STATURE AND WEIGHT OF INDONESIAN CHILDREN COMPARED TO NCHS-REFERENCE

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ABSTRACT

Indonesian nutritionists have problem with growth standards. In the 1970s and 1980s they used the reduced Harvard Standards; now they prefer to apply NCHS-Reference. Harvard Standards seem to be not adequate to Indonesian children, even in the reduced form. Here we compare mean values of children's stature and body weight with NCHS-Reference from six different populations from Java, Madura and Flores. Baby's body weight lays only in the first three months between the 25th-50th percentile then it diminish to the 5th percentile. Mean values of children aged 1-15 years from Flores, Java and Madura lay on below the 5th percentile of the NCHS-Standard. Only the mean values of children from Surabaya aged 6-16 years lay near the 50th percentile but they also diminish slowly to the 10th percentile. The question is: 1. are Indonesian children really undernourished; 2. are the discrepancies an effect of the Bergmann's Rule; 3. are NCHS-Reference applicable outside the US; 4. are standard from one population applicable to another population ?

***Keywords**: stature, weight, Indonesian children, NCHS-Reference*

INTRODUCTION

For years Indonesian nutritionists experience problems with appropriate growth norms for children and youth. In the 1970s and 1980s they used the Harvard Standard, reduced by 20%, as the national standard. Recently they apply the NCHS-Reference. It seems that both, the reduced Harvard Standard as well as the NCHS-Reference, are not adequate for the Indonesian populations which consists at least of four racial groups (Glinka, 1981). Indonesian newborn and infants when compared to the Harvard Standard are commonly too heavy in the first two to three months of age, while in the following months and years of age they are too light (Glinka1973, 1980, 1984, Kardjati 1977-79). Here we do compare some data from Indonesia with NCHS-Reference.

MATERIAL

The data were taken from publications on growth of Indonesian children and youth from Flores, East Nusa Tenggara Province (NTT) (Glinka 1973, 1984); Java (Glinka 1980, Yulianti 1992, and yet unpublished data by Kristiani & Koesbardiati), and Madura (Kardjati 1977-79, Glinka 1984)

Data from Flores (Table 1, 5 & 6), East-Java and the Madura island (Table 7 & 8) Come from rather not well nourished population whose diet contains little proteins, mostly vegetable protein (made from soya bean and known as *tahu* and *tempe*). Data from Jakarta (Table 1, 5 & 6), and Surabaya (Table 9 & 10) represent a social middle class where proteins are consumed more often, perhaps even daily. All Indonesians prefer carbohydrate dishes, like rice or maize (especially in the East Nusa Tenggara Province) with only few vegetables and meat or *tahu tempe*. Small quantities of protein in the diet are not always the problem of affordability but more a problem of taste, and something of ignorance about healthy food.

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Table 1. Body Weight by Age from Birth to 12 Month after Birth-Flores (Glinka 1973)

Age	mean	s.d.	N	mean	s.d.	N
Month		males			females	
0	3034	334	134	3031	362	107
1	3975	459	88	3751	532	55
2	4905	519	78	4619	508	43
3	5601	572	73	5256	596	50
4	6215	670	68	5645	751	44
5	6623	773	57	6219	773	37
6	6881	780	52	6522	623	36
7	7140	742	47	6676	666	34
8	7341	595	37	6894	584	35
9	7535	620	34	7142	601	31
10	7706	654	34	7329	678	28
11	7936	711	33	7529	800	34
12	8131	761	32	7610	806	30

Table 2. Body weight by Age from Birth to 12 after Birth-Surabaya (Yulianti 1992)

Age	mean	s.d.	N	mean	s.d.	N
Month		males			females	
0	3122	405	519	3033	398	420
1	4130	509	519	3873	453	420
2	5161	608	519	4748	530	420
3	5937	682	519	5413	604	420
4	6522	748	519	5947	652	420
5	6947	797	519	6341	708	420
6	7271	852	519	6641	749	420
7	7526	885	519	6890	788	420
8	7757	909	519	7123	813	420
9	7960	942	519	7333	841	420
10	8159	982	519	7534	873	420
11	8354	1011	519	7738	889	420
12	8857	1085	421	7922	932	334

ANALYSIS

Because our data are taken from literature the analysis is very simple. We compare our data graphically to demonstrate their relation to the NCHS-reference. As one can see in Fig. 1 (Table 1) the body weight mean values of male infants from Flores after first three months lay between the 25th and 50th percentile of the NCHS-reference but beginning with the fourth month their values diminish and at age of 12 month they lay below the 5th percentile. A similar picture we have in Fig. 2 illustrating the body weight growth curve for female infants from Flores though the decrease is not so fast as in the case of the boys. Mean body weight values of the infants from Surabaya (Tabl.2) in the first three months of life lay, as expected, between the 25th and 50th percentile, then the means diminish to lay between the 5th and 10th percentile.

Table 3. Stature by Age – Jakarta (Glinka 1980)

age	mean	s.d.	N	mean	s.d.	N
Year		males			females	
6	108.2	3.12	19	107.6	4.60	24
7	112.8	6.04	117	111.4	4.94	130
8	114.2	5.47	40	116.4	7.61	40
9	117.2	5.34	28	117.5	5.73	21
10	127.4	10.52	19	125.0	8.27	15
11	127.0	6.60	10	129.7	6.87	12
12	135.3	7.33	24	135.1	7.74	19
13	137.1	8.29	25	140.0	7.26	23
14	143.1	7.79	15	144.7	5.33	14

Table 4. Body Weight by Age – Jakarta (Glinka 1980)

age	mean	s.d.	N	mean	s.d.	N
Year		males			females	
6	16.3	1.34	19	15.8	1.75	24
7	17.6	1.95	117	17.1	2.17	130
8	18.0	1.99	40	18.6	2.89	40
9	19.5	2.42	28	20.6	2.51	21
10	23.2	3.41	19	22.8	3.42	15
11	23.9	3.43	10	27.0	4.59	12
12	30.3	9.79	24	28.5	6.24	19
13	30.2	6.21	25	33.8	5.60	23
14	34.2	5.62	15	38.9	2.35	14

Table 5. Stature by Age – Flores (Glinka 1984)

age	mean	s.d.	N	mean	s.d.	N
Year		males			females	
1	69.6	6.9	129	69.0	6.4	149
2	78.1	6.1	307	77.6	7.3	322
3	85.8	7.1	562	84.6	7.5	551
4	92.5	7.4	505	91.4	8.9	548
5	98.4	8.4	531	98.2	8.2	478
6	104.5	7.2	414	105.1	7.8	411
7	110.9	6.6	467	111.2	7.4	523
8	115.3	7.8	569	116.7	7.9	520
9	119.8	7.9	435	120.5	9.0	371
10	122.6	8.2	341	124.0	7.5	337
11	125.5	7.4	295	127.8	7.9	272
12	129.8	7.6	370	130.9	8.0	312
13	133.9	8.2	338	133.4	9.5	276
14	136.9	9.2	267	138.1	7.9	215
15	141.1	6.8	88	141.6	8.2	65
16	144.2	9.0	78	145.7	7.8	62

Table 6. Body Weight by Age – Flores (Glinka 1984)

age	mean	s.d.	N	mean	s.d.	N
year		males			females	
1	7.4	1.2	129	7.0	1.6	149
2	9.3	1.6	307	8.9	1.7	322
3	11.0	1.8	562	10.6	1.9	551
4	12.6	2.0	505	12.1	1.8	548
5	14.0	2.1	531	13.7	2.1	478
6	15.6	2.1	414	15.4	2.2	411
7	17.5	2.4	467	17.4	3.4	523
8	18.8	2.6	569	18.5	2.8	520
9	20.3	2.9	435	20.1	3.3	371
10	21.6	3.2	341	21.8	3.5	337
11	22.9	3.6	295	21.5	3.8	272
12	24.4	3.5	370	25.1	4.2	312
13	26.4	4.1	338	26.8	4.9	276
14	28.7	5.0	267	29.3	4.6	215
15	30.8	4.9	88	32.2	5.0	65
16	32.8	6.0	78	32.6	5.1	62

Table 7. Stature by Age – Flores (Sri Kardjati et al. 1977-79 modified by Glinka 1984)

age	mean	s.d.	N	mean	s.d.	N
year		males			females	
1	73.1	4.1	291	72.8	6.6	268
2	79.8	6.2	256	78.8	5.2	260
3	86.6	6.2	376	85.8	5.8	351
4	92.3	6.1	349	92.1	5.7	341
5	98.1	2.9	389	97.6	6.9	369
6	103.7	6.4	302	103.0	6.3	294
7	109.5	5.9	350	107.8	5.7	361
8	113.8	6.3	302	113.4	6.4	368
9	117.8	5.9	278	117.4	6.2	299
10	121.9	7.0	292	121.5	6.7	319
11	125.1	6.5	231	125.3	6.7	267
12	130.1	6.2	310	131.0	6.9	350
13	133.6	7.0	246	136.3	7.6	251
14	139.6	9.1	134	141.6	6.3	125
15	144.8	8.5	107	144.8	6.2	129

The decrease of body weight in Flores population could be explained by lack of additional baby food besides the mother's milk because at that time there were no special baby food available in this region; traditionally additional baby food consist of simple rice pap without any proteins. In Surabaya, a metropolitan city, all sorts of baby foods are available but may be that a part of the population is not wealthy enough to buy them, and this perhaps influences the mean population values.

All boy's and girl's mean values as well as body weight from Flores and Java-Madura aged 2 – 15/16 years lay below the 5th percentile of the NCHS-Reference (Table 5 – 8). During the growth period the discrepancies in body weight become bigger and bigger. As mentioned above, these data originate mostly from a lower socio-economical class with partly undernourished children.

Table 8. Body Weight by Age – Flores (Sri Kardjati 1977-79 modified by Glinka 1984)

Age	mean	s.d.	N	mean	s.d.	N
year		males			females	
1	8.6	1.6	291	8.2	1.2	268
2	9.9	1.4	256	9.5	1.5	260
3	11.5	1.7	376	11.1	1.7	351
4	12.8	1.6	349	12.6	1.6	341
5	14.1	1.7	389	13.7	1.8	369
6	15.3	1.9	302	15.0	2.0	294
7	17.0	2.2	350	16.4	2.4	361
8	18.4	2.3	302	18.0	2.3	368
9	19.9	2.9	278	19.2	2.4	299
10	21.4	3.0	292	21.6	3.6	319
11	22.7	3.0	231	22.7	3.2	267
12	25.2	3.9	310	26.0	3.8	350
13	27.3	3.9	246	28.8	5.0	251
14	31.4	5.0	134	33.0	4.9	125
15	34.0	5.4	107	35.2	5.7	129

Table 9. Stature by Age – Surabaya (unpublished by Kristiani & Koesbardiati)

Age	mean	s.d.	N	mean	s.d.	N
year		males			females	
6	113.3	5.24	33	111.4	4.84	43
7	116.9	5.34	59	116.5	5.99	59
8	121.5	6.70	73	120.3	5.80	70
9	125.1	6.02	86	126.7	5.96	68
10	130.2	6.12	90	132.1	7.62	83
11	134.9	7.60	76	138.7	6.91	82
12	141.4	7.66	71	144.4	7.33	83
13	147.1	8.18	82	148.4	5.98	90
14	154.9	7.60	82	150.3	5.48	98
15	160.1	7.51	72	150.5	4.12	64

Table 10. Body Weight by Age – Surabaya (unpublished by Kristiani & Koesbardiati)

Age	mean	s.d.	N	mean	s.d.	N
year		males			females	
6	19.8	3.43	33	18.3	3.56	43
7	21.2	5.20	59	20.5	4.54	59
8	23.2	5.43	73	21.4	3.65	70
9	24.9	5.45	86	25.2	5.67	68
10	17.5	5.67	90	28.0	6.19	83
11	30.5	7.03	76	31.8	7.67	82
12	34.8	7.90	71	35.7	7.30	83
13	37.7	8.28	82	39.1	7.08	90
14	43.8	10.27	82	42.2	7.33	98
15	47.9	10.93	72	24.6	5.50	64

Mean values from children from Jakarta, aged 6 – 14 years, and from Surabaya, aged 6 – 15 years (Table 3 – 4, 9 –10), give different pictures. While children from Jakarta lay below the 5th percentile NCHS-Reference in stature as well as in body weight, children from Surabaya lay commonly between the 10th and 25th percentile where the values of achievement better values than boys, except at the age of 13 to 15 years, where the values of the stature of the girl are dropping down. To the contrary, the body weight values of the girl are better at this age than those of the boys. This demonstrate the differences in sexual maturations among boys and girl at this stage of growth.

The data from Jakarta originate from a suburb area and from that time when the Indonesian economy has not yet recovered after the bad period of the 1960s. The data from Surabaya come from a middle-class population and the time when the Indonesian economy was very good. Unfortunately, no data were available from the upper class because most growth researches in Indonesia are oriented towards lower socio-economic class to explore undernourished children which eventually need special help.

CONCLUSION

In conclusion we can say that, compared with the NCHS-Reference, middle, lower economic class of Indonesian children are commonly smaller and ligther. Rather than an answer we put some questions. These question are: (1) Are Indonesian children really undernourished? (2) Are the discrepancies an effect of the Bergman's Rule? (3) Is NCHS-Reference applicable outside the US? (4) Are standards from one population applicable to another population?

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