Laying a Foundation: The National Action Plan's Call for Basic Health Literacy Research

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Research Growth Spurt

We have moved from the
Age of Associations to the
Age of Interventions
-- David Baker, M.D.

Basic Research

Associational Research

Intervention Research

A National Action Plan



Goal 6

- Increase basic research and the development, implementation and evaluation of practices and interventions to improve health literacy

Basic Research

- **Fundamental mechanisms and patterns; causes; knowledge that is essential to design effective interventions**
  - Sources: NIH
    - Basic Behavioral and Social Science Opportunity Network (OppNet)
    - Behavioral and Social Science Research on Understanding and Reducing Health Disparities (PAR-10-136)
    - Understanding and Promoting Health Literacy (PAR-10-133)

Causes

- Health disparities FOA: The primary basic research question is the causes of differences in the health status of populations

- Health literacy FOA: Basic research to elucidate the mechanisms underlying health literacy and to determine the causal pathways that link health literacy to a behavioral outcome or to tease out the underlying components of health literacy

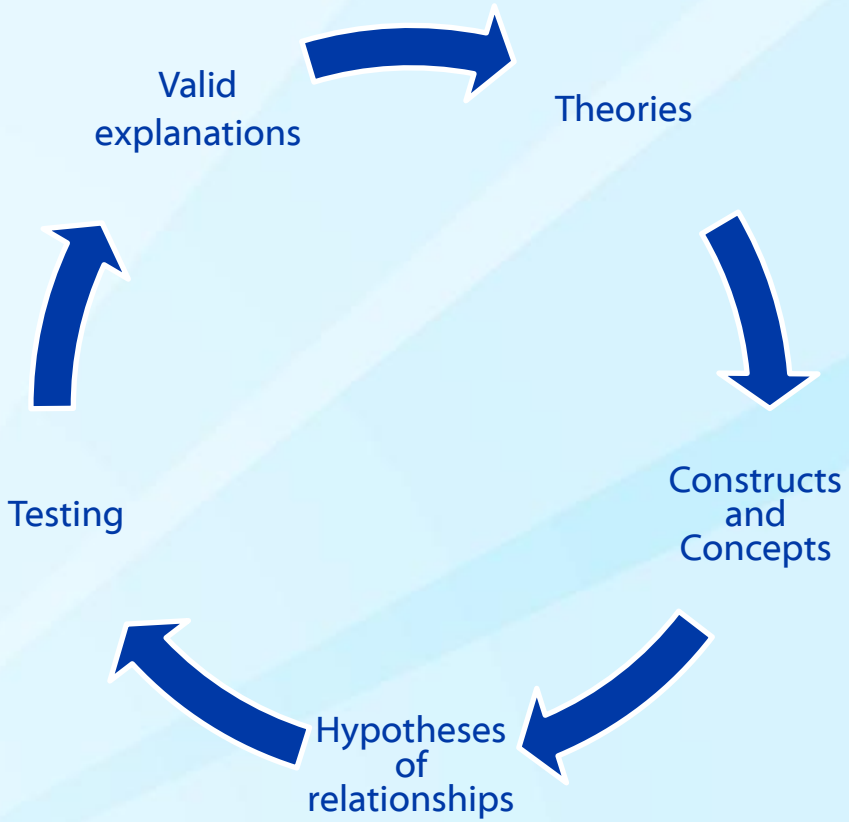
Examples of Basic and Applied Research for Health Literacy

- **Decision-making**
  - Basic – cognitive mechanisms linking choices and decision-making
  - Applied – efficacy of new techniques to frame choices for decisions about cancer screening
- **Information-seeking**
  - Basic – psychosocial factors influencing information seeking behaviors
  - Applied – who seeks information about cancer screening and other preventive behaviors

More Examples

- **Understanding health information**
  - Basic – How do experience and cultural beliefs affect understanding of health information?
  - Applied – Which experiences and cultural beliefs affect mothers' acceptance of vaccine recommendations?

Feeding the Intervention Process



What does Basic Research Require?

- Theories
- Constructs
- Concepts
- Models
- Definitions
- Hypotheses
- Methods that produce replicable results

What does Basic Research Deliver?

- Refined definitions
- Inputs to interventions
- Explanations
- Predictions
- Relationships of influence
- Measurable factors of health literacy



Questions?

Cynthia Baur

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National Action Plan to Improve Health Literacy

http://www.health.gov/communication/HLActionPlan/

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333
Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov Web: www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

A Process/Knowledge Approach to Health Literacy in Older Adults

Dan Morrow

University of Illinois Champaign-Urbana

Support from R01 AG31718

Overview

- Health Literacy
  - HL, comprehension, and self care
  - Process/Knowledge model
- Study of HL-related cognitive abilities among older adults with hypertension
- Implications
  - Models of HL
  - Measures of HL
  - Supporting older adults' self-care

Health Literacy

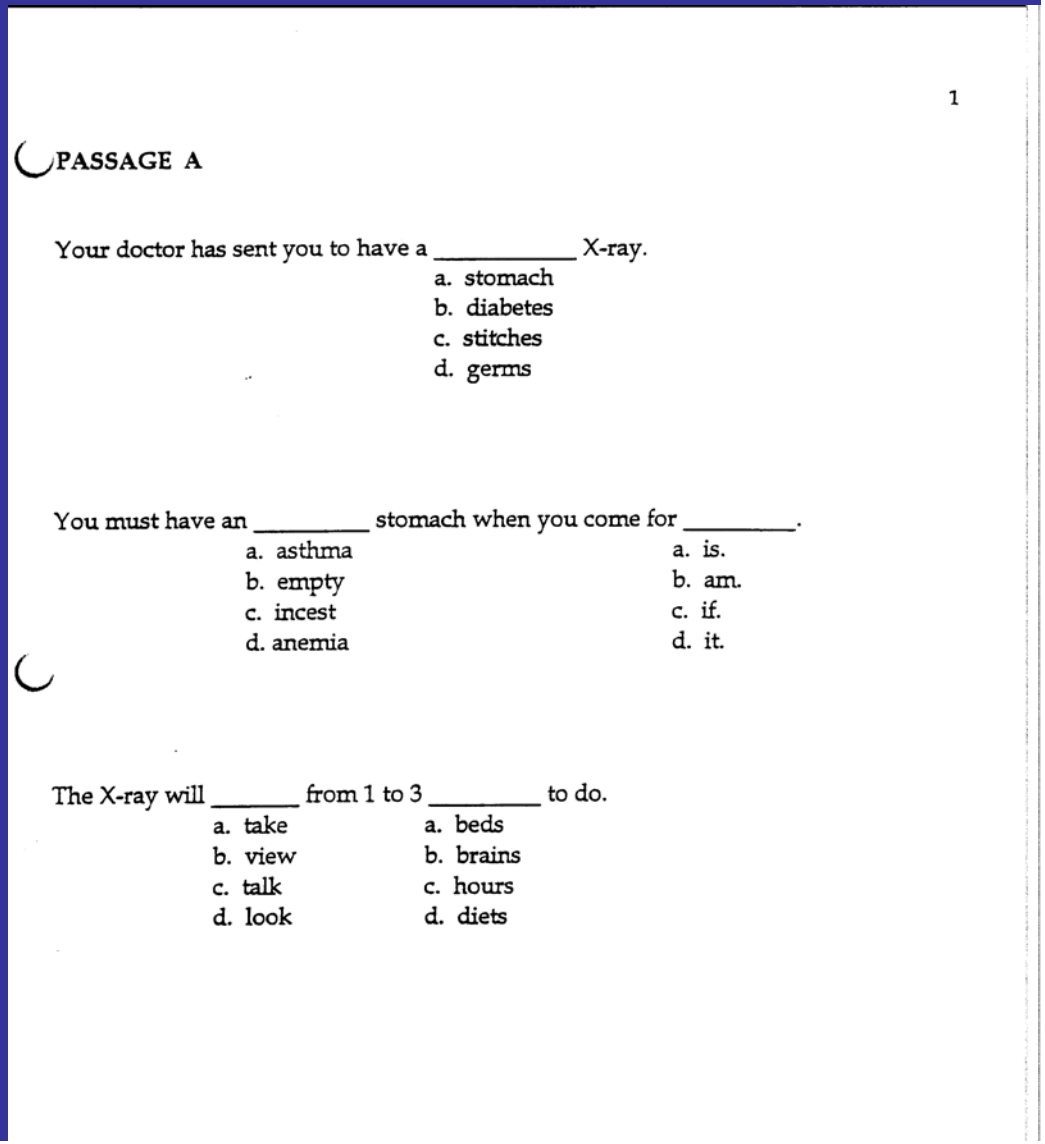


- "…capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Healthy People 2010)

- Critical role of *comprehension*
  - Analyzing health literacy as grounded in reading and other literacy activities necessary for self-care
  - Standard tests measure (reading) comprehension

Short Test of Health Literacy for Adults (STOFHLA; Baker et al., 1999)

- Read medical texts and fill in missing words



1

PASSAGE A

Your doctor has sent you to have a _____ X-ray.

a. stomach
b. diabetes
c. stitches
d. germs

You must have an _____ stomach when you come for _____.

a. asthma
b. empty
c. incest
d. anemia

a. is.
b. am.
c. if.
d. it.

The X-ray will _____ from 1 to 3 _____ to do.

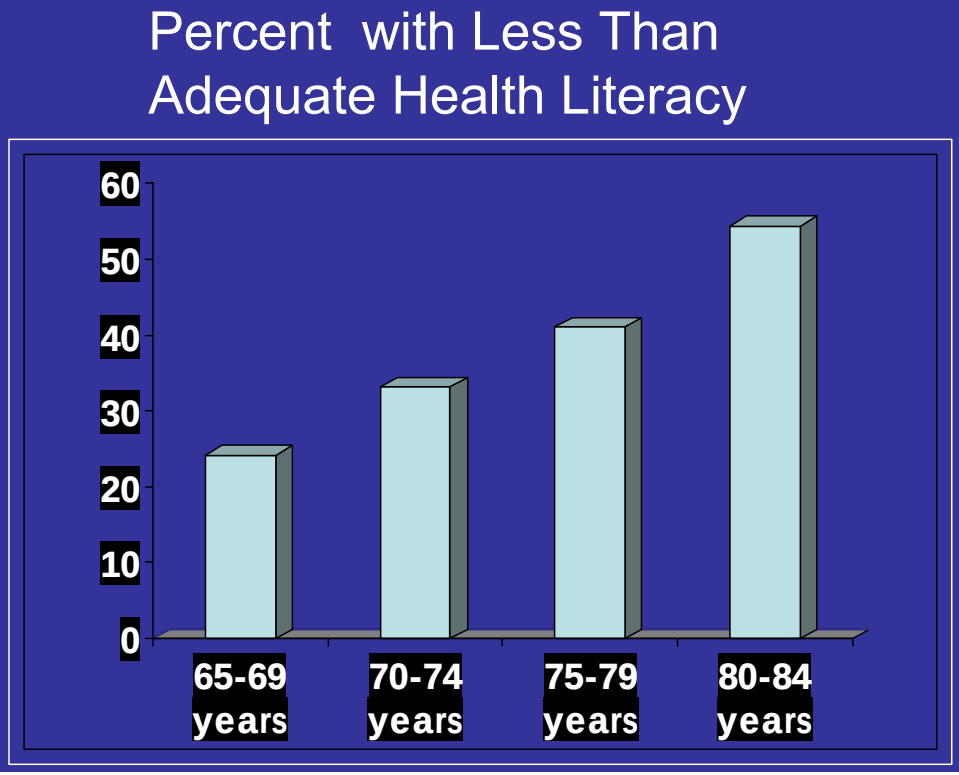
a. take
b. view
c. talk
d. look

a. beds
b. brains
c. hours
d. diets

Older Adults are at Risk For Low Health Literacy

- Almost half of adults in the US have less than adequate health literacy (Paasche-Orlow et al. 2005)

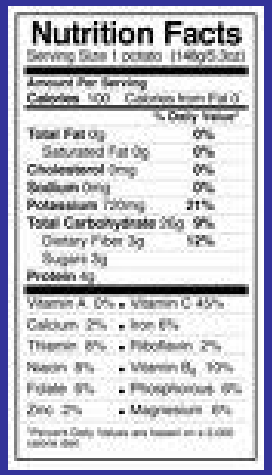
- Especially common for older adults with chronic illness (Gazmararian et al., 1999):



Challenge of Low Health Literacy for Older Adults' Self-Care

- While older adults have lower health literacy, they also have more need for self-care!
  - Take average of 4-5 prescribed medications (Kaufman et al 2002)
  - Follow recommendations for diet, exercise…
  - Monitor symptoms









Literacy and Self-Care (e.g., Medication)







(Photo credit: Davies + Starr)







MED/pharmacy Ph: www.med.com

INDIANAPOLIS, IN

IF YOU HAVE ANY QUESTIONS ABOUT YOUR MEDICATION, PLEASE CONTACT YOUR PHARMACIST:

PATIENT PRESCRIPTION INFORMATION

01-29-2001

INDPLS, IN 46224-0000 Refills: 0

LASIX 80 MG TABLET TEV

TAKE 1 TABLET BY MOUTH 2 TIMES A DAY

FUROSEMIDE (DIURETIC) - ORAL

USES: Furosemide is a diuretic. Diuretics are referred to as "water pills" because they decrease the amount of water retained in the body by incre ing urination. Diuretics are used to treat edema (fluid retention and swelling especially of the hands and feet caused by heart failure and other disea and hypertension (high blood pressure).

HOW TO TAKE THIS MEDICATION: May take with food or milk if stomach upset occurs. If this medication is taken in the late afternoon or eveniny you may need to get up during the night to urinate. Consult with your doctor regarding your dosing schedule.

SIDE EFFECTS: This drug may cause dizziness and lightheadedness especially during the first few days as your body adjusts to it. Rise slowly fr seated or lying position. It may also increase sensitivity to sunlight. Blurred vision, loss of appetite, itching, stomach upset, headache and weaknes may also occur during initial therapy as your body adjusts to the medication. Inform your doctor if you develop muscle cramps, pain, nausea or von while taking this medication. It may be a sign of low blood potassium. Contact your doctor if you experience dry mouth, thirst, unusual bleeding or b ing, rash, yellow eyes or skin, severe nausea or vomiting, or ringing in ears. This medication increases urination. Expect this effect. In the unlikely e you have an allergic reaction to this drug, seek medical attention immediately. Symptoms of an allergic reaction include rash, itching, swelling, dizz ness or trouble breathing. If you notice other effects not listed above, contact your doctor or pharmacist.

PRECAUTIONS: Before using this drug, tell your doctor your medical history especially of kidney problems, unusual decrease in urine output, live disease, diabetes and of any drug allergies. This drug may reduce the potassium levels in your blood. Ask your doctor about adding potassium to y diet. A potassium supplement may be prescribed by your doctor. Furosemide may make you more sensitive to sunlight. Use as sunscreen and we protective clothing. Alcohol may intensify side effects. Limit your alcohol intake. Furosemide should be used only when clearly needed during preg- nancy. Discuss the risks and benefits with your doctor. This drug is excreted into breast milk. Though, to date, no problems have been reported to nursing infants, consult your doctor before breast-feeding.

DRUG INTERACTIONS: Tell your doctor of all prescription and nonprescription drugs you may use, especially of "blood thinner" drugs such as wa rin, lithium, aminoglycosides (e.g. neomycin, kanamycin, gentamicin), large doses of salicylates (aspirin and aspirin-like drugs), sucralfate, ethacryn acid or other diuretics ("water pills"), digoxin, diabetic medication, NSAID (e.g. ibuprofen, naproxen) cisplatin, blood pressure medication, probenec cyclosporine, nasal decongestants and diet-control medicines. Do not start or stop any medicine without doctor or pharmacist approval.

NOTES: Do not share this medication with others.

MISSED DOSE: If you miss a dose, take as soon as remembered; do not take if it is almost time for the next dose, instead, skip the missed dose a resume your usual dosing schedule. Do not "double-up" the dose to catch up.

STORAGE: Store at room temperature away from moisture and sunlight. Do not store in the bathroom.

Consequences of Low Health Literacy for Older Adults

- Low health literacy among chronically ill patients is associated with:
  - **Less effective self-care behavior (e.g., medication adherence)**



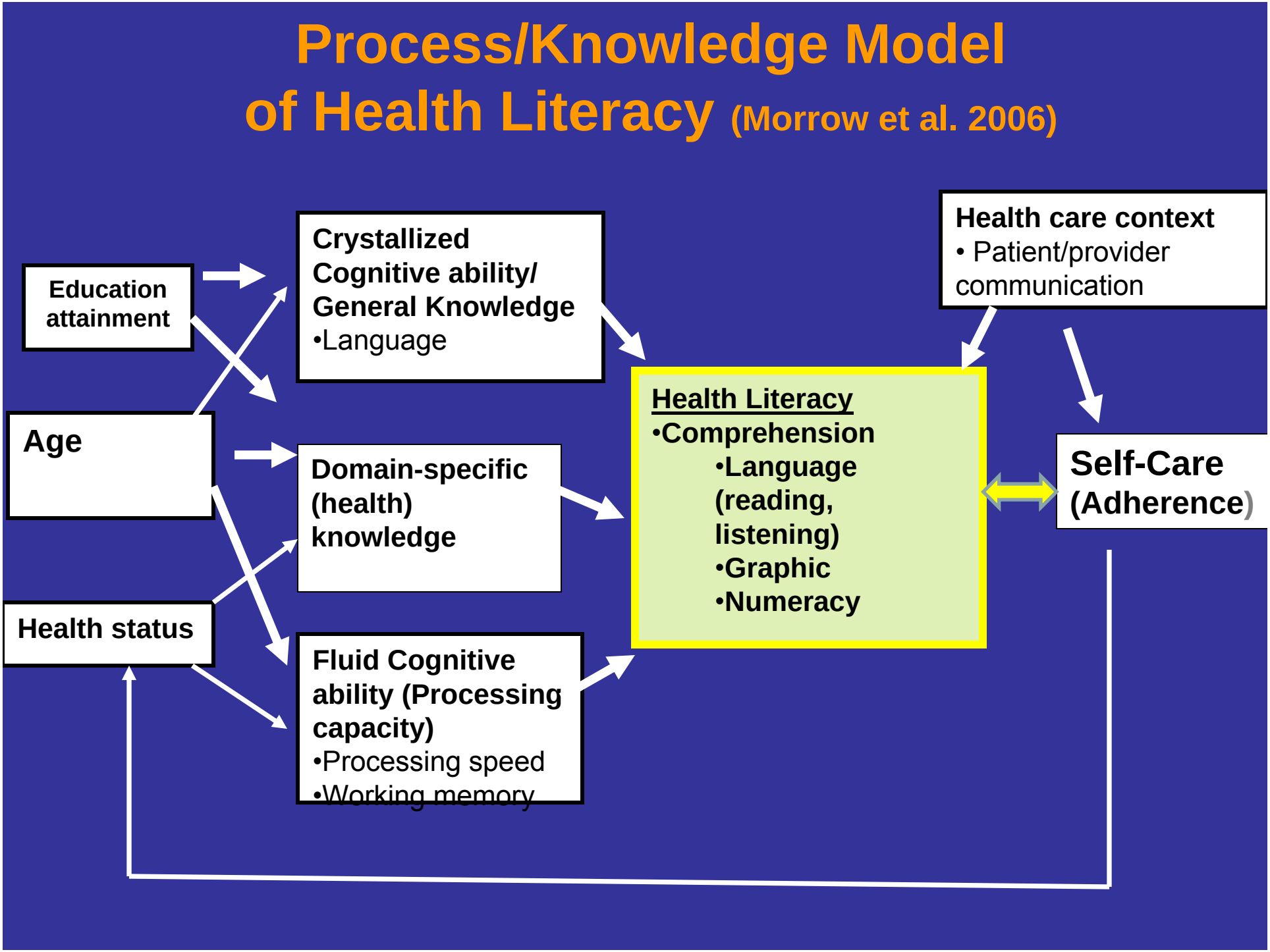
  - **Worse health outcomes**



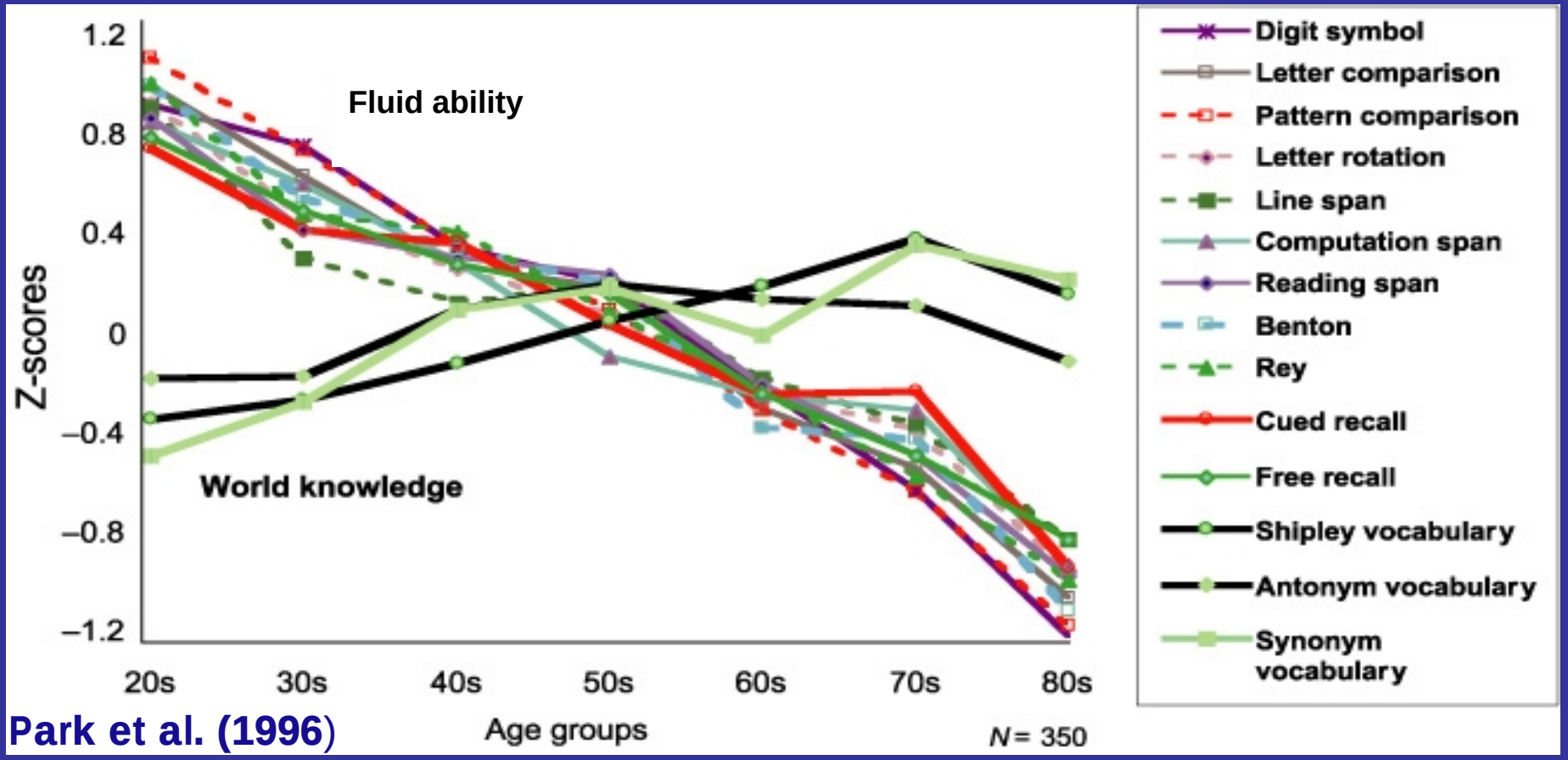
Consequences of Low Health Literacy

- So, *why* is HL associated with health behaviors and outcomes?

Process/Knowledge Model of Health Literacy (Morrow et al. 2006)



Age-Related Changes in Cognition



Park et al. (1996)

Comprehension and Health Literacy:
Cognitive Constraints

"Take two heart pills in the morning and in the evening".

Textbase

P1 (TAKE PILLS)
P2 (QUANTITY: PILLS TWO)
P3 (MODIFY: PILLS HEART)
P4 (TIME: P1 MORNING)
P5 (TAKE PILLS)
P6 (QUANTITY: PILLS TWO)
P7 (TIME: P1 EVENING)
P8 (AFTER: P1 P5)

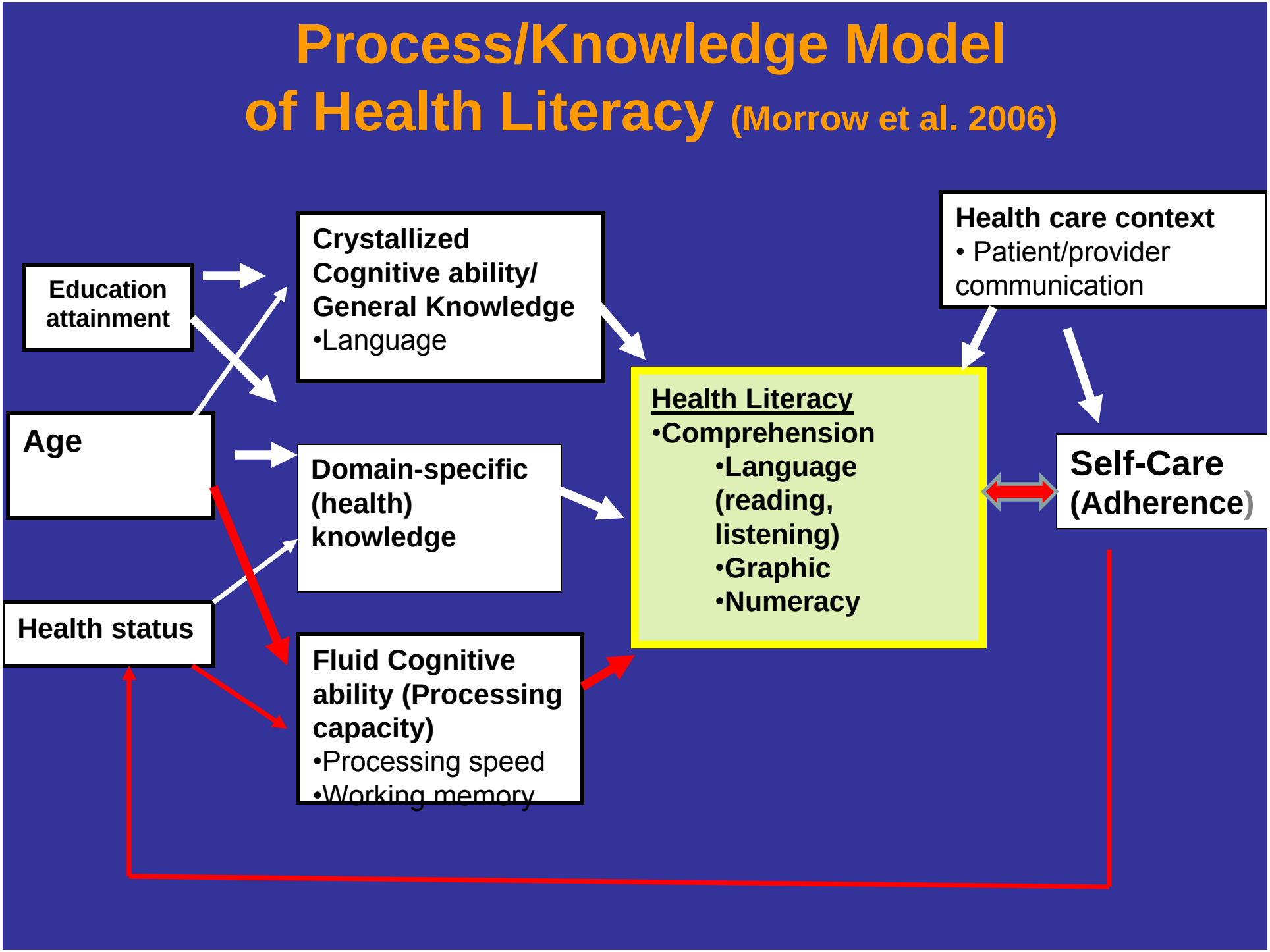
Inferences:
Take by mouth; with water;
Before meals.....

Situation Model



- **Fluid ability limits (working memory, speed of processing) may constrain ability to create textbase and situation model**

Process/Knowledge Model of Health Literacy (Morrow et al. 2006)



Comprehension and Health Literacy:
Cognitive Constraints

"Take two heart pills in the morning and in the evening".

Textbase

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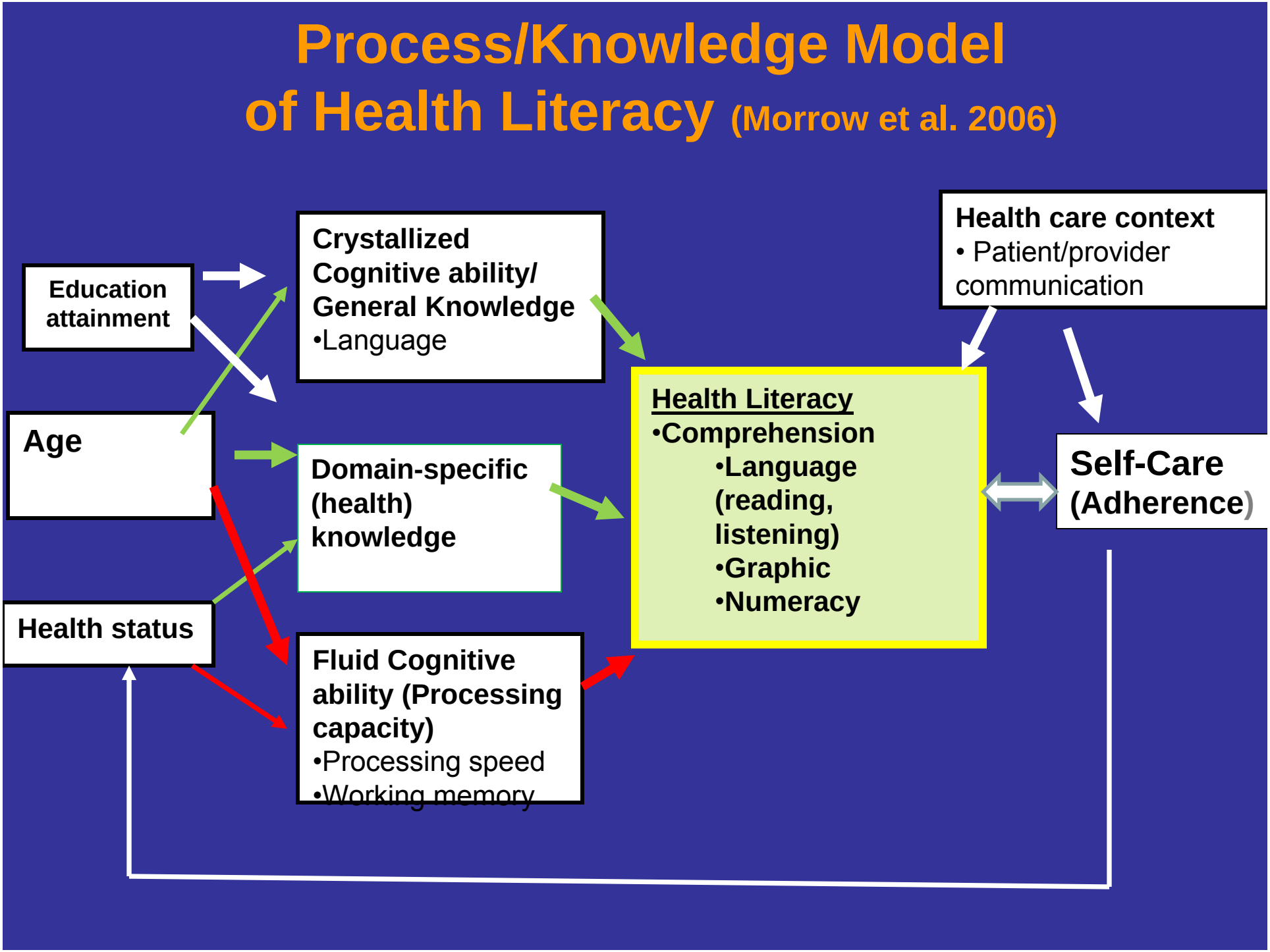
Inferences:
Take by mouth; with water;
Before meals.....

Situation Model



- **Knowledge (Language; Health) may support ability to create textbase and situation model**

Process/Knowledge Model of Health Literacy (Morrow et al. 2006)



Health Literacy, Fluid Ability, & Knowledge in Older Adults with Hypertension

- Sample of older adults varying in age, education and health (subsample without chronic illness).
- How is health literacy related to
  - Fluid ability
  - Knowledge
    - General (crystallized ability)
    - Health (HTN)
- Does knowledge reduce impact of fluid abilities on health literacy?
- Do predictors depend on health literacy task (demands on component abilities)?

Health Literacy, Process Capacity & Knowledge in Older Adults with Hypertension

- 264 adults (mean=69.9; 60-88yrs)
  - 219 diagnosed with HTN
  - 45 without chronic illness
- 61% female
- 14% less than high school education;
  29% high school graduates
- Health literacy measures
  - STOFHLA (6-36; 8% less than adequate HL)
  - REALM (3-66; 15% less than adequate HL)

Fluid Ability and Crystallized Ability (General Knowledge) Measures

- Fluid ability composite
  - Working memory (Letter-Number Sequencing)
  - Processing speed (Pattern Comparison; Identical Pictures)
- Crystallized ability (general knowledge)
  - (Advanced Vocabulary)

HTN Knowledge Measure

- Sources
  - Gazmararian et al. 2003 (25 T/F Qs)
  - American Heart Association website and Oliveria et al. 2005 (8 T/F Qs)
  - Miller et al. 2004 (4 multiple-choice Qs)
- Assessed variety of HTN concepts

  (risk factors, consequences, self-care, heart structure and function)
- $\alpha = 0.90$

Cognitive Demands of Health Literacy Measures

Two HL measures that may require different mix of abilities included in order to more broadly explore component abilities and possible interactions in our model.

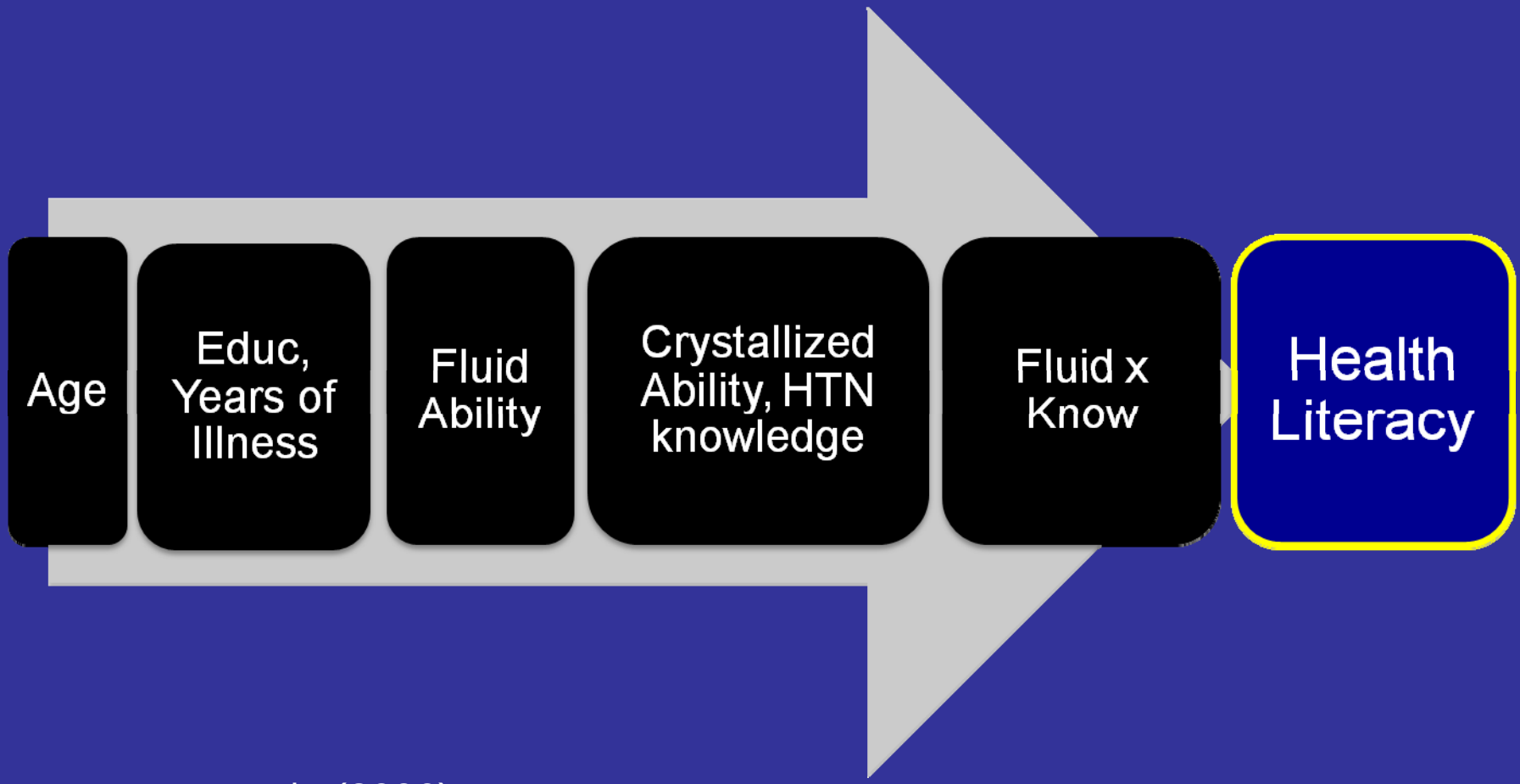
	Fluid Ability	Crystallized Ability (Gen Knowledge)	Health Knowledge
STOFHLA	++	++	+
REALM	+	++	++

Correlations among Age, Education, and Cognition Variables (n=264)

	Age	Edu	STOFHLA	REALM	Fluid	Crystal	Know
Age	1.00	.06	-.11	.10	-.22**	.12*	.07
Educ		1.0	.46**	.47**	.39**	. 54**	.33 **
STOFHLA			1.00	.69**	. 62**	.50**	.30 **
REALM				1.00	. 42**	.46**	.37**
Fluid Ability					1.00	.46**	.32**
Crystal Ability						1.00	.42**
Knowledge							1.00

p<.05*
p<.01**

Regression Model



Morrow et al., (2006)
Beier & Ackerman (2005)

Regression Examining Correlates of ***STOFHLA***

Variable	Step1	Step 2	Step 3	Step 4	Step 5
Model R^2	1.0%	24.0%**			
Age	-0.06	-.08			
Edu, Years of Illness		0.45** -0.13*			
Fluid Ability					
Crystallized Ability, HTN Knowledge					
Fluid x Crystallized, Fluid x Knowledge					

p<.05*; *p*<.01**

Regression Examining Correlates of ***STOFHLA***

Variable	Step1	Step 2	Step 3	Step 4	Step 5
Model R^2	1.0%	24.0%**	43.3%**		
Age	-0.06	-.08	-0.08		
Edu, Years of Illness		0.45** -0.13*	0.26** -0.05		
Fluid Ability			0.50**		
Crystallized Ability, HTN Knowledge					
Fluid x Crystallized, Fluid x Knowledge					

$p<.05$*; $p<.01$**

Regression Examining Correlates of ***STOFHLA***

Variable	Step1	Step 2	Step 3	Step 4	Step 5
Model R^2	1.0%	24.0%**	43.3%**	45.2%**	
Age	-0.06	-.08	-0.08	-0.02	
Edu, Years of Illness		0.45** -0.13*	0.26** -0.05	0.18** -0.05	
Fluid Ability			0.50**	0.44**	
Crystallized Ability, HTN Knowledge				0.17** 0.05	
Fluid x Crystallized, Fluid x Knowledge					

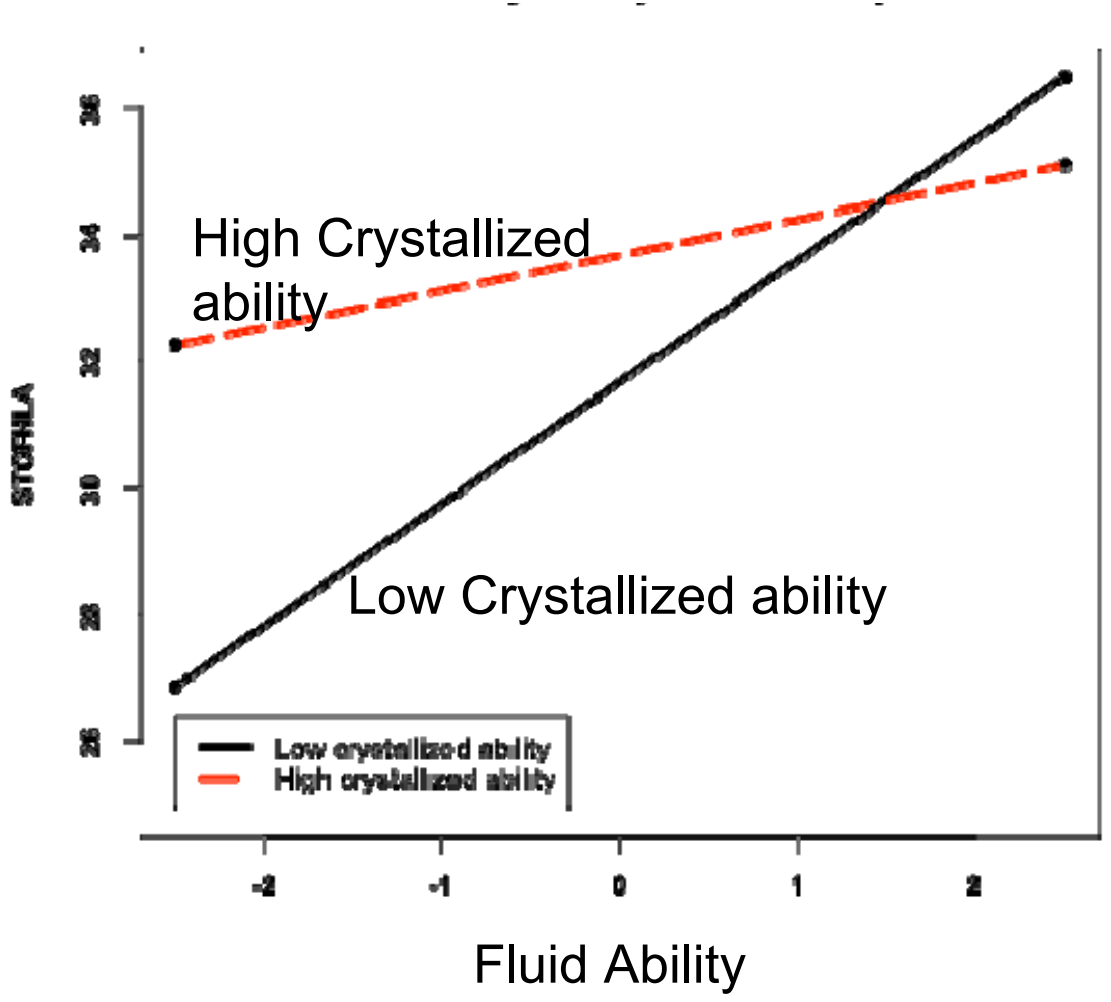
p<.05*; *p*<.01**

Regression Examining Correlates of ***STOFHLA***

Variable	Step1	Step 2	Step 3	Step 4	Step 5
Model R^2	1.0%	24.0%**	43.3%**	45.2%**	56.4%**
Age	-0.06	-.08	-0.08	-0.02	-0.07
Edu, Years of Illness		0.45** -0.13*	0.26** -0.05	0.18** -0.05	0.16** -0.08
Fluid Ability			0.50**	0.44**	0.33**
Crystallized Ability, HTN Knowledge				0.17** 0.05	0.21** -0.00
Fluid x Crystallized, Fluid x Knowledge					-0.33** -0.05

p<.05*; *p*<.01**

Fluid x Crystallized Ability Interaction for STOFHLA



Regression Examining Correlates of ***REALM***

Variable	Step 1	Step 2	Step 3	Step 4	Step 5
Model R^2	1.0%	23.1%**			
Age	0.11	0.10			
Edu, Years of Illness		0.45** -0.11			
Fluid Ability					
Crystallized Ability, HTN Knowledge					
Fluid xCrystallized, Fluid x Knowledge					

p<.05*; *p*<.01**

Regression Examining Correlates of ***REALM***

Variable	Step 1	Step 2	Step 3	Step 4	Step 5
Model R^2	1.0%	23.1%**	30.2%**		
Age	0.11	0.10	0.16*		
Edu, Years of Illness		0.45** -0.11	0.33** -0.06		
Fluid Ability			0.31**		
Crystallized Ability, HTN Knowledge					
Fluid xCrystallized, Fluid x Knowledge					

p<.05*; *p*<.01**

Regression Examining Correlates of ***REALM***

Variable	Step 1	Step 2	Step 3	Step 4	Step 5
Model R^2	1.0%	23.1%**	30.2%**	34.4%**	
Age	0.11	0.10	0.16*	0.11*	
Edu, Years of Illness		0.45** -0.11	0.33** -0.06	0.23** -0.08	
Fluid Ability			0.31**	0.21**	
Crystallized Ability, HTN Knowledge				0.12 0.19*	
Fluid xCrystallized, Fluid x Knowledge					

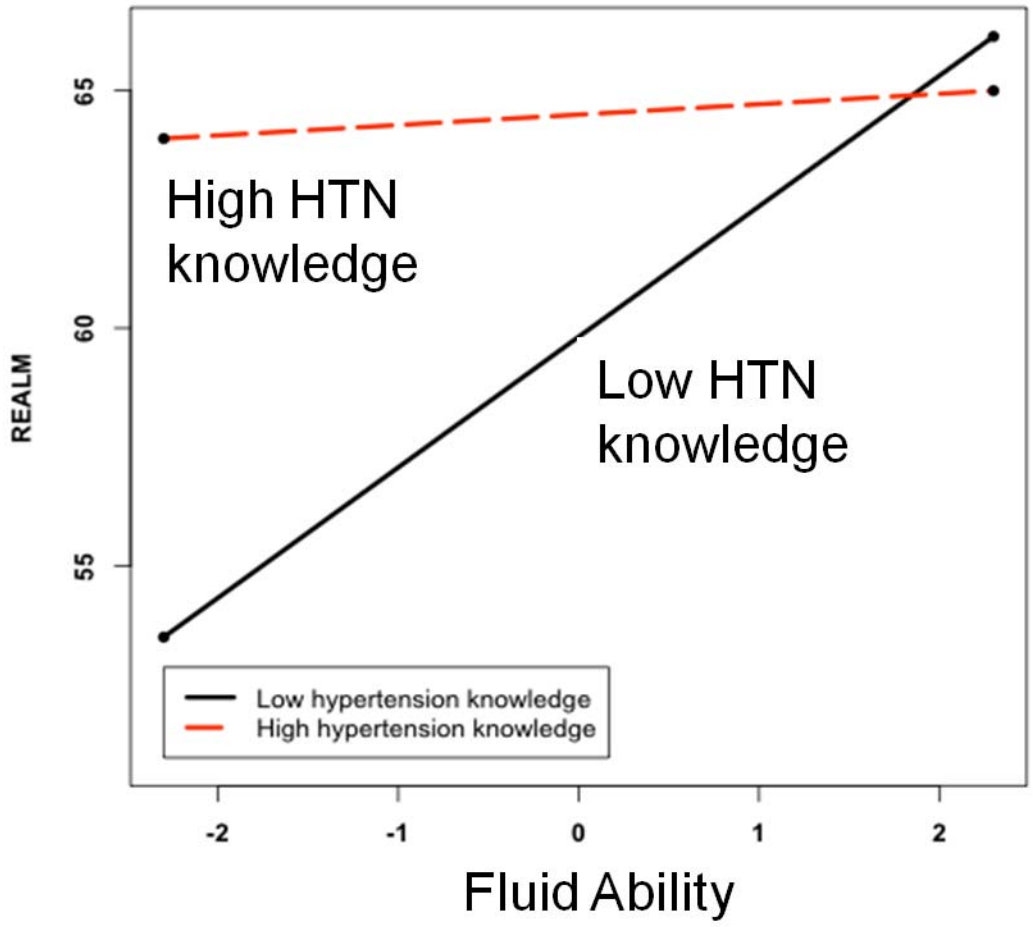
p<.05*; *p*<.01**

Regression Examining Correlates of ***REALM***

Variable	Step 1	Step 2	Step 3	Step 4	Step 5
Model R^2	1.0%	23.1%**	30.2%**	34.4%**	46.4%**
Age	0.11	0.10	0.16*	0.11*	-0.05
Edu, Years of Illness		0.45** -0.11	0.33** -0.06	0.23** -0.08	0.21** -0.10
Fluid Ability			0.31**	0.21**	0.11
Crystallized Ability, HTN Knowledge				0.12 0.19*	0.15* 0.14*
Fluid xCrystallized, Fluid x Knowledge					-0.30** -0.11^

^ $p<.10$*; $p<.05$*; $p<.01$**

Fluid x Knowledge Interaction for REALM



Summary

- Lower health literacy →
  - lower fluid abilities (Federman et al., 2009; Levinthal et al., 2008; Morrow et al., 2006)
  - lower crystallized abilities (general knowledge) and health knowledge
    - Both help explain education-related differences in health literacy

- Fluid ability more of a limiting factor for STOFHLA;
  Health knowledge may be more important for REALM;
  General knowledge important for both measures:
  Overlap of health and general literacy abilities

Summary

- High levels of knowledge may offset impact of reduced fluid abilities on health literacy
  - Consistent with previous work
    - Aging and comprehension
      - Age-related resilience in situation model, reflecting knowledge gains (Radvansky & Dijkstra, 2007; Stine-Morrow et al., 2006)
    - Aging and learning
      - Knowledge better predictor than processing capacity of older adults' ability to perform open-ended knowledge-based tasks (Ackerman 2007)

Implications

- Models of health literacy
  - Process/knowledge model identifies critical abilities and how they interact to determine health literacy. Helps explain WHY health literacy is linked to health behaviors and outcomes.
  - Health literacy may be achieved by different ability constellations
- Measures of health literacy
  - Different measures may tap different component abilities
  - Importance of “criterion task”. Need for illness-specific health literacy measures?

Implications: Improving Health Literacy

- Design health care system (e.g., patient education materials) in order to
  - Reduce demands on vulnerable patient abilities (fluid abilities)
  - Build on, support, or expand patient knowledge

Collaborators

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Purdue University

Basic psychological research and health literacy

Ellen Peters, Ph.D.
Psychology Department
The Ohio State University

National Action Plan to Improve Health Literacy

- Develop and disseminate health and safety information that is accurate, accessible, and actionable

- To promote good health

Focus on specific mechanisms

- To understand why strategies work and don't work
- To predict what might work better

- Focus on numeracy today
- And descriptive research aimed at understanding mechanisms
  - Normative analysis is also required (more at the end on this)

Dual process model

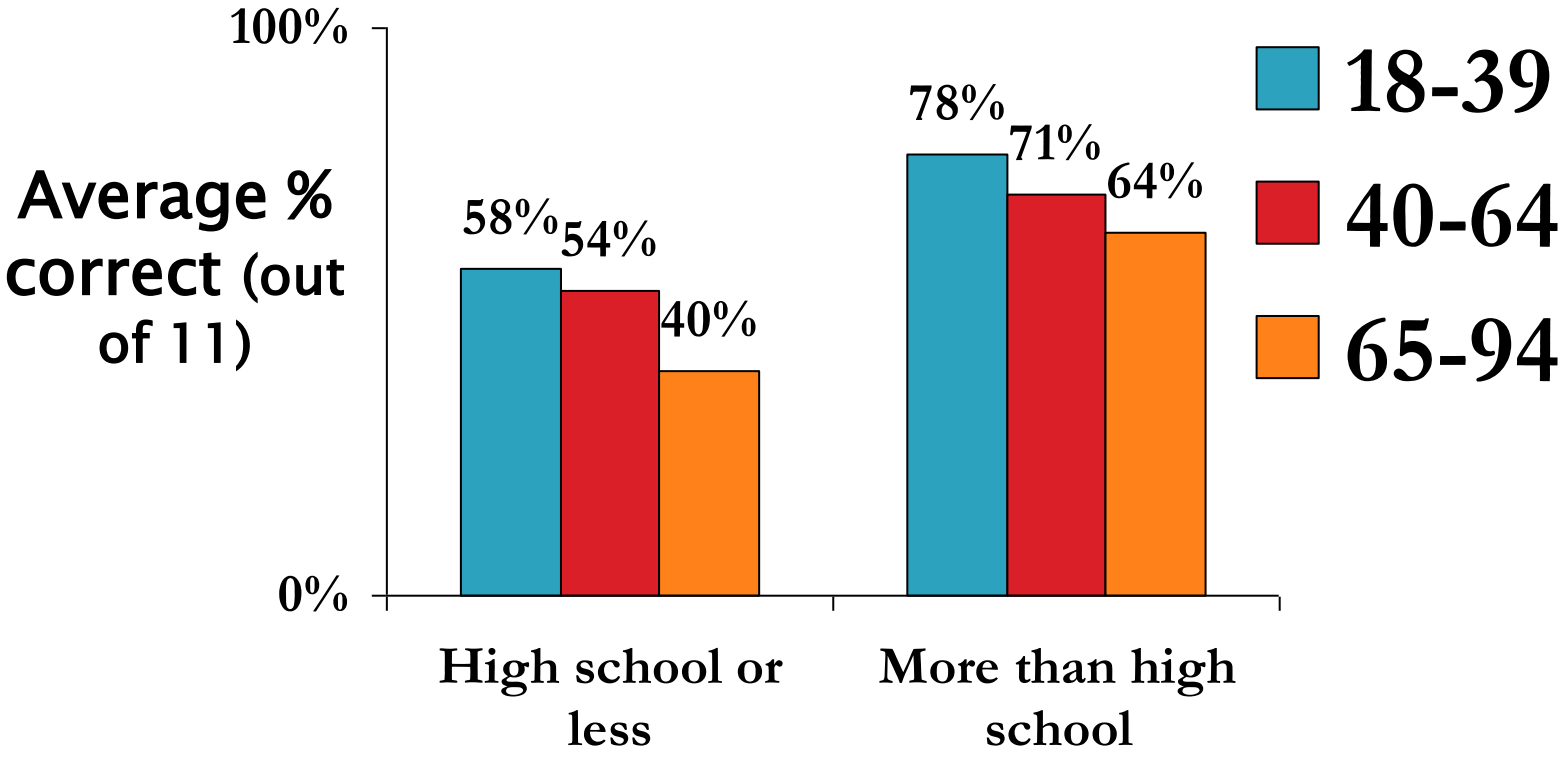
- Experiential
  - affective
  - intuitive and holistic
  - based on our experiences
  - fast
- Deliberative
  - logical
  - analytical
  - slower
  - may monitor the quality of processing

(Kahneman, 2003; Stanovich & West, 2002; Petty & Cacioppo, 1986; Slovic et al., 2002)

Numeracy

- The ability to understand and use basic probability and mathematical concepts
- About half of Americans do not have the minimal math skills needed to use numbers embedded in printed materials (Kirsch et al., 2002)
- Measured with a math test

Numeracy scores are lower among older and less educated populations



6

Potential psychological mechanisms underlying the use of numbers in decisions

- Pay **attention** to risk and other numbers
- **Comprehend numbers**
- Estimate the **magnitude** of differences
- Comprehend their **meaning**
- **Remember** them
- **Manipulate** them

- **Weight and use** the information in decisions

For effective promotion of good health, consumers must:

- Pay **attention** to risk and other numbers
- **Comprehend numbers**
- Estimate the **magnitude** of differences
- Comprehend their **meaning**
- **Remember** them
- **Manipulate** them

- **Weight and use** the information in decisions

For effective promotion of good health, consumers must:

- **Comprehend numbers** (Schwartz, Woloshin, et al., 1997 and benefits of mammograms; Rothman, Housam, et al., 2006 and nutrition facts labels)

- **Weight and use** the information in decisions

Reduce cognitive effort: Less can be more

- Delete less relevant information whenever possible
  - Note: Requires someone to prioritize information
- Highlight the meaning of only important information
- Require less cognitive effort – Use numbers in a direction consistent with how people usually process numbers

(Peters, Dieckmann, et al., 2007, *Medical Care Research & Review*)

Less is More I

- Subjects choose among three hospitals based on cost, quality information, and other information
- Two conditions (both include cost)
  - All information
  - Only the quality information

(Peters, Dieckmann, et al., 2007, *Medical Care Research & Review*)

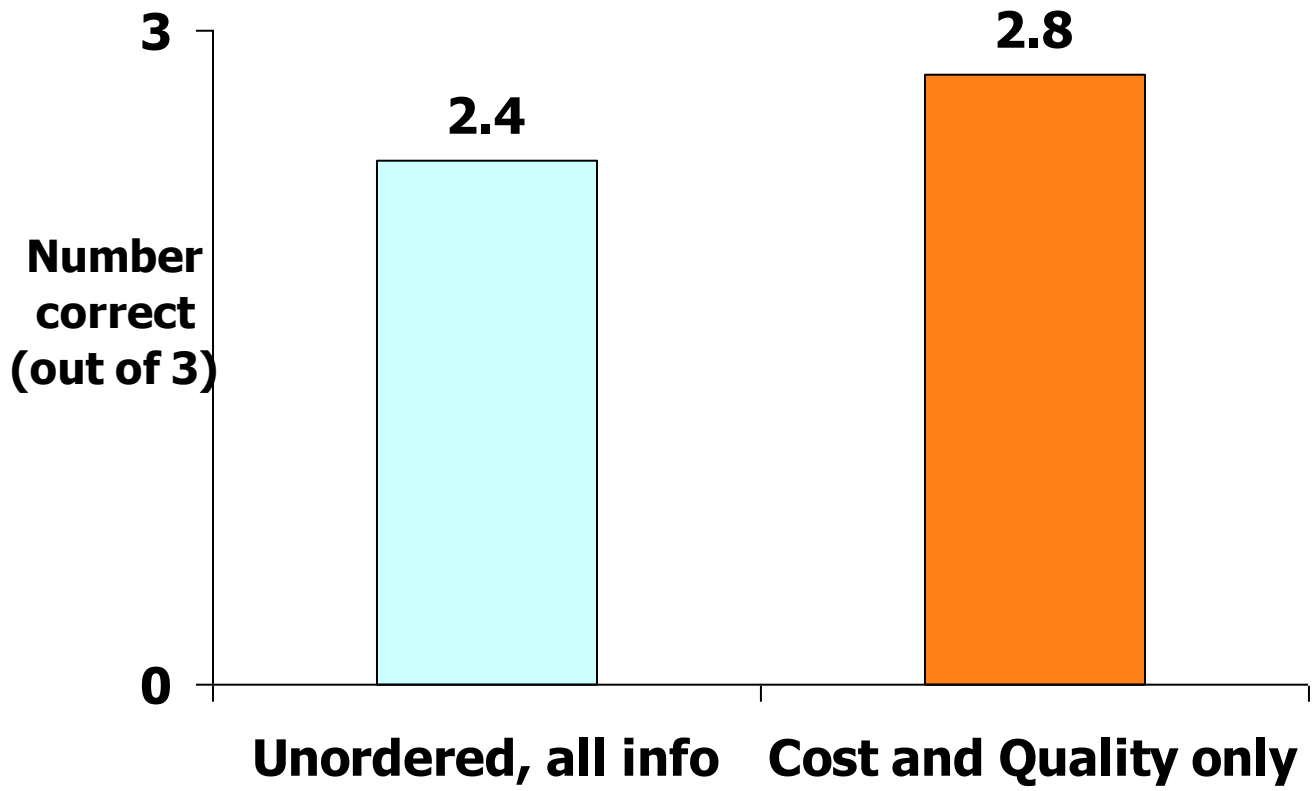
Condition = Unordered, all information

Indicators	Hospital X	Hospital Y	Hospital Z
Your out-of-pocket costs	$	$$$	$$
Number of general care beds	550	231	180
Rated quality of hospital food (higher is better)	4.1	1.1	2.0
% of time guidelines for heart attack care are followed	82%	92%	87%
% of time guidelines for pneumonia care are followed	60%	89%	78%
Number of visiting hours per day	11	6	8
Number of Registered Nurses per 100 patients	18	38	29
Patient references available	Limited	Limited	Limited
Has computer system to prevent medication errors	No	Yes	Limited

Condition =
Cost and Quality Information only, Quality Highlighted

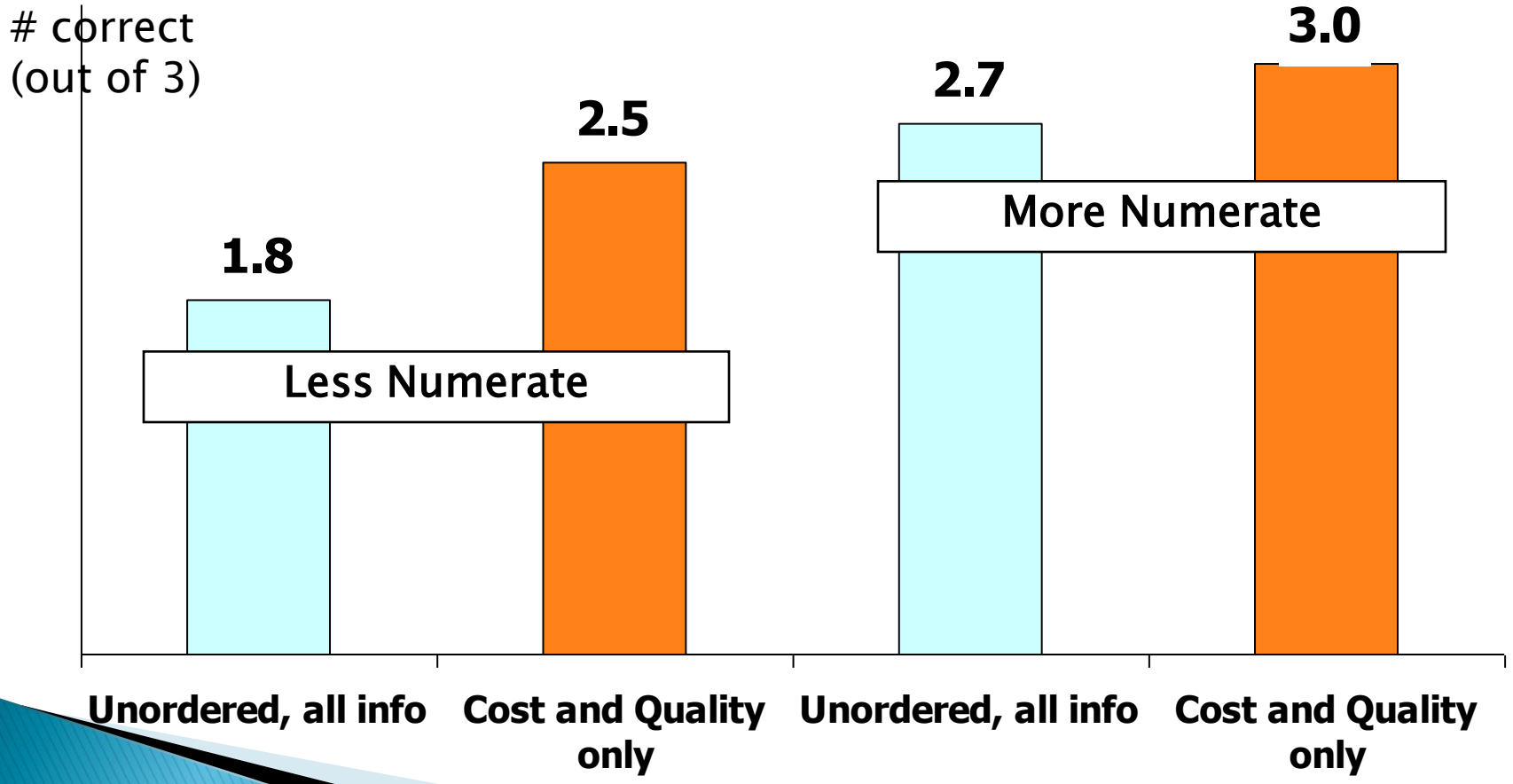
Indicators	Hospital X	Hospital Y	Hospital Z
Your out-of-pocket costs	$	$$$	$$
Number of Registered Nurses per 100 patients	18	38	29
Has computer system to prevent medication errors	No	Yes	Limited
% of time guidelines for heart attack care are followed	82%	92%	87%
% of time guidelines for pneumonia care are followed	60%	89%	78%

Comprehension improves when less information is shown



The conditions are significantly different, $F(2,298)=6.4$, $p<.01$

Including less information helps comprehension the most in the less numerate



For effective promotion of good health, consumers must:

- Pay **attention** to the numbers
- **Comprehend** them
-
-
-
-
- **Weight and use** the information in decisions

Suggests that consumers may not always pay attention to important information

- How can health materials draw attention to important information?
  - Order information from most important to least important (Hibbard & Peters, 2003)
  - Make only important information easier to evaluate through the use of symbols (Peters, Dieckmann, et al., 2007)
  - Use a *disfluent* font to highlight important information in text that is otherwise fluent (Sagara, 2010)

For effective promotion of good health, consumers must:

- Pay attention to the numbers
- Comprehend them
-
-
-
-
- **Weight and use** information in decisions

For effective promotion of good health, consumers must:

Beyond comprehension

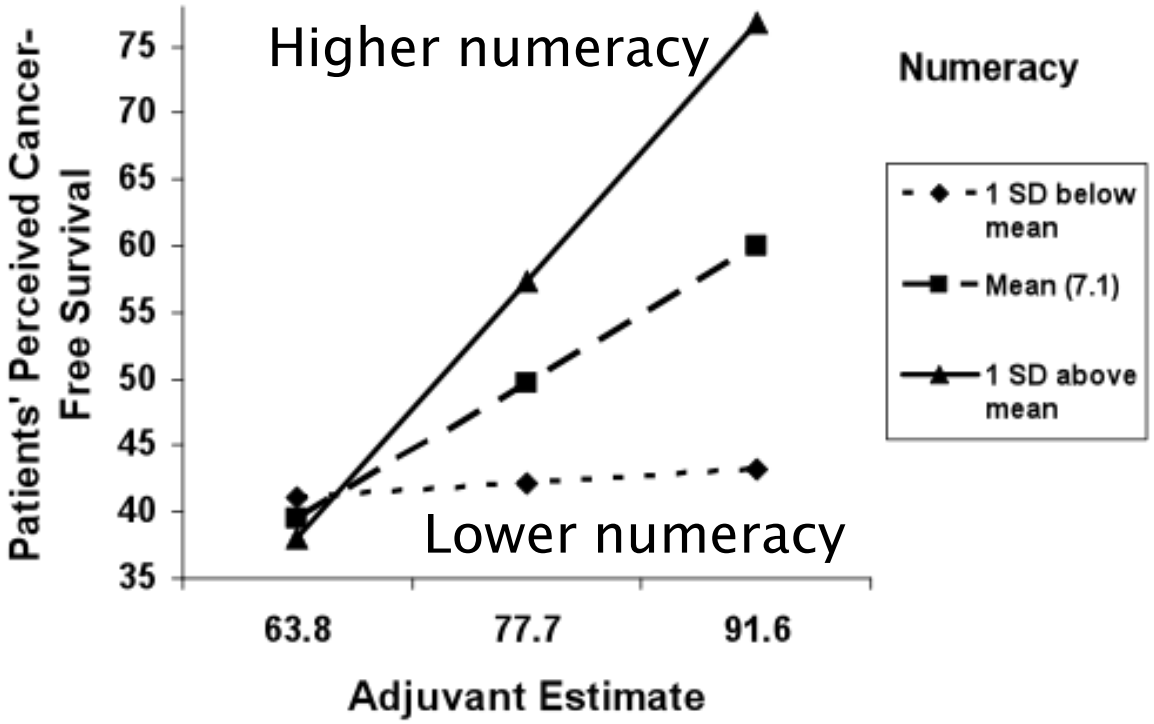
- Use of numeric information
- Influence of other, often emotional, sources of information

Women with early stage estrogen receptor positive cancers

- N=106 had ER+ disease and received surgery for early cancer (mean age=55 years; 73% Caucasian; 77% at least some college or trade school)
- Now faced with decision about adjuvant treatment options
- Adjuvant Online decision aid (Siminoff et al., 2006)

(Lipkus, Peters, Kimmick, Liotcheva, & Marcom, 2010, *Medical Decision Making*)

Personal estimates of cancer-free survival associated with numeracy



(Lipkus, Peters, et al., 2010, *Medical Decision Making*)

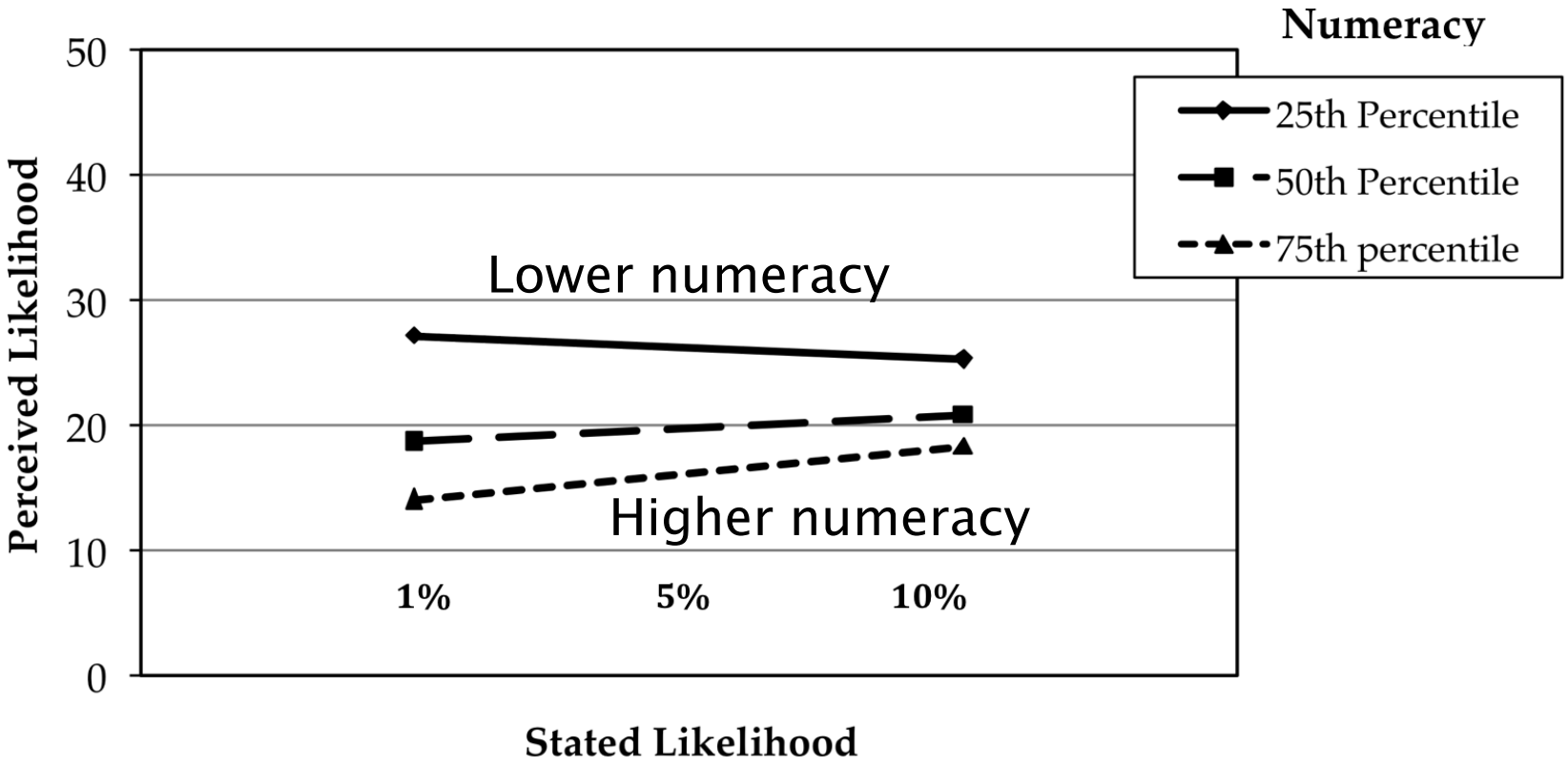
- What information do less numerate individuals weight and use?

Numeracy and use of numbers versus narrative information

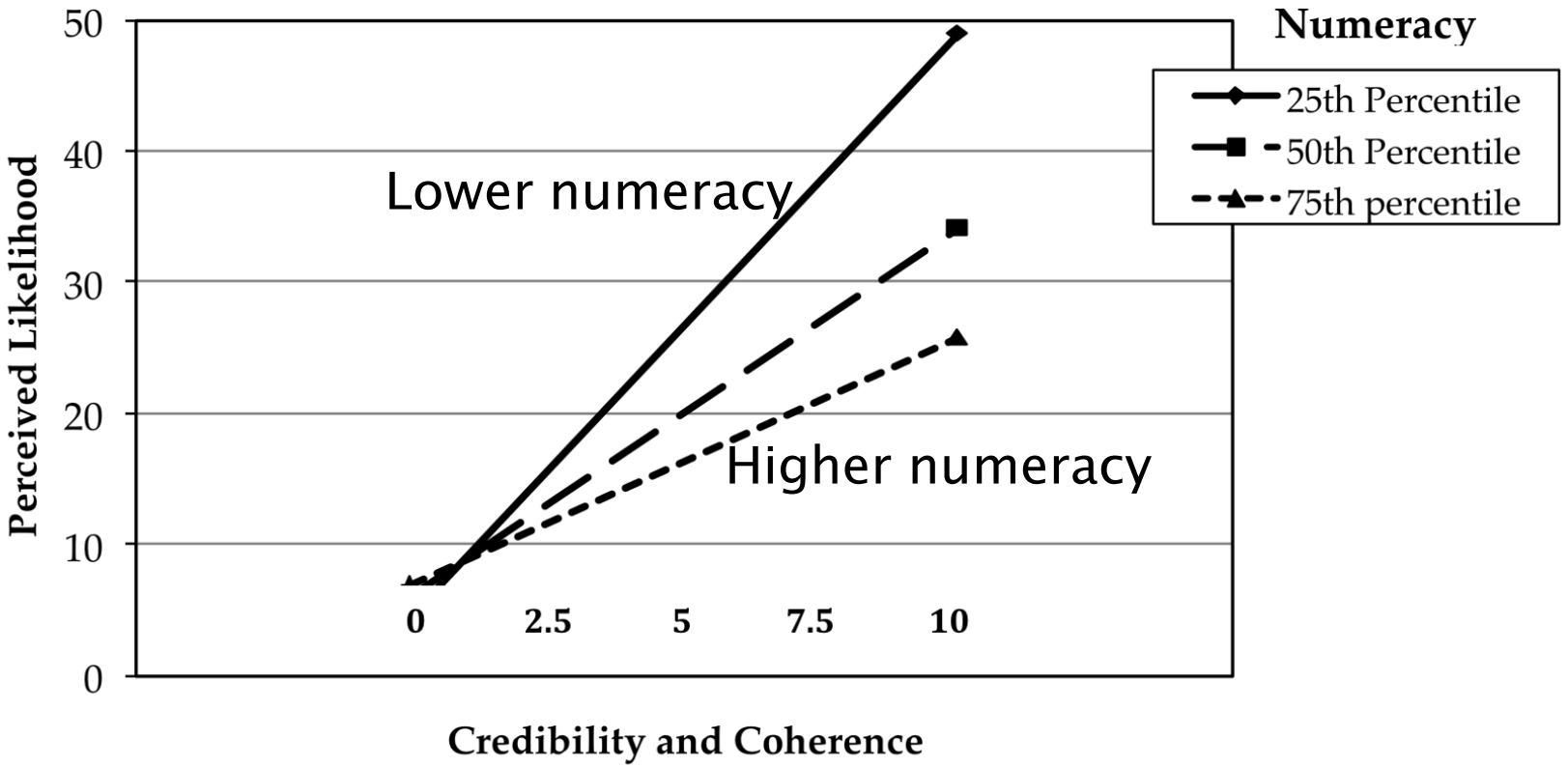
- Highly educated sample (N=58, 91% grad students; 53% female; mean age=28)
- Three simulated intelligence forecasts of a possible terrorist attack
  - Narrative from intelligence report
  - Probability of attack=1%, 5%, and 10%

(Dieckmann, Slovic, & Peters, 2009, *Risk Analysis*)

Perceived likelihood of attack – Less numerate insensitive to probability



Less numerate were more sensitive to perceptions of the narrative evidence



Numeracy moderates what information is processed and used

- Highly numerate individuals are more sensitive to numbers and develop more precise feelings based on them
- The less numerate appear to be more sensitive to affective and emotional sources of information that are non numeric (narrative, information frames, mood states)

- How can we help numbers and other information come “alive with feeling”?

Hospital quality study: We can provide just the numbers

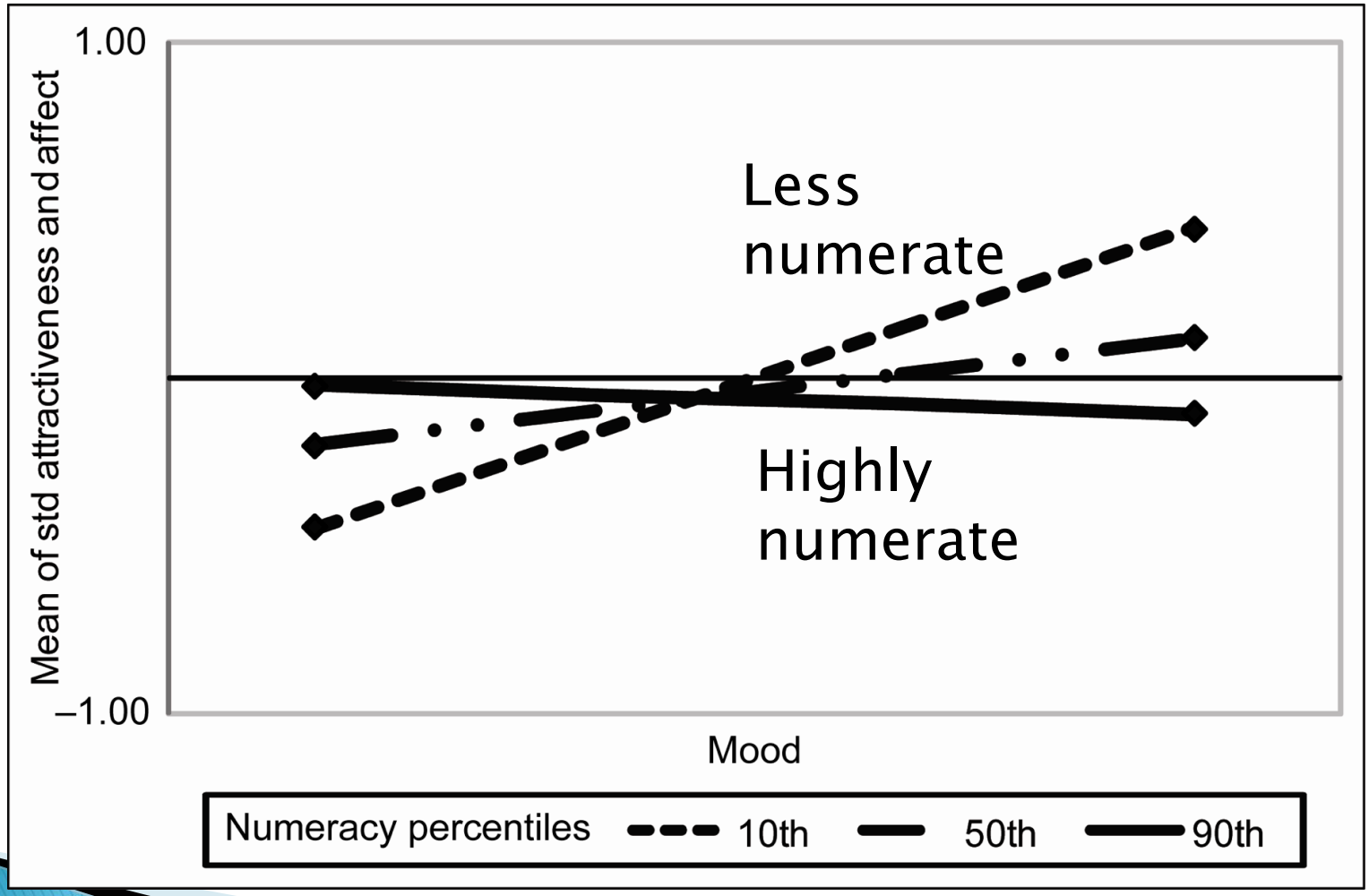
- Community sample (n=152)
- Self report mood measure before experimental task
- Subjects rate the attractiveness of a hospital based on three indicators of hospital quality
  - Three levels of each quality indicator in full factorial design (3x3x3).
  - 27 different conditions

(Peters, Dieckmann, et al., 2009, *JEP: Applied*)

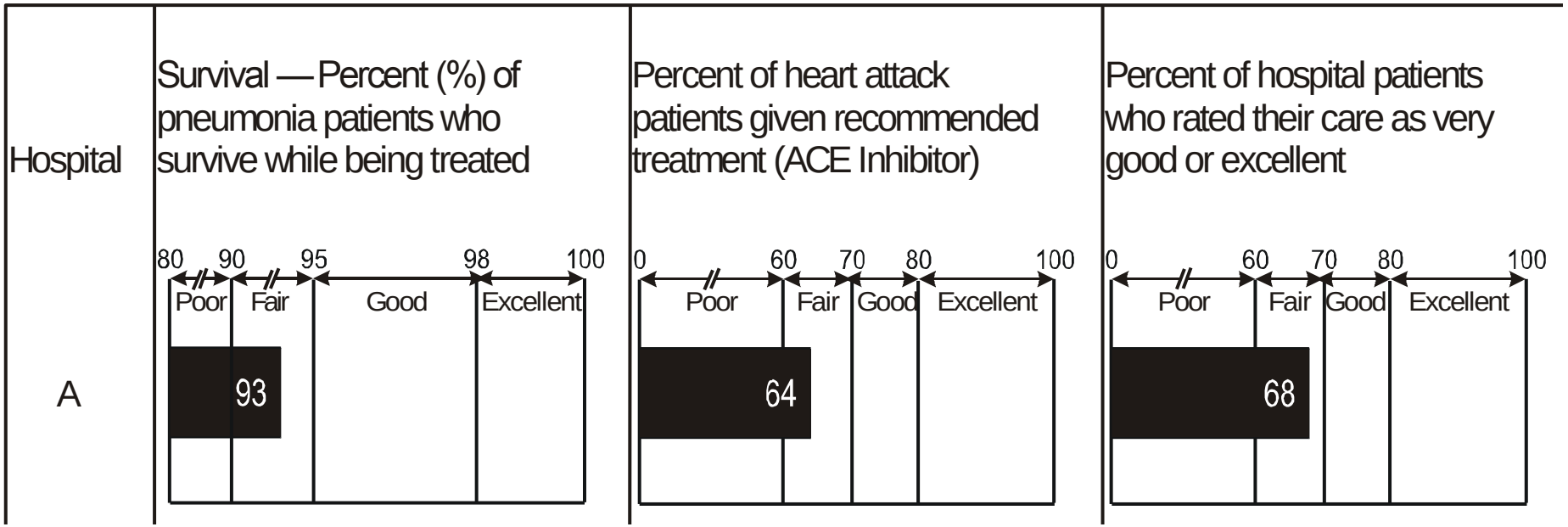
Stimuli

Hospital	Survival – Percent (%) of pneumonia patients who survive while being treated	Treatment - Percent (%) of heart attack patients given recommended ACE Inhibitor	Satisfaction - Percent (%) of hospital patients who rated their care highly
A	93	64	68
	[96% or 99%]	*[74% or 84%]*	*[78% or 88%]*

The less numerate used their mood to evaluate the hospital



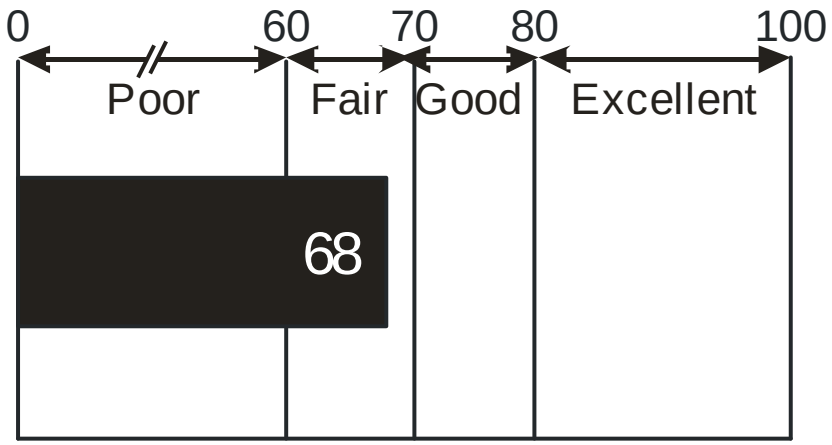
Instead of providing just the numbers, how can we improve these judgments?



Evaluative labels help consumers to access their feelings about the numbers

Hospital **Satisfaction - Percent of hospital patients that rated their care highly**

A



. . .

We found that this manipulation allows decision makers to access their feelings faster than their thoughts so that feelings may then drive decisions more

Participants used the two objective quality indicators

- Patient rating (%), ns
- **Recommended treatment (%), Beta=.25, p<.001**
- **Survival (%), Beta=.34, p<.001**

- No effects of numeracy or mood

An understanding of mechanism is key

Careful attention to how information is presented can help consumers:

1. Attend to numbers more (Sagara, 2010, disfluency)
2. Understand more (by requiring less cognitive effort and fewer inferences; Peters, Dieckmann, et al., 2007, Less is more; Greene, Peters, et al., 2008, provide a framework)
3. Interpret the meaning of numbers (Peters, Dieckmann, et al., 2009, evaluative categories)
   - This will lessen the influence of less relevant sources of information such as mood states (Peters, Dieckmann, et al., 2009, evaluative categories)

Descriptive, normative, and prescriptive

- We just talked about descriptive mechanisms
- To know how to help promote health in any situation, a normative analysis is also needed
  - What is the **best** decision, if any?
  - What information is **most** important, if any?
  - What information is being **underweighted or overweighted**?
- Then can think about a prescriptive solution

Conclusions

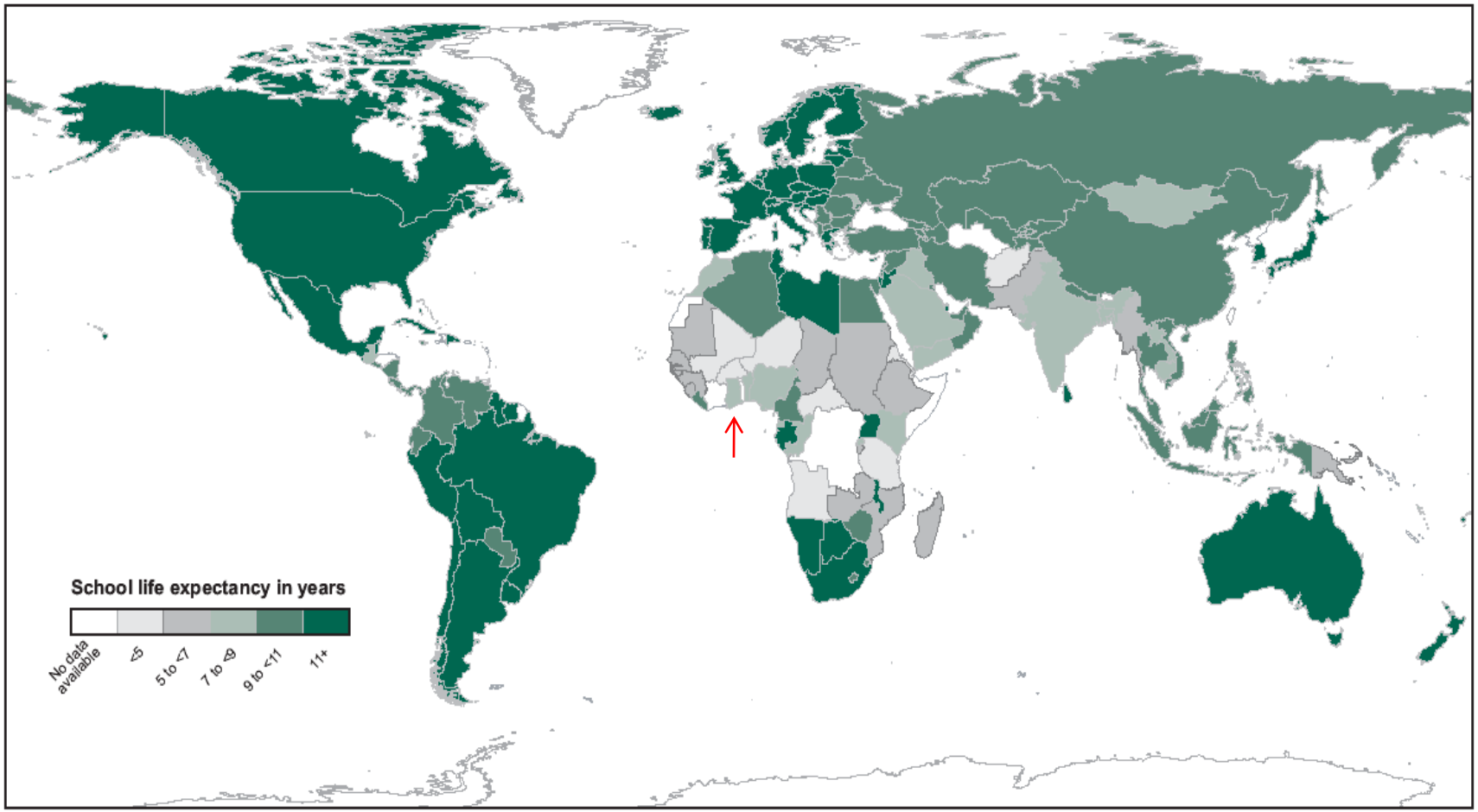
1. Basic research is important
   - It is identified as one of the seven goals of the *National Research Plan.*
2. Health literacy research, if guided by basic theory, can be informed and improved by research in other domains
3. Understanding basic mechanisms is critical for understanding why some strategies work and others don't
4. Through an understanding of theory, better and more robust interventions can be developed that work across situations
   - Helping us to build knowledge across health and nonhealth domains

Thank you!

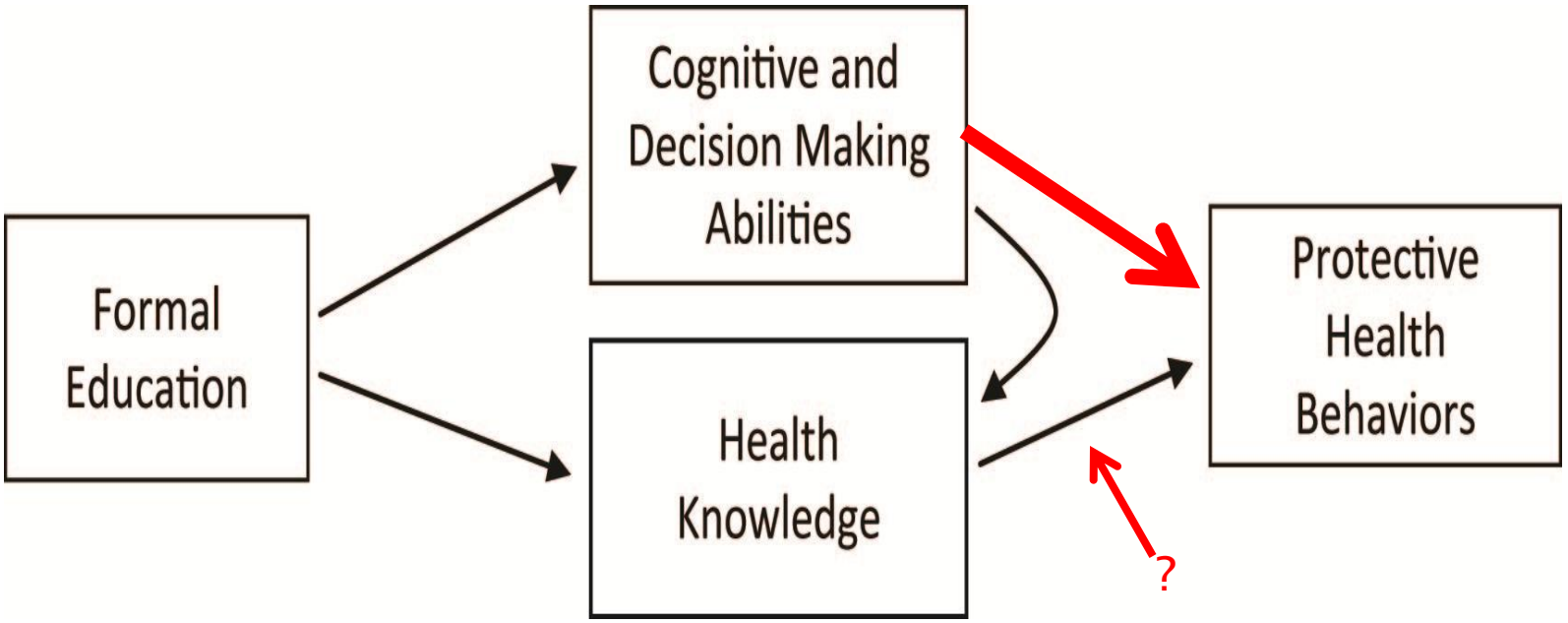
How can the playing field be leveled long-term? – Linking education and health

Figure 3. How long can children expect to stay in school?

Average school life expectancy in years for primary to secondary education by country, 2001



Schooling-Decision-Making Model



Peters, Baker, et al., 2010, *Psychological Science*

HIV Risk in Sub Saharan Africa

- Two-thirds of all AIDS infected individuals' live on the Sub-Saharan Africa continent (UNAIDS, 2006)
- HIV/AIDS is the leading cause of death in SSA
- HIV/AIDS is responsible for 25% of all deaths in SSA
- One in seven adults in SSA is infected with HIV/AIDS (Björkman, 2002; Brown, 2004; UNDP, 2002)



4 remote villages (population=200-4,000)

N = 190

Age = 30-65



Mean education = 6.6 years;

range = 0-20 years



Tested cognitive abilities, numeracy, and decision abilities



Tested HIV/AIDS knowledge and asked about HIV protective behaviors

Working Memory – Backward Digit Task

The examiner tells the subject a string of digits out loud at a rate of about one per second. The subject is asked to repeat the string back to the examiner in reverse order.

For Example:

	Researcher Says	Correct Response
1	6-2	2-6
2	3-8	8-3
3	9-0-7	7-0-9
4	4-1-5	5-1-4



Reasoning D-KEFs Tower Test

The item shown here is one of the most difficult items. The task begins with only two disks and gets progressively more complex.



From the start position above, build the tower shown on the right in as few moves as possible.

Rule 1: Never move more than one disk off the pegs at a time.

Rule 2: Never place a larger disk on top of a smaller disk.

Numeracy Test – Woodcock Johnson Calculation subtest

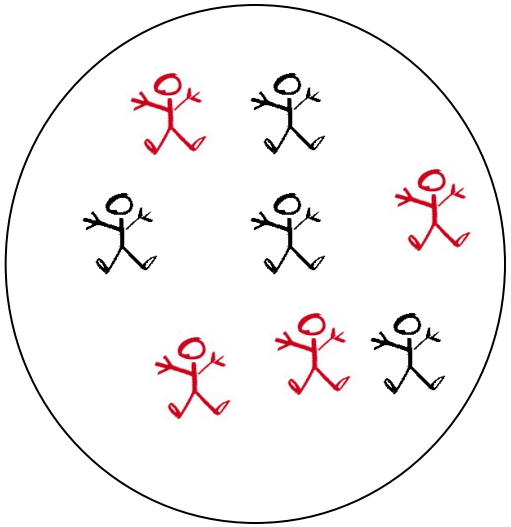
Subjects are asked to complete basic calculation problems beginning with the simplest addition and subtraction and continuing through basic multiplication and division.

Sample Problems:

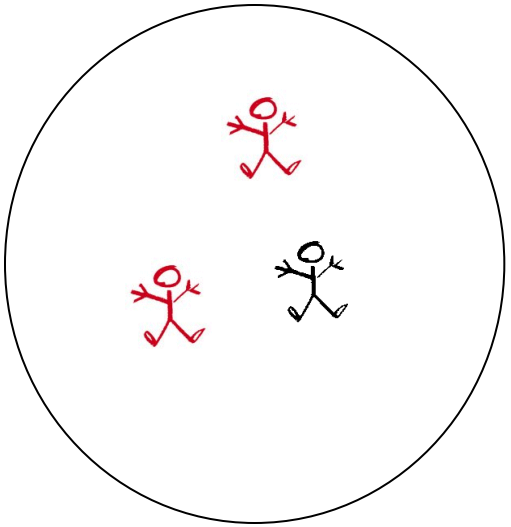
1 + 1	89 – 18
14 x 6	12 / 3

Risky Decision-making Task

A



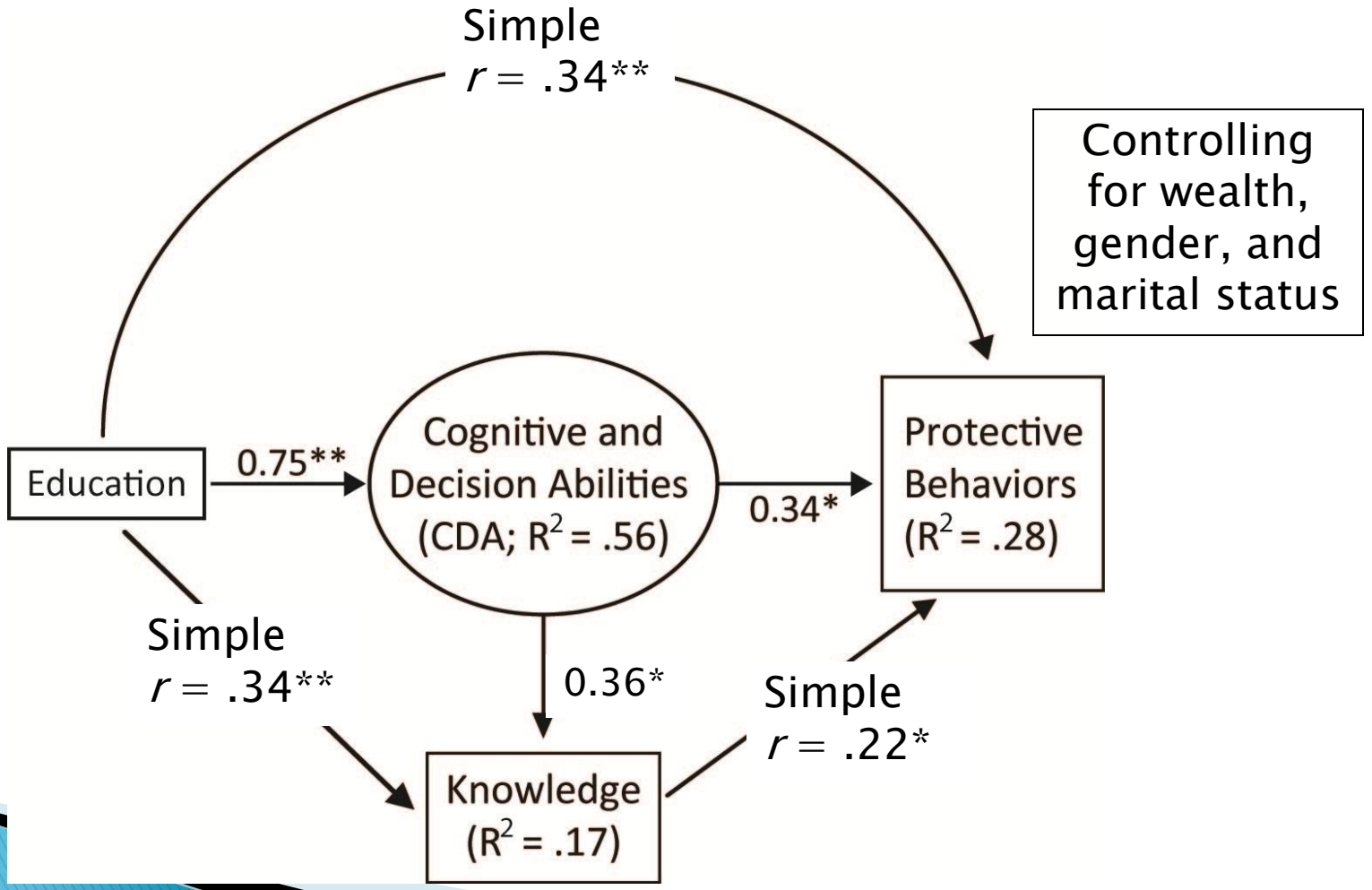
B



A red figure represents a person with AIDS and a black figure represents a person that does not have AIDS. If you were to send your child to each of these communities, in which community A or B, is it most likely that the first person that your child meets when they enter the village will have AIDS.

CDA mediated relationship between Education and Protective Behaviors

(Peters, Baker, et al., 2010, *Psychological Science*)



CDA mediated relationship between Education and Protective Behaviors

(Peters, Baker, et al., 2010, *Psychological Science*)

