa	Co-founder, Actuarial Analyst; Anthropologist & Public Health Consultant	What ELP characteristics (including Programme Quality), and broader environmental factors are associated with positive deviants? Includes funding/facility access, administration (i.e. registration), grant support, and access to other support/services.
E	Harvard University, USA	Masters student, Public health	Open-ended (the team was given the freedom to explore the question as they wished)

+Descriptive analysis

*Due to the difference in scope of the research, DataDrive2030 sought to amend the analysis. The amended analyses are reported here. We provide the submitted report and the amended version in the supplementary material.

Expert reference group and peer review process

Mid-analyses, in September 2022, interim results from analysts were shared with an independent expert panel. Panellists shared invaluable insights about methodologies used and ways in which

analytic teams could enhance their analysis. Panellists are listed below, and a short bio of their expertise is provided.¹⁶

PANELLISTS:

● **Dr. Abbie Raikes** is an associate professor and founder of ECD Measure in the United States. Abbie is also a social impact leader, academic, and entrepreneur on a mission to address social inequities through innovative solutions and networks. Over the past 20+ years, she has led organisations, portfolios, and initiatives to improve education and early childhood across the globe.

● **Dr. Basma Albanna** is a lecturer at the Faculty of Computer and Information Sciences, at Ain Shams University. Her doctorate research explored the possibility of leveraging big data sources to identify positive deviants. She is a founding member and the methodological lead in the Data Powered Positive Deviance initiative that is aiming at applying and scaling this approach in different domains and countries.

● **Dr. Gabrielle Wills** is an education economist and researcher with RESEP, in the Department of Economics at Stellenbosch University, South Africa. She has extensive experience working on multiple projects including identifying outlier no-fee schools in South Africa whilst exploring factors associated with academic resilience in challenging contexts.

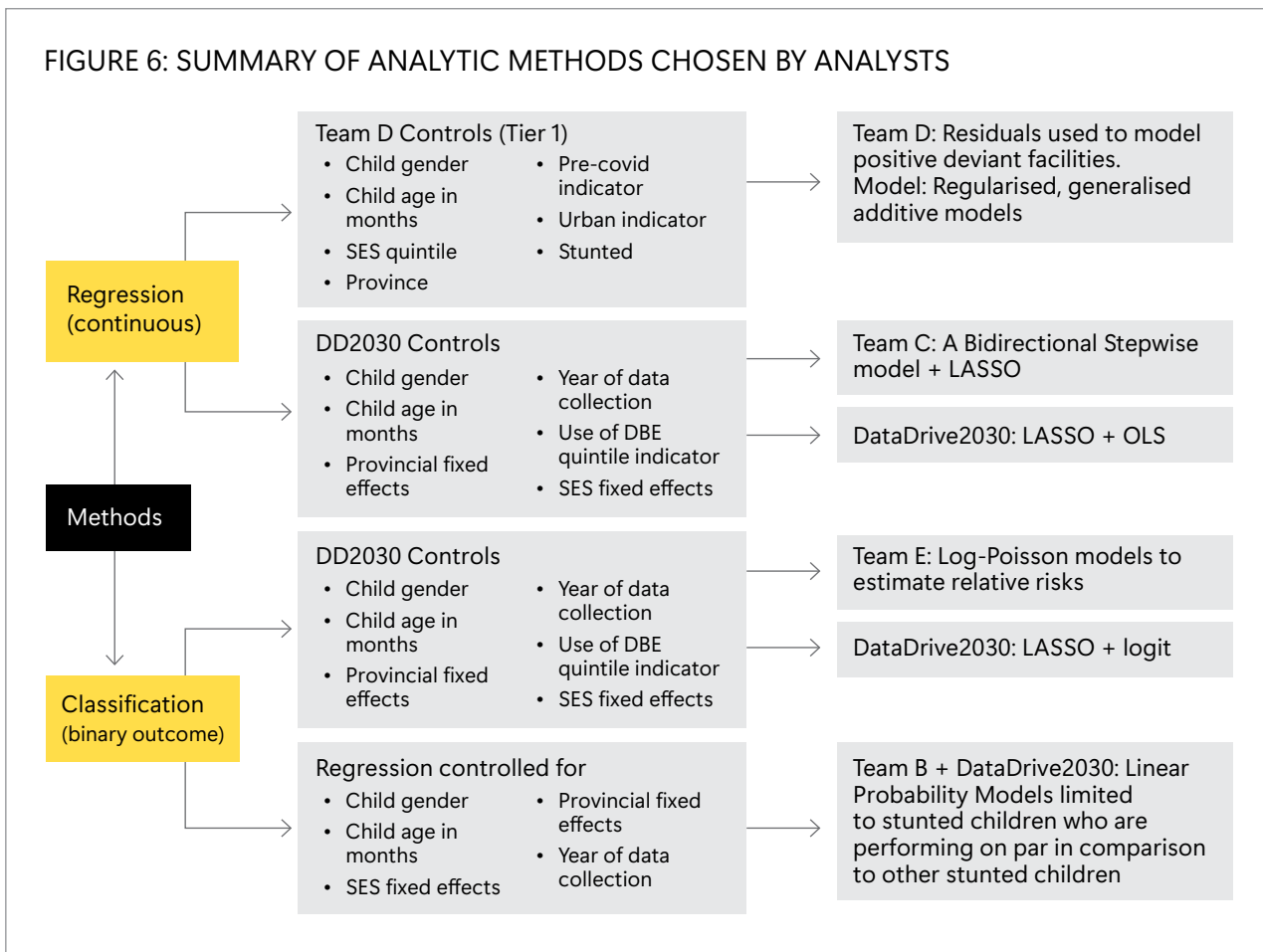
Analytic methods

Figure 6 below provides a brief overview of the methods taken by each team, excluding Team A who adopted a purely descriptive approach. All remaining teams with the exception of Team B used a two-stage approach that first modelled residuals based on a set of controls. The PD definition and controls differed only for Team D where stunting and an urban indicator was included. The reason for their exclusion in the other analyses was that the urban indicator was not well populated (missing for more than a third of cases) and whether a child is stunted could be both targeted in an intervention

and was an intended outcome in our initial research questions. Our aim was to include structural factors that cannot be changed. Another difference is that Team D modelled their first stage residuals on the constrained sample (SES 1-3) whereas other analyses modelled PDs on the full sample in order to identify positive deviants who are performing on par with their higher SES counterparts. Analysts then used these residuals in regression analysis or they were further truncated into a binary variable as described in Table 3.

16. Individuals with relevant expertise were also invited to review the final reports from the analysts. Dr. Gabrielle Wills reviewed reports for Teams B and D, and Dieter von Vintel (Stellenbosch University) reviewed reports for Team C.

FIGURE 6: SUMMARY OF ANALYTIC METHODS CHOSEN BY ANALYSTS



The most popular method used by analysts included a least absolute shrinkage and selection operator (LASSO). In light of the large number of variables included in the dataset, this method enables both variable selection and regularisation in order to enhance the prediction accuracy and interpretability of the model. In conjunction, analysts sometimes used stepwise regression or list deletion methods. Other methods included linear probability models, logistic regression, log-Poisson models, and Generalised Additive Models. More details on the method each contracted analyst used and their

limitations are provided in Table 6.

Most analysts used the total ELOM and domain PD definitions as outcomes at the child and facility levels. Only two teams (Team E and DataDrive2030) explored all definitions. Significance was defined at the 5% level, with the exception of Team D.¹⁷ Analyses were refined with input from both the external stakeholder group as well as the peer review process.

17. The team relied on the LASSO model structure (which forces coefficients without strong predictive power to zero) and model selection (the final model chosen is the one that minimises Root Mean Squared Error, which results in a handful of variables being dropped from the full list of candidates).

TABLE 6: DESCRIPTION OF METHODS AND LIMITATIONS OF EACH ANALYSIS

Team	Method	Limitations
A	Descriptive analyses of positive deviants	These are not drivers of PDs but rather a descriptive analysis and therefore not included in the main quantitative analyses.
B	Linear Probability Models, clustered at the facility level using robust standard errors. Controls include age, gender, provincial fixed effects, socioeconomic fixed effects data year fixed effects. The sample is limited to moderately or mildly stunted children. Additional analyses exploring the top 10 percent of children were conducted by DataDrive2030 and results are reported.	The sample is limited to stunted children, and therefore may not be representative of the broader ECD population. Definitions of PD are defined as children who are On Track for their development, this is by no means representative of children who excel. The regressions do not control for multiple variables but rather for each variable in addition to common controls.
C	<p>A Bidirectional Stepwise model combined with a LASSO. Ward was used as a clustering term to adjust for clustering at the facility level, and the facility was used to adjust for clustering at the child level. Statistical significance was determined based on a p-value <0.05. Outcomes used were multivariate residuals in a continuous outcome.</p> <p>Analyses for the HLE tool and practitioner interviews were not included here due to a small sample size by construction of the analysts' chosen model.</p>	The analysis is limited to practitioner interviews and facility observation subsets of data. Predictors were determined by looking at each subset of data in isolation. Models using a combination of variables from both datasets may influence these outcomes. The model did not zero out negative residuals, so includes "negative deviants".
D	Generalised Additive Models using a 2-tiered approach. The second tier model used residuals from the first tier described above. Tier 2 residuals from the total ELOM score and domain 4 score (at the child level) were then used to identify positive deviant facilities and wards. Positive deviants are identified using a binomial model to model the number of top-quartile performers in a facility or ward.	Positive deviants were identified in relation to the lower three quintiles, and not across the spectrum for children who perform on par with fee quintiles 4 and 5. Tier 2 models were restricted to Thrive by Five and R&S samples, although this does contribute to increasing the robustness of findings due to the random sampling of children. Finally, the inability of the model to produce standard errors does not provide us with a sense of statistically significant variables, although an arbitrary cutoff, precision cannot be precisely determined and therefore may include spurious results.
E	Log-Poisson models to estimate relative risks, caregiver education and the number of distinct individuals engaging in caregiving activities were included as controls. Estimates at the child and facility levels.	The HLE sample is small (N=282). The negative finding from sibling engagement is counterintuitive. However, we do not know the age of siblings, and the negative relationship between sibling engagement in stimulating activities and ELOM outcomes may be a result of the primary caregiver engaging in fewer activities.
DD2030	LASSO for variable selection on both binary outcomes (logit models) and standardised residuals (OLS) from the multivariate regressions described in the first stage above. Regressions used robust standard errors and were clustered at the facility level. Variables were split into a large sample and small sample variables (variables which had more and fewer data, the latter from the 2021 SAEIYI audit). Regressions were run separately in order to maintain the sample size. A sensitivity regression on all variables was run but resulted in a severe reduction in sample size.	The separation of variables into large and small samples limits our ability to analyse all variables simultaneously. The smaller sample primarily relates to variables collected in the audit (such as learning programme quality) which was mostly excluded from other analyses.

PARALLEL EFFORTS

Wild card competition

In parallel, we advertised a data analytic “Hackathon” competition through partners, including DataFirst at the University of Cape Town, the Department of Commerce at Wits University, ExploreAI, and various individuals with access to student networks.

Competition participants were assigned a PD definition and given the question: *What factors/variables or combinations thereof are associated with positive outliers: young children who thrive against the odds?*

Data were provided to all interested participants on the 18th of August 2022 and submissions were due on the 31st of August. Three prizes were awarded: First prize – R10,000, Second prize – R5,000, and Third prize – R4,000. The current report includes the results from the first-prize winners of the competition. ExploreAI was a key partner in conducting the competition and helped to facilitate communication between participants as well as a Q&A webinar on the 11th of August 2022.

In total, 74 individuals expressed interest with the intent to compete (58 from Explore and 16 from

other platforms such as DataFirst). The majority of these individuals (78 percent, 58 individuals), signed and returned the Data Sharing Agreement, which enabled them to receive the data (42 from Explore and 16 from other platforms). A third of the participants made submissions.¹⁸

Of the submissions, candidates explored a broad range of methodologies such as logit and LASSO regressions, descriptive analyses, and Boruta and Ranger algorithms. They were marked according to a pre-shared rubric that focused on the participant methods and results (i.e. the description and motivation of methods used and subsequent sensitivity analyses), discussion and conclusion (i.e. the implications and limitations of their results), innovative use of the data and the overall impression (i.e. flow, presentation, clarity of storyline). Competition submissions were then adjudicated by Jaco Van Rensburg, the Curriculum Director and Lead Scientist at ExploreAI; Sonja Giese, the Executive Director of DataDrive2030, and Junita Henry from DataDrive2030. We incorporate the findings from the winners into the findings section below.

Engagement with ECD practitioners

To enhance our understanding of everyday practices and to contextualise what was emerging through the quantitative analysis, the PD project included structured conversations with ECD practitioners at two time points in the process. We put out a call explaining our approach to organisations within our network and interested practitioners responded.

Our first round of conversations ran whilst teams were analysing the data (September 2022), and questions were mainly open-ended. The second round of conversations occurred after we had results from each analytic team (January 2023). The latter involved feeding back preliminary findings to ECD practitioners to gauge their perspectives.

Round 1: September 2022

We conducted interviews and focus groups with practitioners from 10 ECD sites across Mpumalanga (N=2), Limpopo (N=1), Western Cape (N=2), Gauteng (N=1) and Eastern Cape (N=4). Fees varied at these ELPs, but all ELPs charged below R750 per month. Preschools in the Eastern Cape were no-fee but received a subsidy and were in a rural setting. In four cases, one practitioner was interviewed and in the other cases, multiple practitioners were interviewed. Interviews lasted about 40 minutes on average. Participants’ facilities ranged from having 12 children in the 4-6 year old class to 55 children.

18. In order to inform our approach to future competitions, we surveyed participants who expressed interest and completed the form but did not submit a report. The majority of participants expressed time constraints (80%), and unfamiliarity with the subject matter, or a lack of confidence or expertise in dealing with a large dataset.

The main questions asked included introductory questions about the practitioner setting, experience, and the ELP environment. The remainder of the conversation centred around identifying exceptional child traits and characteristics/environmental factors. For example, we asked:

- Are there children in your class that stand out as being exceptional?
- What are the kinds of behaviours they exhibit?
- If you picture those children is there anything that you know about their circumstances that may contribute to them being exceptional?

Round 2: January 2023

Post quantitative analyses, in January 2023, we had a second discussion with 7 of the practitioners interviewed in September 2022. Practitioners came from six sites across Mpumalanga (2 practitioners from one site), Limpopo (2 practitioners from two different sites), Western Cape (2 practitioners from two different sites), and Gauteng (1 practitioner). All sites were in low-income areas and work in under-served communities.

The aim of these discussions was to sense-check key findings from the quantitative analysis. That is, questions were structured according to our findings presented in the results section below.

FINDINGS

In this section, we summarise the high-level findings from the quantitative results. We provide this descriptively due to the variable nature of the models and methods used across analyses, and the inability to directly compare coefficients across them. Our approach to collation was to first divide

analysis results by the analyst and outcome. We then ranked statistically significant coefficients according to their size and direction within analyses. Ranks were compared across models in order to identify patterns.

RESULTS FROM QUANTITATIVE ANALYSES

We categorise the quantitative results into groups by outcome. We group outcomes by domain and then into overall development scores (total ELOM, composite scores, percentage of children On Track at the facility, and children who are On Track for all five domains).

When it comes to characteristics of ELPs that impact learning outcomes, the literature buckets these

broadly into structural and process quality variables. Structural quality variables include the physical setting, teacher qualifications, group size and ratios, and learning materials. Whereas process quality variables include classroom interactions (teacher-child and child-child), pedagogical approaches, and following the curriculum.^[34] Given the nature of our data, we extend this to include child and household-level factors.

Within domains

Here we report on the variables that stand out as being commonly associated with children from low-income communities who significantly outperform their peers, within each of the five ELOM assessed domains.

- **DOMAIN 1: GROSS MOTOR DEVELOPMENT (GMD)**

For GMD we find a range of results but the most common recurring being that the facility serves at least one meal a day. We find a range of results for practitioner class groupings (with both individual or alone and whole class groupings as beneficial).

- **DOMAIN 2: FINE MOTOR COORDINATION AND VISUAL MOTOR INTEGRATION (FMC-VMI)**

For FMC-VMI, we find that meeting the socio-emotional benchmarks and assessor-rated scores on a child's task orientation is important. We also find strong effects for having a person check who enters and leaves the facility, facilities that use solid fuels for lighting (this may be confounded by SES), having a more child-focused approach to learning, using a tippy-tap for handwashing, and grandparent engagement.

- **DOMAIN 3: EMERGENT NUMERACY AND MATHEMATICS (ENM)**

Similarly, for ENM, we find that meeting the socio-emotional benchmarks and assessor-rated scores on a child's task orientation is important. Additionally serving at least one meal and having a more child-focused approach to learning were associated with positive effects.

We also find negative results for sibling engagement, practitioners who regularly meet with mentors and use an alternative Grade R curriculum.

- **DOMAIN 4: COGNITIVE EXECUTIVE FUNCTIONING (CEF)**

For CEF, in addition to seeing consistent positive and strong results for socio-emotional functioning and task orientation, we find strong associations for whether learning materials are accessible to children in the ELP. In addition, we find positive effects for whether the facility is part of a network, the practitioner feels recognised for their work, has cognitive-related materials such as puzzles, and educational games, practitioners have a more child-focused approach to learning, have first aid training, and separating classes by age group. Interestingly, we find mixed effects for qualification (at least an NQF 4&5), ECD-specific training online or NCF training, facilities that have drinkable water, and whether the child receives a grant.

- **DOMAIN 5: EMERGENT LITERACY AND LANGUAGE (ELL)**

Similarly to other domains, there are positive and strong results for socio-emotional functioning and task orientation. In addition, we see positive effects for children answering their own questions (child agency), ELP having swings, engagement with mothers/aunts/uncles, practitioners who have special needs training, longer child exposure to the programme, and one-on-one grouping. However, we find negative associations between ELL and reported levels of grandparent engagement and sibling engagement.

Positive deviant descriptive analysis for three domains

For three domains, namely GMD, FMC-VMI, and CEF, Team A undertook descriptive analysis of characteristics associated with outliers. Key findings are noted here -

- **MATERIALS:** For the FMC-VMI domain, the descriptive analysis found fantasy play materials were more frequently observed in positive deviants (67%); physical activity materials were observed more frequently for the GMD domain outliers (67%); and musical equipment was observed more frequently for the CEF domain outliers (62%).

- **HIGH ENGAGEMENT:** Almost all PD practitioners reported joining in children's play often to help them learn for the FMC-VMI and CEF domain outliers (98% and 92% respectively), with slightly fewer for the GMD domain (81%).

- **SATISFACTION AND SUPPORT:** PD practitioners in the FMC-VMI and CEF domains provided much lower ratings of resource satisfaction than non-PD practitioners. However, PD practitioners consistently reported higher satisfaction of support scores in comparison to non-PD practitioners across all three domains. All practitioners in the CEF domain reported the highest satisfaction rating (5 out of a scale from 0 to 5). Related to this, 100% of PD practitioners reported feeling supported in their work for the GMD and FMC-VMI domains, whereas this was lower at 80% for the CEF domain. Across all 3 domains, 100% of practitioners reported feeling recognised for their work.

Across domains

Here we look at child, household and facility characteristics associated with outperformance in the total ELOM score, ELOM composite score (i.e. four domains only, excluding GMD), children On Track for all domains, and the percentage of children On Track at each facility.

● CHILD LEVEL

All child-level variables that indicated strong associations were related to socio-emotional functioning and approaches to learning. Perhaps the strongest and most consistent finding across all analyses was that children who present as positive deviants meet the socio-emotional benchmark. A possible limitation of this finding, however, is that because the measure is teacher-reported, teachers may contain a bias where they upwardly rate

children's socio-emotional functioning based on their academic performance.

We also found that task orientation/approaches to learning were associated with positive deviance. Task orientation was measured on a rating scale by the assessor at the end of the assessment. Ratings were based on four questions relating to the child's concentration, diligence, perseverance, curiosity, and interest.

● HOUSEHOLD LEVEL

At the household level, we find that mother engagement is positively associated with PD children.

We find strong and positive associations between

children who are positive deviants but not at PD facilities. In other words, children who outperform their peers but do not attend a facility that outperforms other facilities. This may be a proxy for an external factor such as the home environment, or an unknown underlying construct.

● FACILITY LEVEL

Dosage

We find that the number of years a child is in the programme is positively associated with PD when it comes to overall development (total ELOM score). We also find evidence to indicate that older children are associated with PD. This may be correlated with dosage, where older children are more likely to have been exposed to an ELP for a longer period of time.

We also find that children that are in facilities that are open for longer hours and during the school holidays are associated with PD. However, there is some indication that opening a programme earlier than 7am may be negatively associated with PD. This may be confounded by socioeconomic and home-level factors, for example, caregivers who work far away and may not be as present as those who don't.

Structural quality

Learning materials: The main structural input associated with PD at ELP level is learning materials. In particular, that learning materials were accessible and that at least 10 books were available. We found strong associations for cognitive materials such as LEGO or similar products, puzzles, and educational toys. We also find that materials such as a fantasy area, dress-up clothes, masks and pretend food, pots, and pans were significantly associated with positive deviance.

Management and supportive conditions of service:

Additionally, we find that being an ECD centre, being school-based (may be confounded with the fact that these are likely to be older children), receiving government subsidy, being part of a network and being partially or fully registered with government or an Non-Profit Organisation are positively associated with PD.

There is also some evidence indicating that organisational practices, such as keeping records of child information and displaying the menu, are associated with PD. Parent-practitioner engagement also emerged as important, in particular where practitioners report that parents have reached out to them for information on their children's development. We find mixed evidence on whether having someone check who enters or exits the facility is associated with PD.

Health, nutrition and sanitation: We find that handwashing practices such as using a tippy tap are positively associated with PD, as is having first aid training. We find strong effects for facilities that use solid fuels for lighting. This may be confounded by SES but may also be the result of a spurious finding. We find that the number of meals served is positively associated with PD.

Group size and ratios: We find that having separate classes for different age groups and a greater number of classrooms is positively associated with PD.

Teacher qualifications and pedagogy: We find that having at least a matric (national senior certificate) or an NQF level 4-5 is positively associated with PD. Interestingly; we do not find strong associations between ELP curriculum type and PD.

Process quality

Sensitive, mediated caregiver/child interaction targeted to the needs of individual children: We find strong effects for engagement where teachers join in children's play to help them learn. This includes individual needs being assessed where practitioners observe children to inform their planning and support needs. In addition, our wildcard competition winners found that teaching strategies were positively associated with PD. The teaching strategies score was composed as a sum

of several variables, namely: allowing children to choose what play to engage in and which materials to use, levels of engagement during playtime, group times that allow for child participation, asking open-ended questions to expand children's thinking, and creating opportunities for autonomy.

Balance of child-initiated activities and adult-led activities: We find positive associations for individual/alone, pair, and small group activities. We do not find positive associations for whole class grouping

Continuum of different types of play: We find a positive association between PD and developmentally supportive play (including free play) that promotes child agency.

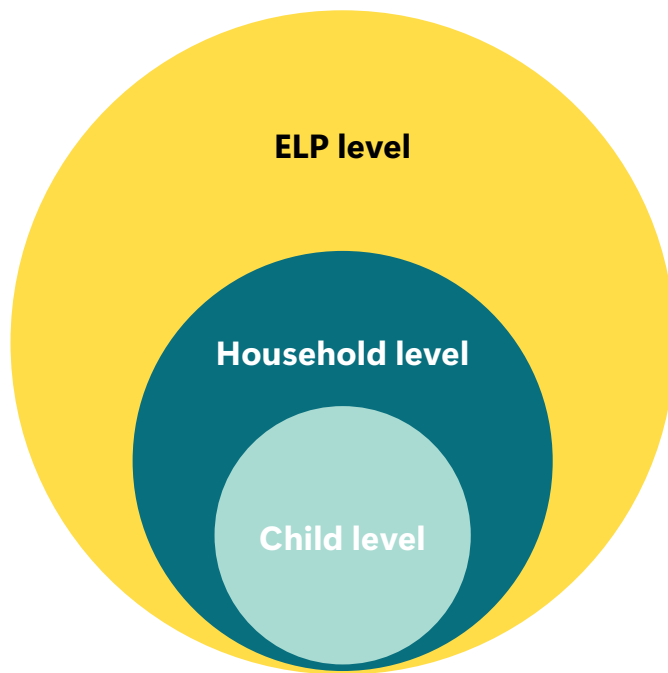
● POSITIVE DEVIANTS BY ITEM

As an additional exploratory descriptive analysis, we looked at whether PD children had statistically significantly different scores by each ELOM item (there are a total of 23 items across the 5 domains in the ELOM 4&5 tool). We found that PD children had statistically higher scores on the items listed alongside. Interestingly, most of these items overlapped with those in the [ELOM 4&5 Targeting tool](#). The targeting tool provides a relatively quick and easy way of identifying children who may be Falling Far Behind the expected standard for their age. We find that these items are sensitive to both ends of the distribution – children that are Falling Far Behind and those that are performing exceptionally well.

The ELOM Targeting tool contains 5 items which are bolded below.

- **Item 4: Catching a bean bag with the non-preferred hand**
- **Item 6: Copying a triangle**
- **Item 9: Counting in classes**
- Item 10: Addition and subtraction
- **Item 15: Pencil tapping test**
- Item 17: Picture puzzle completion
- Item 18: Expressive language- empathy
- **Item 19: Expressive language- self-awareness**
- Item 23: Initial sound discrimination

FIGURE 6: SUMMARY OF RESULTS FROM TEAMS



Child level

- Social-emotional functioning
- Task orientation: focus, persistence curiosity
- Specific items in the ELOM tools
- Exposure to ELP

Household level

- Engagement with mother/grandparent/aunt, uncle
- Less engagement with siblings

ELP level

- Practitioner engagement- joining children's play to help them learn
- Individual or alone, pair or small group activities
- Time spent engaged in free play / play that promotes child agency
- Separate classes for different ages
- Learning materials, accessibility of materials
- Having a tippy-tap for handwashing
- Being in an ECD centre/school based
- Practitioner has a matric/NSC/ NQF4-5
- ELP is open during school holidays/ longer hours
- Being registered (partially/fully) with government
- Being funded by donations/ government subsidy
- Parents have been in contact with practitioners
- Keeping records of child grant/ background information
- ELP is part of a network
- First aid training
- Having someone check who enters or exits the facility*

*Mixed findings, but mostly positive

PARALLEL ENGAGEMENT WITH ECD PRACTITIONERS

This section summarises topics covered and insights generated from conversations with ECD practitioners about the characteristics and circumstances that distinguish exceptional children. These conversations took place at two time points: before and during quantitative analysis.

Conversations Round 1: September 2022

1. PARENTAL INVOLVEMENT was mentioned by practitioners in all of the sites. Five mentioned that just being loved is a common characteristic among exceptional children. Two mentioned that parents play and talk to these children. One site explained that child behaviours are an extension of the home, especially regarding socio-emotional development, and the difficulty of teaching these skills without home reinforcement. Two other sites mentioned the importance of parents understanding the interests of their children, and that exceptional children's interests are supported at home. A respondent gave the anecdote of an exceptional child who is able to name all the dinosaurs because this interest is fostered by their parents. Another practitioner mentioned the importance of parental awareness and the need to educate parents on children's developmental milestones. Two facilities encourage parental involvement by 1) sending daily notifications of what the facility does and 2) creating ice-breaker meetings and opportunities to foster relationships between parents and sites. One site mentioned that exceptional children come from traditional families with both a present mother and father. Other practitioners (from rural Eastern Cape) noted that home environments varied but that exceptional children tended to have at least one person (sibling, parent, grandparent) who showed an interest in and encouraged their learning.

2. POSITIVE AFFIRMATION: All sites mentioned the importance of encouragement from teachers and positive affirmation in exceptional children. They spoke about how much these children enjoy praise and are driven by encouragement and rewards.

3. SOCIO-EMOTIONAL SKILLS: Practitioners mentioned that exceptional children have good sharing skills (such as the ability to share with others as well as regulate their emotions). Their ability to share what is bothering them limits their anger and frustration. They also have good social skills and work well in small group activities. One site also mentioned that exceptional children take part in sports, which encourages teamwork.

Four sites also mentioned that exceptional children communicate more effectively and

are excellent listeners. Practitioners spoke about various interactions with children and how important it was to engage with patience and understanding. Two sites mentioned the importance of siblings in this regard. They spoke about siblings being able to make children more social, and effective communicators; they also spoke about children with siblings being more confident in class. Practitioners in the Eastern Cape described how older siblings (those attending high school in particular) were important role models when it comes to stimulating an interest in learning.

Two sites also mentioned that exceptional children are more confident in general, but that outliers were not limited to confident children. Three sites mentioned that exceptional children tend to be a lot more independent, and one site mentioned that children with younger siblings are more independent and also tend to be more helpful in class.

Practitioners spent a lot of time on the theme of socio-emotional development and went into depth on sharing things that they do to foster these skills such as anti-bullying policies, creating different spaces to ensure that everyone feels like they are at home (N=3), and developing empathy at the ELP.

4. PRACTICAL LEARNING: Three sites mentioned that exceptional children respond best to practical learning (small groups and outdoor activities). This is also tied to social skills. One ELP practitioner spoke about the language barrier of having a diverse set of children coming from different home language environments but being taught in English. The practitioners mentioned that the use of practical learning and visual aids (together with parental involvement) really enabled children to overcome language barriers. Two sites also mentioned that understanding the interests of children is what makes them exceptional.

5. COGNITION AND EXECUTIVE FUNCTIONING: Two sites spoke about the notable concentration ability and memory span of exceptional children. Lastly, several sites spoke about the curiosity of exceptional children. Exceptional children tend to ask more questions (particularly during story time) and are also more eager to answer questions. Practitioners noted how

these children would be the first to explore the classrooms in the mornings and to ask questions about what they'd be doing that day.

- 6. OTHERS:** Other things that sites noted were the leadership qualities of exceptional children. Practitioners in the EC spoke about how exceptional children tended to imitate teachers and were typically the ones to enact teaching in the playground.

Other factors associated with exceptional children are greater programme exposure and more regular ELP attendance, more advanced knowledge of the curriculum, access to TV which increases their exposure to different things in limited environments, having healthier snacks, a structured routine and teaching children skills that are included in the Grade 1 curriculum.

Positive deviants were not limited to outgoing extroverted children, or to children who are healthy. Practitioners spoke about shy, withdrawn, sickly, and relative-to-the-class

poor children as being exceptional too. They also spoke about children who do well but have limited parental involvement and described creating safe spaces for these children to share their experiences and do homework under the supervision of a teacher.

Practitioners tended to want to give answers on improving negative deviants and child development in general. It was a challenge to keep bringing it back to their views on positively exceptional children. Practitioners struggled to think about factors in a child's environment that contribute to them being a positive deviant other than parental involvement. It is interesting that looking back, these conversations ended up being conversations around what exceptional children look like and the types of skills they embody. Practitioners associated deviants with intrinsic characteristics (difficult to measure) rather than environmental factors (that are measurable).

Conversations Round 2: January 2023

● CHILD LEVEL

At the child level, we asked what the characteristics of good socio-emotional functioning (SEF) are, and what teachers do to support SEF, concentration, and curiosity.

Practitioners described children with good SEF as those who are able to share (N=6), cooperate (N=4), are confident (N=4), and are good communicators. They described them as children who are motivated to ask questions (curious). They are able to manage their emotions (N=3) and understand and obey the class rules. Two practitioners described these children as those who are able to develop trust and who seek comfort more easily. On the contrary, children who struggle with SEF are anxious and fearful. Two practitioners mentioned that good SEF does not mean better cognitive outcomes, it is about the adaptability of children and their routines.

Practitioners support SEF and curiosity by encouraging children to ask questions (N=1) and instilling a sense of confidence in children (N=2) through praise and positive reinforcement. Most emphasised the importance of morning routine and introductions of how they are feeling (N=6), this allows practitioners the opportunity to identify children who may need more attention during the day and to take them aside or observe them as needed. Practitioners mentioned that the

way practitioners greet children in the morning encourages children to feel safe and comfortable. One practitioner described a "focus table" where practitioners ask children to reflect on and encourage introspection. Practitioners also encourage one-on-one practitioner-child and child-child interactions to facilitate connectedness and socialisation, and emphasised the importance of communication through this process. However, this connection takes time. Three mentioned the importance of drawing/painting to help children to express their feelings.

Two practitioners mentioned that they support SEF by being connected with the home environment. Two practitioners also stressed the importance of the holistic NCF-aligned curriculum at the ELP and that SEF skills are embedded within it, rather than being treated as stand alone. One practitioner mentioned that exposure to an ELP is essential for SEF and that she has seen a drastic improvement in SEF and understanding routines after as little as three months enrolment.

All practitioners spoke about the importance of story time for curiosity development. Practitioners also spoke about playing with puzzles to facilitate concentration.

● LEARNING MATERIALS

We asked practitioners what types of learning materials improve child development, and variations in how children use different materials. We also asked what materials practitioners think make the most difference to development.

This theme tended to overlap with child agency and SEF. Most practitioners favoured children choosing their materials for play, based on their interests. Practitioners mentioned that it is not about the materials themselves, but it is about how the children communicate with each other when they are playing with various materials.

One practitioner mentioned that fantasy play is a way to increase child confidence and creativity by allowing them to play as they wish and “come out of their shell”. Some mentioned the importance of fantasy play materials to foster SEF skills, where practitioners are able to facilitate how children should treat each other and their fantasy materials (i.e. a doll) in play. It also reveals the characteristics of the child or the way they feel toward others around them including the practitioner (i.e. when children imitate their teacher). It is also an

opportunity to see what is happening at home (for example, the way that children talk to and treat their dolls).

Again, related to SEF/approaches to learning one practitioner mentioned the importance of morning “discovery” tables. This is where they put interesting items that encourage sensory engagement on the tables for children to explore i.e. lemons/ sugar, fostering curiosity and concentration. The importance of sensory engagement was stressed by 2 practitioners.

Some practitioners mentioned that puzzles/LEGO are important because they teach problem-solving, and help with cognitive development by allowing children to sort colours, shapes, and size. They noted that these also tend to be the “smarter” children (N=3).

Two practitioners stressed the importance of learning through play and that all play materials make a difference but it is up to the practitioner to ensure that children are engaging across a range of different materials. There isn’t a specific material that is important. It’s about the state of the child and what they feel like playing with at that time.

● AGENCY

We asked whether play materials should be chosen by the practitioner or the child and why. We also asked whether learning should be practitioner-led or child-led and why.

All practitioners mentioned that children should choose their own materials, but emphasised the role of teachers to ensure that the materials available are safe. Choosing for children is not a good idea because they have their own preferences and exploring different types of play is important for development (N=5). One teacher really stressed the

importance of materials needing to speak to the child’s interests and preferences. Another cautioned that although the child should choose, if they don’t get a diversity of materials they do not develop holistically.

When learning, a combination of child-led and practitioner-led approaches is helpful. This, however, depends heavily on the context. Child-led activities allow the practitioner the opportunity to observe/ monitor whether children are understanding what they are learning (N=5). Only two practitioners favoured practitioner-led learning.

● FREE PLAY

We asked how practitioners feel about joining in on children’s play, circumstances that affect their choice of joining in or not, and whether they think joining in makes a difference.

All practitioners mentioned that they just sit and observe how children interact/play with each other, but intervene and join in play when disputes between

children occur. One mentioned that she would join in when children ask her to. Two strongly supported joining in because children get more excited and expressive when practitioners join. One teacher mentioned that when children are playing alone, they cooperate better than when the practitioner joins in (less trying to get the teacher’s attention) and two mentioned that they will also join in to demonstrate a game (N=2).

● MANAGEMENT AND GOVERNANCE

We asked how practitioners resonate with the notion that when practitioners feel supported in their work, children do better. We also asked about how and when practitioners feel most supported.

There was a general consensus that supporting practitioners can only benefit children. Practitioners mentioned that support through structural materials (clay/playdough/counting materials, a printer, etc.) makes the job easier and is what matters the most (N=5). Practitioners also mentioned that encouragement and emotional support (getting feedback and praise, or corrections) are

important (N=3). In particular, through constant communication in a one-on-one setting between themselves and the principal. Two practitioners mentioned that guidance from management on how to manage relationships with children and engage with them is important, and two practitioners also mentioned support in the form of professional development courses. One practitioner mentioned that the right curriculum can improve teacher support through structured lesson plans. One practitioner also mentioned the importance of spiritual support and ensuring that practitioners have clearly articulated goals.

● ENTRY POINT AND TIPPY TAP

Finally, we asked practitioners what they thought about our mixed findings that tippy taps/having someone checking who comes in and out of the gate are associated with facilities that do exceptionally well and what these findings might be telling us.

Having someone at the gate mainly stemmed from fulfilling safety requirements (N=5) but practitioners were able to reflect on the effects of this. It allows practitioners (if they are the ones standing at the gate) the opportunity to turn children's moods around and observe the types of moods and emotions they are feeling coming into the school day and ensuring they start the day well (N=5). One practitioner mentioned that she enjoys giving children high fives, baby fives, and foot fives when they arrive at the ELP in the morning, and that this seems to make a difference to the children. One teacher mentioned that while they have cameras,

standing at the gate allows them the opportunity to get to know the parents and assure children that they are going to have a fun day. It's about the physical security of the children as well as creating an emotionally safe environment.

For tippy taps, practitioners mentioned that it is more observable (more centrally located), wastes less water, and is more mobile. Others mentioned that children tend to cluster around it and socialise. It also creates a sense of independence when children do it by themselves.

The overarching themes in the second round of conversations emphasised the importance and interconnectedness of SEF in most activities that are conducted in ELPs. This is also closely linked with how learning materials are used and with promoting child agency. Across the conversations, there was a heavy focus on observing and monitoring children and on establishing good early morning routines.

DISCUSSION AND NEXT STEPS

This first phase of the PD initiative identified several key factors as potential contributors to positively deviant preschool children and facilities. In the second phase, we examined these further through a [qualitative ethnographic observational study](#).

In order to inform this work, we identified the following thematic areas for further exploration:

● MEETING SOCIO-EMOTIONAL FUNCTIONING STANDARDS

Meeting the SEF benchmark for emotional school readiness and social skills was consistently associated with PD. Despite the growing enthusiasm and general consensus on the importance of socio-emotional functioning in ECD, relatively little is known about the impacts of early childhood education programmes on SEF. There is a lack of consensus among researchers and practitioners regarding how to define, evaluate, and promote SEF. A contributing reason could be that specific aspects of SEF functioning may vary based on cultural factors, highlighting the importance of remaining culturally sensitive in this space. A recent review showed that participating in ELPs may enhance SEF through:^[35]

- High-quality teacher-child relationships, e.g. via professional development, small class sizes, and safe, stable learning environments;
- Opportunities for socialisation with peers and social skills practice; and
- improvements in children's academic and cognitive skills may also contribute to improvements in SEF over time creating a virtuous feedback loop.

The major drawback of our data is that SEF was teacher-rated and therefore subject to potential bias. Additionally, approaches to learning were assessor rated. Our next phase of qualitative work may include an observational measures of SEF, how teachers and children interact with each other, and how teachers perceive, construct and incorporate

SEF into their daily routines and activities. Linked to SEF, was the consistent finding (from engagement with practitioners) that observing children is a mediator to identifying SEF issues. Implicit in this was the importance of using morning routines to identify how children are doing at the start of the day.

Additionally, in our next phase, we will have to define SEF to incorporate cultural sensitivity. According to the Collaborative for Academic, Social, and Emotional Learning (CASEL) model,^[36] SEF consists of five key competencies:

1. Self-awareness, i.e. the ability to recognize a person's emotions, thoughts, and their influence on behaviour;
2. Self-control, i.e. the ability to regulate one's emotions, thoughts, and behaviour in different situations;
3. Social awareness, i.e. the ability to assume the other's perspective and empathise with people from different cultures, understanding the social and ethical norms of such behaviour;
4. Relationship skills, i.e. the ability to establish and maintain healthy and rewarding relationships; and
5. Responsible decision-making, i.e. the ability to make constructive and respectful choices about personal behaviour and social interactions based on ethical standards, safety concerns, and social norms, considering the well-being of oneself and others.

● MORE FREQUENT ENGAGEMENT WITH CAREGIVERS AND OTHERS IN THE HOME

Alongside teacher-child interactions, caregiver engagement in the home was a recurring theme across the quantitative (although limited to a small sample) and local stakeholder group discussions. While we cannot observe behaviour in the home, we intend on interviewing caregivers in the qualitative

phase. There is also evidence showing the effect of multi-component programmes that include familial components on SEF.^[35] Our qualitative work could explore the extent of engagement between the home and ELP and how this fosters child development.

● MORE ENGAGED PRACTITIONERS, MORE FREQUENT PRACTITIONER-CHILD INTERACTIONS AND CLASSROOM MANAGEMENT

Our findings are consistent with the literature. There is a large body of research showing that in comparison to structural indicators, process quality has a greater influence on child development.^[19,20] In particular, sustained and reciprocal interactions foster children's communication skills, extend their thinking, develop their ability to manage emotions and relationships and instil the skills and confidence to be effective learners.^[21]

In high-income countries such as the US, teacher professional development programmes have focused

on the classroom emotional climate, teachers' instructional support, and behaviour management techniques as pathways to improve children's non-academic and academic skills development. Research in South America (Chile and Ecuador) has shown that similar classroom processes facilitate the development of social-emotional skills in children.^[37,38] We could examine these aspects, as well as how this relates to individual child needs, how practitioners construct class groupings for children and its interaction with SEF, and lastly – play.

● CHILD-LED PLAY AND LEARNING

Free play and child-centered learning were recurring predictors of PD. In our setting, this has cultural nuances that would need to be addressed and investigated further. The qualitative work could explore teacher/stakeholder perceptions of free

play and child-focused learning and its interplay in various cultural settings. We could explore and observe to what extent practitioners engage in free play and under what circumstances or how they set up activities for free play. Further, one could explore the intentionality of free play.

● DOSAGE

We found dosage to be an indicator of PD. This is similar to findings from the ELPO study which found that higher programme exposure was important for developmental performance.^[39] Wasik and Snell (2019) argue that "increases in time and adult-child contact are only as effective as the quality and content of the interactions".^[40] This has already been

proposed in prior points, but qualitative work could explore differences in the contextual influences and interactions among children who are younger/older but have greater/less exposure to the programme. Further, understanding the contextual factors that lead to increased dosage (such as being open during the holidays or for longer hours each day) could also be explored in qualitative work.

● LEARNING MATERIALS

Access to appropriate learning materials was associated with PD across a number of developmental domains. In addition to the importance of how or when materials are accessible, in the qualitative work we need to explore how practitioners and/or children engage with these

materials (i.e. at particular times, guided, or free). Their usage may be more important than access. Further, we could explore how practitioners' perceptions of support and satisfaction with resources influence their engagement with children, key sources of support, and preferences to particular resources.

● MANAGEMENT AND GOVERNANCE

Several factors associated with PDs can be interpreted to be associated with good management and governance. For example, being registered with DSD, being part of a network, having staff trained in first aid, maintaining good records, having a monitor at the gate, or offering professional development

opportunities to staff. The qualitative research will explore management practices through interviews and field worker observation. This will also uncover an array of immeasurable constructs, or provide insights into mechanisms that we do not currently understand at the quantitative level.

● PD SITE SELECTION

We used the quantitative data to identify and select sites to visit / interview for the second, qualitative, phase of this work. Figure 7 below shows a map of total ELOM score deviant facilities which had geo-located data (N=22 out of 33) in yellow placemarks, according to the PD definitions described earlier,

in Table 3. The top 40 facilities identified by residual ranking are shown in red placemarks. The green placemarks show the overlap facilities between the two approaches. From the graph, it can be seen that the top PD facilities tend to be in either the Western Cape, Eastern Cape, Gauteng, or Mpumalanga.

FIGURE 7: MAP OF DEVIANT FACILITIES WITH GEO-LOCATED DATA



KEY LESSONS

- **THE VALUE OF ENGAGING WITH PRACTITIONERS 'ON THE GROUND':**

Conversations with practitioners in low-income settings proved to be exceptionally helpful in understanding the mechanisms behind our quantitative findings. Parallel engagement with real experiences, which are often missing from quantitative data, contributed greatly to our processes. Future work should always include a grounded component.

- **THE VALUE OF CLEAR, COMMON DEFINITIONS DEFINED IN MULTIPLE WAYS:**

While there are numerous ways to define positive deviance, and the use of multiple

definitions is beneficial in determining the rigour and robustness of findings, we see the need upfront for consistent and agreed definitions. Our main analyses depart from other teams' analyses in important ways making some of the findings incomparable.

- **THE VALUE OF PEER REVIEW:** The peer review process was exceptionally helpful in identifying issues from an objective third party. However, these were implemented late in the process which extended our analysis period. Future work should include peer review earlier on in the analysis process, and make provision for multiple rounds of review.

CONCLUDING REMARKS

This study sought to identify the factors associated with pre-schoolers (children aged 50-69 months) attending no-fee or low-fee facilities (a proxy for poverty) who significantly outperform their peers in key areas of development as measured on the ELOM 4&5 Assessment tool. The study included secondary analyses of outcomes data from over 12,000 children enrolled in almost 2,000 ELPs and Grade R classes across South Africa.

We used an asset-based, PD approach and included a number of innovative methods such as multiple, independent contracted teams working in parallel, concurrent engagement with local and international stakeholder groups and an open data competition.

We found that children's socio-emotional functioning, ELP process quality variables (such as the quality of practitioner-child engagement, class grouping during activities and free play), cognition-related and accessible materials as well as various proxies for good management and governance at ELPs are all important predictors of positive deviance.

To better understand the underlying dynamics of these various factors, we used the quantitative data to identify PD facilities and to design a qualitative ethnographic observational study which included both telephonic interviews and site visits.

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