



## Lives Saved Tool Technical Note

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For more information, please contact [info@livesavedtool.org](mailto:info@livesavedtool.org)

# Birth outcomes and stunting at age one month

## Introduction

Our objective is to determine the association between birth outcomes and stunting at very young ages among children in low- and middle-income countries. We are interested in four types of birth outcomes: children born at term with size appropriate to their gestational age (term-AGA), at term with small size (term-SGA), prematurely with appropriate size (preterm-AGA), or prematurely with small size (preterm-SGA). This association is a critical input for the Lives Saved Tool (LiST) and its modelling of stunting and child mortality.<sup>1</sup>

## Methods

We have data from three longitudinal cohorts that measured gestational age, birth weight, as well as height over time for children up to 24 months old. We used smoothed heights for these children, which were also used to estimate the within-child association between stunting at a given age and stunting at a later age.<sup>2</sup> We used these smoothed heights, as well as reported gestational age and birth weight for each cohort. Unless otherwise noted, we used gestational age <37 weeks to determine preterm birth (yes/no). We show the odds ratio for the chances of being stunted at an early age for those born preterm, SGA, or both, relative to the odds of stunting for children born term-AGA. We determine whether children are appropriate weight for their gestational age based on the Intergrowth Standards<sup>3</sup> (available at <http://intergrowth21.ndog.ox.ac.uk/>). Each cohort is described below. We used Mantel and Haenszel's method to estimate the common odds ratio for these three cohorts.<sup>4</sup> The resulting odds ratios are incorporated in LiST for estimating the stunting of young children given their birth outcome.

## JAVITA

In the JAVITA cohort, children were weighed and measured for at least six observations, and were also weighed within three days of birth.<sup>5</sup> There are 6,374 children fitting this criteria, of 27,363 children enrolled in the JAVITA study. Most (19,490 or 71%) of the 27,363 children are not included because they have fewer than six observed heights. There are 7,873 children with six or more measured heights, and 6,374 (81%) of these were weighed within three days of birth. Height at one month was defined by a smoothed estimate based on individual growth over time.<sup>2</sup> Whether children were born preterm (yes/no) was determined by estimated gestational age below 37 weeks. Small-for-gestational-age was defined by the Intergrowth cut-offs based on a daily gestational age.

## ZVITAMBO

Children in the Zvitambo cohort were first observed at six weeks of age.<sup>6</sup> We have used this first (smoothed) height at six weeks of age to approximate stunting at one month. In addition, we used gestational age in weeks and birth weight (recorded per study protocol) to determine whether babies

were delivered preterm and if their status was small or appropriate relative to their gestational age. All 1,987 children with at least six measured heights and an observed birthweight and gestational age, who were also measured at age six weeks or earlier, contributed to the analysis in this cohort.

## CEBU

In the Cebu cohort, the first scheduled visit after birth was at two months of age.<sup>7</sup> The smoothed height at this first visit was used to approximate stunting at two months. In addition, we used gestational age in days and birth weight (recorded per study protocol) to determine preterm and weight for gestational age status. There are 2,372 babies in this cohort with the information necessary to determine SGA status and stunting at two months.

## Results

**Table 1. Odds of stunting at age one or two months for those born preterm, SGA, or both, compared to those who were born term-AGA, in three cohorts**

	Stunting at 1 month		
	Est Odds Ratio	Lower	Upper
<b>95% CI</b>			
<b>JAVITA</b>			
Term AGA (reference)			
Term SGA	5.3	3.6	7.9
Preterm AGA	5.8	3.2	9.7
Preterm SGA	35.1	13.5	91.4
<b>ZVITAMBO</b>			
Term AGA (reference)			
Term SGA	4.6	3.5	6.2
Preterm AGA	5.4	3.7	8.0
Preterm SGA	41.8	15.0	116.7
<b>Stunting at 2 months</b>			
<b>95% CI</b>			
<b>Cebu</b>			
Term AGA (reference)			
Term SGA	4.1	2.9	5.7
Preterm AGA	3.8	2.3	6.2
Preterm SGA	28.7	10.6	78.1

**Table 2. Odds of stunting at age one or two months for those born preterm, SGA, or both, compared to those who were born term-AGA, across three cohorts of young children measured at birth**

	Stunting at 1 month		
	Est Odds Ratio	95% CI	
		Lower	Upper
<b><i>Mantel-Haenszel estimated odds</i></b>			
Term AGA (reference)			
Term SGA	5.0	4.2	5.9
Preterm AGA	6.4	5.1	8.0
Preterm SGA	46.5	30.6	70.4

The odds ratios in Table 2 have been incorporated into the LiST model.

## References

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- <sup>4</sup> Mantel N, Haenszel W. Statistical aspects of the analysis of data from retrospective studies. J natl cancer inst. 1959;22:719-48.
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