

# Aunt Cathy's Guide for Problem Solving:

## How Much Should This Baby Eat?

### Troubleshooting in the Front Lines



Cathy Breedon, PhD, RD, CSP, FADA  
Perinatal/Pediatric Nutrition Specialist  
Clinical/Metabolic Nutrition Specialist  
Sanford Medical Center and  
UND School of Medicine, Fargo, ND

It is well known that healthy, typically developing infants will tend to take the amount of breast milk, formula and/or food needed to meet their energy (calorie) needs. When lower energy foods are provided, these babies increase their intake; when higher energy foods are provided, they will eat less. Of course, this depends on a few major factors:

1. The food must not be SO LOW in energy that the baby cannot possibly eat the volume of food required to get enough, or SO HIGH in energy that the amount needed to quench thirst carries with it exorbitant calories.
2. The feeder must make the food easily accessible to the baby.
3. The feeder must not coax, prod or force baby to take more than the amount needed to meet hunger needs, or fail to feed enough in an effort to prevent having a “fat baby.”
4. The baby must be able to eat, to keep the food down, and to digest and absorb it adequately.

This article will provide some tools for judging the adequacy and appropriateness of an infant's or child's intake, including checklists to aid in the detective work needed to identify the reason for a particular growth pattern or reported intake. While these tools can be useful in working with healthy infants and children, they can be especially helpful in evaluating the nutritional status of those children with special health care needs and for identifying appropriate nutrition interventions.

A registered dietitian (RD) can evaluate in detail a child's intake by working together with the primary care provider (PCP), nurse or other health care professionals. Some RDs are also board certified as pediatric nutrition specialists. They will have the credential CSP after their names in addition to the letters RD.

### GUIDELINES FOR EVALUATING AN INFANT'S INTAKE

Caregivers are often concerned about finding the magic number of ounces or spoons of food that a baby “should” take. Once a mother's milk supply is established, a breast-fed baby has much more control over the amount of food taken than a formula fed infant. The breast-fed infant's mother

cannot see how much is taken and how much is left. Bottle feeding tends to encourage “empty bottle syndrome”: making baby take every last drop or bite whether it’s needed or not. (“Come on, Baby...finish this stuff! It’s too expensive to waste!”) This can teach a child to ignore internal hunger cues and it also teaches that the best way to make Mom and Dad happy is to eat everything in sight!

This sort of learning may contribute to later obesity, as suggested by studies assessing the effects of internal and external clues for eating among normal weight and overweight adults. In some studies it was found that overweight individuals tended to eat more in response to external cues to eat (the sight of food, the time of day when one usually eats) rather than in response to an actual sensation of hunger. Breast-feeding as well as bottle-feeding could contribute to this same pattern if one uses feeding as a pacifier and cure for all upsets and discomforts.

Many of us have learned to use food as a therapy for stress, depression, boredom or nervousness. These eating patterns can contribute to weight problems because we are not eating in response to a physical hunger stimulus, but to meet a psychological need.

If a baby is growing appropriately we do not need to be so over-concerned about the amounts an individual infant consumes. Since each baby has his/her own pattern and rate of growth, periods of growth spurts and variable activity levels, it is reasonable to try to let healthy babies set their own energy intake on a daily basis.

For example: a record of normal intakes at 6 months of age indicated that the average intake was 37 oz/day of formula or milk, with an additional 9% of calories coming from other foods.<sup>1</sup> However, the range of normal intakes (between the 10<sup>th</sup> and 90<sup>th</sup> percentiles) at this age was 30 to 50 oz per day. There is no reason to suppose that an individual 6 month old infant should take the “average” amount of formula, especially when the amount of other food eaten by the baby could be far less or far greater than 9% of calories.

There is also no pressing scientific reason behind the “rule” that a baby should never be given more than a quart (32 ounces) of formula a day. This non-helpful guideline probably evolved from four factors:

1. By the time most babies drink a quart of formula daily they have reached a developmental age when it is appropriate to begin to take solids. That is, the baby is usually 4-6 months old, so the rule is a good reminder to begin introducing other foods.
2. A quart (32 oz) of formula provides the RDA for vitamins, minerals and protein, so healthy babies do not need to take more than that volume to meet those guidelines. At this point, if developmentally ready, infants can very safely work on learning to eat other foods. The nutrient balance of baby’s sometimes unpredictable beginning food choices will not be a problem.
3. Because a quart of formula does provide for adequate levels of vitamins, minerals and protein, and since formula can be quite expensive, it is financially reasonable to use no more than 32 ounces of formula each day and provide the additional energy baby needs as other foods.

4. Some confusion on this point has also arisen from the fact that the WIC Program (Special Supplemental Food Program for Women, Infants and Children) provides formula for infants in an amount each month that makes about 26 ounces per day (one can of formula concentrate per day, or a similar amount mixed from formula powder.) People sometimes fail to realize that WIC is a supplemental food program, not a program that purports to meet all of the nutritional needs of its clients.

When infants reach a size when 26 ounces of formula no longer meets their needs, their caregivers are expected to either purchase some additional formula or, if age-appropriate, other foods can be offered to the baby. This WIC program limit of formula provided is based on funding limitations. It is not intended to be used as the upper limit of formula an infant may safely or appropriately take.

So, although the commonly heard “32 ounce limit” of formula daily may be a useful guide, it is certainly not a Rule. Consuming over 32 ounces is not harmful or dangerous. Many infants regularly take over 32 oz/day without any problems. As long as the child is growing appropriately and being given opportunities to acquire developmentally appropriate eating skills, a formula intake above 32 oz/day is of no concern.

However, the quantity of human milk or formula consumed can be a limiting factor in the nutrient quality of an infant’s diet even if the baby’s energy needs are being appropriately met. Babies who are healthy, growing normally and taking the great majority of their nutrition as a nutritionally complete or near-complete product (e.g. human milk or commercial formula) will likely be obtaining the right amount of food and individual nutrients. [Vitamin D needs closer attention, of course.] With the introduction of other foods however, the complete nutrition product will begin to be displaced. This is reflected in the average milk or formula intake at age eleven months dropping to 18-24 oz/day from the peak intake at around 6-7 months of age. Additionally, the content of iron, zinc and vitamin B6 decreases markedly in human milk after 6 months.

The nutrient quality of the diet then becomes more dependent on the particular foods offered and consumed. Many infants are fed an appropriate amount of a variety of foods, but it is at this point that a more careful look at diet proportions is warranted. For example, it is sometimes erroneously assumed that the baby’s diet will be balanced as long as formula or human milk is provided, even when the volume consumed is extremely low.

**A quick-and-easy estimate of the “typicalness” of a formula intake volume for screening healthy infants:**

Multiply the ounces taken in by 20 kcal/oz (this assumes the formula is prepared following the usual directions) and divide by the infant’s weight.

In the first year of life, an intake of about 90-120 kcal/kg (kilocalories per kilogram of body weight) which is the same as 41-50 kcal/lb (kilocalories per pound of body weight) is typical, with the numbers in the higher end of the range most often seen in the first half of the year. In the past, 100-120 kcal/kg (45-50 kcal/lb) have been used as guidelines, but more recently it was found that many infants will grow normally and thrive on the smaller caloric intake levels as well.<sup>2</sup>

**The key of energy (caloric) adequacy will always be :**

**Look at the baby's growth, especially weight for length (weight/length) ratio and apparent body fat stores.**

If other food sources are included in the infant's diet, you can easily calculate the energy contribution of baby foods using the tables of average values from manufacturers' product information or food nutrient tables. New labeling laws also make this much easier than in the past. Additionally, a simplified system like the old diabetic exchange system can be used for table foods.

Calculating the energy intake and then comparing it with the "typical" range is a useful screening tool to help identify problems not immediately apparent. Values above or below this range, even in apparently healthy infants, certainly warrant a closer look since they may be indicators of certain problems. However, the typical range is not to be used as a feeding rule that a particular child must conform to on a regular basis.

This method to interpret the appropriateness of a baby's energy intake for its weight assumes that the baby is of fairly normal weight for age and length. Remember that very thin or very chubby babies will not play by the same rules because their unusual weight for length and age significantly changes the denominator in the ratio:

- Very thin babies will appear to have a more generous caloric intake than they actually do.
- Conversely, a high caloric intake in a chubby baby may appear to be within the usual range because there are so many pounds or kilograms to spread the calories over.

To correct for this effect, it can be helpful to recalculate kcal/kg or kcal/lb using the average weight for a child of the baby's length.

(See Case Studies 1 and 2 for examples.)

## **TROUBLESHOOTING ON THE FRONT LINES**

### **Looking for Explanations when Unusual Intake Patterns are Reported**

Note: All of the case studies and scenarios presented here have come from actual experiences with babies for whom these questions and considerations detected the real cause of inappropriate growth.

#### **Things to Consider in Assessing All Intake Records:**

##### **1. How accurate is the intake record?**

Is the person describing the intake:

- Providing first-hand information (e.g. is baby fed by others part of the day?)
- Guessing?
- Clear about arithmetic and the actual size of the bottle or cup used?
- Remembering to count night feedings, all beverages and all snacks?
- Able to accurately describe formula preparation?

##### **2. How typical is the intake record?**

- Is the record from the weekend at home but baby is fed at a sitter's house five days a week?
- Is the child ill or just now recovered from an illness and weight loss?

##### **3. Check that the total day's intake volume reported is consistent with estimates obtained through other approaches.**

For example, compare a reported estimate of total ounces of formula consumed per day with both the number of ounces prepared daily and the sum obtained when asking the caregiver to go through a typical day describing each feeding.

In addition you may ask the number of cans of concentrate used in a day or how many days one can of powdered formula feeds the baby. This type of cross-checking will pick up errors like missed night feedings, and it can clarify complex situations like Case Study 3 (a very thin infant who was reported to take a lot of formula but who never seemed to be satisfied.)

**Things to Consider in Assessing Specific Patterns of Unusual Intake:**

Figure 1 below describes four scenarios that often are seen when evaluating the intake of infants. Explanations of each of four scenarios follows the figure.

*Authors Note: I often use the term “fluffy” instead of obese when discussing a child with caregivers because it is less judgmental. Our society equates generous adiposity with many negative personal qualities. In order to optimize the therapeutic relationship it is important for the family to know that I care about and **like** their child. Although this term is not scientific or technical, I find that it works well for me and my clients, and it fits my **Aunt Cathy** patient-care style.*

<b>Figure 1:</b>		
<b>Four scenarios to consider when the reported intake seems to be at odds with the baby’s appearance</b>		
<b>Infant Appearance</b>	<b>Reported Intake</b>	
	<b>High</b>	<b>Low</b>
<b>Thin</b>	<b>1</b>	<b>3</b>
<b>Fluffy</b>	<b>2</b>	<b>4</b>

**SCENARIO 1:**

**A very high reported intake, especially for a slim or normally proportioned baby**

**BABY Problems to Consider**

- **Is baby experiencing any malabsorption?** Ask about stool patterns.
- **Is baby vomiting excessively or does the baby have reflux?**

Ask about the frequency, forcefulness and volume. Note that volume of vomitus is often overestimated even by health professionals. To better estimate amounts lost, one can pour a small amount of water on a table surface or cloth and ask the caregiver to compare it with the reported volume. (“Is it about this much?”) It is surprising how a small amount can appear to be quite a lot.

If vomiting is reported to be significant, has pyloric stenosis or gastro esophageal reflux (GER) been ruled out by the physician? In infants reflux can be related to immaturity of the lower esophageal sphincter.

- **Does baby vomit consistently or only under certain circumstances, such as:**
  - Only when left alone after a feeding, as has been reported in cases of rumination associated with nonorganic failure to thrive.
  - Only when made to intake more than a certain volume.
  - Only when fed certain foods or when certain water is used to prepare formula.
  - Only when fed in an “infant seat.”
  - Only when a certain person is the feeder.
- **Is the baby much more physically active, irritable and/or jittery than usual?**
- **Is baby “hypermetabolic”?**

Higher metabolic rates are sometimes seen when babies are working hard to breathe, born small for gestational age, fighting infections, trying to achieve catch-up growth, recovering from an acute illness and sometimes when they have been exposed to significant amounts of alcohol or other drugs in utero.

- **Is the baby adequately oxygenated?**

Progressing to a state of health in which extra oxygen is no longer needed is seen as highly desirable by caregivers both as a significant marker of progress for the baby and because it makes infant care and transportation much easier. For this reason, there can be a tendency for families and health care professionals to want to get the baby off oxygen as soon as possible.

However, sometimes adequate food intake and growth are only able to be achieved because of assisted oxygenation. Prematurely removing oxygen support can result in a baby having to use so much energy to breathe that growth is impaired. Also, exhaustion from the excessive breathing effort can make a baby stop eating before nutritional needs are met.

Providing oxygen when it is needed assures that the child does not have to choose between eating and breathing. Helping all concerned understand these concepts is very important.

### **CAREGIVER Problems to Consider**

- **Is the formula mixed incorrectly?**

If too much water is added, baby must drink a very large volume to try to get enough calories. He/she may fail to get enough to maintain appropriate weight for length.

## SCENARIO 2:

### A very high reported intake, especially “fluffy” baby

#### **BABY Problems to Consider**

- **Is baby truly fluffy (having a very high weight/length ratio) or just large for age (weight/length ratio normal)?**

If the weight/length ratio is within normal limits then the baby likely is managing his/her own intake appropriately. Do not attempt to make baby take less to match some average intake for age.

- **If baby is truly fluffy and also consuming a very high caloric intake, is he able to sense satiety normally?**

Some children with brain injury (such as congenital hydrocephalus) can experience problems with this even as infants. Other children (such as those with Prader-Willi Syndrome) are more likely to experience this problem later in childhood.

#### **CAREGIVER Problems to Consider**

- **Is food being used as a pacifier?**
- **Does the caregiver understand that babies often cry for reasons other than hunger?**
- **Does the caregiver believe that baby needs to take in a particular amount regardless of appetite?**
- **Is there pressure from family members or other to:**
  - Keep that kid quiet!
  - Put some meat on his bones!
  - Give her a lot of food or formula to make her sleep through the night!
- **Is formula being prepared correctly?**

Failure to add enough water to the formula can contribute to dehydration. Babies may be forced by thirst to take more formula than they are hungry for (calorically,) creating a vicious cycle.

- **Is baby being kept too warm and sweating a lot, leading to taking extra formula in an effort to meet fluid needs?**

If so, and if the heat situation cannot be adjusted, give guidelines for a reasonable formula intake and provide additional water in some form as appropriate.



## SCENARIO 3:

### A low reported intake, especially for a slim or normally-proportioned baby

#### BABY Problems to Consider

- **Is the baby much more physically active, irritable and/or jittery than usual?**

Does this behavior use up energy quickly and also interfere with baby's ability to eat because of distractibility or exhaustion?

- **Is the baby hypermetabolic?**

Higher metabolic rates are sometimes seen when babies are working hard to breathe. Some babies in this situation are those with heart or lung conditions. Some were born small for gestational age and they may be trying to achieve catch-up growth.

Babies fighting infections, or recovering from an acute illness may fall into this category. Sometimes babies who have been exposed to significant amounts of alcohol or other drugs in utero will have this problem.

- **Is baby adequately oxygenated?**

(See Scenario 1)

- **Is there anything physically interfering with the baby's ability to suck and swallow adequately?**

Poor lip closure, structural tongue or lip problems, and poor coordination of sucking, swallowing and breathing can all interfere with getting enough in. They can make feeding very time consuming and also quite unpleasant for the baby. Evaluation and recommendations by a pediatric speech therapist or occupational therapist can be very helpful in this situation.

- **Is tummy capacity adequate?**

If a higher caloric density feeding were used, would the baby continue to take the same volume or would he/she decrease intake to maintain the same caloric level?

How long does baby take to finish a feeding?

How often does baby eat?

Does baby seem to experience early satiety?

- **Does the baby perceive hunger?**

Can baby communicate hunger adequately?

Does baby ever cry to be fed or does the caregiver have to initiate the feedings?

Is baby taking any medications that can suppress appetite or cause gastrointestinal distress or drowsiness?

### **CAREGIVER Problems to Consider**

- **Can the caregiver recognize baby's signals that he/she wants to eat?**
- **Does the caretaker have realistic expectations about baby's feeding abilities and needs?**
- **Does the feeder stop feeding too soon, when baby is only catching his/her breath?**
- **Does the feeder engage the baby during feeding? Is there eye contact and cuddling?**
- **Are the feeding utensils appropriate?**

For example, is the type of nipple appropriate and the nipple hole the right size so baby does not become exhausted or frustrated, or choke when eating?

- **Does the feeder have an eating disorder?**

Does the caretaker eat regularly? Does he/she have extreme views about fitness or about not wanting to have a fat baby?

- **Is the caregiver very young and/or inexperienced in basic baby care?**
- **Are there other children to care for, or other obligations? Who actually feeds this baby?**
- **Is the caregiver afraid that frequent feeding or cuddling with "spoil" the baby?**
- **Does the caregiver think that snacking between meals is bad and so feeds baby only three times a day?**
- **Is the feeder engaged in a "Food War," -- a battle of wills -- with an infant that has resulted in disordered eating (e.g. near total food refusal) on the part of the infant?**
- **Is being fed unpleasant for the baby?**

A history of having been intubated or forcibly fed can cause a baby to associate oral eating with unpleasant experiences. Children who have experienced only minimal oral feeding because of

health problems can also find the introduction of an oral feeding regimen to be quite unpleasant and frightening. Those with some degree of dysphagia (“unsafe swallowers”) may experience oral food intake as a terrifying exercise in trying not to choke and aspirate food into the lungs.

Some babies and children are extremely sensitive to certain textures and oral sensations. Some have a “hypersensitive gag reflex.” Again, the RD can assist the family as they talk with the PCP to consider a feeding evaluation by a Pediatric Occupational Therapist and/or Speech Therapist. Many of them have special programs and experience in overcoming this type of feeding aversion.

## SCENARIO 4:

<b>Low reported intake, especially for a very fluffy baby</b>
---

### **BABY Problems To Consider**

- **Is baby hypotonic or less active than usual?**

A baby with low energy requirements will often take less formula than average because of decreased hunger, especially when fat stores are quite generous. But even so, baby may still get more calories than are required because of the drive to meet fluid needs. Sometimes only high calorie fluids are available.

Baby may also be coaxed or forced to take more than he/she would choose because caregivers are concerned about an unusually low intake volume. Chubby children with Down Syndrome or certain types of nerve and/or muscle diseases can sometimes present this way

Tube-fed children with minimal energy expenditure are especially vulnerable to overfeeding when caregivers or health professions set goals based on the usual caloric intake levels observed for the “average” baby’s age, activity/movement or size. Weight gain goals can sometimes be set at levels that are that are inappropriate when baby’s body composition is atypical.

### **CAREGIVER Problems to Consider**

- **Is the formula mixed incorrectly?**

As noted above, if too little water is added, baby may appear to be taking a relatively low volume of formula but he/she actually may be getting quite a lot of calories.

- **Is baby receiving substantial amounts of corn syrup (60 kcal/oz) for constipation problems?**
- **Is a lot of cereal or other thickener added to the formula in an attempt to prevent spitting up or gastroesophageal reflux, or because of dysphagia concerns?**

The caloric contribution of thickeners and corn syrup can be substantial: infant cereals are 9 kcals per level teaspoon, and corn syrup contributes 10 kcals per teaspoon. These additives can also seriously alter the ratios of carbohydrate and/or fat to protein, sometimes leading to a relative inadequacy of protein. The micronutrient content of the diet is also quite likely to be disturbed unless carefully assessed and adjusted.

**CASE STUDY 1:**

**A “fluffy” baby with a reported intake in the typical kcal/kg range**

**DATA:** At age 3 months, LS is a very fluffy-looking baby. He weighs 6.6 kg (14 lb 8 oz) and is 57 cm long (22.5 in). His weight/length is above the 95<sup>th</sup> percentile.

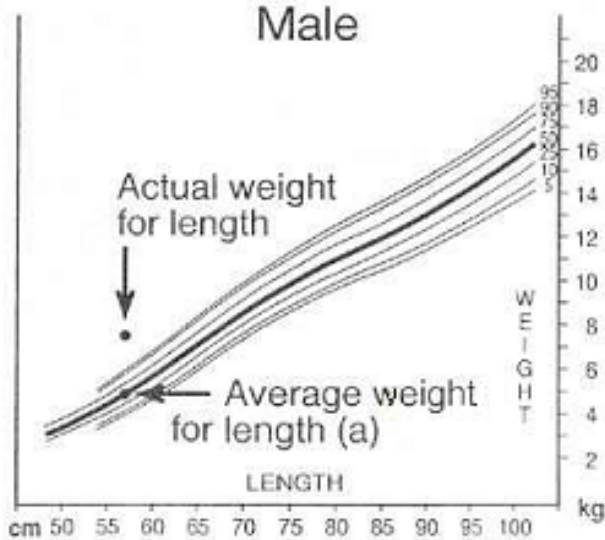
He takes about 760 kcal daily, all from formula, which is 115 kcal/kg, and well within the normal range for his age.

**Question:** Why is he gaining weight at an excessive rate on this apparently normal intake?

**ANSWER:** Since his weight/length ratio is not in the normal range; the Rule-of-Thumb kcal/kg range will not apply directly. It assumes a normal distribution of lean body mass and fat stores.

Children with a disproportionately high amount of fat relative to lean body mass will need fewer Kcal/kg than average to support themselves. This is because lean body mass is the most metabolically active tissue, and the caloric requirements to maintain fat stores are much lower.

Figure 2 - Case 1 - LS's Actual Weight/Length and Average Weight/Length



One can use this alternate calculation to get a sense of the energy needed to support his (tentatively presumed to be normal “non-fat” tissues) plus a more typical amount of fat stores for age.

1. On the weight/length NCHS growth chart above find L.S.’s length along the bottom of the page. Follow a straight line upward at that point until it intersects the 50<sup>th</sup> percentile. Then go to the side to find the average weight for children of that length.

The average weight for this length is \_\_\_\_\_(a).

2. Recalculate the kcal/kg (kcal/lb) using this weight as the denominator. Is the intake still in the typical range? Depending on the situation, it may or may not be. This calculation can provide a clue to help you assess the situation correctly.

$$\frac{760 \text{ kcals}}{(a)} = \text{kcal/kg average wt for length}$$

For example, if the intake is now above the usual range, it may be that the child has normal caloric requirements and he is “fluffy” due to higher than usual caloric intake. **In this case continue your assessment using Scenario 2.**

However, if his recalculated intake is still in the typical range, it may be a clue that the child has lower than normal caloric requirements. This may occur with children who are hypotonic (who have low muscle tone,) those who move less than usual for any reason and in certain forms of muscle disease. **In this case, continue your assessment using Scenario 4.**

**Which scenario is suggested by L.S.’s history? (answers on page 16)**

If a lower weight/length is desirable (e.g. for a child whose condition results in decreased physical activity or decreased lean body mass, such as spine bifida or certain neuro-muscular conditions), pick a percentile that would decrease the risk of overfeeding and of inducing what could be very debilitating “over-fatness.” These children can be quite overfat but not look especially overweight on the charts. Depending on the child’s degree of mobility or muscular impairment, a weight-to-length ratio between the 10<sup>th</sup> to 25<sup>th</sup> percentile may actually be optimal for continued independence. Use that weight to calculate the caloric intake goal.

[Please see my handout “Why Are Children With Chronic Illnesses or Handicapping Conditions at High Risk of Receiving Suboptimal Nutrition?” for more specific information.]

**As always, it is critical to:**

- **follow each child’s individual growth pattern** since all of these Rules-of-Thumb are just starting guesses. Assessment of body fat stores is an important adjunct for children with unusual body composition, in order to assure that fat stores are not depleted or excessive. This may be an “official” assessment – using a caliper and following skinfold thickness – or sometimes just a n

educated eye and a “finger pinch” can be just as helpful. Many neurologically-affected children can have a slim appearance but actually have adequate-to-generous fat stores. In such cases, it is not in their best interests to push for a somewhat arbitrary weight gain that would only make it harder for them to move themselves or to be cared for by others.

- **assess the adequacy of protein, vitamins, minerals and fluids** especially when low caloric requirements result in decreased total food intake or when certain food groups must be eliminated due to allergies or texture problems.
- **consider the potential for altered nutrient requirements.** These may accompany a particular medical condition or therapeutic regimen such as drug nutrient interactions, nutrient malabsorption or excessive losses.

**CASE STUDY 2:**

**A very thin baby with an intake in the typical kcal/kg range.**

**DATA:** at 7 kg and 72 cm (15 lb 6 oz; 28.3 in), AG is quite thin. Her weight -to-length is below the 5<sup>th</sup> percentile and yet she appears to take 100 kcal/kg (45.5 kcal/lb), which is a typical intake.

**Why does she fail to gain well on what appears to be a normal intake?**

**ANSWER:** As with L.S., this baby has an unusual body composition that makes the Rule-of-Thumb not apply. She is virtually all lean body mass (with minimal fat,) so her metabolic rate for her length is higher than would be expected.

1. **Use the alternate calculation:** Find the average weight for her length. The average weight for this length is \_\_\_\_\_ (a). (See Figure 3 on the next page.)
2. **Recalculate kcal/kg (or kcal/lb) using this weight as the denominator.**

$$\frac{700 \text{ kcals}}{(a)} = \text{_____ kcal/kg}$$

**Is the intake still in the typical range?** If it is, this would be a clue that something else is getting in her way, so **continue your assessment using Scenario 1.**

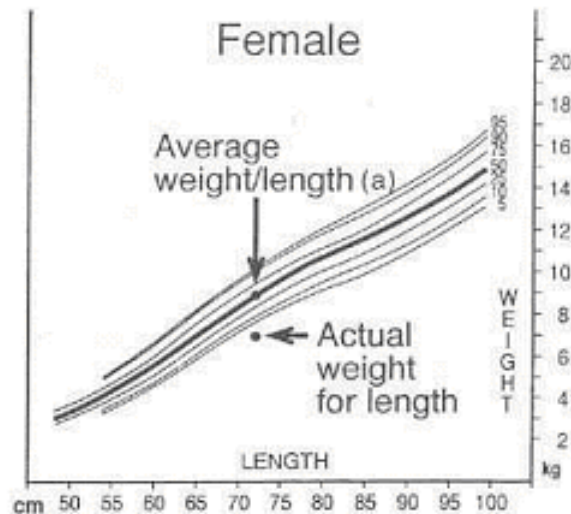
**If the intake now looks low,** it appears that something is preventing her from taking enough volume to meet her needs, so **continue your assessment using Scenario 3.**

**Which Scenario is suggested by A.G.’s history? (answers on page 16)**

-----

This alternate calculation can also assist in setting intake goals for children with special medical or physical problems when it is clinically appropriate to do so.

Figure 3 - Case 2 - AG's Actual Weight/Length and Average Weight/Length



**Example:** In Case Study 2, if this child's nutrition care plan established a caloric and protein intake based on her actual weight, she would continue to be underfed. Instead, choose a weight denominator (using the weight/length ratio on the NCHS growth chart) that is more desirable.

**If an average weight/length is desirable** (e.g. for a child with nutritional needs in the typical range, but whose intake is controlled by others because all feedings are via a tube), *base the energy and protein recommendations on an average weight for a child of that length.* Then follow up by monitoring growth carefully and adjusting the feeding as needed. For catch-up growth, even higher intakes may be needed on a temporary basis. It is not uncommon for children to “outgrow” their feeding unless someone checks this periodically. What was once adequate per kg of body weight drops to a level that fails to support appropriate growth, so follow-up is crucial. Sometimes caregivers can be taught to do this calculation and progress the feeding volume themselves as the child grows.

### CASE STUDY 3:

**A thin infant with a very large reported formula intake volume.**

**DATA:** B.W., a very thin-appearing 6.2 kg baby boy, was reported by his mother to have had a regular intake for many weeks of five 8 oz bottles of formula daily and no solids (40 oz x 20 kcal/oz = 800 kcal/day; 800 kcal/6.2 kg = 129 kcal/kg) which is a higher intake than usual, especially for such a thin baby.

B.W.'s mother reported that he "seems to want to eat all the time" and is "never satisfied" with a feeding. This pattern could reflect a serious medical problem and if found to be a true representation of the situation, it should result in a referral for medical evaluation.

**ANSWER:** On further questioning however, the mother was asked to describe formula preparation and feeding in greater detail and from several different angles. She then described preparing only one can of formula concentrate daily. Formula concentrate contains 40 kcal/oz and comes in 13 oz cans, providing a maximum of only 84 kcal/kg for a 6.2 kg baby). It was discovered that mother was not comfortable with arithmetic or measurement, and that the bottles she was using held only 4 to 5 oz each rather than 8 oz.

B.W.'s mother had been afraid to give the baby more in spite of his evident hunger. She was told by a person staffing a professional pediatric health phone consultation line at a local clinic that giving him 40 oz (as she had been) was "probably over feeding since 32 ounces was the limit." The health care professional indicated that the child's reported desire for more to eat when his intake was already so high was "probably just attention-getting behavior."

**If the health care professional had asked about the child's appearance (very thin), and obtained a more thorough description of formula preparation, the problem would have been immediately apparent and easily resolved.**

A similar picture might have occurred with the over dilution of the formula, and there is an additional threat of water intoxication. This mother avoided that measuring problem by using the empty formula concentrate can as the measuring device for adding water 1:1. Over- and under-dilution of formula are actually fairly common mistakes. One study found that as up to 5% of people preparing formula misunderstand the directions and dilute the formula twice; another 5% fail to dilute the formula concentrate at all. However, only very careful questioning will detect the real problem.

## **SUMMARY**

A good understanding of the underlying assumptions about growth and body composition which provide the basis for the usual nutritional recommendations for infants and children is very important. It makes it possible for the health care professional to make "intelligent departures" from the usual feeding recommendations in order to meet the needs of children with special health problems.

Careful questioning can be of great value in helping to differentiate between the serious health problems that require medical care, and the problems which are correctable by simple dietary adjustments. Knowing the right questions to ask can make it easier to be a successful nutrition detective and an advocate for these young children.

## **Answers to Case Studies 1 and 2**

**Case 1 L.S. Intake = 160 kcal/kg (72 kcal/lb) Scenario 2**

**Case 2 A.G Intake = 78 kcal/kg (36 kcal/lb) Scenario 3**