Introduction

Growth charts are integral tools for public health professionals and clinicians alike, providing a way to assess the health status and growth patterns of children and adolescents. Growth charts have evolved over the years in the statistical methods used and the designs of charts (1). Globally, children are evaluated for their well-being on the basis of their nutritional status as evaluated using growth charts and patterns (2). Ever since World Health Organization
malnutrition in the country, which may cause further complications as children continue to grow (17). There is a clear relationship between nourishment and immunity, which implicates further the importance of the health of children who can be exposed to multiple infectious agents during school outings.

A data-based growth chart can serve as a reference for all future studies and a comparative source for understanding the growth and other associated parameters of school children in the tribal region in Jharkhand.

This study intends to determine the growth patterns of the schoolchildren selected by evaluating obtained data and plotting it in graph using the LMS method. The LMS graph thus created will also be used to compare with the IAP growth chart.

Methods

The present study was conducted in the selected 16 schools under the Gift Milk programme funded by the National Foundation of Nutrition (NFN) India, a joint venture of the National Dairy Development Board (NDDB) and the Rural Electricity Corporation Limited (REC Ltd) (18). The schools were selected randomly from the district of Latehar in Jharkhand as it is a tribal subplan district under Government of India with special emphasis on the tribal population (19). A total of three blocks of the district were chosen for the whole project based on geographic homogeneity, similar demographic populations and logistic availability. Approval for the study was taken by the Institutional Ethical Committee of the Rajendra Institute of Medical Sciences in Ranchi. The project was started in November 2017, and we were to complete the analysis and report-writing by November 2018. We adopted the standard procedures as described in the seminal paper for such projects by Waterlow et al. (20). These guidelines mandate that we have representatives from different age groups and participants from both sexes with a sample size of more than 500 children, use a cross-sectional design, use a defined and reproducible sampling procedure, measure carefully, and, using trained observers, record measurements meticulously using instruments that have been periodically calibrated and tested. In each selected school, 60 students, 30 boys and 30 girls, were chosen randomly, amounting to a total of 960 children between the ages of 6 and 14 years. During data
A pilot study was completed initially to check the feasibility of the study and address any problems. All members of the field team were encouraged to participate in the capacity-building. Piloting was done as an external pilot survey in which a nearby, government-run school was selected. Questionnaires and other assessments were used to obtain a full picture of things to come in the field. The piloting was done on 10% of the total sample size of 960 children. The children were selected randomly so that we could have a fair representation of all age groups. We included 10 children from each age group from 6–14 years. Five males and 5 females were randomly selected from each age group. Ten extra children, 5 male and 5 female, were selected, too. The questionnaire was designed after checking its face validity, which was found to be satisfactory by the Principal Investigator. The data entries of 100 children’s data were supervised after 12 trained physicians recorded the measurements of the children during piloting. The test-retest reliability of the questionnaire was found to be satisfactory, with an overall score of \( r = 0.80 \). All data were collected by the questionnaire designed and finalised in the Department of Preventive and Social Medicine, Rajendra Institute of Medical Sciences Ranchi. The questionnaire had three sections: i) questions related to demographic details; ii) questions related to anthropometric measurements and iii) questions related to dietary habits. Data collected using the anthropometric measurements are used in this paper. We employed the techniques as per the WHO’s monograph (21) to measure all school children. We measured children aged 6–14 years using a stadiometer (Charder HM200PW Wall Mounted Stadiometer), and measurements were performed by one observer following the recommendations. Measurements for height were taken to the nearest 0.1 cm. Freeman’s 15 m fiberglass-top measuring tape was also kept for any need-based measurements. Weight was recorded to the nearest 0.1 kg with minimal clothing. An Omron bathroom scale was used to measure and record the weights. The equipment used was standardised; it was newly purchased for this project and was easily recalibrated, carried and moved around in each school. All data, thus collected were entered in MS Excel sheets and double-checked by trained team members. We also used statistical techniques to minimise the errors expected due to the large volume of data. Data that were collected in the field after piloting were cross-checked by our funders during their field visits. Data after collection in the field on hard copies were entered on MS Office Excel sheets with in-built data checks for all cells in the sheets so that data were not entered in the wrong format. Birth dates were obtained from the children’s school records, which were dependent on the Universal Identity Number UID (Adhaar Card) being mandatorily taken by the schools to cross-check the ages of their enrolled children (22). The decimal age was calculated from their recoded ages and date of visit.

**Inclusion Criterion**

After formal consent (permission from district authorities, consent from teachers, consent from adolescents), all randomly selected students were asked about their well-being and willingness to participate. All willing students after random selection were included in the study. Formal consent was also taken from the teachers.

**Exclusion Criterion**

Those who were severely ill or not willing to participate were excluded from the study. LMS chart maker version 2.5 was used to create the curves, smooth the height and weight and calculate BMI using the following formula: weight in kg/length or height in m² (23). Data analysis was done using SPSS version 23.0 for calculating percentiles of the obtained values for height, weight and BMI. These were then compared with IAP growth charts.

**Results**

While evaluating weight in kg for boys and girls, we found the majority of the boys (377) to be in the age range of 10–13 years; in age group of 6–9 years we had 68 boys, and there were 23 boys in the age group of 14 years. In most of these boys, upon comparing the values of the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentiles from the IAP, we found these values to be less than that of the IAP chart.
We also saw observed the standard deviation values to be less than that IAP values (Supplementary Table 1). During the evaluation of girl students in different schools, we found most (368) girls to be in the age range of 6–14 years, while in age group of 6–9 years we had only 68 girls. For age group of 14 years, we had 31 girls. Like with the boys, among girl students, when we compared the various percentiles with IAP values, we found our percentile scores to be less than that of the IAP, including the standard deviation scores across girls of age group 6–14 years (Supplementary Table 2). Among boys and girls for age 6 years, as the sample size was smaller, we saw all percentile values obtained during observation to be more than the IAP-recommended percentile values. Percentile values obtained for the measured height and weight for boys and girls (Supplementary Tables 3 and 4). Here, too, for age 6 in boys and girls, as the sample size was less than 10, observed percentile values were more than the IAP reference chart. However, the number of boys or girls in any age was more than 10, so the percentile values obtained were less than the IAP-recommended values.

By using the software LMS chart maker, we were able to have the LMS values with Z scores for each age and their respective height and weight for boys and girls. The M score values were the same as the values of the Z (0 score) (Tables 1 and 2). By calculating BMI from height and weight and using the standard formula for calculating BMI, we were able to have LMS scores of BMI for boys and girls as well. The age range taken in our study was 6–14 years (Tables 1 and 2). By obtaining the values using the software, we were able to make the reference charts/growth curves for weight, height, and BMI for boys and girls aged 6–14 years (Figures 1–3).

Table 1. LMS values and Z scores for boys’ and girls’ weight (kg) (values of M and Z score of 0 are same)

| Age | LMS values for boys’ weight (kg) | LMS values for girls’ weight (kg) |
|-----|---------------------------------|----------------------------------|
|     | L | M | S | −3 | −2 | −1 | +1 | +2 | +3 |
| 6   | −1.14555 | 19.72371 | 0.109339 | 16.39805 | 17.32013 | 18.3756 | 21.3035 | 22.97853 | 24.9362 |
| 7   | −1.15034 | 20.87505 | 0.125019 | 16.95297 | 19.02042 | 19.26084 | 22.8126 | 24.9194 | 27.45955 |
| 8   | −1.18715 | 21.32743 | 0.138624 | 16.99377 | 18.1523 | 19.31784 | 23.54948 | 26.037 | 29.13957 |
| 9   | −1.31613 | 23.06292 | 0.149187 | 18.16369 | 19.44694 | 20.98334 | 25.69169 | 28.74495 | 32.73445 |
| 10  | −1.41934 | 25.3406 | 0.157877 | 19.77924 | 21.21155 | 22.94821 | 28.4417 | 32.16594 | 37.26144 |
| 11  | −1.3428 | 27.76437 | 0.164005 | 21.48669 | 23.07194 | 25.04358 | 31.29647 | 35.54165 | 41.34731 |
| 12  | −1.03552 | 29.51492 | 0.168009 | 22.45525 | 24.3012 | 26.51595 | 33.29594 | 37.65652 | 43.7733 |
| 13  | −0.48786 | 31.93998 | 0.170266 | 23.71968 | 25.95865 | 28.56316 | 35.94692 | 40.2284 | 45.24367 |
| 14  | 0.20389 | 33.90303 | 0.17157 | 24.28141 | 27.07328 | 30.15633 | 38.01246 | 42.03885 | 46.3407 |

Table 2. LMS values and Z scores for boys’ and girls’ height (cm) (values of M and Z score of 0 are same)

| Age | LMS values for boys’ height (cm) | LMS values for girls’ height (cm) |
|-----|---------------------------------|----------------------------------|
|     | L | M | S | −3 | −2 | −1 | +1 | +2 | +3 |
| 6   | −0.51297 | 19.59918 | 0.159398 | 14.82959 | 16.1387 | 17.65176 | 21.89106 | 24.31952 | 27.14001 |
| 7   | −0.48981 | 19.89915 | 0.171595 | 14.7471 | 16.14848 | 17.78046 | 22.41715 | 25.1122 | 28.27487 |
| 8   | −0.46599 | 21.52224 | 0.183053 | 15.63921 | 17.22659 | 19.08764 | 24.44066 | 27.59181 | 31.32291 |
| 9   | −0.37479 | 24.2 | 0.192335 | 17.297 | 19.14939 | 21.33123 | 27.65779 | 31.41137 | 35.87892 |
| 10  | −0.38446 | 27.09217 | 0.197152 | 19.15574 | 21.28739 | 23.79691 | 31.05443 | 35.34066 | 40.4187 |
| 11  | −0.30959 | 29.66316 | 0.194634 | 20.97062 | 23.32729 | 26.08131 | 33.91756 | 38.45578 | 43.78409 |
| 12  | −0.1602 | 31.87909 | 0.186929 | 22.55412 | 25.15312 | 28.12309 | 36.18037 | 40.61659 | 45.57276 |
| 13  | 0.20976 | 33.1694 | 0.17235 | 23.47885 | 26.28299 | 29.38738 | 37.32641 | 41.40514 | 45.78088 |
| 14  | 0.50894 | 33.80515 | 0.165311 | 24.0985 | 27.01638 | 30.13911 | 37.67756 | 41.339 | 45.11665 |
Table 2. LMS values and Z scores for girls’ and boys’ height (kg) (values of M and Z score of 0 are same)

| Age | LMS values for boys’ height (cm) | Z scores for boys’ height (cm) |
|-----|----------------------------------|--------------------------------|
| 6   | -3.98546                         | 118.315                         |
| 7   | -3.73893                         | 121.0166                        |
| 8   | -3.51546                         | 123.8385                        |
| 9   | -3.3768                          | 127.7022                        |
| 10  | -3.15496                         | 132.5033                        |
| 11  | -2.69808                         | 137.0053                        |
| 12  | -1.94E+00                        | 140.5078                        |
| 13  | -0.83078                         | 143.8489                        |
| 14  | 0.431266                         | 146.7704                        |

| Age | LMS values for girls’ height (cm) | Z scores for girls’ height (cm) |
|-----|----------------------------------|---------------------------------|
| 6   | -3.98546                         | 118.315                         |
| 7   | -3.73893                         | 121.0166                        |
| 8   | -3.51546                         | 123.8385                        |
| 9   | -3.3768                          | 127.7022                        |
| 10  | -3.15496                         | 132.5033                        |
| 11  | -2.69808                         | 137.0053                        |
| 12  | -1.94E+00                        | 140.5078                        |
| 13  | -0.83078                         | 143.8489                        |
| 14  | 0.431266                         | 146.7704                        |

Figure 1. Reference height curve chart for girls and boys with percentile score
Discussion

Recent evidence suggests wide variations in growth patterns among various populations globally, challenging the notion of using a universal growth chart (24, 25).

In our study, we found the tribal school children population falling behind the growth parameters set by the IAP (percentile values set by the IAP for boys’ and girls’ weight, height and BMI) (Supplementary Tables 1–4) (26). This reflects the importance of prolonged poor nutrition; the WHO and UNICEF define stunting and wasting as two separate, important indicators for nutrition. However, as is evident, different populations can have different charts for measurement, so we need greater sample sizes to determine if the results are due to poor nutrition or the genetics of the tribal populations specific to Jharkhand. We also propose the Z scores using the LMS method with value of median (M) as the value of Z score 0, along with Z scores of -1, -2, -3 and +1, +2, +3 (Figures 1–3). Based on the results thus obtained, we propose the growth curves with percentile values of the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentiles. We have not compared our values to those of international standards like those of...
the WHO or the Centres for Disease Control and Prevention (CDC) as the recent IAP norms have been re-evaluated to conform to international standards.

In similar studies done elsewhere, the growth charts have shown a higher curve when compared to WHO curves for similar percentile values. In our study, we also found that if the number of students was less than 10 or 20, the percentile values were on par with the IAP charts for both sexes (Supplementary Tables 3 and 4), especially for girls. This can be attributed to the benefits of the existing mid-day-meal programme and the overall better attendance of girls as visualised and documented by our team during our visits to the schools. Evidence elsewhere has also suggested benefits in the overall nutrition of the mid-day-meal scheme in India (30).

**Conclusion**

We believe that the present study is sufficient to be projected as a template for school-going children in Jharkhand owing to our sampling procedure following the multi-stage probability random sampling method, which is considered to be one of the strongest methods for studying a sample in large population. This coupled with the reduction of intra- and inter-observation biases, employing accurate instruments and having trained medical professionals taking measurements makes this study better in the sense of quality. Considering this, we recommend our growth curves of height, weight and BMI to be used when studies are conducted to evaluate children of the age group 6-14 years for the tribal population residing in the state of Jharkhand.

**Acknowledgements**

We would like to acknowledge the support of students, teachers, and district administration, and our team of junior residents, for their efforts. We would also like to extend our thanks to our funders, REC Ltd and NFN India, for their support.

**Conflict of Interest**

None.

**Authors’ Contributions**

Conception and design: DK, RKR
Analysis and interpretation of the data: DK
Drafting of the article: RKR
Critical revision of the article for important intellectual content: DK, AK, CK, SS, VK, HS
Final approval of the article: RKR
Provision of study materials or patients: AK, CK
Statistical expertise: DK, RKR
Obtaining of funding: DK, RKR
Administrative, technical, or logistic support: AK, CK, SS, VK, HS
Collection and assembly of data: AK, CK, RKR

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**Supplementary File**

The comparative values of the percentile scores obtained against the Indian Academy of Pediatrics (IAP) recommended percentile values

**Supplementary Table 1.** Boys' weight in kg with percentile values

| Age | n  | 3rd  | 10th | 25th | 50th | 75th | 90th | 97th | mean ± SD |
|-----|----|------|------|------|------|------|------|------|-----------|
| Observed 6 | 9 | 13.4 | 18.4 | 19.1 | 19.8 | 21.2 |      |      | 20.4±2.66 |
| IAP 6 | 14.5 | 15.8 | 17.4 | 19.3 | 21.7 | 24.6 | 28.3 |      | ±3.6      |
| Observed 7 | 8 | 18.4 | 18.4 | 19.52 | 20.45 | 22.45 |      |      | 21.7±3.8  |
| IAP 7 | 16 | 17.6 | 19.6 | 21.9 | 24.9 | 28.6 | 33.4 |      | ±4.2      |
| Observed 8 | 16 | 14.6 | 16.98 | 18.87 | 21.75 | 23.1 | 26.72 |      | 21.43±3.37 |
| IAP 8 | 17.5 | 19.5 | 21.9 | 24.8 | 28.5 | 33.2 | 39.4 |      | ±5.7      |
| Observed 9 | 35 | 18.08 | 20.06 | 20.8 | 23.6 | 25.9 | 27.64 | 33.86 | 23.78±3.49 |
| IAP 9 | 19.1 | 21.5 | 24.3 | 27.9 | 32.3 | 38  | 45.5 |      | ±6.3      |
| Observed 10 | 80 | 20.17 | 21.4 | 23.02 | 25.65 | 29.2 | 34.49 | 45.26 | 27.00±5.73 |
| IAP 10 | 20.7 | 23.5 | 26.9 | 31.1 | 36.3 | 43  | 51.8 |      | ±7.9      |
| Observed 11 | 146 | 20.98 | 22.2 | 25.1 | 28.3 | 32  | 39.13 | 44.19 | 29.44±5.99 |
| IAP 11 | 22.6 | 25.9 | 29.8 | 34.7 | 40.9 | 48.7 | 58.7 |      | ±8.9      |
| Observed 12 | 106 | 22.3 | 24.6 | 27.07 | 30.12 | 34.55 | 39.76 | 43.69 | 31.26±5.66 |
| IAP 12 | 24.9 | 28.7 | 33.3 | 39  | 46  | 54.8 | 66.1 |      | ±10.0     |
| Observed 13 | 45 | 20.81 | 24.6 | 27.95 | 34.4 | 39.55 | 43.92 | 50.7 | 33.94±7.40 |
| IAP 13 | 27.5 | 31.8 | 37  | 43.3 | 51.1 | 60.7 | 72.6 |      | ±11.3     |
| Observed 14 | 23 | 22.8 | 25.26 | 31.8 | 34.1 | 37.2 | 41.58 | 41.58 | 34.09±5.38 |
| IAP 14 | 30.7 | 35.5 | 41.3 | 48.2 | 56.4 | 66.3 | 78.3 |      | ±12.1     |

Note: Red coloured entries show values observed to be less than the IAP growth chart values

**Supplementary Table 2.** Girls' weight in kg with percentile values

| Age | n  | 3rd  | 10th | 25th | 50th | 75th | 90th | 97th | mean ± SD |
|-----|----|------|------|------|------|------|------|------|-----------|
| Observed 6 | 5 | 15.7 | 15.7 | 17.05 | 20.1 | 24  |      |      | 20.4±3.80 |
| IAP 6 | 13.7 | 15.1 | 16.7 | 18.7 | 21.3 | 24.6 | 29.1 |      | ±9.1      |
| Observed 7 | 10 | 15.6 | 15.63 | 16.72 | 17.75 | 21.4 | 24.5 |      | 18.8±5.81 |
| IAP 7 | 15.1 | 16.8 | 18.7 | 21.2 | 24  | 28.2 | 33.4 |      | ±3.4      |
| Observed 8 | 14 | 15.8 | 15.95 | 18.8 | 22.95 | 25.77 | 27.5 |      | 22.22±4.06 |
| IAP 8 | 16.7 | 18.7 | 21.1 | 24  | 27.6 | 32.2 | 38.1 |      | ±8.1      |
| Observed 9 | 39 | 18.34 | 19.5 | 21.1 | 23.7 | 26.4 | 31.6 | 38.68 | 24.40±4.61 |
| IAP 9 | 18.5 | 20.9 | 23.7 | 27.2 | 31.5 | 36.7 | 43.4 |      | ±3.4      |
| Observed 10 | 90 | 18.67 | 21.03 | 23.27 | 26.7 | 31.55 | 37.39 | 39.78 | 27.74±6.0 |
| IAP 10 | 20.7 | 23.5 | 26.9 | 31  | 36  | 42  | 49.4 |      | ±9.4      |
| Observed 11 | 102 | 22.31 | 24.26 | 25.8 | 28.75 | 31.72 | 37.78 | 43.41 | 29.81±5.99 |
| IAP 11 | 23.3 | 26.7 | 30.7 | 35.4 | 41  | 47.7 | 55.9 |      | ±5.9      |
| Observed 12 | 122 | 23.1 | 24.93 | 26.95 | 30.3 | 35.45 | 40.63 | 44.48 | 31.62±5.90 |
| IAP 12 | 26.2 | 30  | 34.5 | 39.8 | 46  | 53.4 | 62.1 |      | ±2.1      |
| Observed 13 | 54 | 24.22 | 25.8 | 28.95 | 32.6 | 37.1 | 39.45 | 42.24 | 32.78±4.99 |
| IAP 13 | 28.9 | 33.1 | 37.9 | 43.6 | 50.2 | 57.9 | 67.1 |      | ±7.1      |
| Observed 14 | 31 | 24.1 | 27.44 | 28.6 | 34  | 36.3 | 42.28 |      | 33.77±5.14 |
| IAP 14 | 31.3 | 35.6 | 40.6 | 45.4 | 53.2 | 61.1 | 70.4 |      | ±0.4      |

Note: Red coloured entries show values observed to be less than the IAP growth chart values
### Supplementary Table 3. Boys' height in cm with percentile values

| Age | n   | 3rd  | 10th | 25th | 50th | 75th | 90th | 97th | mean ± SD |
|-----|-----|------|------|------|------|------|------|------|----------|
| Observed | 6  | 9    | 113  | 113  | 117.5| 120.5| 124  |      | 121.44±6.41 |
| IAP  | 6  |      | 104.2| 107.7| 111.2| 114.8| 118.5| 122.2| 126     | ±        |
| Observed | 7  | 8    | 115  | 115  | 118.25| 121.75| 126.37|      | 123±7.11 |
| IAP  | 7  |      | 109.3| 113  | 116.8| 120.7| 124.6| 128.6| 132.6   | ±        |
| Observed | 8  | 16   | 111  | 114.5| 117.125| 122.75| 129.5 | 135   | 123±7.167 |
| IAP  | 8  |      | 114.3| 118.2| 122.3| 126.4| 130.5| 134.8| 139.1   | ±39.     |
| Observed | 9  | 35   | 117.08| 121  | 123.5| 126.9| 132  | 139.4| 145.32  | 128.4±6.84 |
| IAP  | 9  |      | 119  | 123.2| 127.5| 131.8| 136.3| 140.7| 145.3   | ±45.     |
| Observed | 10 | 80   | 121  | 125  | 129  | 133  | 139.37| 143.97| 151.85  | 133.92±7.57 |
| IAP  | 10 |      | 123.6| 128.1| 132.6| 137.2| 141.9| 146.6| 151.4   | ±51.     |
| Observed | 11 | 146  | 123  | 127.94| 132.37| 138.5| 142.52| 147.8 | 153.01  | 138.15±8.03 |
| IAP  | 11 |      | 128.2| 133  | 137.8| 142.7| 147.6| 152.5| 157.5   | ±57.     |
| Observed | 12 | 106  | 126.31| 131  | 135.37| 141  | 145.45| 150.8 | 157.79  | 140.98±7.76 |
| IAP  | 12 |      | 133.2| 138.3| 143.3| 148.4| 153.5| 158.6| 163.7   | ±8.1     |
| Observed | 13 | 45   | 124.31| 130.92| 136.5| 145  | 152  | 155  | 159.17  | 143.82±9.21 |
| IAP  | 13 |      | 138.3| 143.7| 149  | 154.3| 159.5| 164.7| 169.9   | ±69.     |
| Observed | 14 | 23   | 134  | 137.02| 139  | 145.5| 151.7| 157.18| 157.18  | 145.67±7.26 |
| IAP  | 14 |      | 143.4| 149  | 154.5| 159.9| 165.1| 170.3| 175.4   | ±75.     |

Note: Red coloured entries show values observed to be less than the IAP growth chart values.

### Supplementary Table 4. Girls' height in cm with percentile values

| Age | n   | 3rd  | 10th | 25th | 50th | 75th | 90th | 97th | mean ± SD |
|-----|-----|------|------|------|------|------|------|------|----------|
| Observed | 6  | 5    | 109  | 109  | 113  | 120.5| 130.75|      | 121.80±9.81 |
| IAP  | 6  |      | 102.3| 106  | 109.7| 113.5| 117.4| 121.5| 125.6   | ±25.     |
| Observed | 7  | 10   | 106  | 106.3| 109.75| 119.5| 123.62| 127.45| 117.3047| 764 |
| IAP  | 7  |      | 107.4| 111.4| 115.4| 119.4| 123.5| 127.7| 131.9   | ±31.     |
| Observed | 8  | 14   | 112  | 113  | 115  | 127  | 135  | 136  | 125.66±8.85 |
| IAP  | 8  |      | 112.6| 116.8| 121.1| 125.4| 129.6| 133.9| 138.1   | ±38.     |
| Observed | 9  | 39   | 120.64| 122  | 124  | 129.7| 136  | 143  | 148.76  | 130.76±7.41 |
| IAP  | 9  |      | 117.8| 122.4| 126.9| 131.4| 135.8| 140.2| 144.5   | ±44.     |
| Observed | 10 | 90   | 118.19| 123.55| 128  | 134.5| 142.2| 147.9| 150.63  | 134.83±8.66 |
| IAP  | 10 |      | 123.3| 128.1| 132.8| 137.4| 142  | 146.4| 150.8   | ±50.     |
| Observed | 11 | 102  | 127.48| 130.36| 133.6| 138.5| 143.12| 148.88| 156.45  | 139.13±7.76 |
| IAP  | 11 |      | 128.8| 133.7| 138.6| 143.3| 147.9| 152.4| 156.8   | ±56.     |
| Observed | 12 | 122  | 128.51| 133.01| 136.01| 141.85| 148.11| 152.63| 157.65  | 142.08±7.53 |
| IAP  | 12 |      | 134  | 138.9| 143.7| 148.4| 153  | 157.5| 162     | ±62.     |
| Observed | 13 | 54   | 128.25| 135  | 138.87| 143.8| 148.12| 154.5 | 158.7   | 143.84±7.22 |
| IAP  | 13 |      | 138.2| 142.9| 147.6| 152.2| 156.8| 161.3| 165.9   | ±65.     |
| Observed | 14 | 31   | 129  | 136.81| 142.01| 146  | 150.6| 152.9 | 145.42±6.11 |
| IAP  | 14 |      | 141.3| 145.8| 150.2| 154.7| 159.2| 163.7| 168.2   | ±68.     |

Note: Red coloured entries show values observed to be less than the IAP growth chart values.