



STUNTING INDUCED BY WASTING – WASTING INDUCED BY STUNTING: A CASE STUDY OF J. FAMILY (GROWTH-AND-OBESITY PROFILES)

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Additional File 2

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Box 1. Report preliminaries

- a) All dates are entered as *YYYY-MM-DD* and ages in the format *YY-MM-DD*
- b) Predicted parameters are listed in *italics*
- c) Interpolated and predicted parameters are given at reference age grids.
- d) Estimated-adult height and estimated-adult mass are based on percentiles of current height and current mass, respectively
- e) STUNTED means child is short heighted-for-age, based on mid-parental height, taken as reference; WASTED means child has lesser mass-for-height (do not confuse with everyday meaning of wasted)
- f) Mother's obesity status is valid if she is NOT PREGNANT; in case of pregnancy add estimated weight of fetus and re-determine difference of mass (weight)- for-height and status
- g) To compute Parents' Obesity Profiles in 2011 heights (and, hence, the optimal masses) of the 2007 checkup were used.
- h) Predicted and actual heights (masses) are compared using the following formula:

$$\% \text{ matching} = 100 \left(1 - \frac{|\text{Predicted} - \text{Actual}|}{|\text{Actual}|} \right)$$

Box 2. Abbreviations used

BMI: Body-Mass Index
MUAC: Mid-Upper-Arm Circumference
NGDS: National Growth and Developmental Standards for the Pakistani children (A Pilot Project)

Box 3. Referral notes

provided to
Professor Dr. Durré Samin Akram
Diplomat, American Boards in Pediatrics and Ex-President, Pakistan Pediatric Association
 (when Q. J. and J. J. were sent to her for head-to-toe examination)

Q. J.: Female, 11+ for failure to gain height and weight. Her weight lies below 3rd percentile, and the predicted weight at 11.5 years, still, lies below 3rd percentile. Her height lies at 4th percentile (3.84 to be exact) at 11 years, and the predicted height at 11.5 years is falling below 3rd percentile. Mid-parental height lies at 9th percentile (8.81 to be exact).
History: Academically doing well, participating in athletics, misbehaving with parents, problem with a male classmate in school may be the cause, does not like to eat food, had chicken pox
Psychological: Behavior in lab good, quiet, sensitive, little finger sucking, asked to speak "If I am Mom" (revealed anger within), asked to write, "Why do I want to become a doctor?" (revealed a caring and a loving individual)
Examination: White spots on nails, showed asymmetry on 2 halves of back on forward bending and visual inspection, leg-lengths equal (71.0 cm each), moiré and X rays negative

J. J.: Female, 7+ for failure to gain height. Her height is falling below 3rd percentile, and the predicted height at 7.5 years, still, lies below 3rd percentile.
History: Academically doing well, naughty, does not like to eat food, but drinks milk, had chicken pox, burns
Psychological: Drawing analysis revealed closeness with the older sister
Examination: Unkempt, hyperactive, talkative, teeth yellow, MUAC different (Right/Left: 25.5 cm/24.9 cm), moiré negative

Box 4. Formulae used for computation of growth-and-obesity profiles I

1. Fractional age was computed by, first converting dates from format $YYYY-MM-DD$ into fractional form, using the following formulae [1]:

$$\text{Fractional Date} = YYYY + \frac{\text{Days}(MM - 1) + DD}{365}$$

$\text{Days}(MM - 1)$ represented cumulative days of the previous month. For a leap year, replace 365 by 366.

$$\text{Fractional Age} = \text{Date of Checkup} - \text{Date of Birth}$$

2. Percentile of height of an adult was calculated by linear interpolation using:

$$P(h) = P(h_{<}) + (P(h_{>}) - P(h_{<})) \left(\frac{h - h_{<}}{h_{>} - h_{<}} \right)$$

where $P(h_{<})$, $P(h)$, $P(h_{>})$ represented percentiles corresponding to heights, $h_{<}$ (20-year height read from growth table [2], which was below the measured height), h , $h_{>}$ (20-year height read from growth table, which was above the measured height).

3. Percentile of mass of an adult was calculated with the help of the following formula:

$$P(\mu) = P(\mu_{<}) + (P(\mu_{>}) - P(\mu_{<})) \left(\frac{\mu - \mu_{<}}{\mu_{>} - \mu_{<}} \right)$$

where $P(\mu)$ represented percentile of height and $P(\mu_{<})$ and $P(\mu_{>})$ were the values used for linear interpolation.

4. Optimal mass of an adult was calculated as:

$$\mu_{\text{opt}} = \mu_{<} + (\mu_{>} - \mu_{<}) \left(\frac{P(h) - P(h_{<})}{P(h_{>}) - P(h_{<})} \right)$$

where $P(h)$ represent percentile of height and $P(h_{<})$ and $P(h_{>})$ were the values used for linear interpolation.

5. Mid-parental heights: $B = \frac{F + M + 13}{2}$, $G = \frac{F + M - 13}{2}$, where B , G , F , M represented heights of boy, girl, father, mother, respectively.

Box 5. Formulae used for computation of growth-and-obesity profiles II

6. Status, pertaining-to-height, was computed as (h is height of the individual and h_{MP} was the mid-parental height):

$$STATUS(h) = 100 \frac{|h - h_{CA-MP}|}{h_{CA-MP}}$$

7. Status, pertaining-to-mass, was computed as:

$$STATUS(\mu) = 100 \frac{|\mu - \mu_{opt}|}{\mu_{opt}}$$

8. Detailed description of the models, including calculations of children are available online [1-3]. In order to analyze data of J. family, presented in this report, KFA (Kamal-Firdous-Alam) model [1] was simplified and extended to include multiple checkups. This developed model is described in Additional File 1, uploaded as:

http://www.ngds-ku.org/Papers/J32/Additional_File_1.pdf

Table 1. Parents' obesity profiles of 2 checkups				
	Father		Mother	
Date of Birth	1960-08-22		1971-08-27	
Check up	1st	2nd §	1st	2nd §
Date of Checkup	2007-05-13	2011-03-13	2007-05-13	2011-03-13
Age	46-08-21	50-06-21	35-08-16	39-06-16
Fractional Age (<i>year</i>)	46.72	50.56	35.71	39.54
Heights (<i>cm</i>)	165.8		155.8	
	165.8		155.8	
	165.5		155.6	
Average Height, <i>h</i> (<i>cm</i>)	165.7		155.7	
Average Height (<i>ft-in</i>)	5 ft 5.23 in		5 ft 1.31 in	
Percentile-for-Height, <i>P</i> (<i>h</i>)	6.40		13.47	
Gross Masses (<i>kg</i>)	79.2	77.3	57.3	57.4
	79.2	77.3	57.3	57.4
	79.2	77.3	57.3	57.4
Average Gross Mass (<i>kg</i>)	79.2	77.3	57.3	57.4
Clothing Correction (<i>kg</i>)	0.5	0.3	0.5	0.4
Average Net Mass, μ (<i>kg</i>)	78.7	77.0	56.8	57.0
Average Net Weight (<i>lb-oz</i>)	173 lb 0.54 oz	173 lb 0.54 oz	125 lb 3.90 oz	125 lb 10.96 oz
Percentile-for-Mass, <i>P</i> (μ)	74.12	69.12	53.60	54.07
Body-Mass Index, <i>BMI</i> (<i>kg/m²</i>)	28.66	28.04	23.42	23.50
Optimal Mass, μ_{opt} (<i>kg</i>)	56.63		49.18	
Optimal Weight (<i>lb-oz</i>)	124 lb 13.91 oz		108 lb 6.91 oz	
Δ Mass-for-Height (<i>kg</i>)	+ 22.07	+ 20.37	+ 7.62	+ 7.82
Δ Weight-for-Height (<i>lb-oz</i>)	+ 48 lb 10.63 oz	+ 44 lb 14.65 oz	+ 16 lb 12.99 oz	+ 17 lb 4.05 oz
STATUS (μ)	38.97% OBESE	35.97% OBESE	15.50% OBESE	15.91% OBESE

COLOR CODES FOR STATUSES		<1%	Hue 085, Sat 255, Lum 064	Red 000, Green 128, Blue 000
		1-10%	Hue 042, Sat 255, Lum 128	Red 255, Green 255, Blue 000
		>10%	Hue 000, Sat 255, Lum 092	Red 184, Green 000, Blue 000

§ Second-checkup statuses were computed using heights measured during the initial (1st) checkup.

Table 2. Adult-mid-parental (Target) heights		
BOY/GIRL=(FATHER+MOTHER±13)/2	Boy	Girl
Adult-MP (Target) Height (cm)	167.22	154.22
Adult-MP (Target) Height (ft-in)	5 ft 5.83 in	5 ft 0.72 in
Percentile of Adult-MP (Target) Height	9.43	8.81

Table 3. Growth parameters of Z. J.					
Vital Statistics	Check up	1 st	2 nd	3 rd	4 th
	Date of Checkup	2007-05-13	2007-10-07	2008-06-15	2009-02-15
	Age	10-07-20	11-00-41	11-00-22	12-04-22
Gender	Fractional Age (year)	10.63	11.04	11.73	12.40
Female	Heights (cm)	136.2	139.6	146.3	150.4
Date of Birth		136.5	139.6	146.7	150.2
1996-09-23		136.6	139.9	146.6	150.5
Mass at Birth	Net Masses (kg)	42.5	46.5	49.6	49.2
2.5 kg		42.5	46.5	49.5	49.2
		42.5	46.5	49.5	49.2
	MUAC (cm) [Right/Left]	24.4/24.4	25.1/25.1	25.5/24.9	25.0/24.6

Table 4. Growth-and-obesity profiles of Z. J.: 1 st to 4 th checkup				
Δ (Growth Parameter) = Reference Value – Actual Value	Between 1 st and 2 nd Checkup	Between 2 nd and 3 rd Checkup	Between 3 rd and 4 th Checkup	Between 4 th and 5 th Checkup
Reference-Age Gird (year)	11.0	11.5	12.0	12.5
Mid-Parental Height (cm)	134.29	137.79	140.41	144.41
Interpolated-Actual Height, h (cm)	139.39	144.28	148.10	
<i>Predicted</i>		143.45	149.24	150.97
Comparison (Actual & Predicted)		99.42%	99.23%	
Percentile-for-Height, P (h)	26.97	36.42	33.75	
<i>Predicted</i>		32.25	38.51	31.05
Δ Height-for-Age (cm)	+ 4.11	+ 6.50	+ 7.60	
Δ Height-for-Age (in)	+ 1.62	+ 2.56	+ 2.99	
Estimated-Adult Height (cm)	159.36	161.06	160.58	
Estimated-Adult Height (ft–in)	5 ft 2.74 in	5 ft 3.41 in	5 ft 3.22 in	
STATUS (h)	3.06% TALL	4.71% TALL	5.41% TALL	
<i>Predicted</i>		4.11% TALL	6.29% TALL	4.54% TALL
Interpolated-Actual Mass, μ (kg)	46.13	48.54	49.40	
<i>Predicted</i>		51.09	50.74	49.15
Comparison (Actual & Predicted)		94.75%	97.29%	
Percentile-for-Mass, P (μ)	82.77	81.57	79.94	
<i>Predicted</i>		86.68	80.47	69.47
Body-Mass Index, BMI (kg/m^2)	23.74	23.31	22.52	
<i>Predicted</i>		24.83	22.78	21.56
Optimal Mass, μ_{opt} (kg)	33.11	36.78	38.18	
<i>Predicted</i>		35.95	39.22	39.52
Δ Mass-for-Height (kg)	+ 13.02	+ 11.75	+ 11.22	
Δ Weight-for-Height (lb–oz)	+ 28 lb 11.38 oz	+ 25 lb 14.56 oz	+ 24 lb 11.90 oz	
Estimated-Adult Mass (kg)	70.79	70.05	67.72	
Estimated-Adult Weight (lb–oz)	156 lb 1.54 oz	154 lb 7.42 oz	149 lb 5.27 oz	
Estimated-Adult BMI (kg/m^2)	27.88	27.00	26.26	
STATUS (μ)	39.33% OBESE	31.94% OBESE	29.40% OBESE	
<i>Predicted</i>		42.12% OBESE	29.35% OBESE	24.36% OBESE

Table 5. Growth-and-obesity profile of Z. J.: 5 th checkup (based on KJK model)	
Date of Measurements	2011-03-20
Age	14-05-27
Fractional Age (<i>year</i>)	14.49
Height, <i>h</i> (<i>cm</i>)	152.7
Percentile-for-Height	9.43
Current-Age-Mid-Parent Height (<i>cm</i>)	152.40
Δ Height-for-age (<i>cm</i>)	+0.30
STATUS (<i>h</i>)	0.2% (+)^{&}
Net Mass, μ (<i>kg</i>)	53.6
Percentile-for-Mass, $P(\mu)$	47.44
Optimal Mass, μ_{opt} (<i>kg</i>)	41.45
Δ Mass-for-Height (<i>kg</i>)	+12.15
STATUS (μ)	29.32% OBESE

[&] (+) [(−)] indicates that the child has got excess [lesser] height as compared to mid-parental height, but is not considered TALL [SUNTED].

Table 6. Growth parameters of Q. J.					
<i>Vital Statistics</i>	Check up	1 st	2 nd	3 rd	4 th
<i>Gender</i> Female	Date of Checkup	2007-05-20	2007-09-30	2008-06-29	2009-02-08
	Age	09-06-14	09-10-24	10-07-23	11-03-02
	Fractional Age (year)	9.53	19.90	10.65	11.26
<i>Date of Birth</i> 1997-11-06	Heights (cm)	124.5	126.2	130.2	131.9
		124.2	126.3	130.2	131.9
<i>Mass at Birth</i> 3.9 kg	Net Masses (kg)	124.7	126.4	130.6	131.9
		23.8	24.1	25.3	26.2
		23.8	24.1	25.3	26.3
		23.8	24.1	25.3	26.2
	MUAC (cm) [Right/Left]	17.6/17.6	17.9/17.9	18.6/18.5	17.7/18.4

ADDITIONAL FILE 2: GROWTH-AND-OBESITY PROFILES

Table 7. Growth-and-obesity profiles of Q. J.: 1 st to 4 th checkup				
Δ (Growth Parameter) = Reference Value – Actual Value	Between 1 st and 2 nd Checkup	Between 2 nd and 3 rd Checkup	Between 3 rd and 4 th Checkup	Between 4 th and 5 th Checkup
Reference-Age Gird (<i>year</i>)	10.0	10.5	11.0	11.5
Mid-Parental Height (<i>cm</i>)	129.29	131.41	134.29	137.79
Interpolated-Actual Height, <i>h</i> (<i>cm</i>)	126.83	129.55	131.24	
<i>Predicted</i>		129.42	132.25	132.55
Comparison (Actual & Predicted)		99.90%	99.23%	
Percentile-for-Height, <i>P</i> (<i>h</i>)	4.77	5.10	34.24	
<i>Predicted</i>		4.92	35.42	2.57
Δ Height-for-Age (<i>cm</i>)	– 2.46	– 1.86	– 3.05	
Δ Height-for-Age (<i>in</i>)	– 0.97	– 0.73	– 1.20	
Estimated-Adult Height (<i>cm</i>)	152.38	152.54	152.12	
Estimated-Adult Height (<i>ft–in</i>)	4 ft 11.99 in	5 ft 0.06 in	4 ft 11.89 in	
STATUS (<i>h</i>)	1.90% STUNTED^{&}	1.42% STUNTED	2.27% STUNTED	
<i>Predicted</i>		1.51% STUNTED	2.57% STUNTED	3.81% STUNTED^{&}
Interpolated-Actual Mass, μ (<i>kg</i>)	24.18	25.04	25.83	
<i>Predicted</i>		24.60	26.05	26.60
Comparison (Actual & Predicted)		98.24%	99.15%	
Percentile-for-Mass, <i>P</i> (μ)	4.37	1.78	1.66	
<i>Predicted</i>		0.59	2.10	
Body-Mass Index, <i>BMI</i> (<i>kg/m</i> ²)	15.03	14.92	15.00	
<i>Predicted</i>		14.68	15.22	15.14
Optimal Mass, μ_{opt} (<i>kg</i>)	24.38	26.51	27.12	
<i>Predicted</i>		26.22	26.92	26.60
Δ Mass-for-Height (<i>kg</i>)	– 0.20	– 1.47	– 1.29	
Δ Weight-for-Height (<i>lb–oz</i>)	– 7.09 oz	- 3 lb 3.71 oz	- 2 lb 13.56 oz	
Estimated-Adult Mass (<i>kg</i>)	46.35	44.49	44.41	
Estimated-Adult Weight (<i>lb–oz</i>)	102 lb 3.38 oz	98 lb 1.61 oz	97 lb 14.83 oz	
Estimated-Adult <i>BMI</i> (<i>kg/m</i> ²)	19.96	19.12	19.19	
STATUS (μ)	0.82% WASTED	5.53% WASTED	4.76% WASTED	
<i>Predicted</i>		6.20% WASTED	3.24% WASTED	0.003% (+)[#]

[#] (+) indicates that the child has got more mass than optimal but is not considered as OBESE

Table 8. Growth-and-obesity profile of Q. J.: 5 th checkup (based on KJK model)	
Date of Measurements	2011-03-13
Age	13-04-07
Fractional Age (<i>year</i>)	13.35
Height, <i>h</i> (<i>cm</i>)	147.5
Percentile-for-Height, <i>P</i> (<i>h</i>)	5.55
Current-Age-Mid-Parent Height (<i>cm</i>)	149.03
Δ Height-for-age (<i>cm</i>)	-1.53
STATUS (<i>h</i>)	1.03% STUNTED
Net Mass, μ (<i>kg</i>)	38.0
Percentile-for-Mass, <i>P</i> (μ)	12.13
Optimal Mass, μ_{opt} (<i>kg</i>)	35.76
Δ Mass-for-Height (<i>kg</i>)	+2.24
STATUS (μ)	6.27% OBESE

ADDITIONAL FILE 2: GROWTH-AND-OBESITY PROFILES

Table 9. Growth parameters of J. J.					
<i>Vital Statistics</i>	Check up	1 st	2 nd	3 rd	4 th
	Date of Checkup	2007-05-13	2007-10-21	2008-06-29	2009-02-15
	Age	06-04-19	06-09-27	07-05-21	08-01-14
<i>Gender</i> Female	Fractional Age (<i>year</i>)	6.38	6.83	7.48	8.13
	Heights (<i>cm</i>)	106.9	109.7	112.1	115.8
<i>Date of Birth</i> 2000-12-24		106.8	109.7	112.0	115.7
		106.9	109.8	112.9	115.8
<i>Mass at Birth</i> 3.3 <i>kg</i>	Net Masses (<i>kg</i>)	17.1	18.3	18.7	19.6
		17.1	18.3	18.7	19.5
		17.1	18.3	18.7	19.5
	MUAC (<i>cm</i>) [Right/Left]	16.2/16.2	15.9/16.1	15.8/15.8	16.1/16.5

Table 10. Growth-and-obesity profiles of J. J.: 1 st to 4 th checkup				
Δ (Growth Parameter) = Reference Value – Actual Value	Between 1 st and 2 nd Checkup	Between 2 nd and 3 rd Checkup	Between 3 rd and 4 th Checkup	Between 4 th and 5 th Checkup
Reference-Age Gird (year)	6.5	7.0	8.0	8.5
Mid-Parental Height (cm)	111.03	113.87	120.03	122.29
Interpolated-Actual Height, h (cm)	107.61	110.34	115.03	
<i>Predicted</i>		110.86	113.88	117.90
Comparison (Actual & Predicted)		99.53%	99.00%	
Percentile-for-Height, $P(h)$	2.74	2.61	1.97	
<i>Predicted</i>		3.07	1.39	2.55
Δ Height-for-Age (cm)	- 3.42	- 3.53	- 5.00	
Δ Height-for-Age (in)	- 1.35	- 1.39	- 1.97	
Estimated-Adult Height (cm)	151.37	151.31	150.99	
Estimated-Adult Height (ft–in)	4 ft 11.59 in	4 ft 11.57 in	4 ft 11.44 in	
STATUS (h)	3.08% STUNTED	3.10% STUNTED	4.16% STUNTED	
<i>Predicted</i>		2.65% STUNTED	5.12% STUNTED	3.59% STUNTED
Interpolated-Actual Mass, μ (kg)	17.41	18.41	19.37	
<i>Predicted</i>		18.77	19.02	20.01
Comparison (Actual & Predicted)		98.04%	98.19%	
Percentile-for-Mass, $P(\mu)$	5.80	6.04	2.48	
<i>Predicted</i>		8.46	3.85	
Body-Mass Index, BMI (kg/m ²)	15.04	15.12	14.64	
<i>Predicted</i>		15.27	14.89	14.40
Optimal Mass, μ_{opt} (kg)	16.40	17.35	19.24	
<i>Predicted</i>		16.99	17.18	19.16
Δ Mass-for-Height (kg)	+ 1.01	+ 1.05	+ 0.13	
Δ Weight-for-Height (lb–oz)	+ 2 lb 3.63 oz	+ 2 lb 5.04 oz	+ 4.59 oz	
Estimated-Adult Mass (kg)	46.78	46.87	44.93	
Estimated-Adult Weight (lb–oz)	103 lb 2.37 oz	103 lb 5.37 oz	99 lb 11.30 oz	
Estimated-Adult BMI (kg/m ²)	20.42	20.47	19.71	
STATUS (μ)	6.14% OBESE	6.06% OBESE	0.65% (+)[#]	
<i>Predicted</i>		6.20% OBESE	10.73% OBESE	4.44% OBESE

[#]See note on page 10

Table 11. Growth-and-obesity profile of J. J.: 5 th checkup (based on KJK model)	
Date of Measurements	2011-03-13
Age	10-02-19
Fractional Age (<i>year</i>)	10.22
Height, <i>h</i> (<i>cm</i>)	128.0
Percentile-for-Height, <i>P</i> (<i>h</i>)	3.09
Current-Age-Mid-Parent Height (<i>cm</i>)	128.17
Δ Height-for-age (<i>cm</i>)	-0.17
STATUS (<i>h</i>)	0.13% (-) ^{&}
Net Mass, μ (<i>kg</i>)	23.5
Percentile-for-Mass, <i>P</i> (μ)	<3
Optimal Mass, μ_{opt} (<i>kg</i>)	24.41
Δ Mass-for-Height (<i>kg</i>)	-0.91
STATUS (μ)	3.72% WASTED ^{&}

[&] See note on page 8

Table 12. Growth Parameters of T. J.					
Vital Statistics	Check up	1 st	2 nd	3 rd	4 th
<i>Gender</i> Male	Date of Checkup	2007-05-13	2007-10-21	2008-06-15	2009-02-08
	Age	04-00-23	04-06-01	05-02-09	05-09-25
	Fractional Age (year)	4.06	4.50	5.19	5.82
<i>Date of Birth</i> 2003-04-20	Heights (cm)	98.5	101.7	105.3	109.6
		98.5	101.8	105.3	109.8
<i>Mass at Birth</i> 3.4 kg	Net Masses (kg)	14.3	15.4	16.2	17.4
		14.3	15.4	16.2	17.4
		14.3	15.4	16.2	17.4
	MUAC (cm) [Right/Left]	15.0/15.1	15.2/15.6	15.8/15.7	15.5/15.4

ADDITIONAL FILE 2: GROWTH-AND-OBESITY PROFILES

Table 13. Growth-and-Obesity Profiles of T. J.: 1 st to 4 th Checkup				
Δ (Growth Parameter) = Reference Value – Actual Value	Between 1 st and 2 nd Checkup	Between 2 nd and 3 rd Checkup	Between 3 rd and 4 th Checkup	Between 4 th and 5 th Checkup
Reference-Age Gird (<i>year</i>)	4.5	5.0	5.5	6.0
Mid-Parental Height (<i>cm</i>)	99.77	102.83	105.77	108.80
Interpolated-Actual Height, <i>h</i> (<i>cm</i>)	101.77	104.39	107.51	
<i>Predicted</i>		105.55	107.00	110.94
Comparison (Actual & Predicted)		98.89%	99.52%	
Percentile-for-Height	18.84	16.95	17.53	
<i>Predicted</i>		21.37	15.02	19.68
Δ Height-for-Age (<i>cm</i>)	+ 2.00	+ 1.56	+ 1.73	
Δ Height-for-Age (<i>in</i>)	+ 0.78	+ 0.61	+ 0.68	
Estimated-Adult Height (<i>cm</i>)	170.15	169.59	169.76	
Estimated-Adult Height (<i>ft–in</i>)	5 ft 6.99 in	5 ft 6.77 in	5 ft 6.83 in	
STATUS (<i>h</i>)	2.00% TALL	1.52% TALL	1.64% TALL	
<i>Predicted</i>		2.64% TALL	1.16% TALL	1.96% TALL
Interpolated-Actual Mass, μ (<i>kg</i>)	15.39	15.98	16.48	
<i>Predicted</i>		16.64	16.55	17.73
Comparison (Actual & Predicted)		95.87%	99.58%	
Percentile-for-Mass, <i>P</i> (μ)	18.90	14.76	4.93	
<i>Predicted</i>		21.37	5.56	4.93
Body-Mass Index, <i>BMI</i> (<i>kg/m</i> ²)	14.86	14.66	14.26	
<i>Predicted</i>		14.93	14.46	14.41
Optimal Mass, μ_{opt} (<i>kg</i>)	15.38	16.20	17.75	
<i>Predicted</i>		16.64	17.33	18.65
Δ Mass-for-Height (<i>kg</i>)	+ 0.01	– 0.22	– 1.27	
Δ Weight-for-Height (<i>lb–oz</i>)	+ 0.09 oz	– 7.75 oz	– 2 lb 12.79 oz	
Estimated-Adult Mass (<i>kg</i>)	61.22	59.84	55.95	
Estimated-Adult Weight (<i>lb–oz</i>)	134 lb 15.69 oz	131 lb 15.01 oz	123 lb 5.91 oz	
Estimated-Adult <i>BMI</i> (<i>kg/m</i> ²)	21.15	20.81	19.42	
STATUS (μ)	0.07% (+)[#]	1.36% WASTED	7.15% WASTED	
<i>Predicted</i>		0.0000006% (+)[#]	4.49% WASTED	4.89% WASTED

[#] See note on page 10

Table 14. Growth-and-obesity profile of T. J.: 5 th checkup (based on KJK model)	
Date of Measurements	2011-03-20
Age	07-11-00
Fractional Age (<i>year</i>)	7.92
Height, <i>h</i> (<i>cm</i>)	122.6
Percentile-for-Height, <i>P</i> (<i>h</i>)	20.21
Current-Age-Mid-Parent Height (<i>cm</i>)	119.85
Δ Height-for-age (<i>cm</i>)	+2.75
STATUS (<i>h</i>)	2.29% TALL
Net Mass, μ (<i>kg</i>)	22.5
Percentile-for-Mass, <i>P</i> (μ)	24.79
Optimal Mass, μ_{opt} (<i>kg</i>)	22.07
Δ Mass-for-Height (<i>kg</i>)	+0.33
STATUS (μ)	1.50% OBESE



Figure 1. AP-X ray (standing, external-auditory meatus to hip joint) of Q. J. — X ray taken on October 5, 2007 (child's age: 9 years 10 months 29 days)

(http://www.ngds-ku.org/Papers/J32/Fig_7.htm)



Figure 2. Moiré topographs of Q. J. (from left to right), back, front, side, forward bending during a follow-up examination — photographs taken on June 29, 2008 (child's age: 10 years 7 months 23 days)

(http://www.ngds-ku.org/Papers/J32/Fig_8.htm)



Figure 3. Forward bending (sagittal-plane view to look for missing spinous processes) of J. J. — photograph taken on February 8, 2009 (child's age: 8 years 1 month 14 days)

(http://www.ngds-ku.org/Papers/J32/Fig_9.htm)



Figure 4. Moiré topographs of J. J. (from left to right), back, front, side and forward bending — photographs taken on February 8, 2009

(http://www.ngds-ku.org/Papers/J32/Fig_10.htm)

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**STUNTING INDUCED BY WASTING — WASTING INDUCED BY STUNTING:
A CASE STUDY OF J. FAMILY**

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Additional File 2: GROWTH-AND-OBESITY PROFILES

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