Are boys more vulnerable to nutritional stress? Child weight growth in a Queensland Aboriginal community (1950-1982) in comparison with the new WHO references

Hilary Bambrick

Abstract

Background: Previous studies have universally found that Aboriginal children exhibit poor growth in relation to international references.
Objective: To determine how weight-for-age growth of children born 1950-1982 in a large Queensland Aboriginal community compare with the recent WHO international reference data, and whether girls and boys show similar patterns of growth.
Methods: Weights were obtained from clinic records for 109 children (birth to 60 months, mean=135.4 measurements). Percentiles were fitted and smoothed using cubic B-splines. Growth of girls and boys were compared with the WHO references.
Results: Girls' growth approximated WHO references, while boys' growth was generally reduced. The heaviest boys were significantly heavier than the comparison data.
Conclusions: Generalisability of the data is limited, but they suggest that young boys may be more vulnerable to sub-optimal environmental circumstances than young girls. Community growth percentiles, while not necessarily appropriate for clinical diagnosis, provide useful comparison with international data and can illustrate variation at population level.
Implications: Previous studies have found that Aboriginal children exhibit 'poor' growth overall, but this may not be the case among girls when more recent references are used for comparison. Poor growth may be apparent only among boys, perhaps reflecting greater vulnerability to nutritional and other stress. The greater variability in boys' growth and the sex differences in growth potential should further be explored in light of adult mortality differences. These findings may be cautiously generalisable to similar communities, and perhaps useful as a descriptive baseline against which to assess future improvements in Aboriginal child health.

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Introduction

There has long been debate about the appropriate use of growth reference data, whether at the individual or population level. Previous 'international' growth references, in particular, have been criticised for being unrepresentative. The once widely-used National Center for Health Statistics (NCHS) 1977 reference, for example, relied on data gathered from children in 'white', middle class families living in privileged areas of the United States, who tended to be formula-fed rather than breastfed, and were unlikely to represent 'healthy' growth [1]. References used more recently were those from the US Centers for Disease Control and Prevention (2000), which were based on the growth of both breast-fed and formula-fed infants, in proportion to feeding practices in the US [2]. However, the questionable value of using growth data from a country with the highest – and rising – rates of obesity remained.

In April 2006, following the recognition that exclusive breast-feeding promotes satisfactory growth in infants until six months, the World Health Organization (WHO) released updated growth references [3]. These are based on an international sample of infants exclusively breast-fed for six months, with breastfeeding continuing as solids are introduced. This is considered to represent the healthy biological norm for human babies [3]. These references specifically incorporate data from ethnically diverse groups, and are intended to be representative of growth patterns for many different populations.

Charting Aboriginal child growth

There are currently no detailed Australian growth reference data, and none for Indigenous Australians (but see Smith et al. [4], who have created a small set of data).

The NCHS 1977 references (and earlier, similarly biased data) were used for many years to assess growth patterns among Australia's Indigenous children. Jose and Welch [5] and Cox [6] were among the first to document significant faltering in growth among Aboriginal children. Such a flattening of the growth trajectory can occur as supplementary feeding and weaning introduce new challenges to infant growth, and is commonly observed in poorer countries and in disadvantaged communities in rich countries [7, 8]. The period of slow growth is usually partially compensated for by catch-up growth in the following one to two years. This pattern of faltering in both height and weight growth, usually between three and 12 months of age, was subsequently observed to occur in a number of different Aboriginal populations throughout Australia [4, 9-13].

There is no doubt that the health of Australia's Indigenous children remains much worse than that of the rest of the population, with infant mortality still between two and four times higher [14]. Is this health differential reflected in patterns of growth? The earlier observations of typical faltering were made in relation to now superseded growth references. This paper examines whether such faltering remains apparent when child growth is compared with the more recent and more representative WHO references, and whether it occurs equally for girls and boys.

Methods

Study population

Between 1950 and 1982, an infant health clinic operated in a large, urbanised Aboriginal community located in rural south east Queensland (population currently about 1,200). All infants and children resident in the community attended the clinic for regular weighing and health checks by clinic nurses until they reached 'school age' (about 5 years old).

The data used in this study were limited to individuals still resident on the community in 2000. (Potential biases within the sample are discussed later.) Infant growth records were accessed as part of a study into type 2 diabetes. Recruitment into the study was by two methods: diabetes diagnosis recorded at the community hospital ('cases') and by random household sampling of people who had never been diagnosed with diabetes ('controls'). This produced a total of 111 women and 93 men; 43% of whom had been diagnosed with diabetes). Details of recruitment methods are provided elsewhere [15].

Data were fortnightly weight measurements from birth to five years. These data have been validated elsewhere [16]. Other measures of infant health and growth, such as length and head circumference, were not routinely measured.

The study was approved by the Community Council, the Elders and the Human Research Ethics Committee at the Australian National University, Canberra. Participants gave their informed consent for their infant health records to be accessed.

Sampling

Adult diabetes status is not necessarily independent of child growth patterns (see discussion below). It was therefore important that the sample used to calculate the percentiles was as representative of the community as possible in terms of subsequent diabetes status, rather than biased towards children who subsequently developed diabetes as adults. To avoid over-representation of those children who were later diagnosed with diabetes, only a random sample of the diagnosed participants (43% of the original sample) were included in the percentile calculations to constitute approximately 20% of the study sample, equivalent to the proportion of adults within this community with diagnosed diabetes [15] Child weight growth records were available for 40 women and 47 men participating in the study who had never been diagnosed with diabetes. Added to these were 10 women with diagnosed diabetes and 12 men with diagnosed diabetes (randomly selected from the original sample) to comprise approximately 20% of the final study sample. A total of 50 females and 59 males were included in the analyses.

Analyses

The date of measurement was transformed to months from birth (where a month had 30 days). Percentiles for each month were calculated separately for boys and girls from birth to age 60 months using observations lying within the month +/-0.5.

Construction of the community growth curves was informed by the methods used by the WHO: their reference curves were generated using cubic B-splines to closely represent the empirical data, along with LMS methods to account for any skewing of data [3].

For the community data presented here, cubic B-splines were chosen to generate the percentile curves as they were found to demonstrate adequate goodness-of-fit with the data, while varying the degrees of freedom was the method employed to deal with any skewness in the raw data. The community data were smoothed using cubic B-splines with 13, 15, 17, 20, 17, 15, 15, and 13 degrees of freedom respectively. This method produced curves that were visually smooth, yet captured periods of more rapid or slower growth. In order to produce a visually smooth curve, fewer degrees of freedom were used for the more extreme percentiles as there is more uncertainty (higher standard error) associated with these than with more central percentiles. The differences between the results produced by the WHO method and the one used here are likely to be negligible.

To quantify differences between the weight growth of girls and boys in this community, an index was calculated by expressing the community percentile at each age as a ratio of its corresponding WHO reference percentile. For example, for the 5th percentile at 0 months the index for girls was 1.08, or 8% above the WHO 5th percentile (2.7kg/2.5kg), and for boys it was 1.04, or 4% (2.7kg/2.6kg). The mean differences in the resulting indices between girls and boys for each of the 5th, 50th and 95th percentiles were analysed so that the relative growth of girls and boys could be compared.

Results

On average there were 135.4 weights for each child, measured over the five years (that is, at approximately fortnightly intervals). There were between two and 245 observations per girl and between one and 251 observations per boy. The number of measurements available for girls and boys were fairly evenly distributed across the ages. Tables A1 and A2 (see

Appendix) show the calculated growth curve percentiles (5th, 10th, 25th, 50th 75th, 90th 95th), from birth to 60 months for girls and boys respectively.

Comparisons with the WHO reference

Figures 1 and 2 illustrate the community 5th, 50th and 95th percentiles in relation to the new WHO 2006 references.

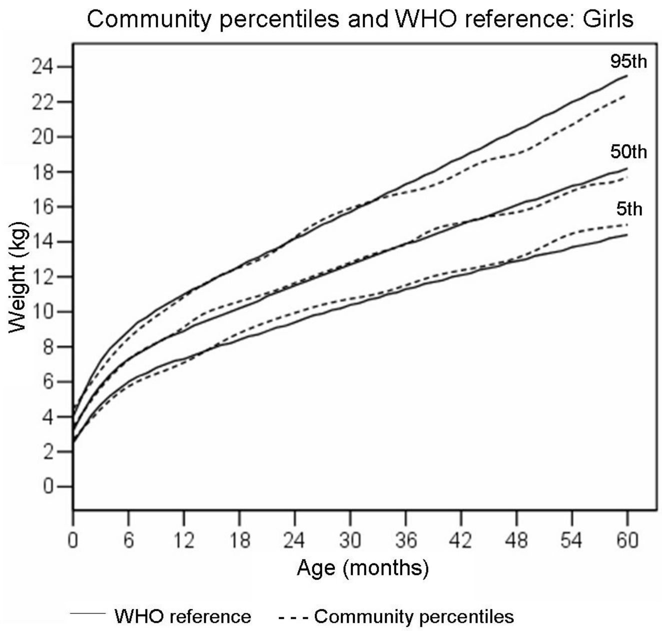

Figure 1. Calculated community growth curve (girls) from birth to 60 months in relation to the 2006 WHO reference, showing 5th, 50th, and 95th percentiles.

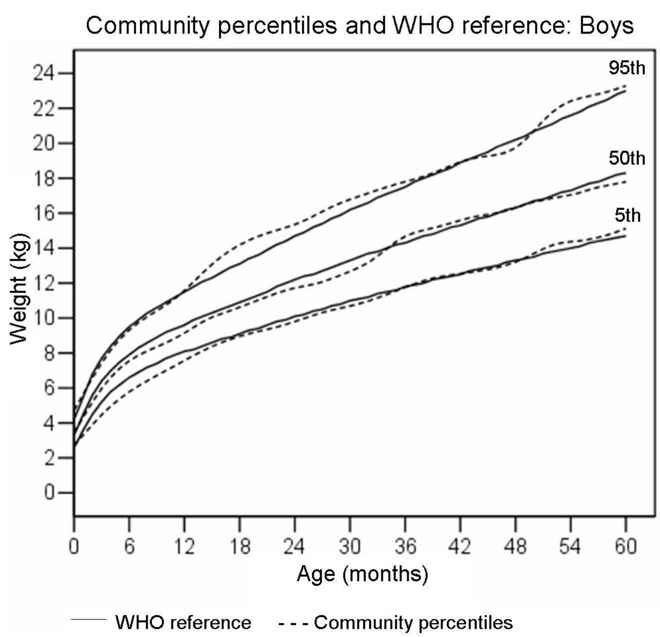

Figure 2. Calculated community growth curve (boys) from birth to 60 months in relation to the 2006 WHO reference, showing 5th, 50th, and 95th percentiles.

The community percentiles for girls match very well the WHO references with only slightly reduced growth for the few months, followed by some slightly more rapid growth from 12 months. Overall, girls tracked the WHO reference fairly closely, with some relative decline among the heaviest girls from about three years of age.

Weight growth among boys appears more variable. The heaviest boys (95th percentile) tracked the WHO reference well for the first 12 months, and then exceeded the reference until about three years. The lightest boys (5th percentile) had slower growth than the 5th percentile of the WHO reference for the first 18 months, and then followed the reference closely. The community median for boys was lower than the WHO median until about 36 months.

On average for the whole period from birth to five years, girls at the 5th percentile were 255g heavier than the WHO reference (95% CI =173-337g, $p<0.001$) while those at the 95th percentile weighed on average 479g less (95% CI = 340-617g, $p<0.001$). There were no differences for girls between the two medians (95% CI = -78-57g, $p=0.759$). For boys, those at the 5th percentile weighed an average of 166g less than the WHO reference (95% CI = 81-251g, $p<0.001$) while the heaviest boys were on average 319 g heavier (95% CI = 208-430g, $p<0.001$). The community median for boys was on average 234g lighter than the median WHO reference (95% CI =157-310g, $p<0.001$).

Comparisons between girls and boys in the community

The means and standard deviations of the average indices of community growth relative to the WHO reference percentiles are shown in Table 1. These differences in weight growth between girls and boys in the community in relation to their respective WHO references were highly significant. At the 5th percentile, the relative growth of girls was on average 4.5% greater than boys (95% CI = 3.8-5.2%, $p<0.001$) and at the median it was 2.6% greater than boys (95% CI = 1.7-3.5%, $p<0.001$). At the 95th percentile, boys' growth was 4.7% greater than girls (95% CI = 4.1-5.4%, $p<0.001$). In summary, the lightest boys weighed less than girls relative to their WHO references, as did boys at the median compared with girls at the median, while the heaviest boys were significantly heavier than the heaviest girls relative to the WHO references.

Table 1. Means and standard deviations for the 5th, 50th and 95th community percentile relative to the WHO references

Percentile		Mean ratio relative to WHO reference	Standard deviation
5th	Girls	1.02	0.04
	Boys	0.97	0.05
50th	Girls	1.00	0.02
	Boys	0.98	0.03
95th	Girls	0.97	0.03
	Boys	1.02	0.03

Discussion

Growth faltering and overall poor growth in Aboriginal children has long been considered near universal. However, past findings were based on comparisons with growth references that have now been superseded. Using 32 years of infant health records from a large Queensland Aboriginal community, this study compared the weight growth of girls and boys aged from birth to five years with the latest WHO international reference data, and compared the patterns of girls' and boys' growth.

The growth of girls generally tracked the new reference data, while boys in this sample showed greater variability in postnatal growth patterns. In general, boys grew relatively more slowly than girls, but the heaviest boys were much heavier than the international reference and gained weight relatively more rapidly than the heaviest girls. Previous studies in Aboriginal communities have also found some sex differences in faltering patterns; for example, boys showed a greater deficit in weight-for-age than girls in a study of Western Australian Aboriginal children [10], but not in overall variability as found here, where boys' growth tended to be at the two extremes.

The faltering that occurred among boys may simply be a continuation of a prenatal characteristic: because of the more rapid early fetal growth generally among males, they may be more susceptible to prenatal nutritional stress. There may be postnatal sex differences in energy storage: for example, McCowan and colleagues [17] found that girls were more likely to exhibit catch-up growth than boys, which may be protective in times of subsequent nutritional stress [18].

It is, of course, possible that the observed differences in weight growth between boys and girls could be due to fewer poorly growing girls surviving into adulthood (and thus being included in the study) giving the illusion that girls had 'healthier' growth. However, the demographic profile of the cohort suggests that this is unlikely. There were nearly 20% more adult women than men from this cohort (born 1950-1982, ages 19-51 years at the 2001 census) in the community. This, along with the demographic structure of the community at the time of the study (Figure 3), suggests that the apparent better growth of young girls compared with boys among the survivors is not an artefact of greater mortality among poorly growing girls. Sex differences in mortality and survivor bias appear instead to be in the other direction, with fewer surviving males, even at very young ages before sex differences in behaviour (particularly relating to trauma and risk-taking) would become evident. The demographic structure of the population could also reflect more men than women moving away from the community (and thus not being available to be included in the sample), but such migration is unlikely to be related to patterns of child growth. Demographic data lend support to the conclusion drawn here that boys may be more vulnerable to nutritional and other environmental stresses than girls, and that the poorer growth exhibited, even by those surviving to adulthood, could actually indicate poorer child growth overall. If, however, there had been fewer girls than boys surviving childhood, it would suggest that those with less healthy patterns of growth had died young and were therefore missed in the study.

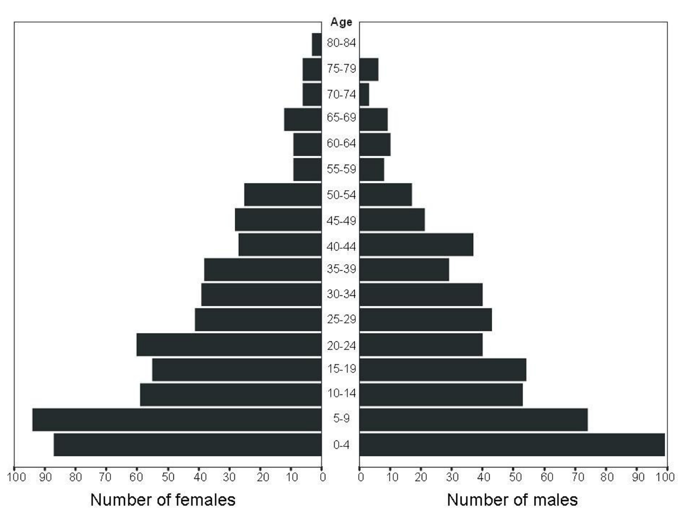

Figure 3. Community age distribution, by sex and age group. Data from ABS Census of Population and Housing, 2001.

That boys may be more susceptible to nutritional stress may not explain satisfactorily the greater variability in growth observed among boys in this study, where the heaviest boys appear to have gained weight very rapidly. There are extremes in the community data in boys' growth: the lightest males were significantly lighter than the reference, as were those at the median, but the heaviest boys were much heavier. This was not the case for girls, where the heaviest girls were found to be significantly lighter than the heaviest WHO reference. This sex difference is particularly interesting.

Maternal diabetes during pregnancy tends to produce high birthweight babies (>4,500g) and heavier infants, but this would be expected to affect male infants and female infants equally. It is possible, however, that there was higher mortality (either pre- or postnatally) among girls of diabetic mothers.

Slow and rapid infant growth have both been implicated in the subsequent development of type 2 diabetes. The 'programming hypothesis' suggests that babies who are subject to nutritional deprivation prenatally or in early postnatal life are 'programmed' to develop insulin resistance (related to diabetes) if there is subsequent over-nutrition [19, 20], while large babies resulting from maternal diabetes during pregnancy are also at increased risk of developing diabetes as adults [21, 22],

Men and women in this community exhibit similar levels of diagnosed diabetes [15], and, as similar proportions of women and men with diagnosed diabetes were included in the sample, the differences between boys' and girls' growth are unlikely to be due to an over-representation of men with diabetes. It is expected that if there had been any diabetes-related bias in the sampling – either subsequent development of diabetes or over representation of children of mothers with diabetes – this would have occurred equally for both groups.

That faltering seems to occur even among the heaviest children suggests that a number of children are born large (perhaps due to maternal diabetes), but that postnatal environmental circumstances are less than optimal for growth. Again, there is no reason to suspect that these environmental circumstances might be different for boys and girls.

Weight-for-age is not a perfect indicator of overall health and growth. The same weight could theoretically be observed for a stunted but relatively heavy child and a lean but tall child. Weight used in conjunction with linear measurements would provide a better overall indication of growth, but, unfortunately, length measurements were not routinely taken at the infant clinics.

Growth is not a reflection only of nutritional adequacy. Infections can play a significant role in reducing growth (and also poorer growing children tend to be more susceptible to infection). Other environmental factors which either relate to infant and child growth, through nutrition, or interact with it include socioeconomic status, emotional stress, and, in some regions, season and climate [9, 23]. Again, it is unlikely that exposure to these environmental factors differed systematically by sex, so they cannot explain the greater variability among weights for boys unless the response to these factors differs by sex.

This study did not take into account any secular trends in child growth. Health outcomes for children in the community did improve over the study period: infant mortality declined from approximately 250 per thousand in 1952, through 150 in 1960s, 40 in the 1970s (still twice the rate for the rest of Queensland at the time) to approximately 16 per thousand in the 1980s [24]. It could be expected that the most vulnerable children were also the lightest, and, as infant mortality declined, more of these children would have survived and would form part of this sample. Or conversely, gains in growth may have contributed to the decline in mortality.

Indeed, postnatal growth patterns in the study community have changed slightly over the study period, but the average increase may reflect an increase in the proportion of heavier children, rather than an overall increase [25, 26]. This may be what is reflected in the weights of the heaviest boys in the sample. Changed feeding practices (Figure 4) probably had little influence on growth patterns in this study population: differences in growth between breast-fed and formula-fed infants in this community were found in a previous study to be negligible [27], probably reflecting the much stronger influences of other community environmental factors (such as exposure to infection).

Throughout the 30-year study period the living conditions in this community were generally those of substantial deprivation relative to Australia generally. State government administration of the community continued into the 1980s. Many traditional practices had been lost, children were often institutionalised in dormitories, and rations (white flour, sugar, tea and some poor quality meat) were relied on until the 1970s. The population in this study was unlikely to be well-nourished by today's standards, but severe malnutrition was probably rare [25]. All the children included in the sample, however, had survived into adulthood, suggesting that the growth characteristics of the sample may be better than one containing children who did not survive into adulthood.

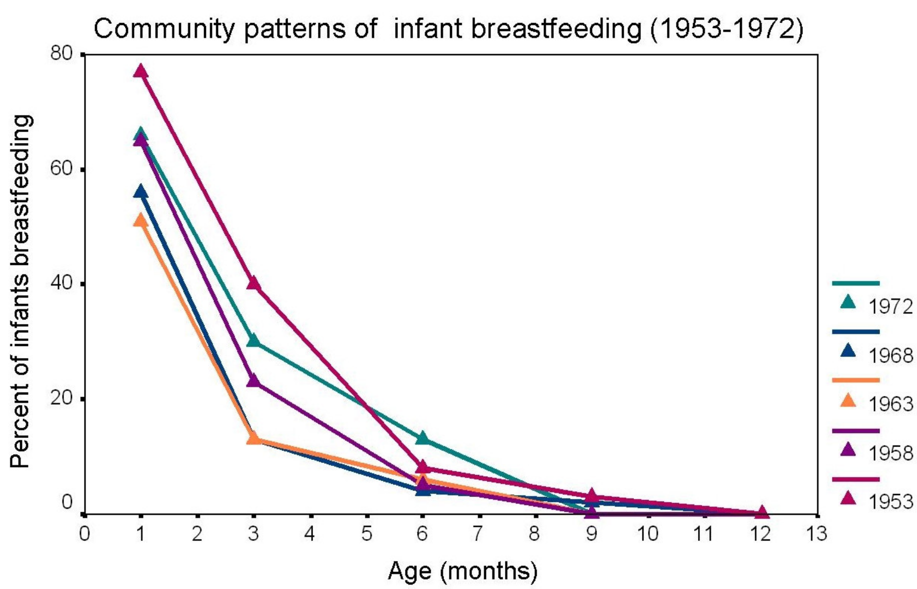

Figure 4. Changing patterns of breastfeeding in the study community, 1953-1972. Data from [27]

Adequate weight gain is not always equivalent to good health, but the WHO references form a useful point of comparison to assess overall growth patterns within a community. The community growth percentiles presented here are not intended to be considered optimal for Aboriginal children, but go some way to describe what may have been 'normal' under the particular circumstances of a socioeconomic disadvantaged, urbanised community.

The size of the study data set was limited by the size of the community, so there is some uncertainty, especially at the more extreme percentiles, that delivers some 'lumpiness' into the derived curves. These curves could have been smoothed further, but this would have compromised the accuracy of the curves as a reflection of the observed data.

Another limitation of this analysis is that comparisons between the observed and reference percentiles do not take into account the imprecision of the two sets of estimates. The WHO reference data, being based on many more measurements, are comparatively precise, while the community percentiles would have much greater variability.

Taking these limitations into consideration, comparison with the latest international weight growth reference data suggest that significant faltering was not necessarily universal among Aboriginal children, but that boys may have been more vulnerable to nutritional (and perhaps infection) stress than girls. Boys appear to have followed two extremes of growth, being either very heavy or very light in relation to the international data, while girls tracked the reference percentiles fairly closely. It is unknown what may be behind these sex differences in variability. Given that life expectancy of Australia's Indigenous people is far lower than for the rest of its population and the relative difference between Aboriginal men and women is also substantial [14], factors leading to these sex differences in mortality may extend back into sex differences in responses to early childhood environment. Possible differences between girls and boys in achieving 'healthy' growth therefore need to be assessed further and addressed. These findings may be generalisable to similar communities, and may be used cautiously as a baseline against which to assess future improvements in Aboriginal child health.

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Further information

Contact details:

Dr Hilary J Bambrick, Research Fellow, National Centre for Epidemiology and Population Health, The Australian National University, Canberra ACT 0200, Australia, email: hilary.bambrick@anu.edu.au

Ethical approval:

The study was approved by the Community Council, the Elders and the Human Research Ethics Committee at the Australian National University, Canberra. Participants gave their informed consent for their infant health records to be accessed.

Conflict of interest:

None

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Appendix

Table A1. Community weight growth percentiles for girls (0-60 months)

				Percentiles (weight in kilograms)											
age	**5**	**10**	**25**	**50**	**75**	**90**	**95**	**age**	**5**	**10**	**25**	**50**	**75**	**90**	**95**
0	2.70	2.85	3.10	3.43	3.85	4.14	4.43	**31**	10.83	11.19	12.05	13.02	14.64	15.80	16.10
1	3.30	3.47	3.77	4.21	4.63	4.94	5.21	**32**	10.92	11.30	12.18	13.22	14.98	15.98	16.27
2	3.89	4.08	4.43	4.97	5.37	5.71	5.96	**33**	11.04	11.40	12.29	13.38	15.22	16.13	16.44
3	4.45	4.66	5.05	5.66	6.05	6.43	6.69	**34**	11.18	11.50	12.39	13.53	15.40	16.26	16.59
4	4.95	5.18	5.61	6.27	6.66	7.10	7.36	**35**	11.34	11.63	12.47	13.68	15.54	16.38	16.72
5	5.39	5.63	6.10	6.80	7.20	7.70	7.96	**36**	11.51	11.77	12.57	13.85	15.62	16.50	16.83
6	5.74	5.99	6.52	7.26	7.67	8.23	8.49	**37**	11.70	11.94	12.69	14.14	15.67	16.64	16.94
7	6.03	6.28	6.86	7.64	8.08	8.70	8.95	**38**	11.88	12.12	12.83	14.46	15.73	16.79	17.06
8	6.26	6.52	7.12	7.95	8.44	9.10	9.37	**39**	12.03	12.30	12.99	14.71	15.85	16.97	17.23
9	6.46	6.74	7.32	8.21	8.78	9.46	9.75	**40**	12.17	12.48	13.18	14.88	16.01	17.17	17.45
10	6.66	6.98	7.54	8.47	9.10	9.78	10.11	**41**	12.27	12.63	13.43	14.99	16.18	17.39	17.71
11	6.87	7.24	7.81	8.77	9.44	10.12	10.48	**42**	12.37	12.75	13.72	15.08	16.36	17.64	17.99
12	7.10	7.54	8.14	9.13	9.80	10.47	10.85	**43**	12.46	12.85	14.02	15.20	16.54	17.88	18.26
13	7.36	7.85	8.50	9.52	10.15	10.83	11.21	**44**	12.56	12.96	14.27	15.33	16.70	18.08	18.50
14	7.65	8.15	8.83	9.85	10.46	11.18	11.54	**45**	12.67	13.07	14.45	15.45	16.84	18.22	18.69
15	7.96	8.42	9.11	10.09	10.71	11.50	11.84	**46**	12.79	13.20	14.58	15.53	16.99	18.29	18.81
16	8.26	8.67	9.35	10.27	10.90	11.80	12.10	**47**	12.92	13.35	14.69	15.60	17.12	18.31	18.91
17	8.54	8.89	9.54	10.43	11.10	12.05	12.33	**48**	13.07	13.53	14.82	15.69	17.22	18.32	19.03
18	8.79	9.08	9.72	10.6	11.32	12.25	12.53	**49**	13.27	13.73	14.96	15.82	17.26	18.36	19.22
19	9.01	9.26	9.88	10.74	11.57	12.42	12.73	**50**	13.50	13.97	15.12	15.98	17.29	18.48	19.48
20	9.22	9.46	10.06	10.89	11.81	12.59	12.95	**51**	13.76	14.22	15.31	16.21	17.35	18.66	19.81
21	9.41	9.66	10.25	11.07	12.03	12.79	13.21	**52**	14.03	14.52	15.51	16.45	17.44	18.86	20.13
22	9.60	9.86	10.41	11.24	12.21	13.03	13.52	**53**	14.28	14.80	15.71	16.69	17.55	19.08	20.42
23	9.77	10.05	10.58	11.43	12.39	13.30	13.88	**54**	14.47	15.03	15.90	16.90	17.69	19.29	20.69
24	9.94	10.23	10.77	11.65	12.60	13.61	14.27	**55**	14.61	15.18	16.08	17.10	17.86	19.49	21.01
25	10.11	10.40	10.96	11.84	12.81	13.98	14.64	**56**	14.71	15.25	16.22	17.25	18.04	19.6	21.33
26	10.26	10.55	11.15	12.04	13.05	14.38	14.98	**57**	14.79	15.25	16.31	17.33	18.20	19.62	21.61
27	10.41	10.69	11.33	12.23	13.31	14.78	15.27	**58**	14.85	15.22	16.37	17.37	18.37	19.60	21.88
28	10.54	10.81	11.53	12.42	13.58	15.11	15.51	**59**	14.92	15.20	16.41	17.50	18.58	19.54	22.14
29	10.64	10.93	11.72	12.62	13.87	15.39	15.72	**60**	14.98	15.18	16.45	17.70	18.81	19.45	22.40
30	10.74	11.07	11.90	12.81	14.23	15.61	15.92								

Table A2. Community weight growth percentiles for boys (0-60 months)

	Percentiles (weight in kilograms)														
age	5	10	25	50	75	90	95	**age**	5	10	25	50	75	90	95
0	2.70	2.61	3.09	3.45	4.00	4.70	4.72	**31**	10.82	10.43	11.75	12.90	13.94	17.23	16.97
1	3.31	3.17	3.90	4.34	4.88	5.79	5.66	**32**	10.98	10.57	11.96	13.19	14.30	17.36	17.15
2	3.91	3.71	4.69	5.21	5.72	6.85	6.58	**33**	11.15	10.79	12.18	13.55	14.63	17.50	17.33
3	4.47	4.18	5.41	5.97	6.50	7.82	7.44	**34**	11.35	11.03	12.39	13.96	14.91	17.68	17.50
4	4.96	4.58	6.02	6.62	7.16	8.66	8.19	**35**	11.56	11.27	12.59	14.37	15.12	17.90	17.65
5	5.40	4.92	6.50	7.15	7.73	9.30	8.81	**36**	11.76	11.48	12.73	14.67	15.29	18.16	17.80
6	5.78	5.22	6.86	7.56	8.20	9.74	9.32	**37**	11.96	11.67	12.86	14.88	15.43	18.42	17.94
7	6.12	5.53	7.12	7.87	8.58	10.04	9.74	**38**	12.13	11.84	13.02	15.03	15.57	18.69	18.10
8	6.42	5.87	7.32	8.12	8.90	10.27	10.09	**39**	12.28	12.00	13.26	15.15	15.71	18.94	18.29
9	6.72	6.24	7.51	8.36	9.20	10.49	10.42	**40**	12.39	12.12	13.55	15.29	15.88	19.16	18.51
10	7.00	6.58	7.74	8.59	9.53	10.77	10.75	**41**	12.47	12.19	13.86	15.44	16.10	19.32	18.73
11	7.29	6.91	8.03	8.85	9.88	11.15	11.13	**42**	12.54	12.25	14.14	15.59	16.34	19.43	18.94
12	7.57	7.22	8.39	9.15	10.24	11.67	11.57	**43**	12.61	12.33	14.39	15.74	16.56	19.52	19.09
13	7.86	7.54	8.79	9.47	10.58	12.31	12.08	**44**	12.69	12.44	14.53	15.85	16.71	19.63	19.20
14	8.13	7.85	9.18	9.79	10.87	13.01	12.60	**45**	12.78	12.56	14.56	15.93	16.81	19.77	19.27
15	8.38	8.13	9.50	10.05	11.11	13.68	13.08	**46**	12.89	12.69	14.57	16.02	16.91	19.96	19.34
16	8.60	8.36	9.74	10.25	11.30	14.28	13.51	**47**	13.03	12.83	14.68	16.14	17.04	20.21	19.48
17	8.79	8.55	9.92	10.43	11.48	14.73	13.88	**48**	13.21	13.01	14.92	16.32	17.24	20.55	19.74
18	8.96	8.71	10.05	10.62	11.63	14.99	14.19	**49**	13.44	13.21	15.21	16.50	17.47	21.01	20.16
19	9.10	8.85	10.18	10.82	11.79	15.11	14.45	**50**	13.70	13.44	15.46	16.64	17.71	21.55	20.71
20	9.24	8.97	10.32	11.02	11.94	15.16	14.67	**51**	13.96	13.66	15.64	16.76	17.96	22.05	21.29
21	9.35	9.07	10.45	11.22	12.09	15.18	14.86	**52**	14.17	13.83	15.74	16.86	18.20	22.45	21.78
22	9.48	9.18	10.58	11.42	12.23	15.24	15.02	**53**	14.30	13.92	15.79	16.95	18.40	22.72	22.16
23	9.64	9.32	10.70	11.58	12.36	15.34	15.18	**54**	14.37	13.97	15.86	17.05	18.55	22.9	22.41
24	9.81	9.49	10.84	11.72	12.48	15.50	15.36	**55**	14.42	14.03	16.00	17.18	18.67	23.00	22.58
25	9.98	9.68	10.99	11.82	12.61	15.74	15.57	**56**	14.50	14.14	16.19	17.34	18.80	23.07	22.70
26	10.16	9.88	11.13	11.93	12.77	16.03	15.83	**57**	14.62	14.27	16.35	17.49	18.99	23.12	22.82
27	10.32	10.06	11.25	12.07	12.95	16.34	16.10	**58**	14.75	14.43	16.46	17.59	19.21	23.17	22.95
28	10.45	10.19	11.35	12.26	13.15	16.65	16.36	**59**	14.93	14.65	16.60	17.69	19.44	23.29	23.11
29	10.57	10.28	11.45	12.46	13.37	16.90	16.59	**60**	15.13	14.92	16.77	17.80	19.66	23.45	23.28
30	10.69	10.35	11.57	12.67	13.63	17.09	16.79								