

The bubble chart: An update on its development

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The effectiveness of growth monitoring (the regular, preferably monthly, weighing of infants and young children to detect growth trends and the onset of health problems) has been a topic of discussion recently at several UNICEF sponsored consultative meetings and in *The Lancet* [1] and various other publications [2-4]. Several concerns have been common in all. First, knowing whether a child is “normal” or classified as having first-, second-, or third-degree malnutrition may not be a sufficiently sensitive measure of that child’s growth. Second, community-level workers do not always record weight information on growth cards with the necessary precision and, relatedly, do not always make correct interpretations. And, third, the information acquired often is not adequately communicated to and understood by the mother and used to assist the child.

Fortunately, a new concept in growth monitoring is evolving to address the first and underlying concern. And experiences have been promising with new growth-monitoring tools, such as the bubble chart, which was designed to add the necessary precision to the recording process and clarity for easy interpretation and the requisite counselling.

In a significant shift, health practitioners have begun emphasizing the monitoring of a child’s weight change month by month, rather than his or her nutritional status. The reason is that changes in weight reflect a possible illness or other setback to good health more quickly than does knowing the grade of nutritional status. Because weight change is a better indicator, it leads to better diagnosis and to more accurate and appropriate responses from health personnel. For example, a child in the upper range of the growth curve who loses weight because of an episode of diarrhoea will be identified immediately for special attention, even though this child’s nutrition classification is still “normal.” In contrast, a child in the lower range of the growth curve who is gaining adequate weight would not receive special attention, but the child’s mother would be encouraged to continue her practices.

At its most sensitive, the weight-change concept monitors not just any upward movement in the child’s growth line but adequate upward movement.

Programmes in India and the Dominican Republic have established criteria for defining adequate monthly weight gain for early detection of nutrition and health problems in children (table 1). By these criteria, a 20-month old child who gains 200 grams a month is doing just fine. But to show a change of only 200 grams requires a precision in weighing and recording that is not always so simple. Although scales often have 100-gram markings, the smallest increment printed on most growth cards is 500 grams. This requires the health worker to estimate readings within a 500-gram spread or to round off to the nearest 500 grams. Experience has shown that health workers can read scales and plot points more accurately if they can count 100-gram delineations rather than estimate. Implementation of the weight-gain system thus requires a growth card that makes 100-gram units easy to see and plot.

Table 1. Standards of adequate monthly weight gain for young children established by the Tamil Nadu Integrated Nutrition Project in India and the Applied Nutrition Education Program in the Dominican Republic

Age (months)	Minimum weight gain per month (g)
Tamil Nadu	
6-11	500
12-35	165 ^a
Dominican Republic	
0-8	500
12-23	200
24-59	100

a. Or 500 g every three months

When we set out to design such a card, we wanted the 100-gram units to be clear, so those working in dimly lit settings or whose vision is less than perfect could see the demarcations. (The vision of health workers may, in fact, be an overlooked problem among the concerns raised about the accuracy of plotting growth monitoring.) We also wanted to eliminate the confusion many health workers face with the traditional graph of whether to mark a weight on the vertical line or between vertical lines. The new chart follows the standard presentation

with the child's age in months along the horizontal axis and weight on the vertical axis. Instead of lines at every 500 grams, however, a circle represents each 100-gram unit. This change (1) improves accuracy by eliminating the need to estimate points within 500-gram demarcations, (2) helps health workers determine if the gain has been adequate because they can count the 100-gram unit changes between months, and (3) eliminates confusion about whether the dot representing current weight goes between or on the lines reflecting the child's age. Also, switching from the usual horizontal format and elongating the chart vertically, makes the monthly changes in growth velocity more visible and interpretation easier for health workers and mothers.

In addition to monitoring the progress of individual children, the bubble chart can also be adapted for monitoring the community. By transferring the mark from the chart of each child weighed during a month to a single community" chart, it is possible to provide a picture of the community's nutrition conditions month by month. This can be a good motivator for community action to improve food availability or hygiene. In some settings it may be possible to use computerized optical scanning to read the community charts and compile aggregate regional and even national information. Such an approach permits comparisons by area in the same time period as well as changes over time. It also would provide insights on the effectiveness of interventions.

So far the chart is being tested or is in use in India, Mexico, and Lesotho. Results of the initial experiences with the chart are promising.

India-Gujurat and Maharashtra

The chart shown in figure I was initially tested and introduced in two districts in the government's Integrated Child Development Scheme, assisted by USAID, in the states of Gujurat and Maharashtra. When this chart was tested, health workers told researchers that it was "big and clear," "easy to fill," "had more pictures," and would be "easy to explain to the mothers." In a test of plotting accuracy, almost all the workers (who previously had used conventional charts) could be trained in a short time to plot hypothetical examples correctly. No major concerns or apprehensions were expressed by the workers, even about the absence of the standard nutrition grades [5].

The chart was also tested with mothers. After an initial explanation, mothers understood it clearly. After exposure to a few hypothetical examples, they were able to offer correct interpretations of weight gain and loss. Even those mothers who previously were not getting their children weighed expressed a

desire to weigh their children so they could see their child's weight gain or loss.

After these tests, the UNICEF office in New Delhi, in collaboration with a task force of experts in growth monitoring representing government and non-governmental agencies, arranged for testing different prototype charts with 100-gram delineations. These featured different combinations of colours (either one colour or a rainbow of colours), background grids (lines versus bubbles), and the presence or absence of growth-band divisions [6]. The objective of the test was to learn which of the charts was easiest to plot, understand, and interpret. The latter two objectives were also tested with mothers. The results: 90% of the community workers believed the new prototype charts were an improvement over the current chart because of the 100-gram divisions and their attractiveness. The charts with the bubbles were the most accurately plotted (80% of the workers could plot bubble charts accurately, compared with a 70% plotting accuracy on charts with lines at 100-gram intervals and 50% accuracy on the conventional chart).

India-Tamil Nadu

The Tamil Nadu Integrated Nutrition Project, one of the more successful large-scale growth-monitoring efforts, has plans under way for introducing the bubble chart. After being adapted to meet local needs, the bubble chart received favourable reactions from the project's community nutrition workers and their supervisors. As of this writing, a first printing of 150,000 charts is being introduced for a large-scale test.

Mexico

The bubbles are transformed into tortillas in a chart being used in a pilot nutrition-education project in five communities by Mexico's National Institute Salvador Zubirán. Experience to date indicates that the chart is well understood and makes plotting and interpretation easier for health auxiliaries. Also, health workers find that mothers better understand the connection between weight gain and growth with this card. They tell the mothers, "As a mother accumulates tortillas on her table while cooking them, so a child accumulates weight month after month." The health workers pursue the connection even further by relating tortillas to the calorie needs of the child for growth (the accumulation of bubbles). Contingent on continued positive findings from the pilot project, the Mexican Institute plans to incorporate usage of the bubble chart in the operations of its eight regional centres [Dr. Homero Martínez, personal communication. 1988].

शिशु विकास कार्ड

नामः	नामः		
मातायु नामः	जन्म तिथि	पतिनाम	वयः
पितायु नामः	तारीख		

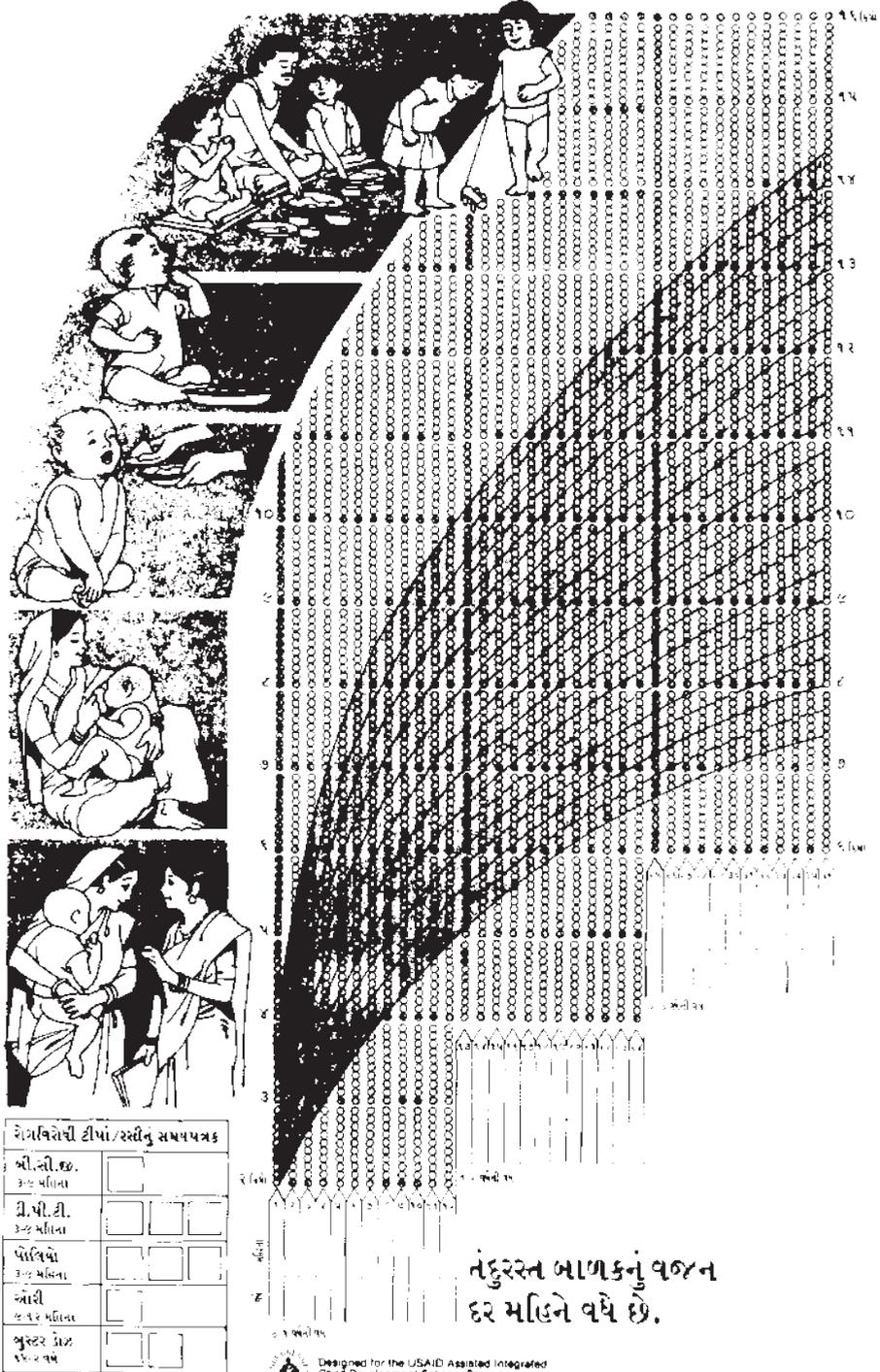


FIG. 1. Bubble chart prepared for the Integrated Child Development Scheme in India

Lesotho

Recently the government of Lesotho has considered printing a growth chart for national use. The committee working on its design thought that the bubble chart looked promising, so produced a bubble as well as a conventional line grid for testing. Both were improvements over the past in that each could be plotted to the nearest 100 grams. More than 300 weights were plotted in clinic situations by the person with the least experience; a few had none. There were fewer weight mistakes with the bubble chart, but more age mistakes. Six of seven doing the plotting said they preferred the bubble chart but that both were easy to use. Those preferring the bubble chart often said something like, "It's easier because the bubbles are already there; you just have to fill them in." Trainers favoured the line graph. Doctors, however, believed the bubbles made plotting easier. And mothers liked the bubbles because they are easy to see. One mother said that the "bubbles stand for weight." This statement generated the idea of filling in the bubble chart like a bar graph, i.e., filling in all the bubbles in the monthly column until reaching the bubble that represents the child's weight. At the time of this writing no final decisions had been made about a national card [7. and S. Almroth personal communication 1988]

The value of growth monitoring is being questioned in some circles. Our view is that when it is practiced correctly, it is perhaps the most important tool in the whole primary-health-care chest-both to identify a problem and to trigger a response. One of the reasons the potential for growth monitoring has not been achieved is the growth-monitoring instrument itself. Most growth cards are visually too difficult to use accurately.

The development of the bubble chart is an attempt to address the difficulties. The 100-gram unit demarcation is the only way to evaluate adequate weight gain, and this has the advantage of making growth monitoring a better diagnostic technique. Because the bubble chart makes

plotting easier and more accurate, interpretation is more likely to be correct. And, by making the interpretation more obvious to both the health worker and the mother, it makes it more likely that appropriate recommendations will be made to improve the child's situation or to maintain good growth [8]. The experiences described point to the potential usefulness of the bubble chart. It is our hope that this and other adjustments to growth-monitoring tools will help to overcome the constraints that have kept growth monitoring from realizing its potential.

References

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