Focusing In: Numeracy and Parental/Child Literacy

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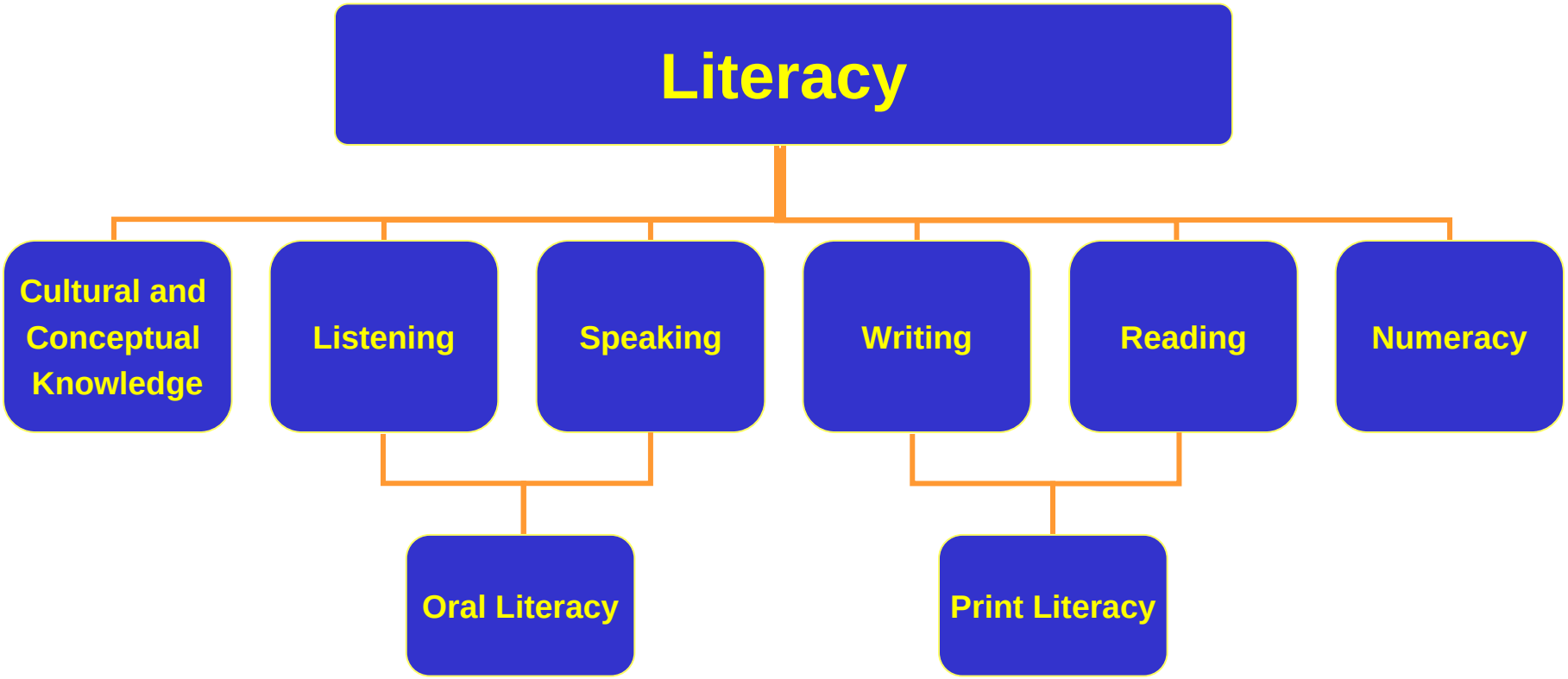
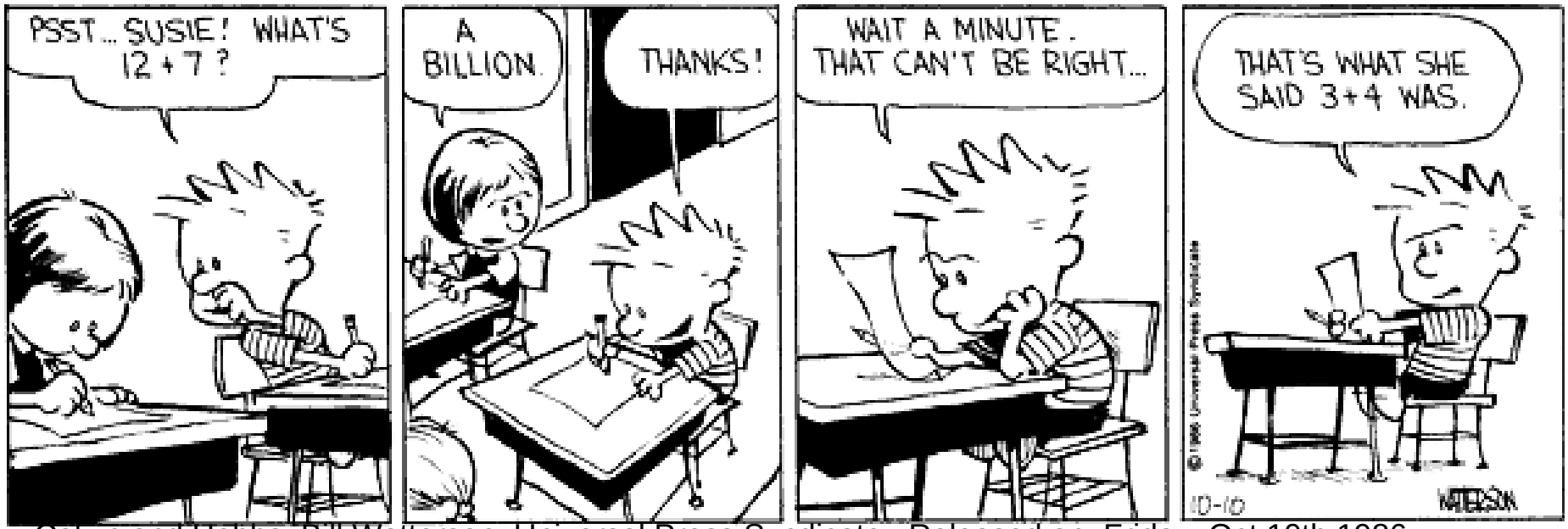
Components of Literacy



IOM, Health Literacy, 2004

Numeracy

- **Ability to understand and use numbers in daily life**
- **Highly correlated with literacy, but not perfect**



Calvin and Hobbs, Bill Watterson, Universal Press Syndicate, Released on: Friday, Oct 10th 1986.

Rothman et al, J of Health Comm, 2008

Components of Numeracy

Common numeracy skills

Skills
Numeration/counting/hierarchy
Calculations (addition, subtraction, multiplication, division)
Understanding time/dates
Reading graphs/tables/figures/measurement
Using fractions/decimals/percentages/proportions
Understanding probability
Higher-order mathematics (algebra, geometry, calculus, etc.)
Applied (contextual) skills
Performing multistep math problems
Estimation
Applying logic
Ability to interpret/infer mathematics from problem/situation, problem solving

Rothman et al, J of Health Comm, 2008

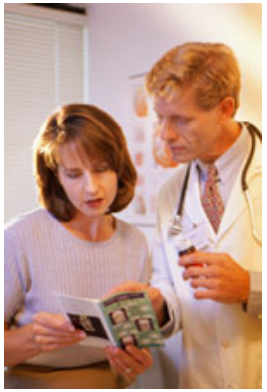
Assessment of Numeracy

Measure	Duration	Comment
WRAT	15 minutes	Primarily calculations
Woodcock Johnson	Test until ceiling reached	Lengthy
KeyMath	35-50mins	Focused on children K-9
K-Tea	30-75 mins	Basic and applied skills. Individually admin.
NALS, NAAL, HALS		Not readily avail.
TOFHLA	10 mins (num)	Items rely on document literacy
NVS	3-5 mins	Primarily for screening
Lipkus/Shwartz	1-3 mins	Focus on probability
Medical Data Int Test	18 items	Focus on med stats
DNT, DNT15	10-35mins	Diabetes focused

Rothman et al, J of Health Comm, 2008

Who has poor numeracy ?

- **NALS (1992) and NAAL (2003)**
  - **110 million Americans with basic or below basic quantitatitve skills.**
  - **Difficulties reading bus schedule, sending a letter by certified mail, etc.**



Numeracy in Health

- **Numeracy skills needed:**
  - **Understanding of risk and probability**
  - **Understanding medication information**
  - **Interpreting glucose readings, insulin**
  - **Understanding weight status**
  - **Understanding nutrition information**
  - **Understanding exercise**
  - **Understanding food labels**
  - **Understanding portion size**

Numeracy in Nutrition and Diabetes

- Cross-sectional studies linking numeracy to outcomes
- Low Numeracy linked to poorer understanding of food labels, portion sizes, and BMI
- Lower numeracy associated with poorer diabetes related skills, self-efficacy, and glycemic control

Nutrition Facts

Serving Size ½ cup (114g)
Servings Per Container 4

Amount Per Serving

Calories 90 Calories from Fat 30

	% Daily Value*
Total Fat 3g	**5%**
Saturated Fat 0g	**0%**
Cholesterol 0mg	**0%**
Sodium 300mg	**13%**
Total Carbohydrate 13g	**4%**
Dietary Fiber 3g	**12%**
Sugars 3g	
Protein 3g	

Vitamin A 80% • Vitamin C 60%
Calcium 4% • Iron 4%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

If Blood sugar is:	Units of Insulin
130-180	0
181-230	1
231-280	2
281-330	3
331-380	4

Rothman et al, *Am J Prev Med.* 2006
Cavanaugh et al, *Annals of Internal Medicine*, 2008

Numeracy vs Literacy

Table 3. The relationship among numeracy, literacy, and education status

Variable (n = 200)	Numeracy ability (Measured by WRAT) 1–6th grade	7th–8th grade	9th–12th grade	>12th grade	P value**
Education level					<0.0001
<High school	15 (88%)	2 (12%)	0 (0%)	0 (0%)	
High school	35 (73%)	5 (10%)	8 (17%)	0 (0%)	
Some college	31 (46%)	12 (18%)	18 (26%)	7 (10%)	
≥College	11 (16%)	15 (22%)	24 (36%)	17 (25%)	
Literacy level*					<0.0001
0–6th grade	16 (100%)	0 (0%)	0 (0%)	0 (0%)	
7th–8th grade	20 (67%)	6 (20%)	3 (10%)	1 (3%)	
≥9th grade	56 (36%)	28 (18%)	47 (31%)	23 (15%)	

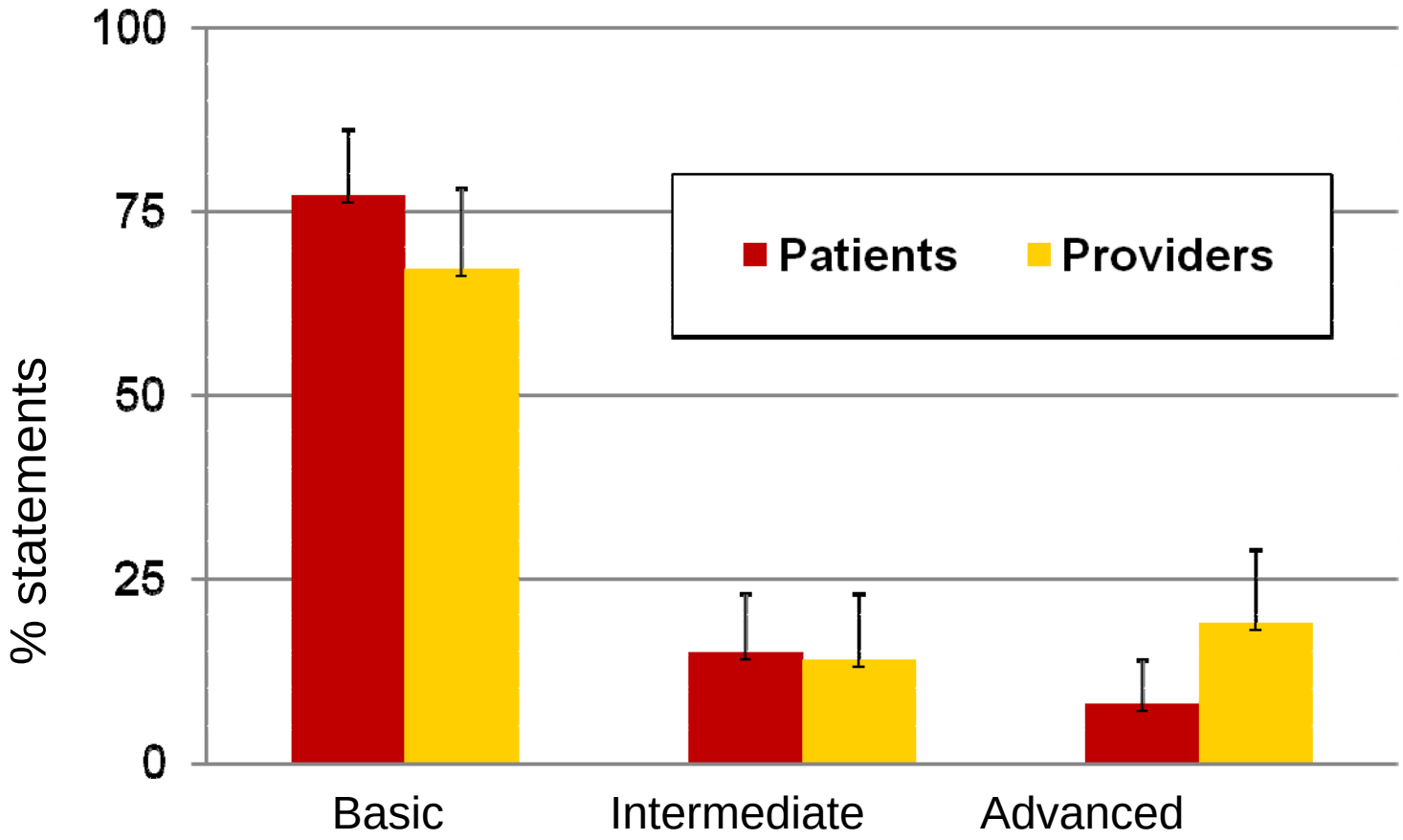
*Measured by Rapid Estimate of Adult Literacy in Medicine (REALM).
**Chi-squared analyses.

Rothman et al, J of Health Comm, 2008

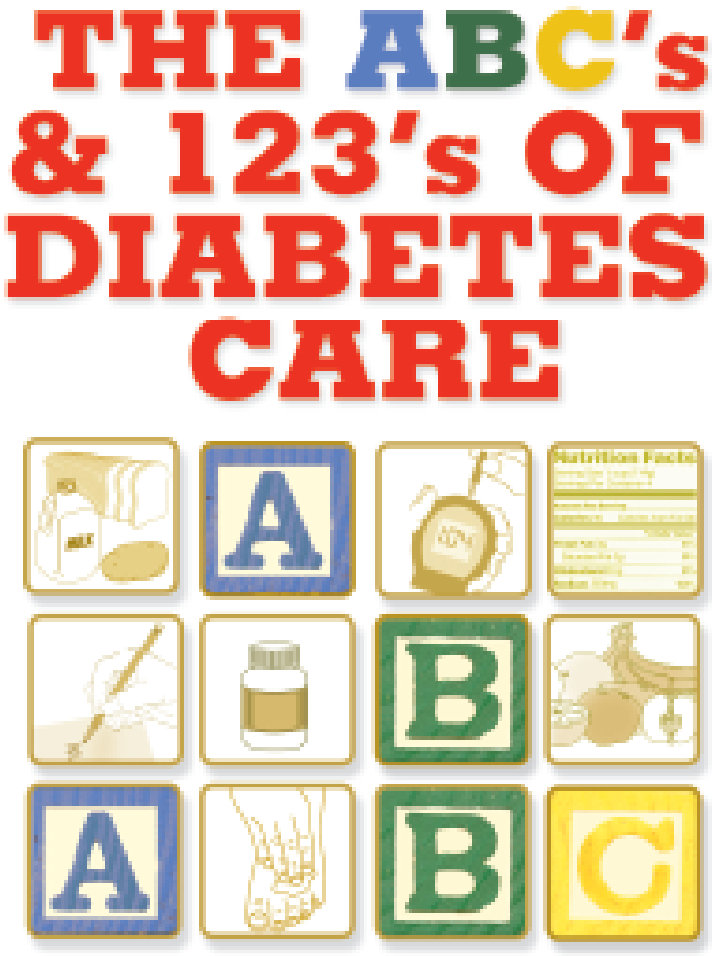
Oral Assessment of Numeracy

Basic	Identify and make sense of numbers without manipulation
Value	age, weight, blood glucose, blood pressure
Time	calendar, clock
Simple money	dollars, cents
Drug dose without frequency	"Atenolol 25 mg."
Intermediate	Count, quantify, compute and simple manipulation of numbers
Calculations	addition, subtraction, multiplication
Counting	"Looks like I have 8 pills left."
Drug dose and frequency	"Take 3 pills twice daily for 7 days."
Complex money	"I can get 2 tablets for $5."
Advanced	Make sense of numerical information using multiple sources/formats, critically analyze quantitative health information
Fractions/percent/decimals	"I still have 30% of my pills remaining."
Appropriate drug dosing	"20mg of Lisinopril is too high."
Cost comparison	"The medication is expensive and no better."
Statistics	Risk/benefit (e.g. probability, NNT, RRR, ARR)
Graphs/tables	"Let me show you a graph of how meal dose insulin works during the day."

Distribution of Oral Numeracy



Diabetes Literacy and Numeracy Study



Taking care of your diabetes

If you have diabetes, you need to:

- Check your blood sugar every day.
- Be aware of how much starch and sugar (carbohydrates) you eat at every meal.

- Be active every day!
- Take your diabetes medicines every day.

- Clean and look at your feet every day.

- Go to your doctor's office for regular check ups.

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Cavanaugh et al, Diabetes Care, 2009, in press

Challenges and Opportunities

- Initial studies suggest that numeracy is an important component of overall literacy that may be independently predictive of health

- Assessment can be challenging (intimidation of a math test vs duration of an applied test)
- Challenging to develop a pure applied numeracy assessment tool (not based on literacy, previous knowledge, culture)
- Mode of assessment (paper, oral , computer)
- Assessment in different contexts (illness vs health, etc)
- Assessment in non-English patients

- Need better General Health Numeracy assessment tool, and more longitudinal studies to evaluate
- More studies needed to evaluate how to address numeracy in health, and the impact of addressing numeracy in interventions

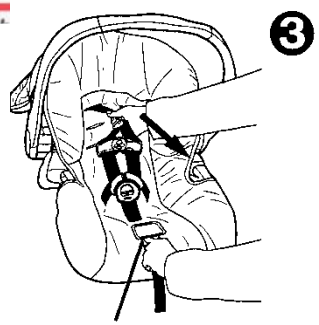
Assessing Health Literacy in Families

- **Current health literacy assessment tools are primarily geared towards adults**
- **Tools typically test adult health situations or adult related words**

Current Pediatric Health Literacy Tools

- **Parental Literacy**
  - **PHLAT (Pediatric Health Literacy Assessment Test)**
- **Child Literacy**
  - **WRAT**
  - **REALM-Teen**
  - **Literacy assessment tools**

Parental Health Literacy Activities Test (PHLAT)



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Patient Characteristics

Variable (n=182)	Avg or Percent
Age of Caregiver (yrs)	25.5
Latino or Hispanic	12%
Relationship to Child is Mother	87%
On WIC	78%
Education Level ≤ HS	58%
Adequate Literacy (STOFHLA)	98%
Numeracy Skills ≤ 8th grade	83%
Parental Health Literacy Test Score	68%

Reading a Thermometer

You are told by your baby's pediatrician to call him if the baby has a temperature of 100.4ºF or greater.

The thermometer looks like the following:

Should you call the doctor?

___ YES

__X__ NO

Correct Response: 69%

Mixing Formula

- **Using the instructions provided on the Enfamil powder formula, how much water and formula would you add to make a 4oz. bottle?**

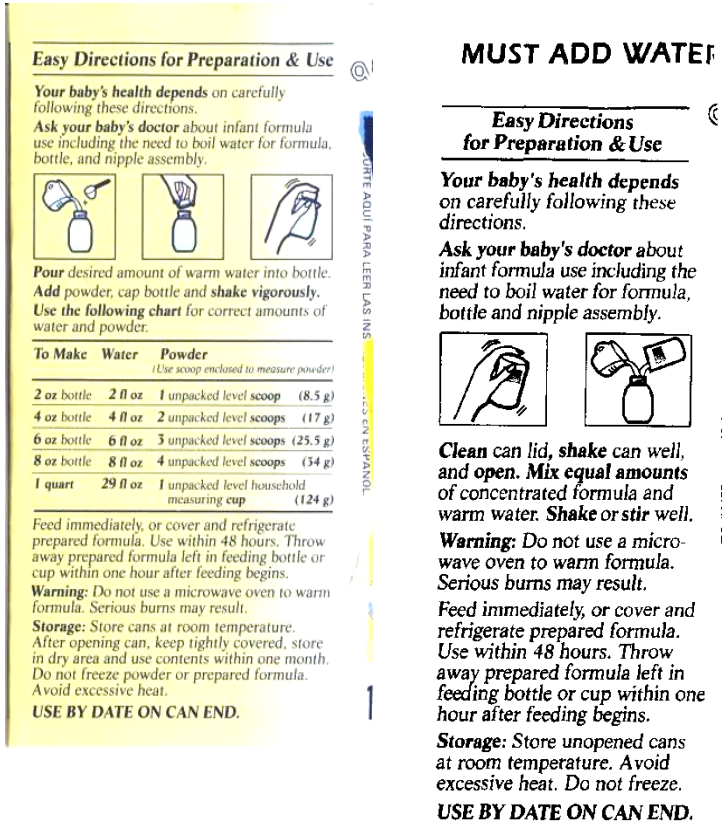
  Amount of water added: __4__
  Number of scoops added:__2__

  Correct Response: 90%

- **Using the instructions provided for the Enfamil concentrated formula, how much water and formula would you add to make a 4oz. bottle?**

  Amount of water added:__2__
  Amount of concentrate added:_2__

  Correct Response: 47%



Easy Directions for Preparation & Use

Your baby's health depends *on carefully following these directions.*

Ask your baby's doctor *about infant formula use including the need to boil water for formula, bottle, and nipple assembly.*

Pour *desired amount of warm water into bottle.*
Add *powder, cap bottle and* ***shake vigorously.***
Use the following chart *for correct amounts of water and powder.*

To Make	Water	Powder (Use scoop enclosed to measure powder)
2 oz bottle	2 fl oz	1 unpacked level scoop (8.5 g)
4 oz bottle	4 fl oz	2 unpacked level scoops (17 g)
6 oz bottle	6 fl oz	3 unpacked level scoops (25.5 g)
8 oz bottle	8 fl oz	4 unpacked level scoops (34 g)
1 quart	29 fl oz	1 unpacked level household measuring cup (124 g)

Feed immediately, or cover and refrigerate prepared formula. Use within 48 hours. Throw away prepared formula left in feeding bottle or cup within one hour after feeding begins.
Warning: *Do not use a microwave oven to warm formula. Serious burns may result.*
Storage: *Store cans at room temperature. After opening can, keep tightly covered, store in dry area and use contents within one month. Do not freeze powder or prepared formula. Avoid excessive heat.*
USE BY DATE ON CAN END.

MUST ADD WATER

Easy Directions for Preparation & Use

Your baby's health depends *on carefully following these directions.*

Ask your baby's doctor *about infant formula use including the need to boil water for formula, bottle and nipple assembly.*

Clean *can lid,* ***shake*** *can well, and* ***open. Mix equal amounts*** *of concentrated formula and warm water.* ***Shake*** *or* ***stir*** *well.*
Warning: *Do not use a microwave oven to warm formula. Serious burns may result.*
Feed immediately, or cover and refrigerate prepared formula. Use within 48 hours. Throw away prepared formula left in feeding bottle or cup within one hour after feeding begins.
Storage: *Store unopened cans at room temperature. Avoid excessive heat. Do not freeze.*
USE BY DATE ON CAN END.

Growth Chart

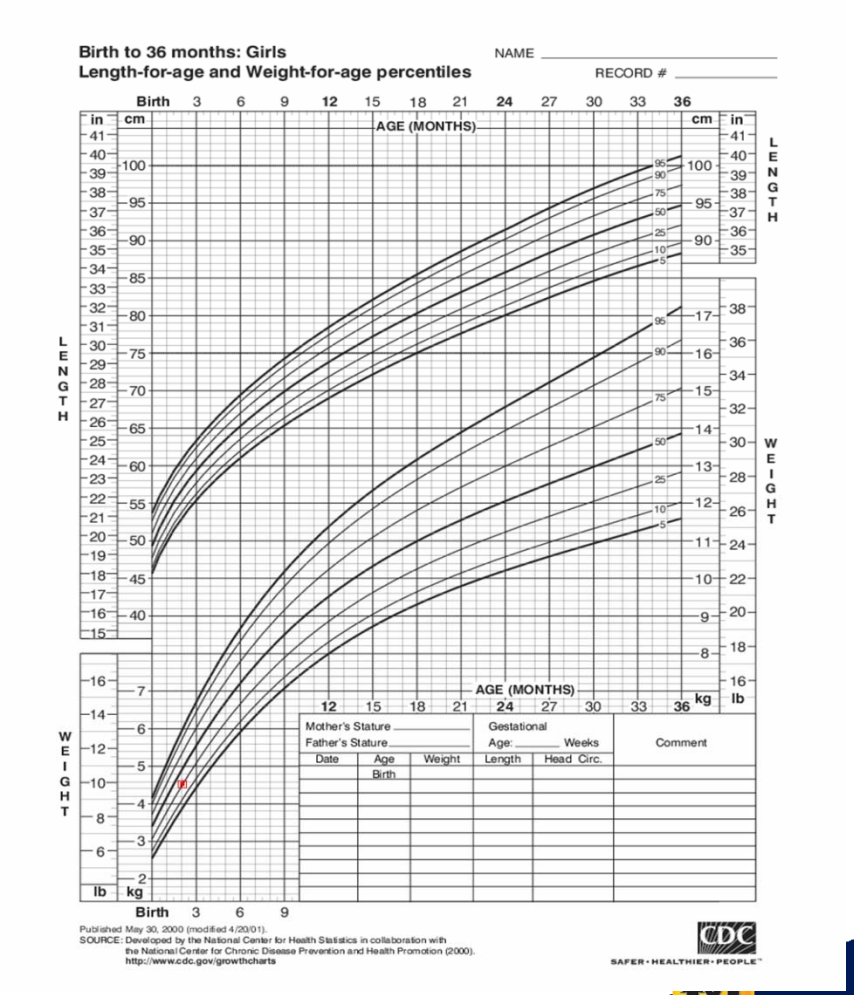
At your baby's 2-month follow-up appointment, her doctor tells you that according to the infant growth curve, she is in the 25th percentile for weight. What does this percentile mean?

a) **Out of 100 babies, your baby is bigger than 25 of them.**

b) **Out of 100 babies, your baby is smaller than 25 of them.**

c) **Out of 100 babies, your baby is bigger than 75 of them.**

d) **Out of 100 babies, your baby is bigger than 52 of them.**



Correct Response: 51%

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OTC Cough and Cold Products

- 180 parents of young children at Vanderbilt, UNC, UMiami
- Over 80% would give products to children < 2 yrs of age
- Greatly influenced by pictures, claims on product
- Lower numeracy assoc with poorer understanding

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Lokker et al, Pediatrics, in press 2009

PHLAT Conclusions

- **Significant parental deficits in skills related to early parenting**
- **Skill deficits are correlated to underlying literacy and numeracy**
- **Opportunities to improve our communication efforts and parental education/anticipatory guidance**
- **Validation of Spanish version in process**

National Pediatric Obesity Initiative

- Project supported by NIH (NICHD). Collaboration between Vanderbilt, UNC, NYU, and UMiami
- Will enroll 1,000 English and Spanish speaking families with children age 2 months and follow for 22 months. Intervention sites will focus on obesity prevention, while control sites will focus on injury prevention.
- Will train intervention Pediatric providers in improved health communication skills and give them a literacy sensitive toolkit to use with families to promote healthy lifestyles for their children

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Challenges and Opportunities

- Need to develop better assessment tools of parental literacy in the context of child care
- Need to develop better assessment tools of child health literacy
- Determine when to assess parent, child, or both
- Develop tools for assessment in Non-English Patients

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Questions


Stu's Views
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How many of you comprehend the term "follicular"?
What does "comprehend" mean?