PB-226 016

METHODOLOGY OF GROWTH SURVEILLANCE IN CHILDREN UNDER FIVE YEARS

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Prepared for:

Agency for International Development

1972

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BIBLIOGRAPHIC DATA SHEET	1. Report No. 612.654-B264	2.	PB 226 016

4. Title and Subtitle "METHODOLOGY OF GROWTH SURVEILLANCE IN CHILDREN UNDER FIVE YEARS"	5. Report Date 1972
	6.
7. Author(s) Cecile De Sweemer, et al	8. Performing Organization Rept. No.
9. Performing Organization Name and Address John Hopkins University School of Hygiene & Public Health Baltimore, Md. 21218	10. Project/Task/Work Unit No. 931-11-574-121
	11. Contract/Grant No. AID/csd-1939
12. Sponsoring Organization Name and Address Department of State Agency for International Development Washington, D.C. 20523	13. Type of Report & Period Covered Research Pamphlet
	14.

15. Supplementary Notes

16. Abstract

In developing countries, the combined operation of malnutrition and infection results in a high incidence of protein calorie malnutrition. Preventing minor degree of nutritional deficiency from developing into a major episode of malnutrition calls for personal and individualised health education and early detection. As malnutrition in children is usually associated with growth retardation, detection and prevention of malnutrition become easier when a careful watch is kept on growth rate. Our study of the interaction of nutrition and infection in 15 villages of Ludhiana district (India) has enabled us to acquire some insights into the problem.

This paper concentrates exclusively on methods to detect growth failure and only touches on the very important health education that has to accompany the surveillance.

17. Key Words and Document Analysis. 17a. Descriptors

Reproduced by
NATIONAL TECHNICAL INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group 613

18. Availability Statement	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 6
	20. Security Class (This Page) UNCLASSIFIED	22. Price $3.00 - 1.45

FORM NTIS-35 (REV. 3-72) USCOMM-DC 14952-P72

339069

Perspectives in Nutrition, Ed. R. Rajalakshmi,
Baroda University, Baroda (1972)

METHODOLOGY OF GROWTH SURVEILLANCE IN CHILDREN UNDER FIVE YEARS*

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In developing countries, the combined operation of malnutrition and infection results in a high incidence of protein calorie malnutrition. Preventing minor degree of nutritional deficiency from developing into a major episode of malnutrition calls for purposeful and individualised health education and early detection. As malnutrition in children is usually associated with growth retardation, detection and prevention of malnutrition become easier when a careful watch is kept on growth rate. Our study of the interaction of nutrition and infection in 15 villages of Ludhiana district (Punjab) has enabled us to acquire some insights into the problem.

This paper will concentrate exclusively on methods to detect growth failure and will only touch on the very important health education that has to accompany the surveillance.

Selection of Growth Parameters

Growth surveillance has to fulfill the following criteria:—

1. Its methodology should be simple and straightforward, so that it can be carried out by auxiliary workers on a mass scale.
2. Its interpretation should permit sensitive nutritional assessment.
3. Its interpretation should be demonstrable to the mothers as their understanding is vital to the ensuing health education.

In addition to the above criteria, the parameters used for growth surveillance should have a good inter and intra personal repeatability and should be sensitive indicators of recent changes in nutritional status.

Circumferences and caliper measurements do not fulfill any of the above-mentioned criteria. Body length is a relatively good parameter. But even by adopting the best possible technique body length among children under five years has a low interpersonal repeatability. As much as a difference of 3 cm can be introduced due to different degrees of forcible stretching of the body. Body length, moreover, is a parameter which is absolutely insensitive to recent deterioration in nutritional status; it has, therefore, very little value in evaluating the progress or deterioration of nutritional status over a short period of time. As an indicator of duration and severity of past nutritional deficiencies, however, body length is unequalled.

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* This research was supported by NIH Grant No. 5R22, AM11047-01, 02, 03 and WHO Grant under contract with Indian Council of Medical Research.

Body weight is the most useful parameter for growth surveillance because it permits an overall appraisal as well as a close follow-up of change in nutritional status. The expected increment in weight during the first few years is significant even over a short period and can be easily assessed. Body weight can be measured on a variety of scales. Two types of weighing machines based on two different principles are available in India, namely, the beam balance scales and the spring scales. Though the beam scales are more accurate—provided they are carefully looked after—the balancing of the beam, the lengthy procedure of finding the correct position of 2 counter weights and the additions involved in finding out the end result are too much for the attention span of an average auxiliary worker. Moreover, each procedure inevitability brings its own errors. It has been our experience that the spring scales having clear and big divisions provide good intrapersonal and interpersonal repeatability. The machine should be checked regularly against standard weights. Its error margin should be less than 100 g.

Methods of Appraisal

The weight of a child can be used for the assessment of its nutritional status either by comparing it with a standard weight for age or for length. Comparing the weight for length standards alone has a drawback. It is based on the assumption that the past nutrition of the child has not affected the length (Gomez *et al.*, 1955). This assumption is obviously wrong in cases with long standing nutritional problems.

Comparing with standards of weight for age entails two problems. One problem which is rather easily overcome in children under 5 years is the assessment of correct age. Most mothers can remember the correct birth dates of their younger children according to the local calendar dates. Providing correct conversion lists between local and Gregorian calendar has solved the problem of correct age assessment for children under five years in our set up. The second problem relates to the selection of standards. It has been demonstrated that a great variety of ethnic groups have the same growth potential and under favourable circumstances grow according to " Harvard standards " (Jeliffe, 1966; King, 1966; Morley, 1968). However, the actual average growth achievement in most communities in developing areas comes close to the 3rd percentile of Harvard standards (Jeliffe, 1966). Consequently, at least for half of the population, percentile Harvard classification becomes useless. Health risks seem to increase sharply if a child has less than 80% (or 3rd percentile) of weight for age according to Harvard Standards (Scrimshaw *et al.*, 1962). The lower the weight for age, the higher the health risk (Scrimshaw *et al.*, 1962). Priorities for follow-up can be planned accordingly. It is therefore necessary to resort to Gomez classification (Gomez *et al*, 1955) or any variation of it, giving the relative position of weight for age in straight arithmetic percentage (Jeliffe, 1966). Unfortunately, it is not possible to distinguish on the basis of a single weight measurement between recovering and deteriorating children. A series of weight measurements on a child provide all the benefits of a longitudinal study. Even more important than repeated assessment of the relative position of the child compared with the standards for age is an assessment of the velocity of growth

between two measurements (Tanner, 1966a, b). If measuring velocity has to serve the practical purpose of growth surveillance, we need to follow a proper timing for our measurements. We choose our intervals so that minimum expected increments should be of the order of 500 g, above the range of errors of measurement. On the basis of this criterion one needs monthly measurements upto the age of 9 months, two monthly measurements upto 21 months and three monthly measurements for older children. Children with less increment than the expected one need special care by the medical team.

Method for recording

Records should facilitate the fullest use of the information collected. Growth data collected as part of a surveillance program, should be available for assessment by members of the medical team, and for health education of the parents, particularly the mother. Possibly they might also be used in an overall evaluation of the services or a community diagnosis of malnutrition. The objectives of the surveillance program are best served by the use of simple weight graphs.

The weight graphs* (Fig. 1) first used in Ilesha (King, 1966; Morley, 1968) can easily be handled by medical auxiliaries alone. On these, age is self-calculating and furthermore,

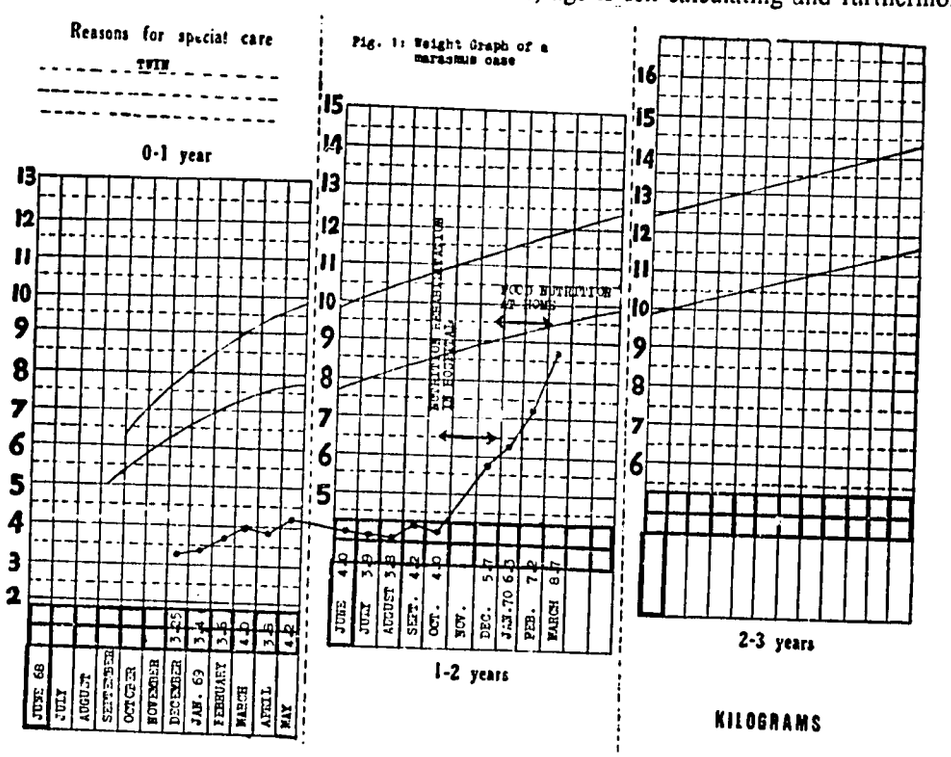

Fig. 1: Weight Graph of a marasmus case

* Material for education in using the weight graph is available from Dr. David Morley, Institute of Child Health, 30, Guilford Street, London.

the ideal path for growth is shown. The ideal path on the weight graph lies between Harvard average and local average (local average as mentioned above is mostly the same as Harvard 3rd percentile). The actual position of each weight point above the path, on the path, or below the path, gives a gross estimate of present nutritional status, on or above the path meaning good, below meaning unsatisfactory. If the weight point is below the path, the distance to the lower limit of the path is an indication of the degree of malnutrition. More important still, the line connecting different weights indicates the trend. The elusive concept of velocity becomes thus readily visible and understandable for the auxiliary workers as well as for the mothers. The importance of velocity is so great that it over-rides the meaning of the present nutritional status. If the growth curve flattens off or shows a drop, even if the weight achieved is still on or above the path, extrapolation shows prognosis is poor and immediate action is called for. The weight graph has proved to be a powerful health education tool and service tool.

In our set up we have also used a weight record giving weight achieved and increments in numerical form. This has proved a satisfactory recording system for use by the medical officer in setting priorities for medical and nutrition care, furthermore it forms the basis for sophisticated analysis of growth patterns in the community. Numerical weight records have though very limited if any health education value and proved unsatisfactory as a service tool in the hands of auxilliaries.

Adoption of the described weight graphs would help to make pediatric clinics and baby clinics efficient in growth surveillance of their individual patients. The simplicity of the technique makes population wide growth surveillance possible. Closely linked with health education it is the best attack against the widespread inadequate feeding practices and the ever present danger of malnutrition in children under five.

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