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US-Childhood-Obesity Problem: Solutions Proposed in Pakistan

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Obesity is becoming a problem globally among youngsters, with rise in incidence of childhood obesity throughout the world. One of the contributing factors may be socioeconomic disparity among different factions of society. Obesity in children may be linked to serious psychological, physical and social consequences resulting in impaired economic, educational and social productivity. Not long ago, first lady of one of the superpowers, **Her Excellency, Michelle Obama** declared childhood obesity an epidemic for the United States. The disease is contributing, significantly, to adult obesity, diabetes as well as non-communicable diseases. Hence, it becomes important to detect the problem at an early stage to plan and to implement efficient and effective intervention strategies. However, this over-consciousness of issue at times results in requiring a slightly obese child to lose mass (weight) on the basis of current obesity profile. Since a child is, also, gaining height in addition to mass, this action makes the child wasted over a period of time. There is a need for a sophisticated mathematical modeling to take up this issue. 'Growth-and-Obesity Profiles' of a family were first introduced in 2011, introducing the concept of optimal mass, degree of wasting/obesity and stunting/tallness expressed as a percentage (http://www.ngds-ku.org/Papers/J29.pdf). In 2012, the concept of *estimated-adult BMI*, body-mass index of a child at the end of growth period, giving a rough estimate of obesity status of child based of adult-*BMI* scales, was introduced (http://www.ngds-ku.org/Papers/J30.pdf). In 2013, **the First-Generation Solution** of childhood-obesity problem was proposed, in which recommendations to gain height and gain/lose mass were prepared based on height and mass values 6-*month* ahead of current age (http://www.ngds-ku.org/Presentations/Roadmap.pdf). In 2014, **the Second-Generation Solution** of childhood-obesity problem was given, when the recommendations were fine-tuned to give month-wise targets for the next 6 *months* (http://www.ngds-ku.org/Presentations/Enhanced.pdf). In order to deal with extreme cases, CDC Growth Charts (http://www.cdc.gov) were extended to include heights and masses for boys and girls (2-20 *years*) for 0.01^{th}, 0.1^{th}, 1^{st}, 99^{th}, 99.9^{th} and 99.99^{th} *percentiles* (http://www.ngds-ku.org/papers/J34.pdf) using mathematical-statistical tools. Methods to generate 'Growth-and-Obesity Roadmaps' of Pakistani children were published in the beginning of this year (http://www.ngds-ku.org/papers/J35.pdf), which included roadmaps of 2 children, the first one wasted, who needed to gain weight during the next 6 *months* and the other one excessively obese, who was required to shed off weight during the next 6 *months*. In June of this year, **the Third-Generation Solution** of childhood-obesity problem was presented (http://www.ngds-ku.org/Papers/J38.pdf) in the context of optimal-mass management for obese children. The issue was illustrated by presenting the case of a girl for her 5 checkups. Although she was classified as obese at her last 2 checkups, she was advised to gain mass to keep up with recommended height gain based on target (adult-mid-parental) height. To achieve these goals, targets (on checkup date of each successive month) to possess specific heights and masses (weights), on particular dates of a certain month, as well as lifestyle adjustment, exercise and diet plans were provided. Recently, the model has been extended to quantify 'severity of acute malnutrition' through a detailed Growth-and-Obesity Roadmap (http://www.ngds-ku.org/Papers/J40.pdf), which included percentile-for-height, estimated-adult height, algebraic and qualitative statuses (pertaining-to-height), month-wise-height management (both *cm/month* and *in/month*), percentile-for-net-mass, estimated-adult mass (*kg*) and estimated-adult weight (*lb-oz*), algebraic and qualitative statuses (pertaining-to-mass), month-wise-mass (-weight) management (mass management in *kg/month* and weight management in *lb-oz/month*), nutritional status and build of the child (http://www.ngds-ku.org/Papers/J37.pdf). Optimal-mass management could be viewed as an optimal solution of diet, exercise and lifestyle adjustment (http://www.ngds-ku.org/Papers/J32.pdf) — optimization approach. **The Fourth-Generation Solution** of childhood-obesity problem is expected to be launched in 2016 as 'Growth-and-Obesity Vector-Roadmaps' of children, by applying the strategy to manage height according to mass, so that the child possesses a sustainable optimal mass throughout life. This becomes possible when values as well as slopes match for percentile curves of height and mass — dynamical-system approach. Such strategy was proposed by controlling both position and velocity vectors, simultaneously, of a satellite-launch vehicle (http://www.ngds-ku.org/Presentations/ExtendedQ.pdf) in the context of astromathematics — a branch of mathematics focused on geometrical aspects to study orbits from a kinematical perspective, in which the force expressions did not, explicitly, appear (http://www.ngds-ku.org/Presentations/Astromathematics.pdf). Mathematical framework of rocket maneuvering (astromathematics) may be borrowed to analyze 3-D gymnastic movements (anthromathematics and sport mathematics). This brings us to the threshold of 'astro-anthromathematics', which may be considered as the branch of mathematics utilizing the techniques of astromathematics to deal with the problems of anthromathematics and sport mathematics.

2013	**1st Generation Solution http://www.ngds-ku.org/Presentations/Roadmap.pdf**
2014	**2nd Generation Solution http://www.ngds-ku.org/Presentations/Enhanced.pdf**
2015	**3rd Generation Solution http://www.ngds-ku.org/Papers/J38.pdf**
2016	**4th Generation Solution (expected)**

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*HTML version***:** http://www.ngds-ku.org/pub/confabstB.htm#C131:

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