

## An exploration of updated Thrive by Five Index stunting rates in children aged 50-59 months enrolled in Early Learning Programmes in South Africa

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### Introduction

Based on data collected in 2021, on over 5000 children aged 50 to 59 months enrolled in Early Learning Programmes, the [Thrive by Five Index](#) (2022) originally reported stunting rates of 25 percent nationally in this population of children. Following the launch of the Index in April 2022, further cleaning and analyses were done in order to prepare the data for open access. Through this process, it became evident that there were significant errors in the reported stunting rates.

The table below explains the World Health Organisation (WHO) definition of stunting. The definition includes 3 categories - mild stunting, moderate stunting and severe stunting. In most reports on stunting rates, only the moderate and severe categories are included. Due to incorrect coding in the original Index analyses, the Thrive by Five report erroneously included all 3 stunting categories. This significantly inflated the stunting figures.

When mildly stunted children are removed from the total, the percentage of children aged 50 to 59 months enrolled in ELPs who are classified as stunted drops from 25 to 6 percent nationally (figures are rounded).

**Table 1: WHO definitions of stunting**

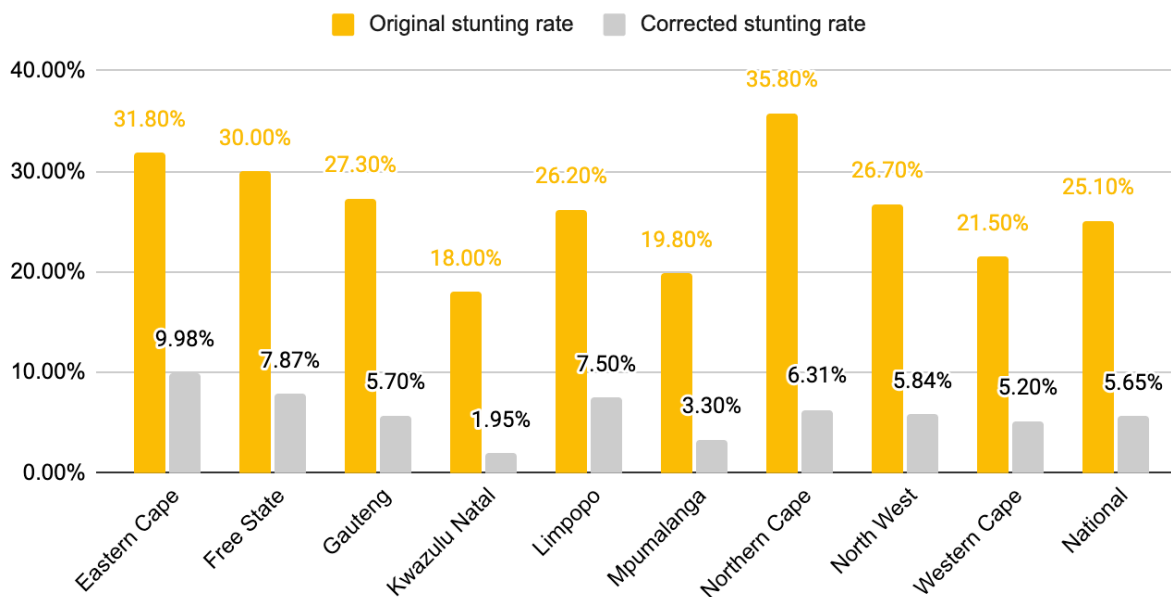
Category	World Health Organisation definition	Categories included in the original Index Report	Categories included in the updated Index Report
Mild stunting	Between 1 and 2 SDs below the WHO Child Growth Standards median	25% stunting in children aged 50-59 months enrolled in ELPs	
Moderate Stunting	Between 2 and 3 SDs below the WHO Child Growth Standards median		6% stunting in children aged 50-59 months enrolled in ELPs
Severe stunting	> 3 SDs below the WHO Child Growth Standards median		ELPS

Upon discovery of the error, a re-analysis was done using the correct WHO standards definitions. Additionally, prior reported analyses used months to determine Standardised Height for Age (HAZ) scores. However, the Child Growth Standard age groups were formed using age in days (World Health Organisation, 2006). As a result stunting rates were recomputed using age in days and the correct WHO criteria.

Figure 1 below compares the original published results with the updated results, both per province and nationally. For the most part, the difference between the original and revised stunting figures reflects the proportion of children in each province and nationally who are (only) mildly stunted.

**Importantly, these findings do not take into account stunting rates in the approximately 45%-55% of children aged 50-59 months who are *not enrolled* in an ELP, and who are likely to be at greatest risk of malnutrition. Additionally, as discussed later in this paper, there is evidence of a 'catch-up' effect between ages 2 and 5 years. Stunting rates at age 4 to 5 years therefore tend to be lower than stunting rates in younger children.**

**Figure 1: Provincial comparison of stunting rates by reported and updated results, for children aged 50-59 months attending an ELP in 2021**



Subramanian, Karlsson and Kim (Subramanian et al., 2022) observe that “By definition (following the WHO normative distribution), the stunting prevalence among children living in ideal environments is expected to be around 2 - 3 percent.” One can apply this estimate to South Africa to judge our distance from this rate. In Thrive By Five, we find 5.65 percent of the children fall below the 2 SD cut-point for stunting. This would mean that  $\pm 3$  percent more children in this age group in South Africa are below the cut-point for stunting than expected.



The new reported results (5.65% nationally, weighted) are significantly lower than previously reported rates of stunting for children under-five in South Africa. Furthermore, a 2015 systematic review of stunting research suggests that the stunting prevalence in South Africa has remained persistently high since the 1990s (Said-Mohamed et al., 2015). In light of this, the Index findings warranted further investigation. This paper provides a high level overview of the process followed to interrogate our findings in order to better understand these lower-than-expected stunting rates.

The paper covers the following -

1. A comparison of the Thrive by Five Index stunting data to stunting data collected through other ELOM studies of preschool children undertaken between 2016 and 2022. In addition, we explored variation across co-variates, including sex, age and income levels.
2. A comparison of the Index stunting data to the Demographic Health Survey (2016) and the National Income Dynamics (NIDS) survey (2008-2017)
3. An interrogation of the representativity of the Index data, relative to the 2021 ECD Census.

We conclude with a brief discussion of findings and key research questions:

1. It remains to be determined whether stunting rates for children who are *not* enrolled in ELPs are significantly different and, if so, to what extent ELP participation offers some protective elements.
2. There is some evidence of a decrease in stunting rates from 2012. It would be useful to explore this further, to understand possible contributing factors, and to investigate whether this downward trend has continued.
3. Moderate to severe growth stunting has a strong impact on children's learning outcomes (as measured on ELOM). The impact of *mild* stunting on learning outcomes is smaller, but is still significant, and underscores the importance of considering this group, who might in some classification systems not be considered stunted. Longitudinal data of child physical growth and cognitive and socio-emotional development is important to better understand how stunting changes over time, and to what extent growth faltering in the earliest years impacts long term cognitive development.
4. Given the evidence of the ageing effect on stunting, we recommend age-disaggregation in reporting on stunting rates in South Africa.
5. And finally, when we looked at stunting data from several other smaller, more targeted studies, we found much more variability in stunting rates. Further research is needed to understand what can be learnt from these data about particular subsets of children in this age group.



## A comparison of the Thrive by Five Index data to height for age data collected through other ELOM studies of preschool children

Several large [ELOM](#) studies over the past six years have collected height for age measurements of participating children. Combined, these studies include 9 398 child records, over the years 2016-2022. Table 2 shows the distribution of the sample by year and the proportion of the sample that fall into the 50-59 month age category (the same age as the Index sample) – while the remaining percentage of the sample falls between 60-69 months.

In the comparisons and analyses that follow in this section, we use the unweighted data from Thrive by Five so as to render these findings comparable with other unweighted data. As a result, there will be minor discrepancies between these data and the weighted findings shared in the Thrive by Five report and website.

**Table 2: Number of children aged 50-69 months with stunting data across the years 2016-2022.**

Year	Total N	Data source	Percentage of sample in 50-59 month band**	Provinces
<b>ELOM data</b>				
2016	1329	ELOM 2016 age validation study***	20%	Free State, Mpumalanga, Western Cape
2019	1678	ELOM 2019 Grade R***	15%	Free State, KwaZulu Natal, Mpumalanga, Western Cape
2021	5215	Thrive by Five Index (N=5215)*	100%	All provinces
2022 <sup>1</sup>	1176	Programme Evaluation (N=589)	98%	Eastern Cape, Limpopo, Mpumalanga, Northern Cape
		Roots & Shoots Study (N=587)***	3%	Western Cape
<b>Total</b>	<b>9398</b>		<b>66%</b>	

\*includes children who do not have a sample weight as per the Thrive by Five Index Report

\*\*The remainder of the sample falls within the 60-69 month category.

\*\*\*Includes children located in Grade R classes in primary schools

<sup>1</sup> These sampling strategies were targeted. This will impact representivity.



**Distribution of height for age:** Figure 2 shows the distribution of the standardised height for age score (HAZ<sup>2</sup>) for these studies combined (and using unweighted Thrive by Five data). Means across the age groups are -0.36 (SD=1.31) and -0.45 (SD=1.045) for the 50-59 and 60-69 month groups, respectively. The red lines indicate the -2SD and -3SD cutoffs according to the WHO Child Growth Standards. Where the child's date of birth was available HAZ scores were calculated using age in days, where date of birth was not available, monthly HAZ scores were used.<sup>3</sup>

**Figure 2: Distribution of standardised height for age scores, using data from large ELOM studies conducted between 2016 and 2022**

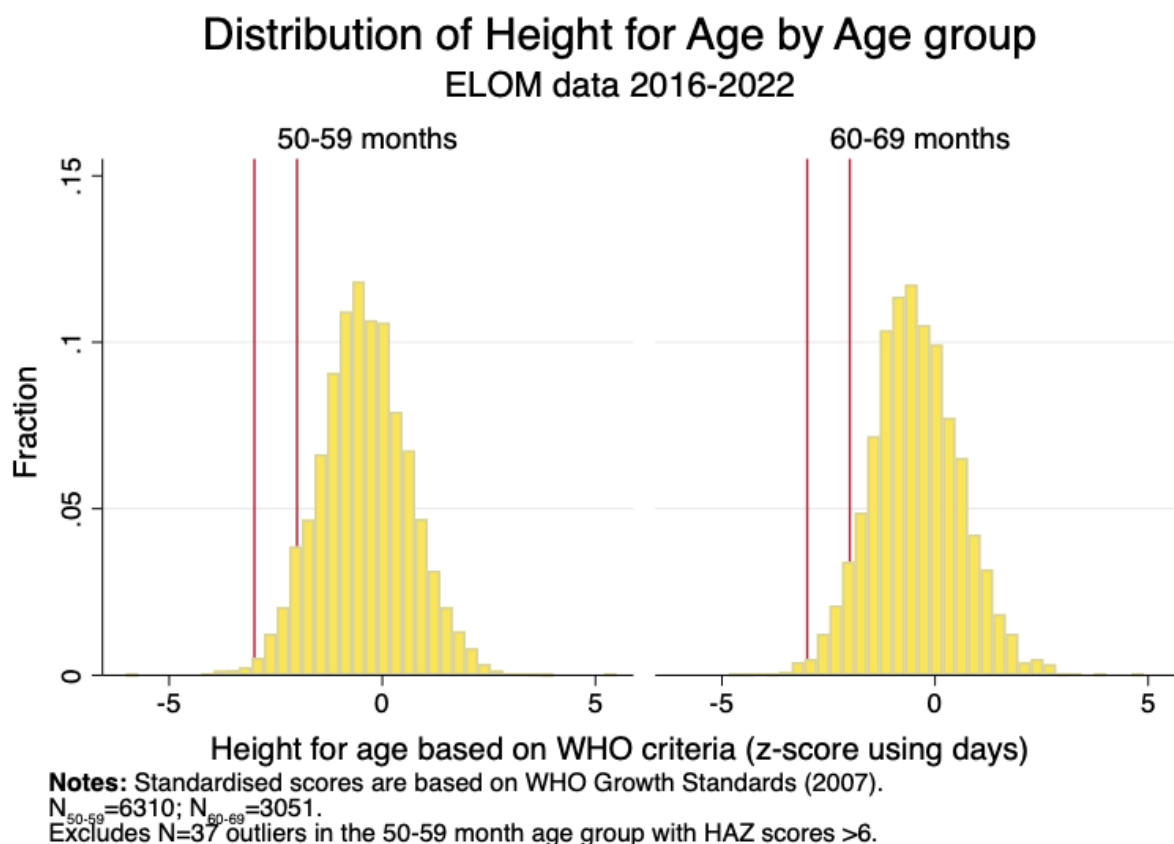


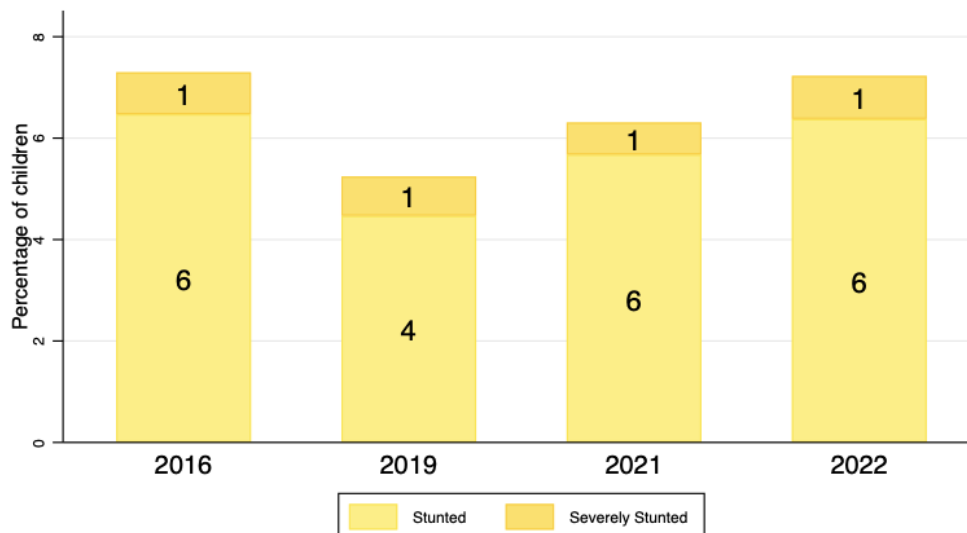
Figure 3 displays overall stunting rates in the ELOM data by year. Stunting rates within the 50-69 month age group are estimated to be around 5-7 percent, which is consistent with what we found in the Index sample. Severe stunting has remained at an average of less than 1 percent over the years. For the 2021 Thrive by Five Index, the graph illustrates the *unweighted* sample rate, which is slightly higher than the weighted rate of 5.7%.

<sup>2</sup> HAZ scores were calculated in Stata, version 17 using the *zanthro* package according to the WHO Child Growth Charts and WHO Reference 2007 Charts.

<sup>3</sup> All date of birth information was available for the Thrive by Five Index (N=5215). Of the full sample, date of birth was not available for 3007 children and age in months was used to calculate HAZ scores.



Figure 3 Stunting estimates by year, using data from large ELOM studies conducted between 2016 and 2022



**Notes:** Children are defined as 'Stunted' if their height-for-age is more than 2 SDs below the WHO Child Growth Standards median and 'Severely stunted' if below 3 SDs.  
 N<sub>2016</sub>=1329; N<sub>2019</sub>=1678; N<sub>2021</sub>=5215; N<sub>2022</sub>=1176. Unweighted.

We tested differences in stunting rates across various covariates in the ELOM data (2016-2022), including gender, age and socio-economic status.

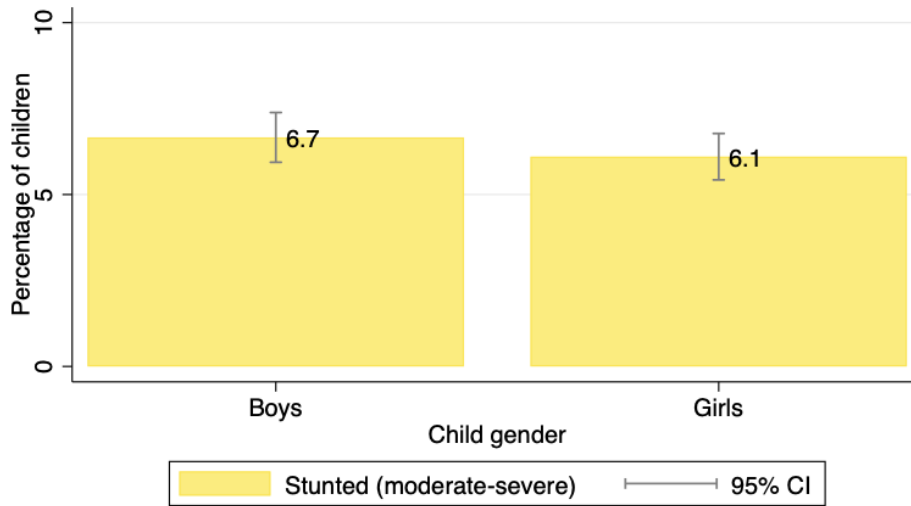
### Stunting rates in boys and girls:

On average boys appear to have a higher rate of stunting than girls, however this difference is not statistically significant at the 5 percent level.

Table 3: Breakdown of sample size by sex and year

Gender	2016	2019	2021	2022	Total
Male	638	845	2522	558	4563
Female	691	833	2693	618	4835
<b>Total</b>	<b>1329</b>	<b>1678</b>	<b>5215</b>	<b>1176</b>	<b>9398</b>

Figure 4: Stunting estimates by sex, using data from large ELOM studies conducted between 2016 and 2022



**Notes:** Children are defined as 'Stunted' if their height-for-age is more than 2 SDs below the WHO Child Growth Standards median.  
 N<sub>Boys</sub>=4563; N<sub>Girls</sub>=4835. Pooled across years (equally weighted). All ages combined.

**Stunting rates by age:**

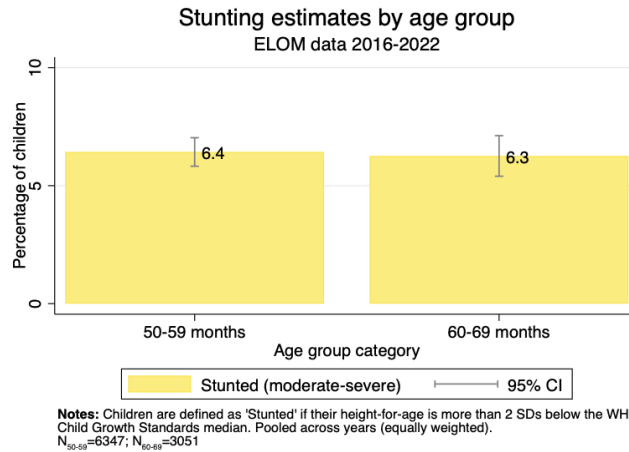
We find no statistically significant differences in stunting rates by age, when comparing children aged 50 to 59 months with children aged 60 to 69 months. This could however be confounded by the different sampling strategy for different ages i.e. older children are more likely to have been sampled from Grade R classes and younger children from ELPs. Because ELPs charge fees and Grade R is free (and therefore more inclusive), it is possible that there is a difference in the population of children enrolled in ELPs vs children attending Grade R.

Table 4: Breakdown of sample size by age group and year

Age group	2016	2019	2021	2022	Total
50-59 months	256	278	5215	598	6347
60-69 months	1073	1400	0	578	3051
<b>Total</b>	<b>1329</b>	<b>1678</b>	<b>5215</b>	<b>1176</b>	<b>9398</b>



**Figure 5: Stunting rates by age group, using data from large ELOM studies conducted between 2016 and 2022**



**Stunting rates by ELP fee levels, as a proxy for children’s socio-economic status:**

In the absence of household income data, the Thrive by Five Index used DBE quintiles as a proxy for socio-economic status of ELPs. This is not ideal, as the DBE quintile system was not designed for this purpose. DataDrive2030 has since undertaken an exercise to refine the variables used in determining the socioeconomic gradient in child outcomes. The alternative proxy used to re-define socioeconomic status for each child is the monthly fee charged at the ELP that the child attends<sup>4</sup>.

Table 5 shows the breakdown of the five fee categories used for this analysis, and only includes the years 2021-2022, and children enrolled in ELPs where fee data are available. Since variation in 2022 is limited and includes more older children likely to be attending free programs (Grade R), careful attention is paid to 2021.

There is a steady decrease in the prevalence of stunting as fee levels increase. In 2021, category 1 (ELP’s charging between R0 and R110 per month) showed a stunting prevalence of 7 percent versus 2 percent in the highest category. Note, the stunting rate in ELP fee level five is statistically insignificantly different from 0 (likely a factor of the small sample size).

<sup>4</sup> For more information on the construction of these ELP fee bands please refer to the Socio-Economic Gradient Problem statement [here](#).

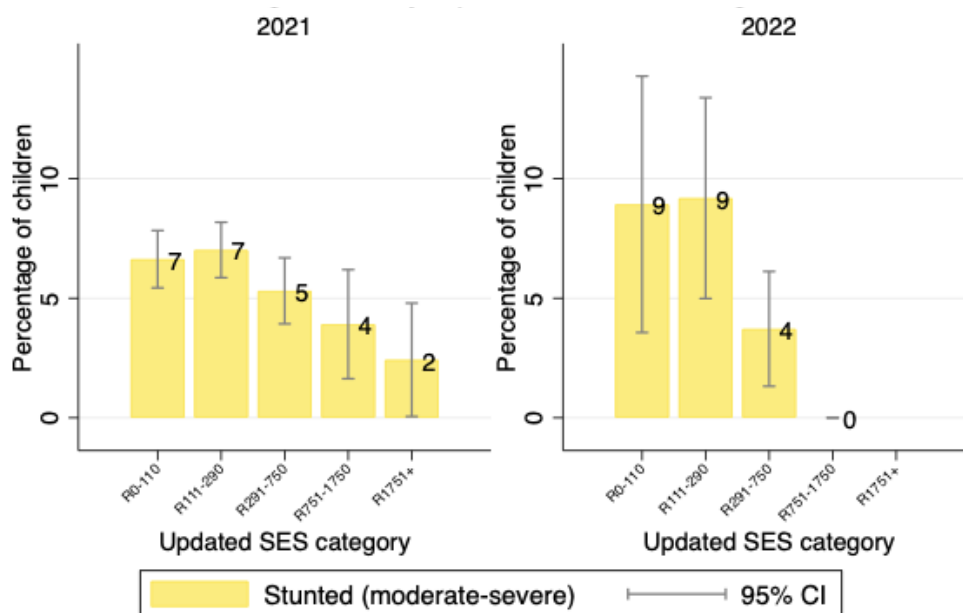




Table 5: Breakdown of sample size by ELP fees and year

ELP fees per month	2021	2022	Total
R0-R110	1658	112	1770
R111-R290	1866	185	2051
R291-R750	1017	242	1259
R751-R1750	281	2	283
R1751+	165	0	165
<b>Total</b>	<b>4987</b>	<b>541</b>	<b>5528</b>

Figure 6: Stunting rates by ELP fees

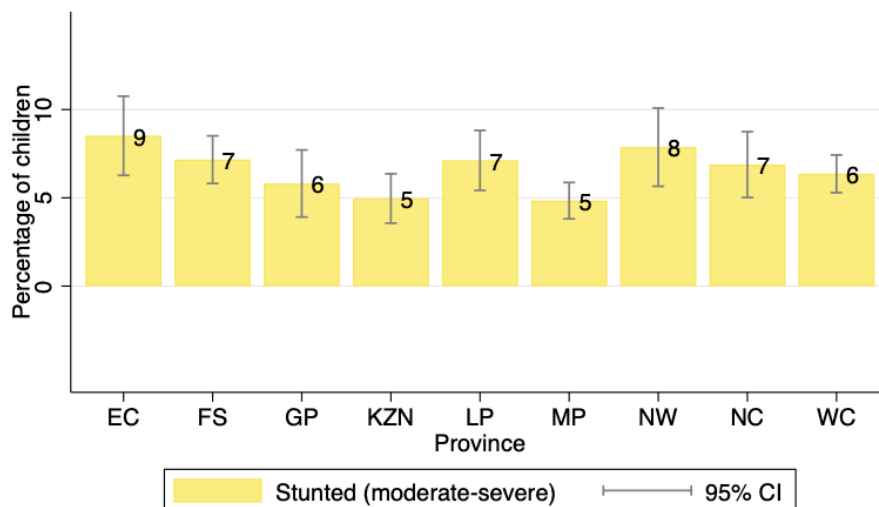


Notes: Children are defined as 'Stunted' if their height-for-age is more than 2 SDs below the WHO Child Growth Standards median. Updated SES categories were determined using monthly fees charged by the programme. Only includes children aged 50-59 months.

### Stunting rates by province:

By province, we consistently find that the Eastern Cape exhibits the highest stunting rates on average (9 percent). This is closely followed by the North West (8 percent). KwaZulu Natal and Mpumalanga tend to have lower rates of stunting of around 5 percent. Differences between provinces are not statistically different for the full sample. We do however, find statistical differences between the Eastern Cape and Mpumalanga, the Free state and Mpumalanga and the Eastern Cape and Kwazulu-Natal using the Thrive by Five Index data only. We are unable to determine reasons for provincial variation based on these data.

Figure 7: Stunting rates by province, using ELOM data collected between 2016 and 2022



Notes: Children are defined as 'Stunted' if their height-for-age is more than 2 SDs below the WHO Child Growth Standards median.

In summary, our investigation of several large ELOM datasets collected between 2016 and 2022 found that stunting rates for children aged 50-69 months remained within the 5-7 percent region. As a next step, we compared our results to other relevant South African datasets.

**A comparison of the Thrive by Five Index data to other available data**

Thrive by Five data were compared with stunting data from two additional sources, the 2016 Demographic and Health Survey (DHS) and the National Income Dynamic Survey panel dataset (NIDS) which includes five data collection waves, between 2008 and 2017.

Table 6: Number of children with stunting data per data source per year

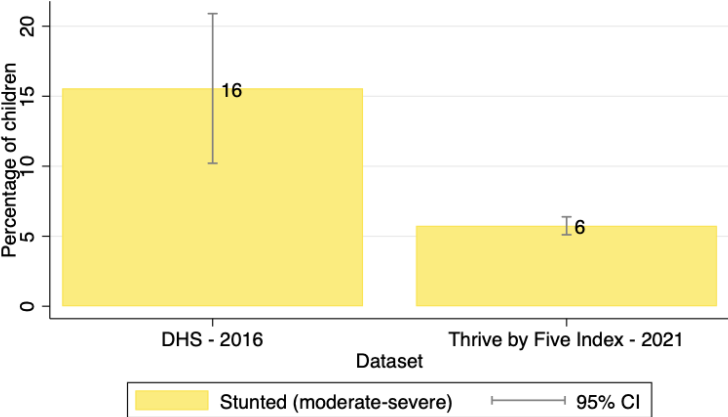
Year	Total N	Data source	Age group	Geographic representivity
2016	180	Demographic Health Survey	50-59 months	All provinces, except the Eastern Cape
2008	1353	National Income Dynamics Survey: Wave 1	1-3 years	All provinces
	1444		4-6 years	
	1551		7-9 years	
	909		1-3 years	



2010-2011	1371	National Income Dynamics Survey: Wave 2	4-6 years
	1338		7-9 years
2012	1815	National Income Dynamics Survey: Wave 3	1-3 years
	2105		4-6 years
	2133		7-9 years
2014-2015	2254	National Income Dynamics Survey: Wave 4	1-3 years
	2636		4-6 years
	2478		7-9 years
2017	2149	National Income Dynamics Survey: Wave 5	1-3 years
	2537		4-6 years
	2631		7-9 years

The Thrive by Five stunting rate is considerably lower than the 27 percent reported for the under-five population in the 2016 South African Demographic and Health Survey (Hall et al., 2019). When including only children aged 50-59 months, the estimated rate is 16 percent (Figure 8).

**Figure 8: Comparison of stunting prevalence between DHS (2016) and the Thrive by Five Index (2021) for children aged 50-59 months**



**Notes:** Children are defined as 'Stunted' if their height-for-age is more than 2 SDs below the WHO Child Growth Standards median. Ages 50-59 months.

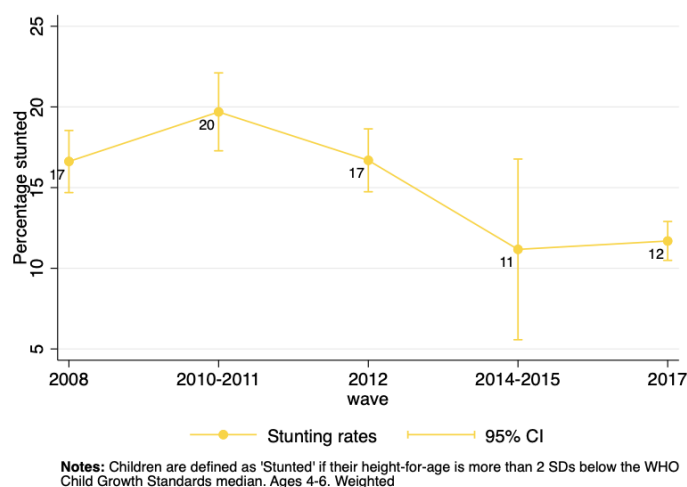


The differences in reported stunting rates may be due to several factors, including the following:

- The DHS dataset for this age group included only 180 children, compared to the 5000+ children included in the Index sample.
- The two studies used very different sampling strategies. The children included in the DHS sample were most likely *not enrolled* in an early learning programme (due to the fact that children were visited at home during the school day), whereas all of the children included in the Index were enrolled in ELPs.

The South African National Income Dynamics Study (NIDS) provides another comparative dataset. Over five waves of the study (2008-2017), the stunting rate for children aged 4-6 years ranges from 11 to 20 percent, with the most recent (2017) estimate at 12 percent.

**Figure 9: NIDS Stunting estimates for 4-6 year olds across waves 1-5 (weighted data<sup>5</sup>)**

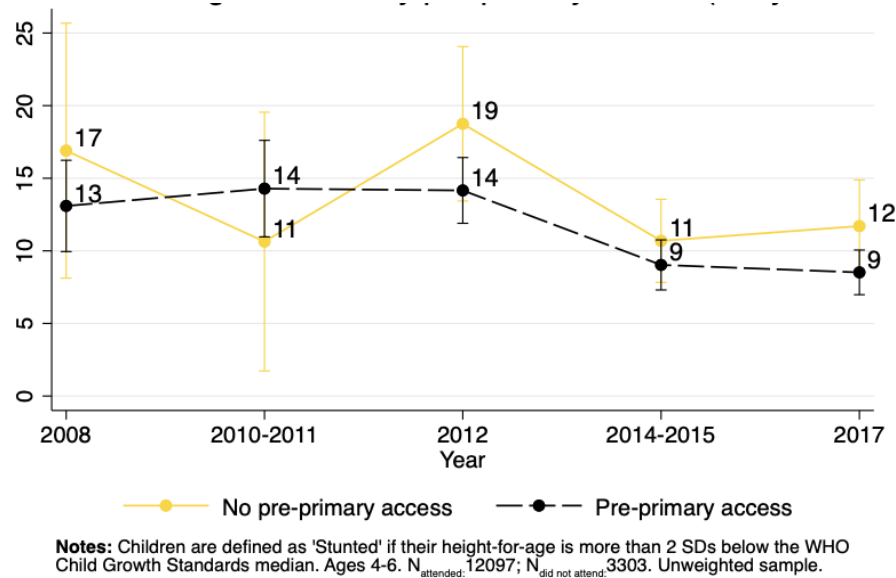


Additionally, we found small differences in average stunting rates by child access to preschool (see Figure 10). From the NIDS *unweighted* data, we estimate that children who attend(ed) pre-primary have a lower prevalence of stunting than those who do not have access, by 3 percentage points on average<sup>6</sup>. This difference is statistically significant for NIDS waves 3, 4 and 5 (i.e. from 2012 onwards).

<sup>5</sup> Differences between weighted and unweighted are small, but it is more technically correct to report weighted. Unweighted: 17, 20, 19, 12, 12

<sup>6</sup> Unweighted. The sample has a larger number of children who have had access to pre-primary school education in comparison to children who do not. The NIDS data is therefore more representative of children who have access to pre-primary education.

Figure 10: NIDS Stunting estimates for 4-6 year olds across waves 1-5, by preschool access (unweighted data)



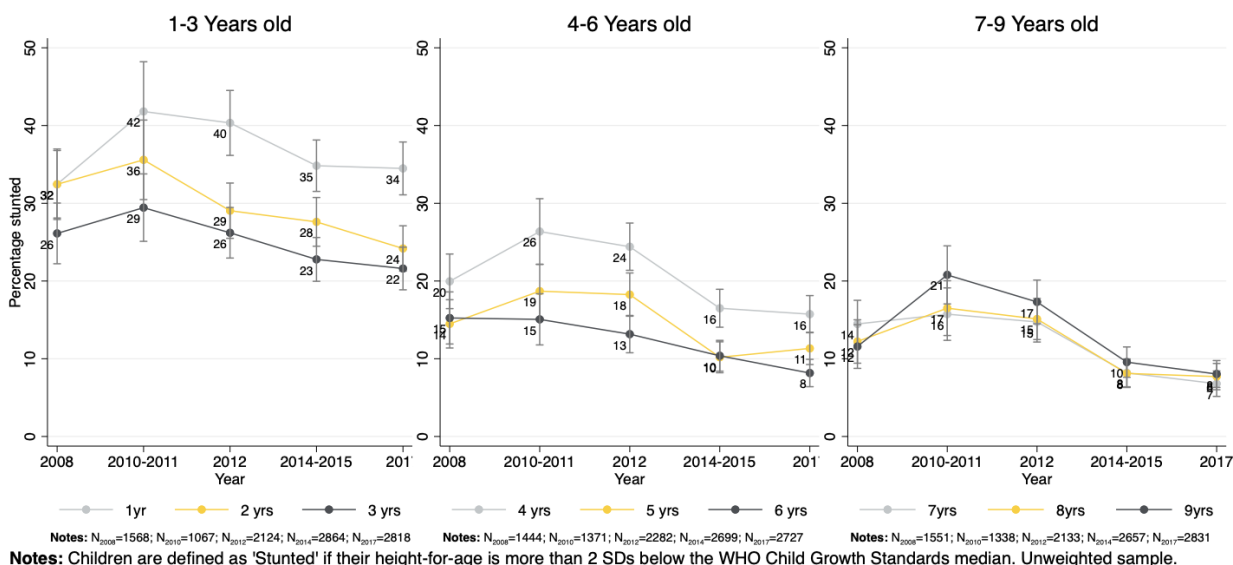
Preliminary analysis of data collected in 2022 by Grow Great found similarly, that stunting rates in children aged 48-60 months who are enrolled in an ELP are lower than those in children of the same age who do not attend an ELP (report pending). It is important to note that this sample was relatively small (509 children), and did not include children from the Western Cape or Eastern Cape.

Further research is needed to explore potential differences in stunting rates between enrolled and non-enrolled children. Lower rates of stunting in ELP enrolled children might be the result of selection bias (children attending an ELP may be better off than those not attending an ELP). Additionally, these findings may point to some protective factors associated with pre-primary attendance, such as access to regular meals and the health benefits of positive interactions and cognitive stimulation.

Lastly, both local and international studies show degrees of growth recovery ('catch-up') between infancy and toddlerhood and age five. Both the NIDS and the Birth to Twenty Cohort study findings provide evidence of substantial catch-up growth through early childhood (Casale, 2020; Casale & Desmond, 2016; Desmond & Casale, 2017). And the Young Lives study findings from four low-and-middle income countries shows that between 27 and 40 percent of children recover from stunting at 12 months by age five years (Benny et al., 2018).

Our own exploration of the NIDS data shows that stunting has both reduced over time (across the years 2008-2017) and average rates of stunting decrease as children get older.

Figure 11: NIDS Stunting estimates across ages and years (unweighted data to maintain sufficient sample size)



### Representativity of Index Data

The Index only included children who are enrolled in Early Learning Programmes<sup>7</sup> and the findings are therefore only representative of this population of children. Since the launch of the Index, the ECD Census was completed, providing us with a national database of (almost) all ELPs in the country. In order to determine whether the ELPs sampled in the Index were indeed representative of all ELPs in SA, we compared characteristics of the Index ELPs with characteristics of the Census ELPs.

A comparison of ELP fee levels (Table 9) shows that the Thrive by Five Index sample is fairly on par with the Census data, but may slightly over-represent poorer children and under-represent wealthier children. The Index sample also includes an over-representation of registered ELPs when compared to the Census population.

The Index finding of an estimated 6 percent stunting is, however, weighted<sup>8</sup>.

<sup>7</sup> An estimated 45%-55% of children aged 50-59 months were enrolled in an ELP in 2021 (GHS data, analysis by K Hall, Children's Institute)

<sup>8</sup> For more information on how the Index sample was weighted please refer to the Thrive by Five Technical Report available at [www.thrivebyfive.co.za](http://www.thrivebyfive.co.za).



**Table 9: Comparison of Thrive by Five representivity and the ECD Census**

ELP fees per month (Rands)	Thrive by Five Index 1, 164 ELPs, 62545+* children			ECD Census 37 204 ELPs, 1 458 395 children		
	% ELPs registered with DSD**	% ELPs in each fee band	% Children in each fee band	% ELPs registered with DSD	% ELPs in each fee band	% Children in each fee band
0-110	40.8	34.1	33.98	41.7	19.01	18.03
111-290	43.3	37.11	37.01	36.5	30.70	32.13
291-750	34.65	20.45	20.37	17.17	34.85	30.57
751-1750	25.4	5.76	5.71	15.19	8.85	9.81
>1751	25.8	2.58	2.93	19.9	6.59	9.45

\*37 ELPs had missing data on the number of children registered

\*\*Registration information only available for 667 ELPs. Includes fully and conditionally registered ELPs.

## Discussion

While the Index stunting rates are substantially lower than previously reported stunting rates in South Africa, comparison of data from other relevant studies (and a critique of measurement reliability, available on request), leads us to conclude that the Index findings are valid. It remains to be determined whether stunting rates for children who are *not* enrolled in ELPs are significantly different and, if so, to what extent ELP participation offers some protective elements. This is an important question warranting further investigation.

It is also interesting to note the apparent decrease in stunting rates from 2012, as reflected in the NIDS data. It would be useful to explore how the percentage across stunting groups (mild, moderate and severe) has changed over the years, what the contributing factors may have been, and whether this downward trend has continued through Covid (and recent increases in food prices that are likely to have impacted household food security, dietary diversity and child health).

An obvious limitation of the Index data is the fact that it is cross-sectional. We do not have growth data of children at earlier points in development. However, it is very probable that our findings of much lower stunting rates than national surveys of children under five may reflect “catch-up growth”. As noted earlier, both local and international studies show degrees of growth recovery (‘catch-up’) between infancy and toddlerhood and age five. However, many children who recover to ‘normal’ height by age five years still suffer the neurological effects of having been stunted at an earlier age.



The figures reported in this research brief include only moderately and severely stunted children. This is in line with most policy-related research on child growth, which focuses on the implications for development of moderate and severe growth stunting. But as Stevens et al. (2012, p.824) point out, “the hazardous effects of undernutrition happen along a continuum of mild, moderate, and severe undernutrition.” The implication is that mild stunting should not be ignored as it could be a barrier to thriving (Tredoux, Dawes, Mattes, 2022).

*Almost one in five children* in the Thrive by Five sample showed signs of mild stunting (child’s height for age Z-score is between 1SD and 2SD below the WHO reference group median).

Findings from the NIDS study reinforce the importance of attending to this group of children. Casale classified children’s catch-up by 4 to 5 years as incomplete if they were mildly stunted. She reports that children in the ‘incomplete catch up’ group did worse on education outcome measures (grade completion and failure) “compared to the children who were never stunted” (Casale, 2020: 14). Most important, there was also little difference in education outcomes between this group and those who remained stunted.

The Thrive by Five Index found that moderate growth stunting has a strong impact on learning outcomes i.e., the greatest difference in total ELOM 4&5 Scores will be found between children who are moderately stunted and those with no stunting (there is a similar difference between those severely stunted and those with no stunting, but the cell size is small, and the estimate of effect less reliable). The difference between mildly stunted children and those with no stunting is smaller, but is still significant, and underscores the importance of considering this group, who might in some classification systems not be considered stunted (Tredoux, Dawes, Mattes 2022).

Longitudinal data (such as that collected through the Birth to Twenty and Young Lives studies) of child physical growth and cognitive and socio-emotional development is important in understanding how stunting changes over time, and to what extent growth faltering in the earliest years impacts long term cognitive development.

Given the evidence of the ageing effect on stunting, we recommend a review of our national approach to reporting stunting rates of children aged 0-5 years, and propose age-disaggregation in reporting.

And finally, when we looked at stunting data from several other smaller, more targeted studies, we found much more variability in stunting rates. We will be investigating this further to understand what can be learnt from these data about particular subsets of children in this age group.





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