

# **Asthma & Health Literacy: Can improving health literacy promote health equity?**

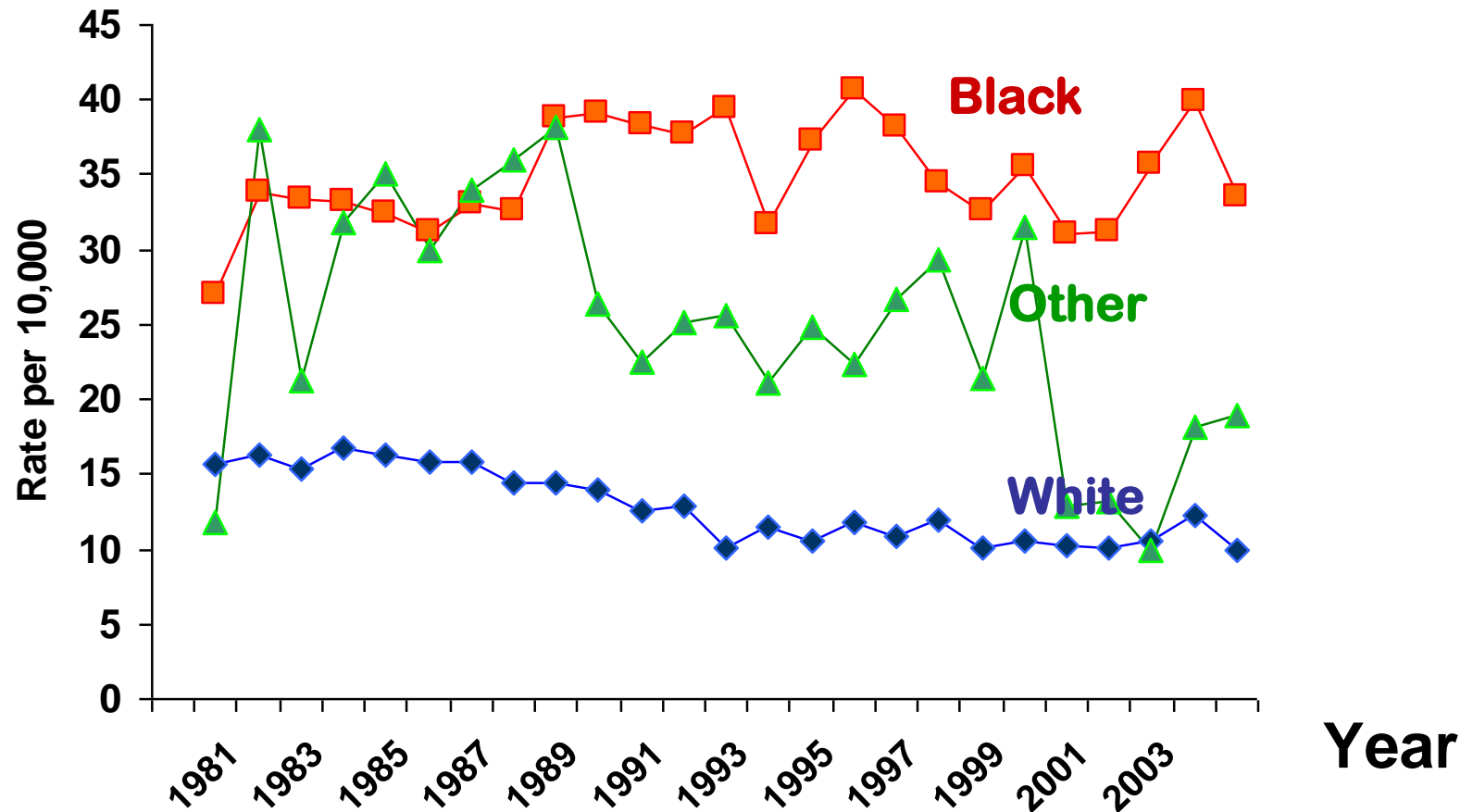
**Andrea J. Apter, MD, MSc  
University of Pennsylvania**

**Support: NHLBI K23 HL04337, R01 HL073932, K02 HL088469, RC1 HL099612**

# Outline

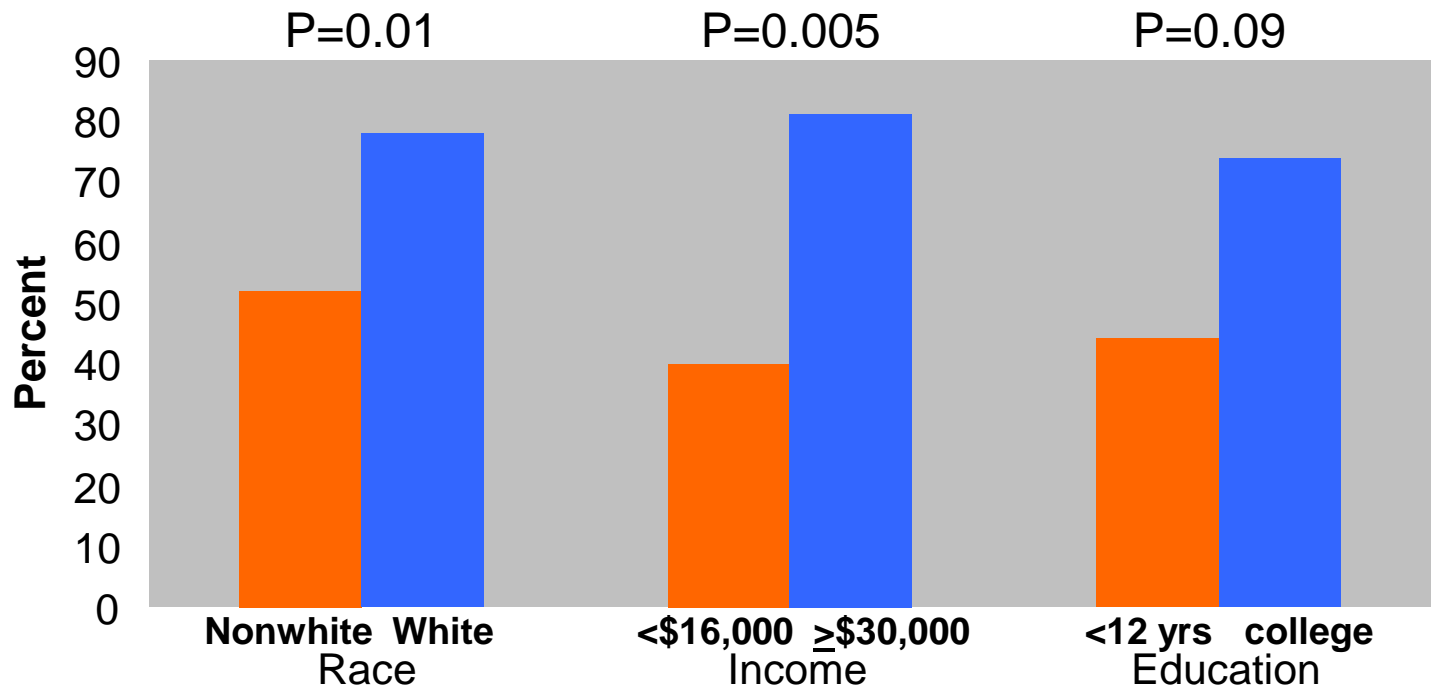
- Health disparities in asthma
- Communication (individualized medicine)
- Literacy
- Numeracy
- Can promoting effective health literacy contribute to health equity?

# Asthma\* Hospital Discharge Rates# by Race: United States, 1980 - 2004



Source: National Hospital Discharge Survey, National Center for Health Statistics

# Intensity of Ambulatory Treatment after Hospital Discharge for Adults with Asthma



Haas et al. J Gen Intern Med 1994;9:121-6.

# Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care

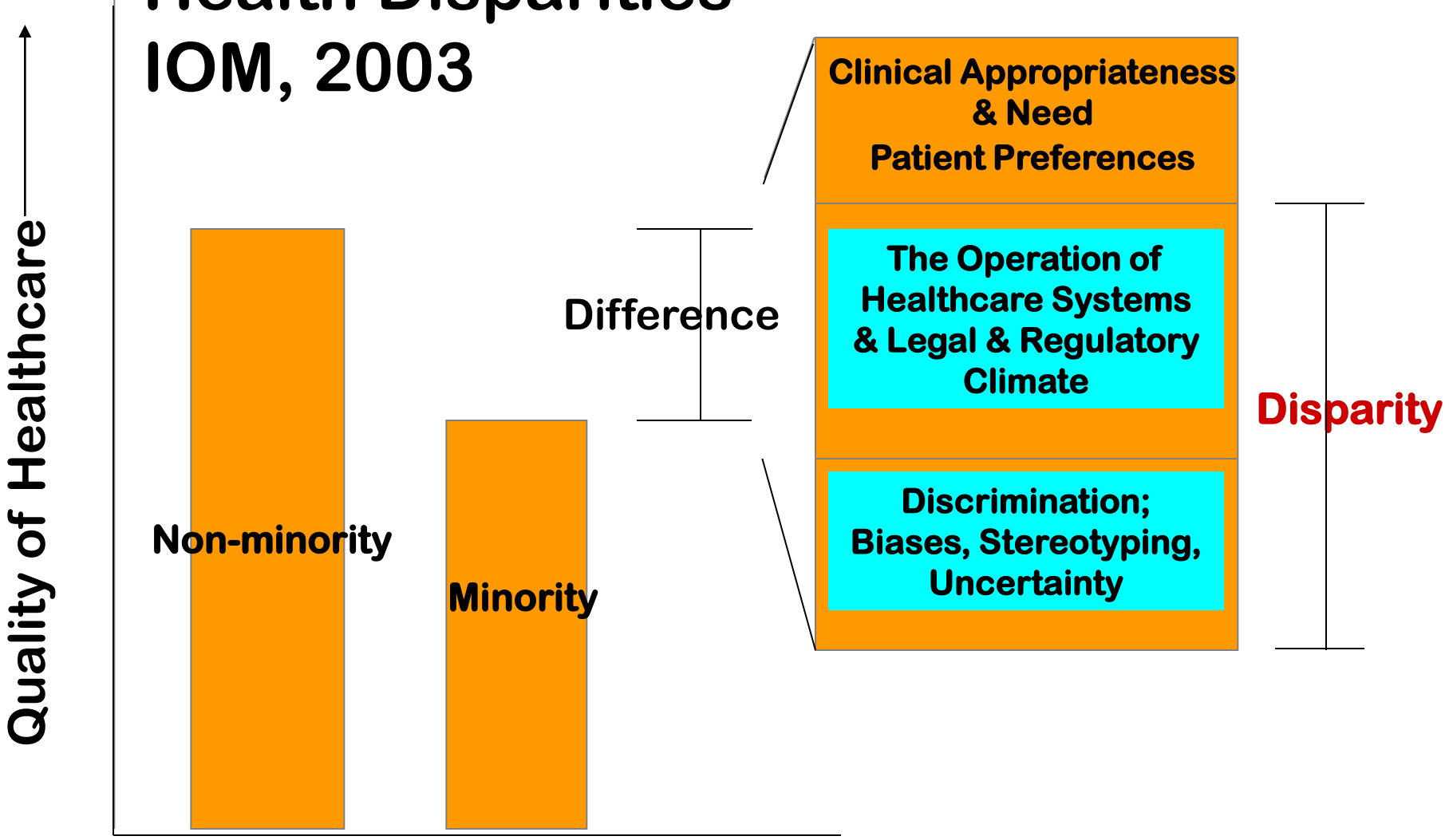
There are “racial or ethnic disparities in the quality of healthcare that are not due to access-related factors or clinical needs....”



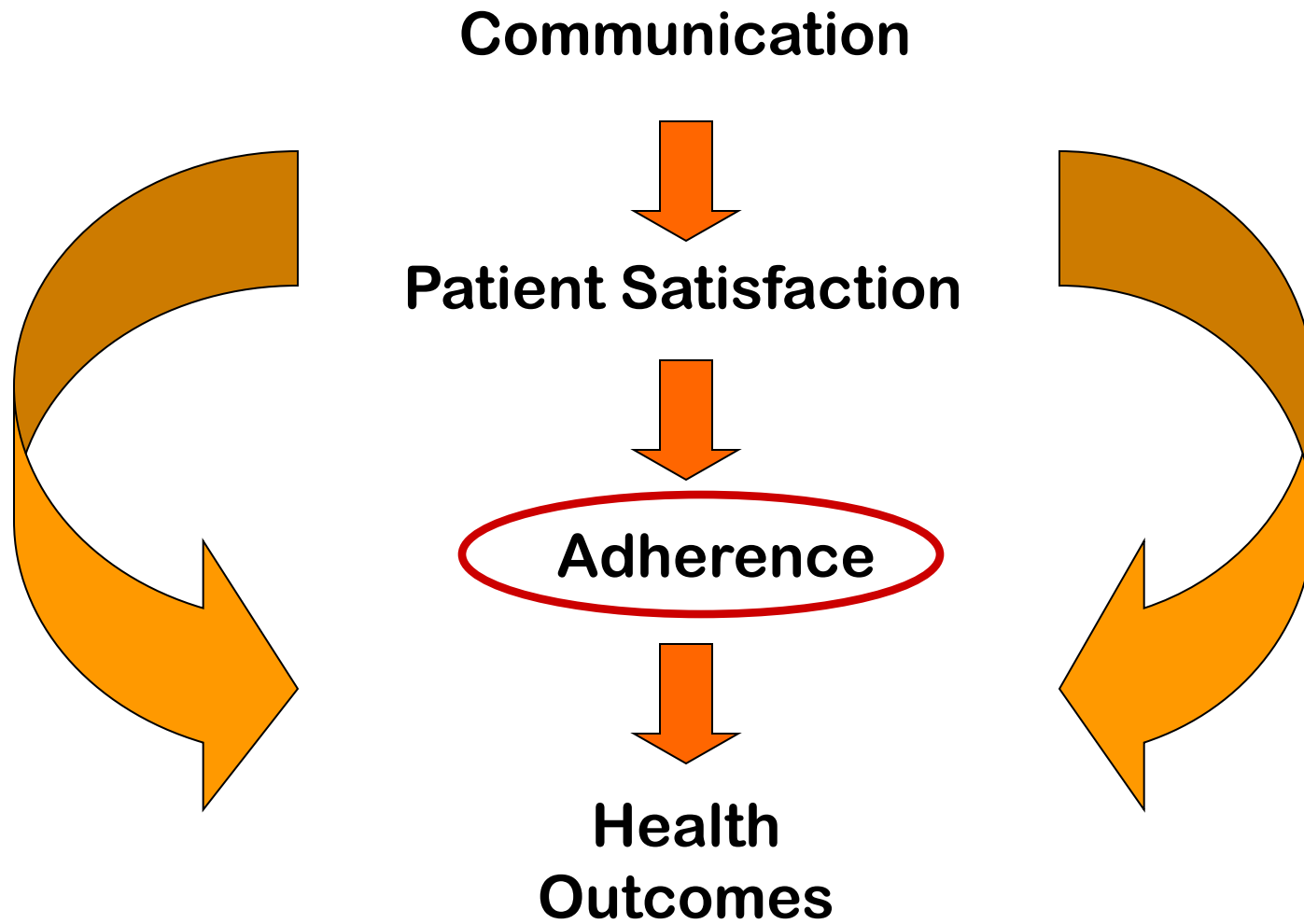
Institute of Medicine, 2003

# Health Disparities

## IOM, 2003



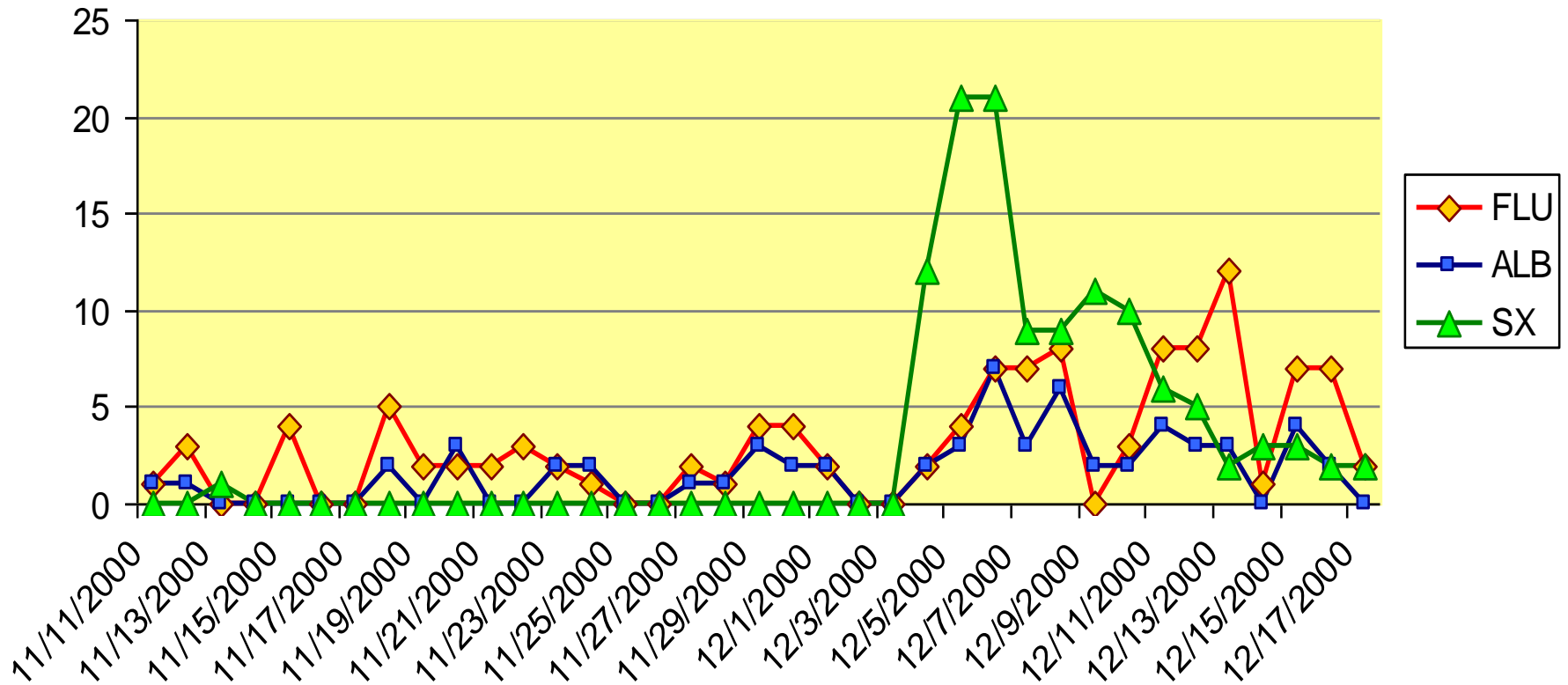
# IOM Model of the Influence of Patient-Provider Communication on Health Outcomes



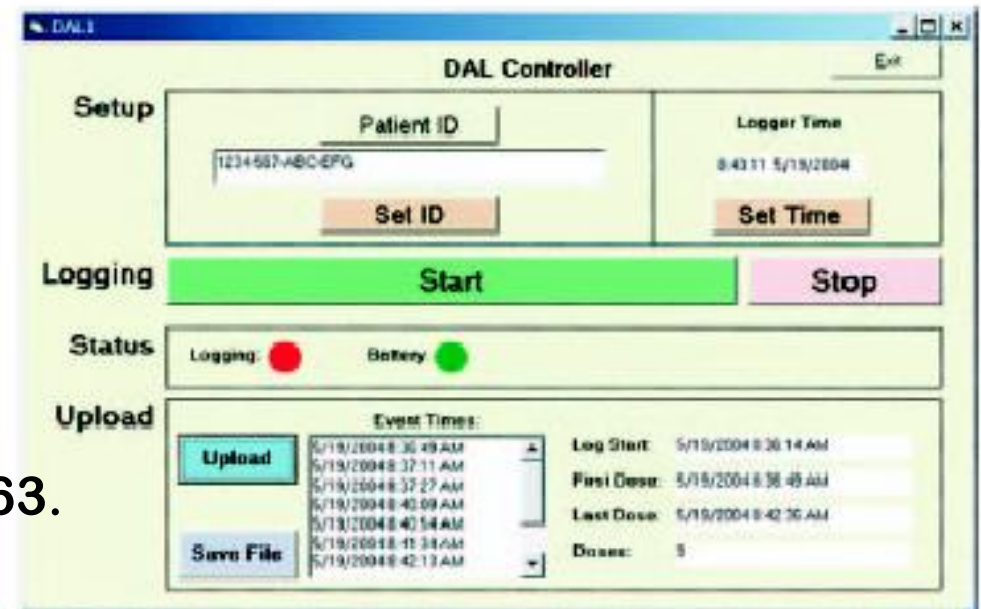
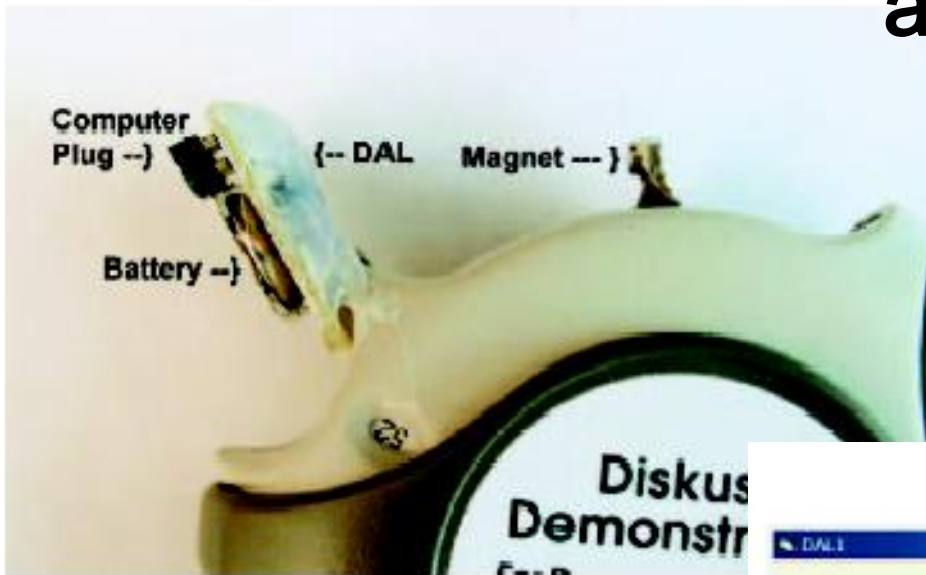
# 70 y.o. female prescribed fluticasone 2p bid

## Patient Disperses

Patient Medication	Date	Time	Shake	Inhale	Multiple Dispense
(0008)					
Flovent					
	11/10/2000				
		10:50:11AM *	No	Yes	
		10:50:25AM	Yes	Yes	
		11:10:10PM *	No	Yes	
		11:10:40PM *	No	Yes	
	11/11/2000				
		11:20:34PM *	No	Yes	



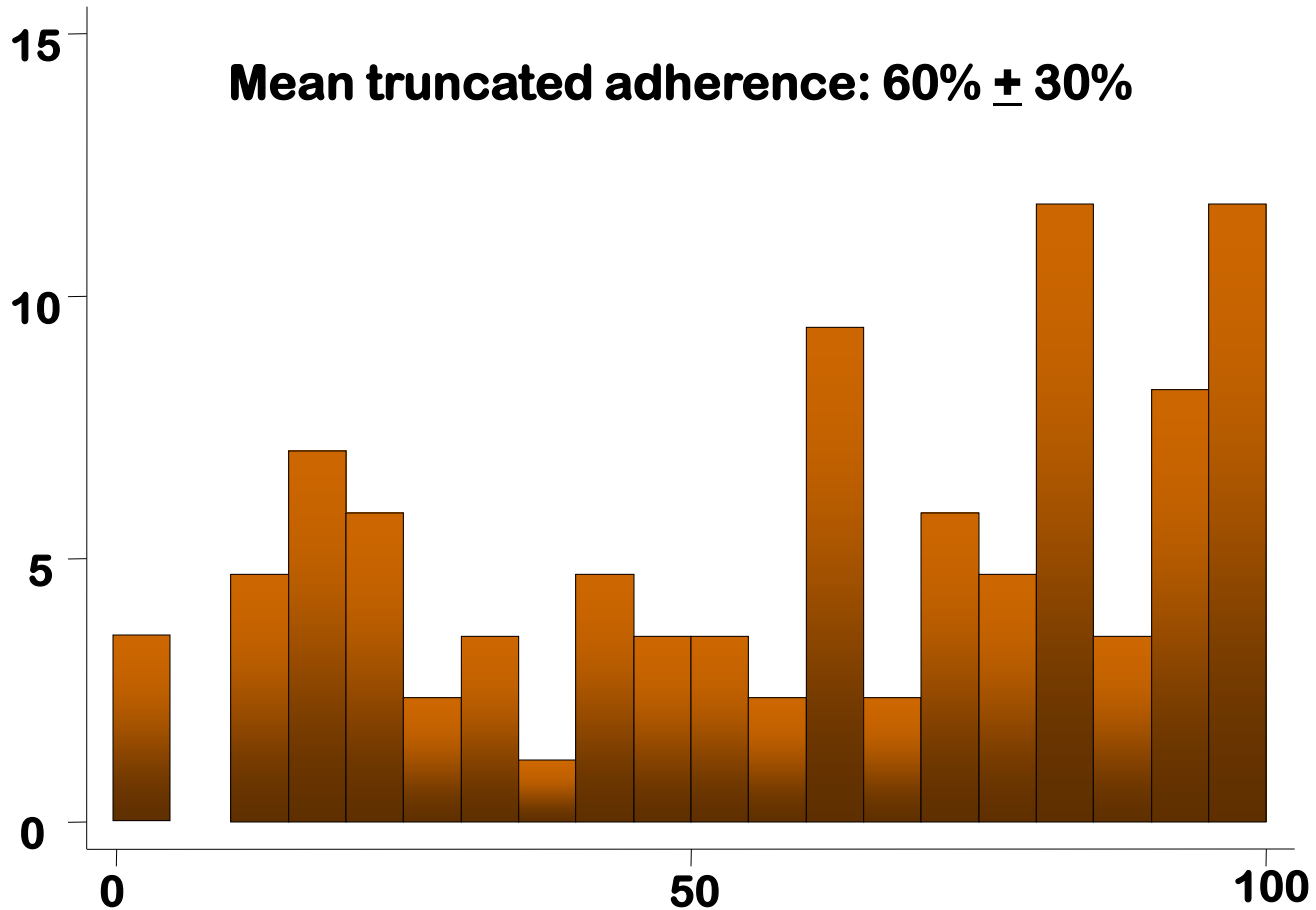
# Adherence logger for a dry powder inhaler



Bogen, Apter JACI 2004;114:863.

# Frequency Distribution of Mean Truncated Adherence

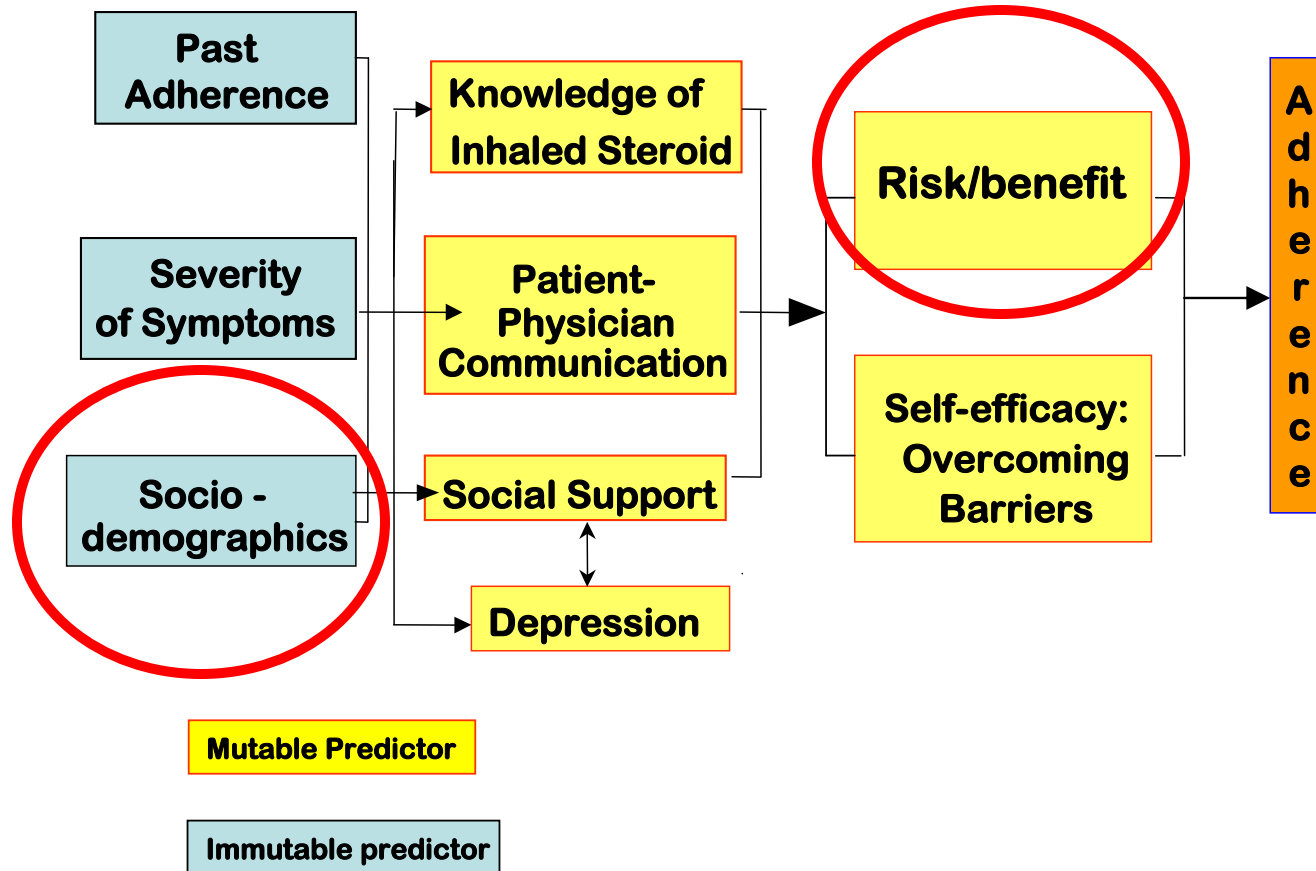
Percent of Subjects



Mean Truncated Adherence (Percent)

# Some Determinants of Adherence

## Model for cross-sectional observational study

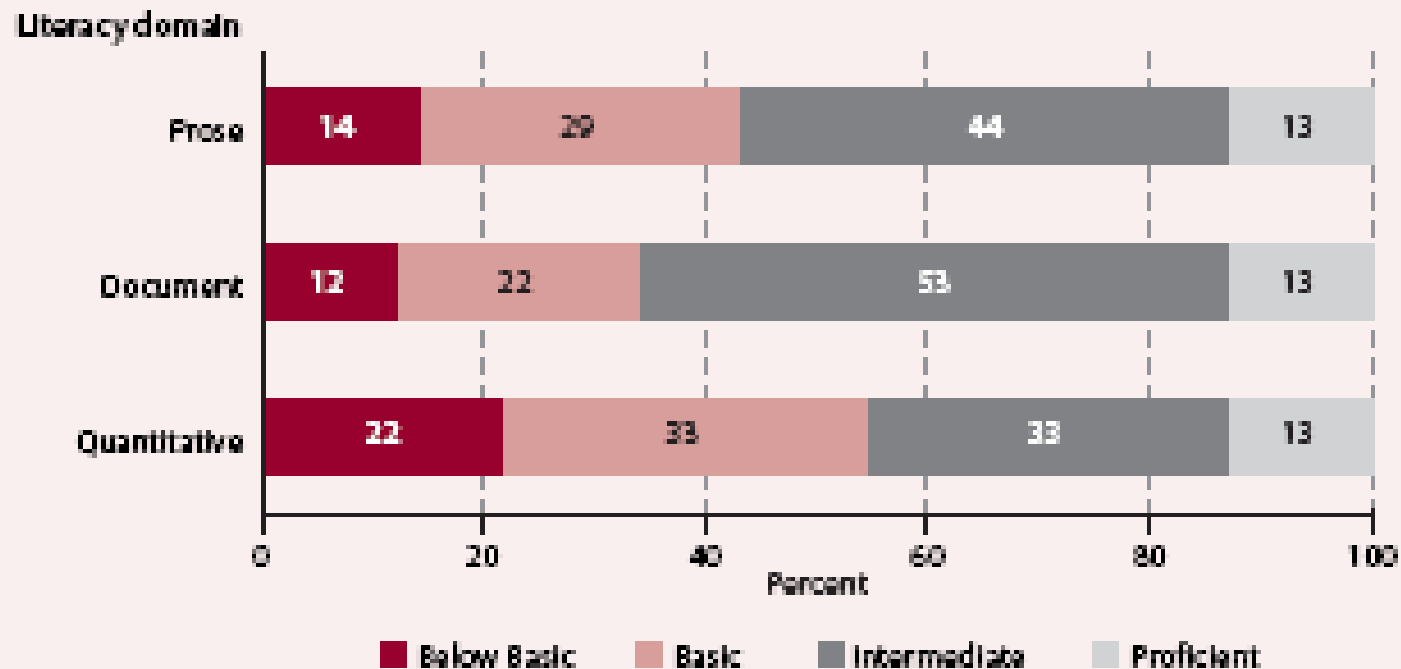


# Mediation of race-ethnicity effect on adherence by modifiable and immutable predictors of adherence

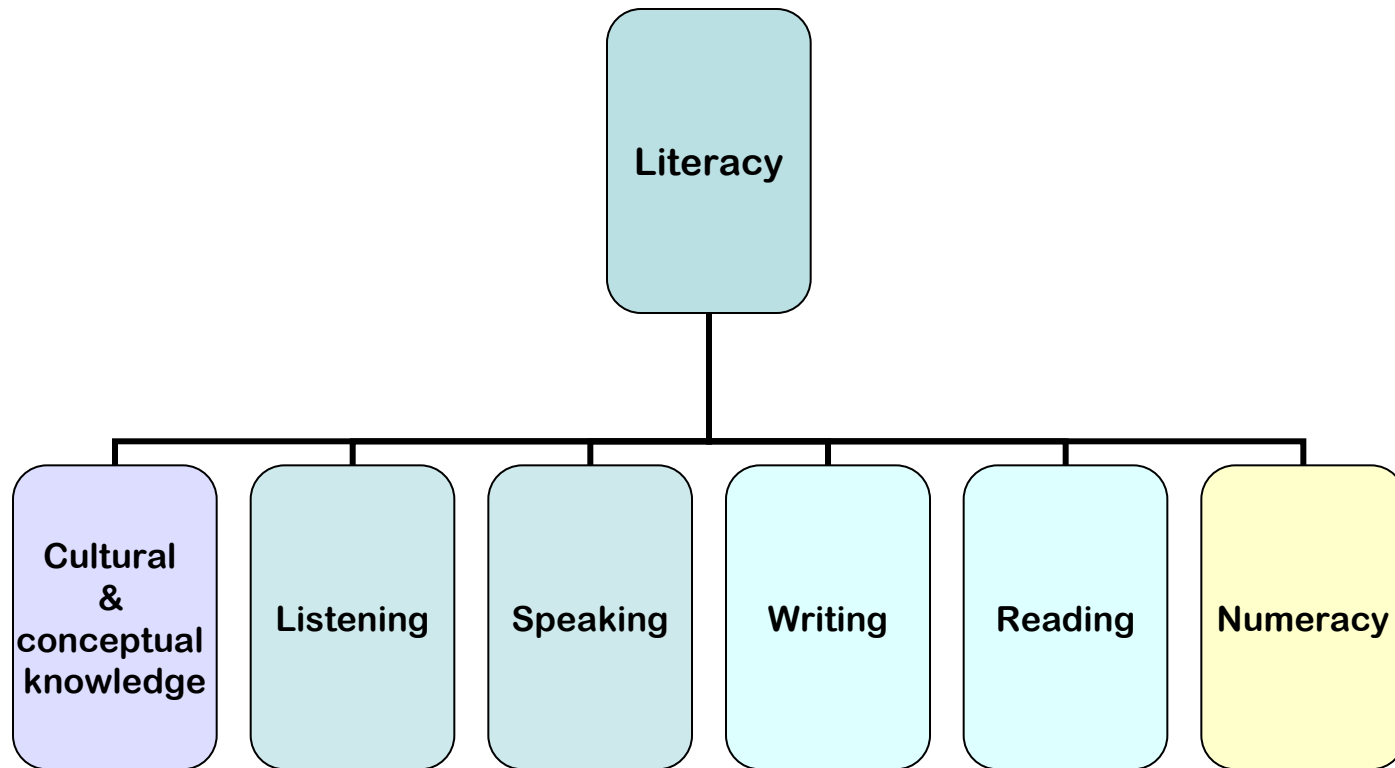
- **Health beliefs (risk/benefit) in the model**
  - Adherence = race/ethnicity
  - Adherence = race/ethnicity + health beliefs
  - 13% reduction in effect of race/ethnicity BUT
- **Income, education, or health insurance in the model**
  - 32% when household income is added
  - 32% when education is added
  - 42% with commercial insurance

# National Assessment of Adult Literacy 2003

ADULT LITERACY PERFORMANCE: Percentage of adults scoring at each achievement level in prose, document, and quantitative literacy: 2003



# Components of Literacy



# Health Literacy

- **Health literacy**
  - **“the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions”**
    - ...Surgeon General, Healthy People 2010**

# Low health literacy is

---

- Found in all patient groups
- Increased prevalence in
  - Poor, immigrants, elderly, minorities
- Unrecognized
- Found among individuals with average intelligence who function normally
- Low HL is a marker for problems with access, history-taking, unsuccessful patient education.

# Health Literacy & Asthma

---

- The National Asthma Education and Prevention Program (NAEPP) requires patients with moderate to severe asthma to have considerable self-management skills.
- Self-management involves numerical concepts.
- Low literacy (REALM) has been associated with poorer asthma knowledge and improper inhaler use.
- Pts with inadequate health literacy had no difficulty learning or retaining appropriate inhaler technique ...Paasche-Orlow et al.

# Numeracy

---



- The ability to understand and act on numerical directions
- Examples: arithmetic, estimation, probability, problem-solving, number sense, risk, understanding graphs and tables
- Patients encounter numeracy concepts when they seek, receive, and pay for medical care.
- There is limited research of the impact of numeracy on health (e.g., diabetes & anticoag control)
- No tool that assesses these skills related to asthma.

# ANQ Question 1

Here are some examples of statements or questions patients might hear in a doctor's office.

1. Your doctor asks you to take 30 mg of prednisone every day for a week. The pharmacist gives you a bottle of 5 mg tablets. How many pills should you take each day?

61/73 (84%) correct



# ANQ Question 2

If a patient has a 1% chance of developing osteoporosis or bone loss, that means

- a. Out of 1000 patients, one will develop bone loss
- b. Out of 100 patients, one will develop bone loss
- c. Out of 10 patients, one will develop bone loss
- d. Out of 5 patients, one will develop bone loss
- e. The patient will develop bone loss
- f. The patient will never develop bone loss



**28/73 (38%) correct**

# ANQ Question 3

You have a peak flow meter.

Your Danger or Red Zone is 50% of your best reading.

Your best reading is 400 L/min. What is your Danger Zone?

L/min or less

**52/73 (71%) correct**

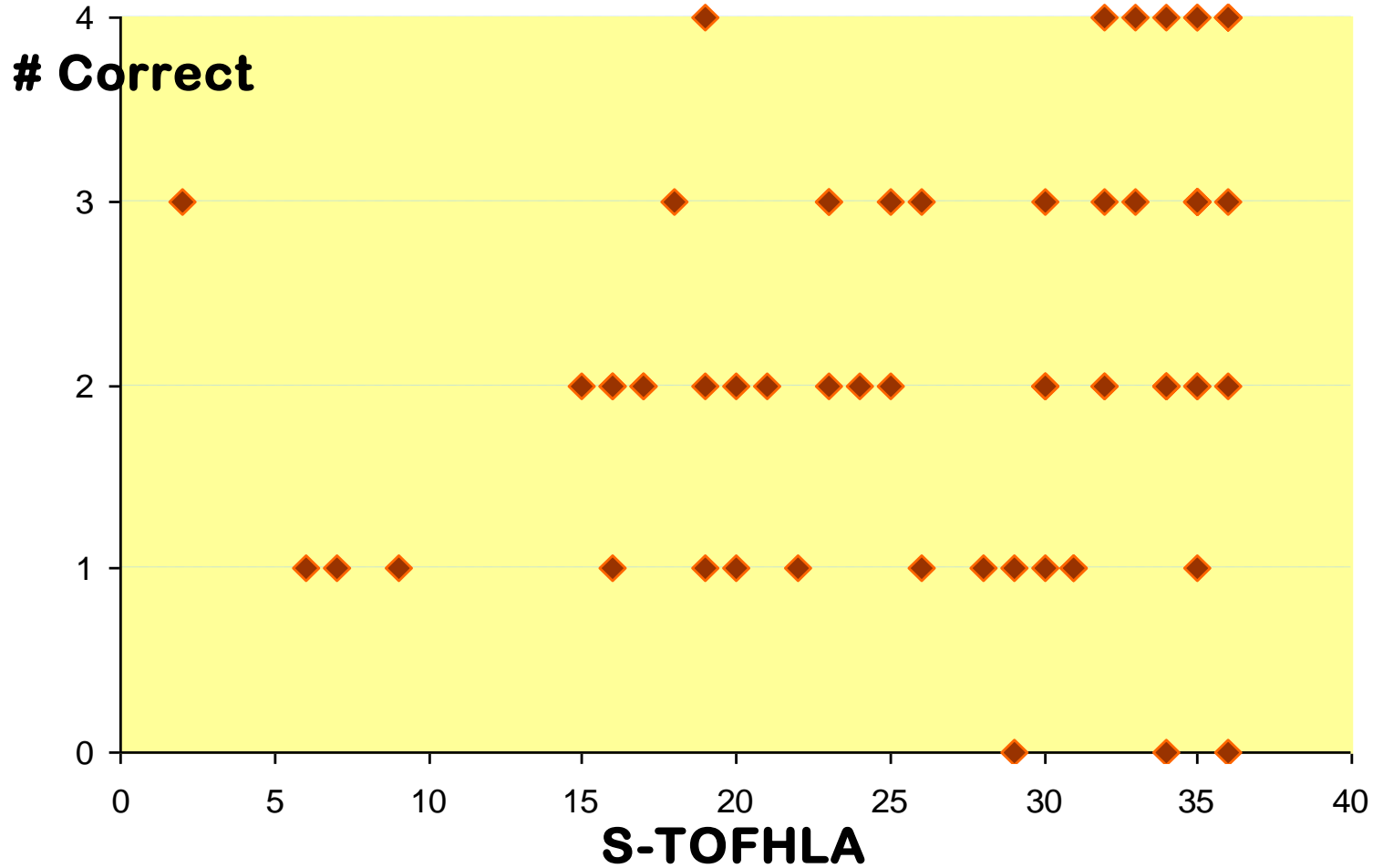
# ANQ Question 4

You are told the Green Zone (the OK zone) is a reading between 80% and 100% of your best reading. Your Worry Zone is between 50% and 80% of your best reading. Your best reading is 400 L/min. When are your readings in the Worry Zone?

- a. Between 300 and 400 L/min
- b. Between 200 and 320 L/min
- c. Between 200 and 300 L/min **21/73 (29%) correct**
- d. Between 240 and 320 L/min
- e. Between 100 and 300 L/min



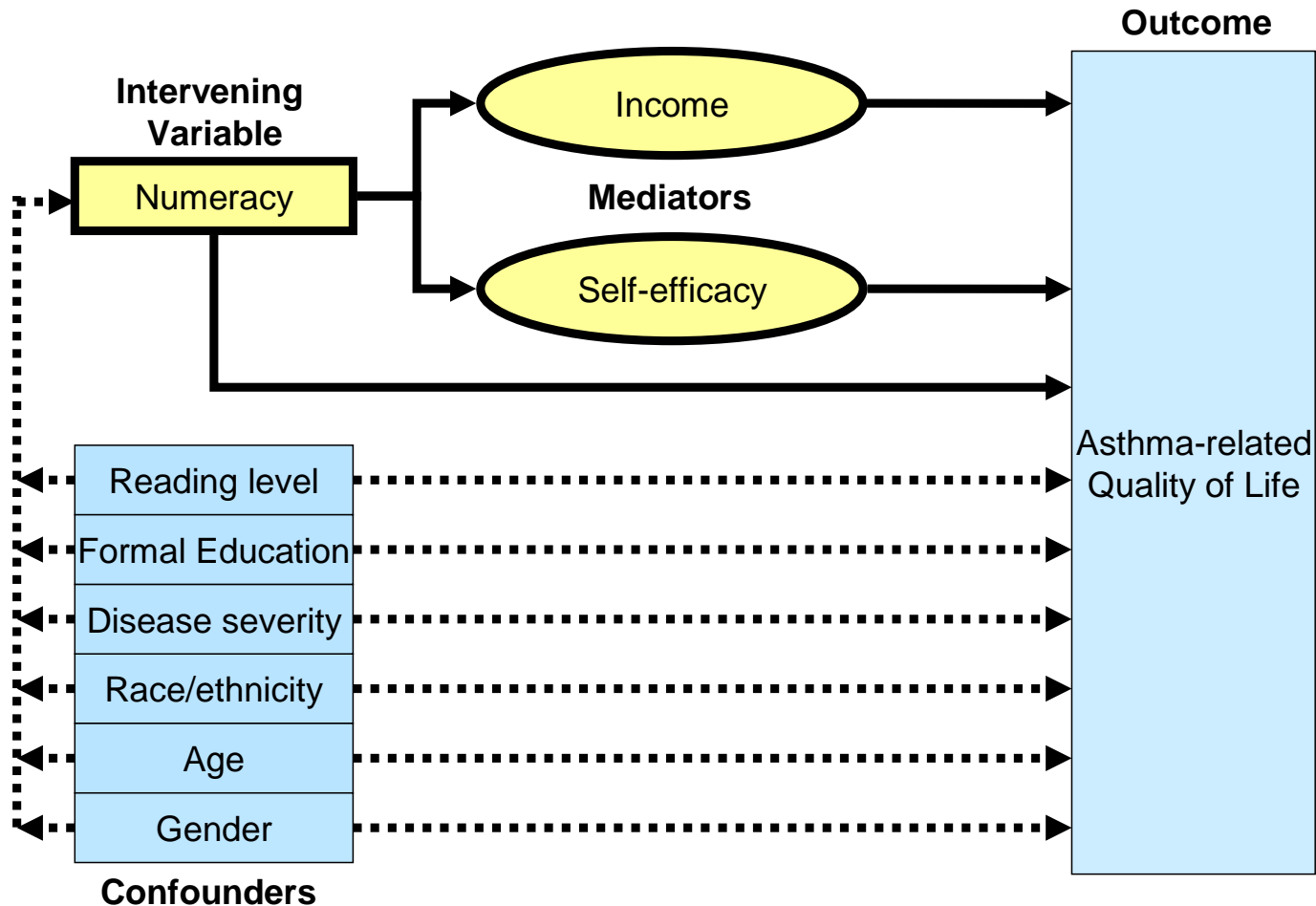
# # Numeracy Questions Correct vs S-TOFHLA Score



# Numeracy and Asthma Severity (Hospitalizations, ED visits)

- Hospitalizations and ED visits for asthma were significantly and negatively associated with ANQ controlling for age, sex, educational attainment, and household income.
  - Hospital OR 0.55 (95% CI 0.34, 0.88),  $p=0.012$
  - ED OR 0.56, (95% CI 0.38, 0.84),  $p=0.004$
- No association between S-TOFHLA

# How numeracy could influence asthma-related quality of life



## Characteristics of 80 Participants

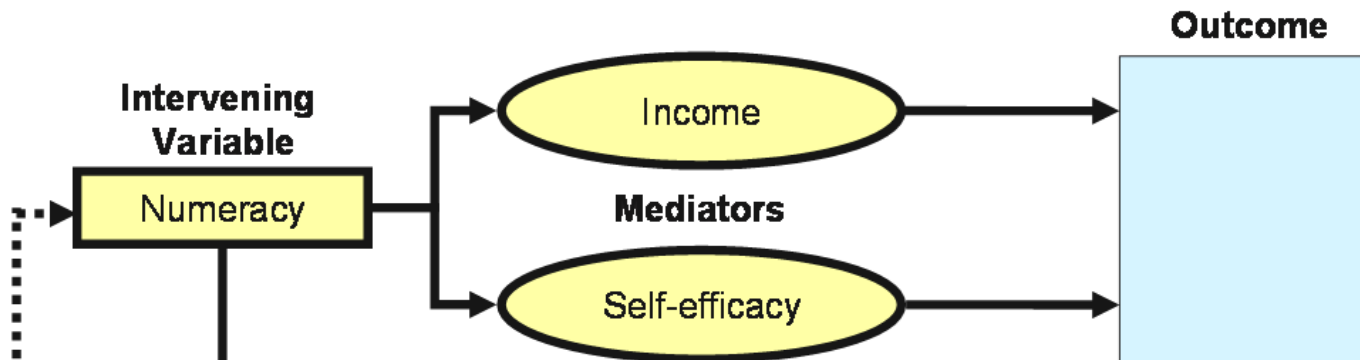
<b>Age (years)</b>	<b>47 13</b>
<b>Female</b>	<b>55 (69%)</b>
<b>Race</b>	
<b>Black/African American</b>	<b>52 (65%)</b>
<b>White</b>	<b>15 (19%)</b>
<b>Other</b>	<b>9 (11%)</b>
<b>No response/declined</b>	<b>6 (8%)</b>
<b>Ethnicity: Hispanic/Latino</b>	<b>9 (11%)</b>
<b>Household income &lt; \$30,000 per year</b>	<b>53 (66%)</b>
<b># High school graduate</b>	<b>69 ( 86%)</b>
<b># Hospitalized for asthma in past year</b>	<b>21 (26%)</b>
<b># Had ED visits for asthma in past year</b>	<b>39 (49%)</b>
<b>Baseline FEV<sub>1</sub> as percent predicted</b>	<b>66% 17%</b>
<b>ANQ</b>	<b>2.3 ± 1.2</b>
<b>Mini-AQLQ</b>	<b>4.0 ± 1.4</b>

# Numeracy & Asthma-specific Quality of Life

---

- ANQ correlated with QOL controlling for demographic confounders: ( $\rho = 0.27$ ,  $p = 0.02$ )
- ANQ-QOL mediated by household income:
  - Correlation reduced 81% ( $\rho = 0.05$ ,  $p = 0.65$ )
- ANQ-QOL partially mediated by self-efficacy:
  - Correlation reduced 26% ( $\rho = 0.20$ ,  $p = 0.08$ )
- S-TOFHLA not associated with QOL

## Conclusions and practical implications



**Numerical skills needed for asthma management influence AQOL primarily through their impact on income and, to a lesser extent, on self-efficacy**

**Adults with asthma will benefit from self-management instructions employing the simplest mathematical constructs whose understanding is confirmed by clinicians.**

# A Matrix for Simplifying Patient-Provider Communication

Numeracy element	Level of Patient Mastery Required (demand on patient)		
	Describe	Interpret	Decision-Making
Reading numbers, counting, telling time			
Arithmetic operations			
Estimation of size, trend			
Frequency			
Percentage			
Problem-solving & inferring the mathematical concepts to be applied			
Logic			
Reading tables			
Reading graphs			
Reading maps			
Estimation of error, uncertainty, variability			
Relative versus absolute			
Risk (cumulative, relative, conditional)			

# Techniques to improve comprehension of quantitative information

- Simplify the numerical concept
- Format for clarity
- Remove nonessential information
- Frame effectively
- Use visuals
- Confirm comprehension

# Format for clarity

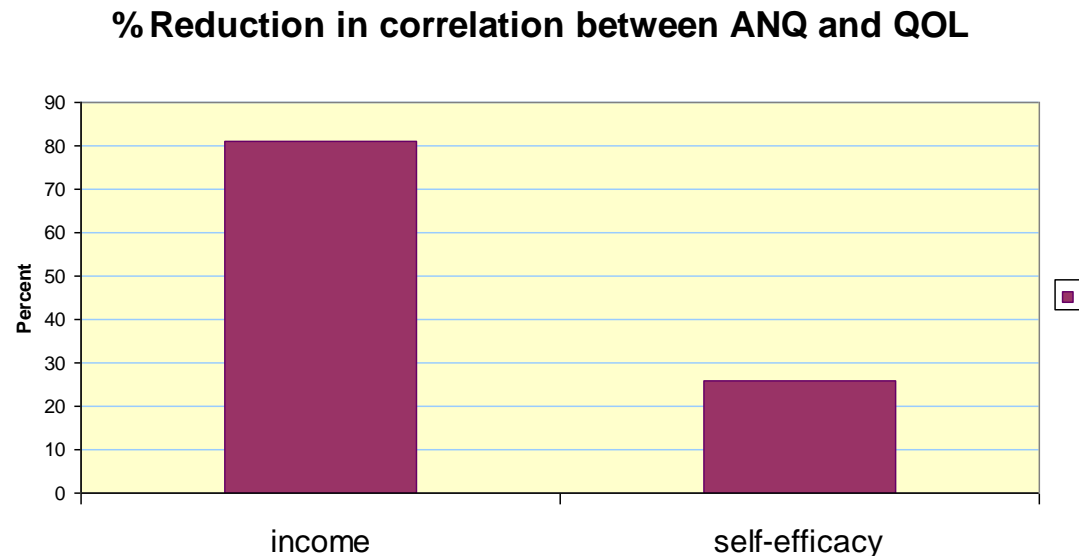
- White space
- Remove unnecessary information
- Most important information 1<sup>st</sup>
- Large numbers for desirable scores

# Framing effectively (packaging, presentation)

- Patients underestimate common risks...
- Interpretation may be different if presented in a positive versus negative light
- When numerical concept (risk) is unfamiliar reliance on framing increases
- Numbers rather than words (e.g. few, many) are associated with a more accurate perception
- Combine words and numbers, several formats
- Consider time frame
- Tailor the information

# Using Visuals

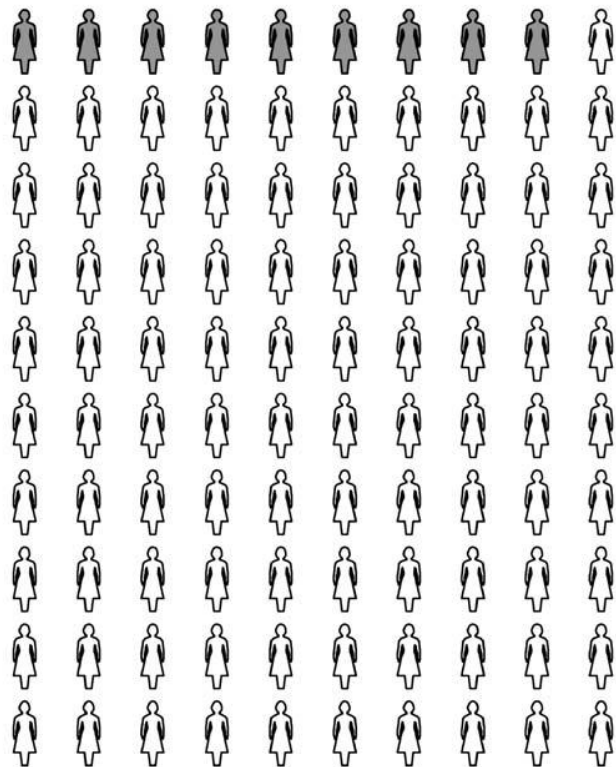
- ANQ-QOL mediated by household income:
  - Correlation reduced 81%
- ANQ-QOL partially mediated by self-efficacy:
  - Correlation reduced 26%



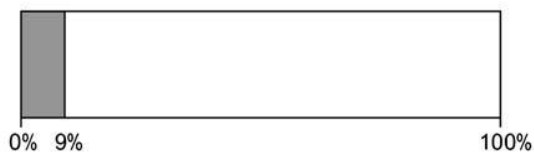
# Using visuals:

the lifetime risk of breast cancer in a 50 y.o. woman

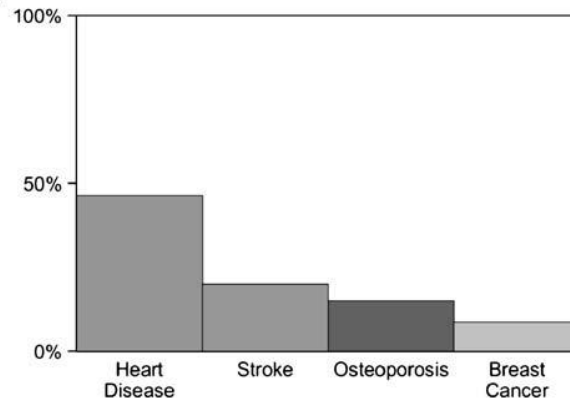
a



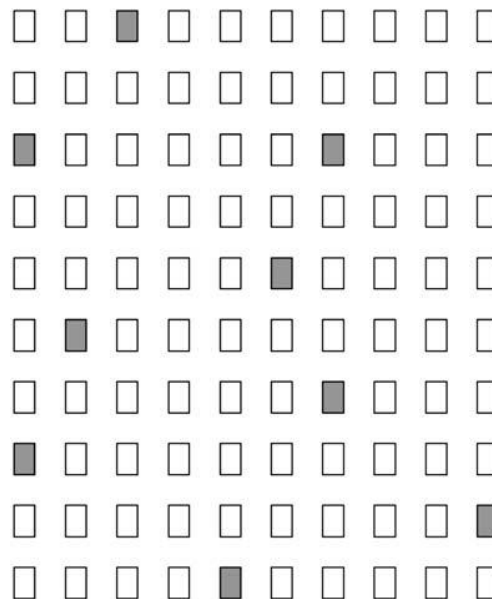
b



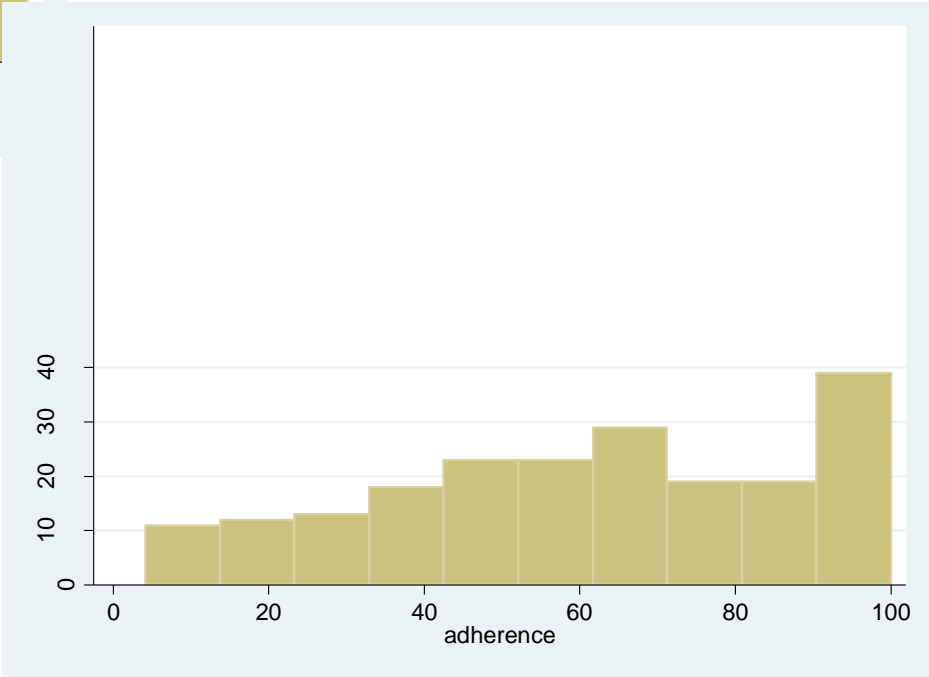
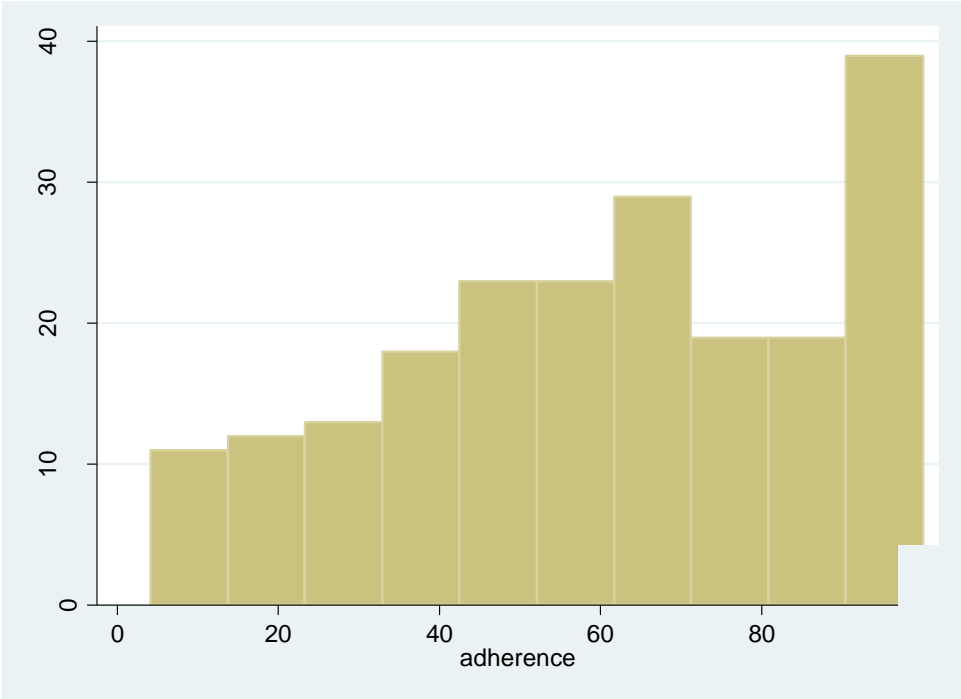
c



d



# Framing



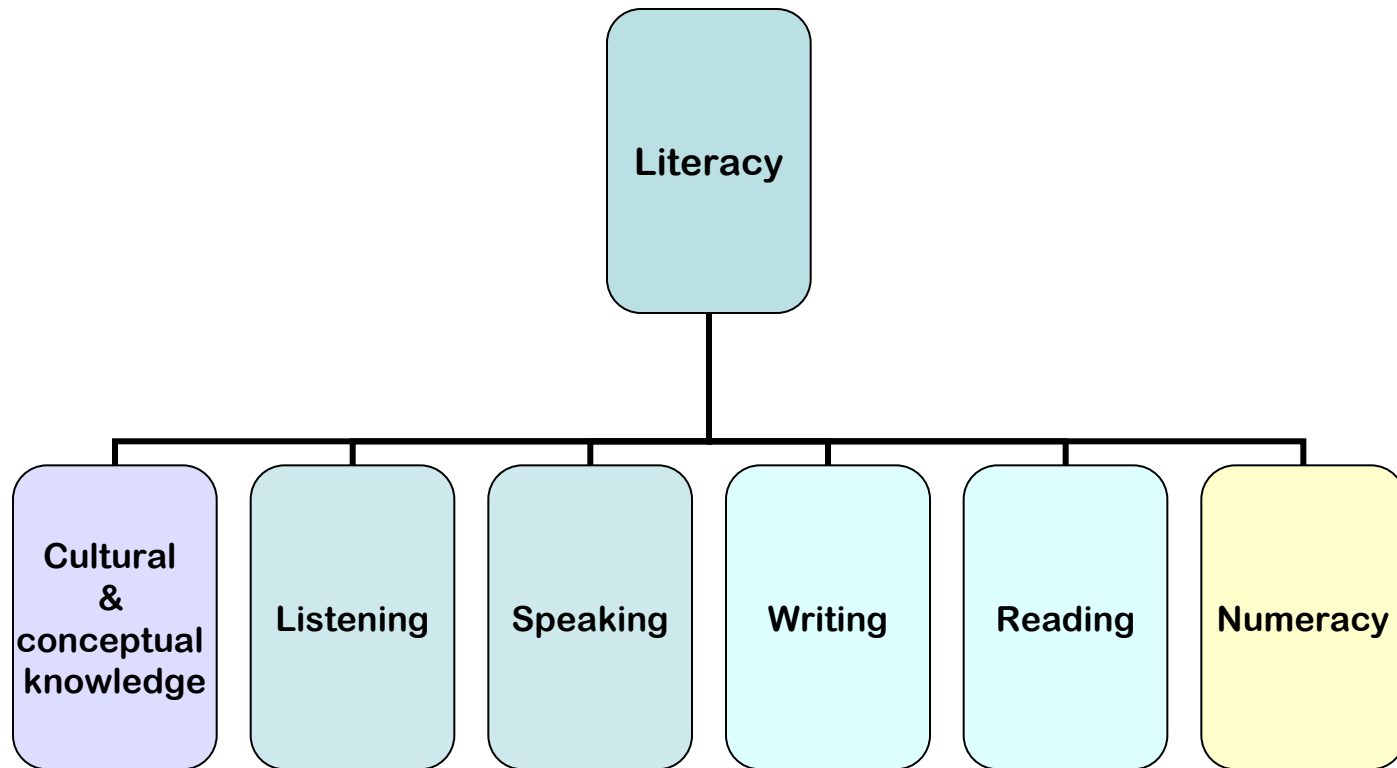
**Can intervening to improve health literacy  
improve asthma (health) outcomes?**

**Formal education**

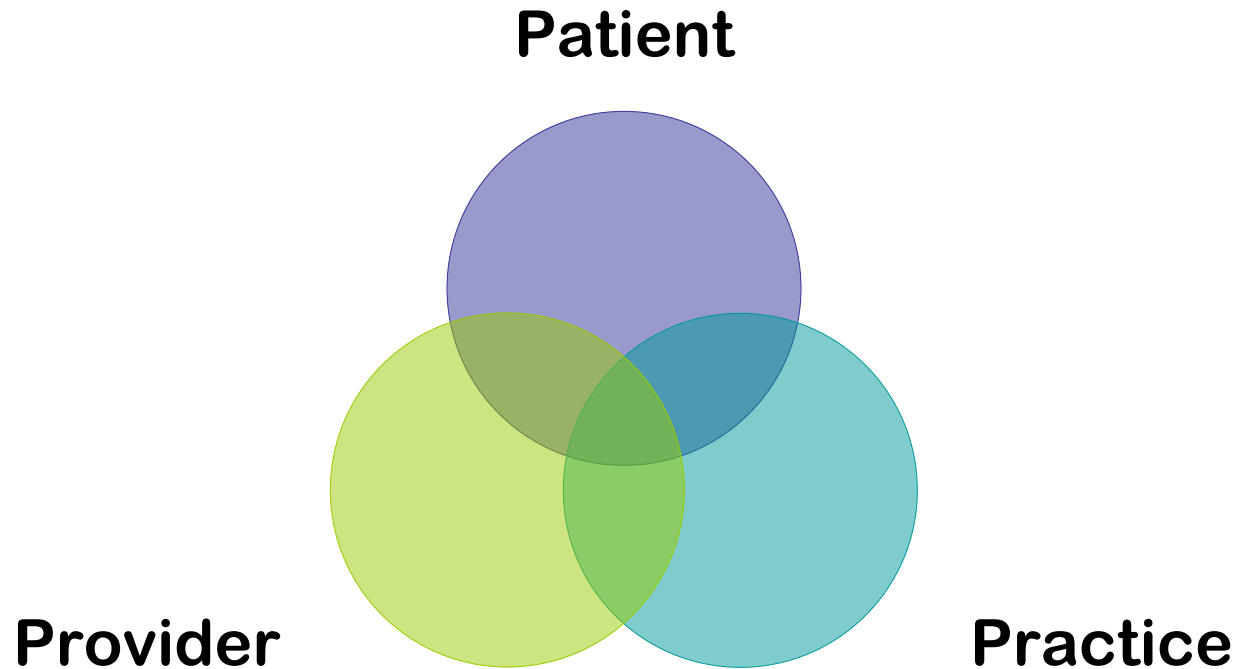
**Clinical practice**

**A Patient Advocate**

# Components of Literacy



# Patient Advocate: a system intervention



# Mentors and Collaborators

- Tom Ten Have, PhD
- Harold Feldman, MD, MSCE
- Daniel Bogen, MD, PhD
- Tyra Bryant-Stephens, MD
- Tom Ten Have, PhD
- Susan Reisine, PhD
- Richard ZuWallack, MD
- Rima Rudd, PhD
- Jing Cheng, PhD
- Dylan Small, PhD
- Michael Paasche-Orlow, MD,MA, MPH
- Maureen George, PHD
- A. Lorraine Norfleet, BSN
- Ray Boston, PhD
- Marshall Joffe, MD, PhD
- Xingmei Wang, MS
- Andrew Cucchiera, PhD
- Tovia Freedman, PhD
- Ian Bennett, MD, PhD
- Sandy Schwartz, MD
- Rhonda Boyd, PhD

## Research team:

**Laura Garcia, Tamie Sharpe, Carmen Frazier, Patricia Mahony-Anaya  
Chantel Priolo, Rodalyn Gonzalez, Danielle Jackson, Jim Becker,  
Juan Gabriel Sanchez, D'Jahna Akinyemi**