

Know your chances:

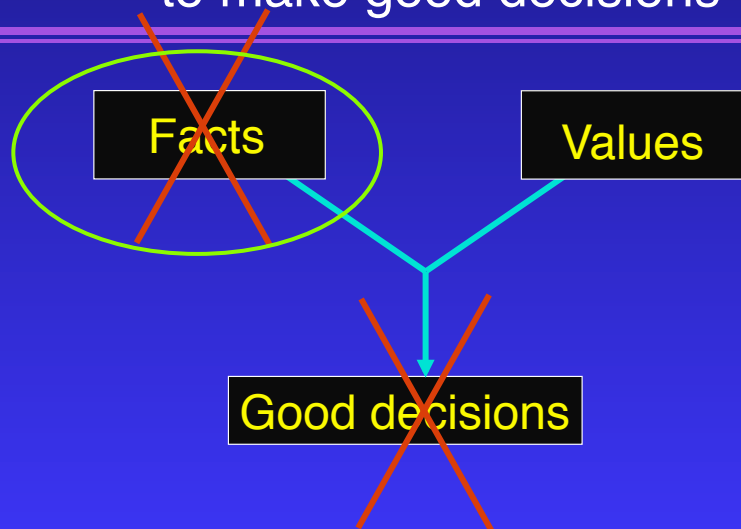
A curriculum to help students become better consumers of statistics

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People need to understand statistics
to make good decisions



In the news



In public service announcements



In medical center ads

The early warning signs
of colon cancer:

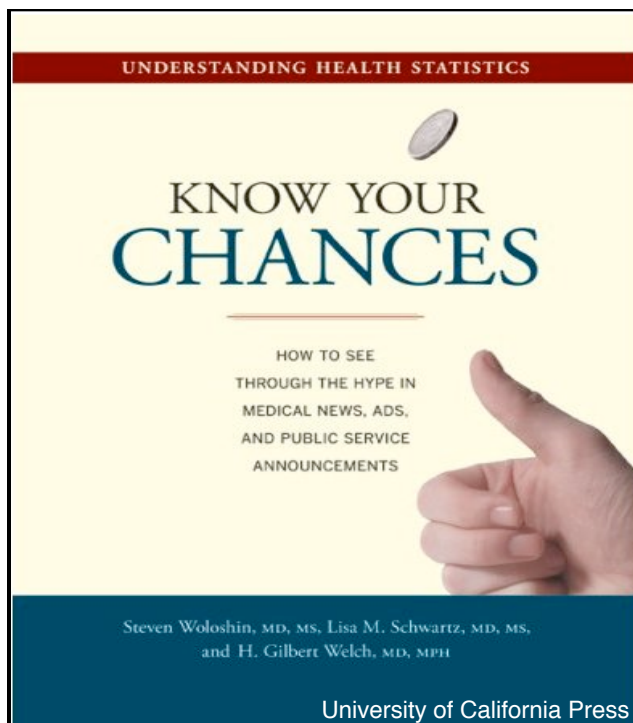
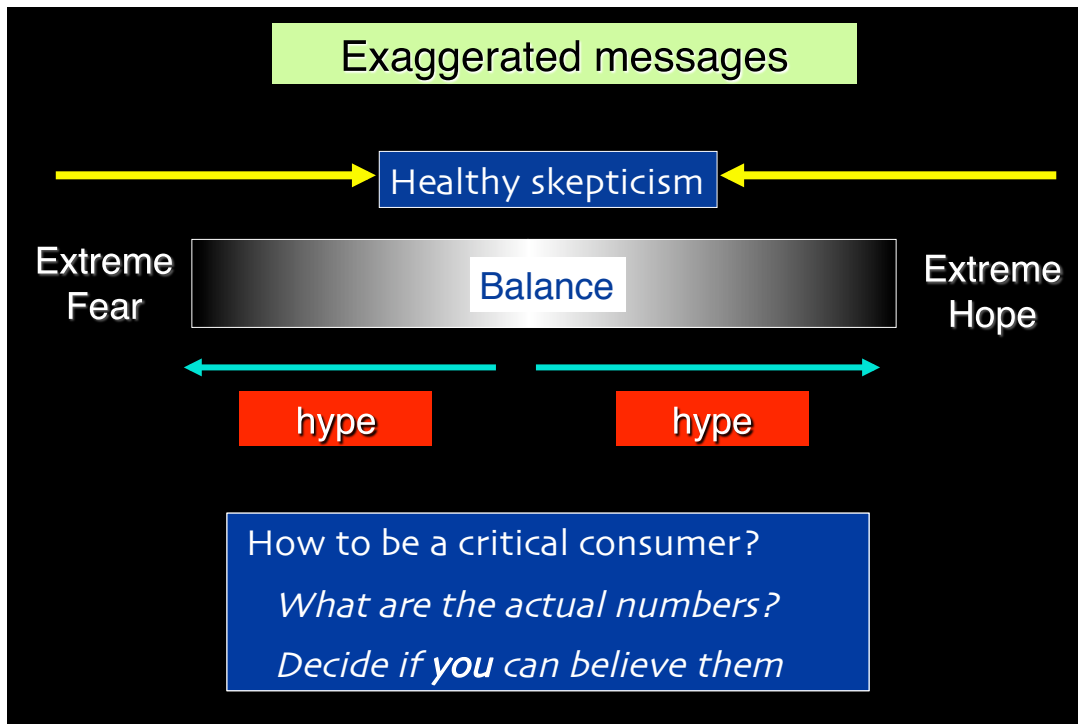
You feel great.

You have a healthy appetite.

You're only 50.

In the mail





A curriculum

Features

Example based

Quizzes

Learn more

Handy references

Talk outline

I. Know your chances: *A curriculum*

Part 1 What is the risk?

Part 2 Can risk be reduced?

Part 3 Does risk reduction have downsides?

Part 4 Developing a healthy skepticism

II. Testing "Know Your Chances"

Part 1 What is the risk?

The early warning signs
of colon cancer:

You feel great.

You have a healthy appetite.

You're only 50.

What numbers will you see?

"Colon cancer will strike 50,000 Americans."

Out of how many?

What is the risk?

The number of people who experience the outcome

$$\frac{\text{Numerator}}{\text{Denominator}} = \frac{50,000}{300,000,000} = 0.0002 = 0.02\%$$

Who could it happen to?

"The risk of colon cancer is 0.02%"
You need other information to give risk meaning

Risk of what?

getting or dying of colon cancer

Be clear about the outcome

Increasing importance to health



Test results
(X-ray, lab)

Diagnosis
of disease

Complications
of disease

Death
from disease

Death
period

The risk of colon cancer is 0.02% Other information to give risk meaning

Risk of what? **dying from colon cancer**

When? **next year**

next year? next 10 years? over a "lifetime"?

Whose risk? **Americans of every age**

Age matters

Imagine 1000 men your age.
In the next 10 years, how many will die of...

Age	Colon cancer
40 yrs	1
50 yrs	2
60 yrs	5

998 in 1000 will NOT die from colon cancer

"FRAMING"

Context

*Imagine 1000 men your age.
In the next 10 years, how many will die of....*

Age	Colon cancer	Prostate cancer	Heart disease	All causes combined
50 yrs	2	1	11	49

Risk Chart for men who have never smoked

Find the line closest to your age and smoking status.† The numbers tell you how many of 1,000 men will die in the next 10 years from....

Age	Smoking	Vascular Disease		Cancer			Infection			Lung Disease	Accidents	All Causes Combined*
		Heart Disease	Stroke	Lung	Colon	Prostate	Pneumonia	Flu	AIDS	COPD		
35		1	1						2		5	15
						Fewer than 1 death			-			
40		3	1	1	1				2		6	24
45		6	1	1	1				2		6	35
50		11	1	1	2	1	1		1		5	49
55		19	3	1	3	2	1		1	1	5	74
60		32	5	2	5	3	2		1	1	5	115
65		52	9	4	8	6	3			3	6	176
70		87	18	6	10	12	6			5	7	291
75		137	32	8	13	19	12			6	11	449

† A never smoker has smoked less than 100 cigarettes in his life and a current smoker has smoked at least 100 cigarettes or more in his life and smokes (any amount) now.
* The numbers in each row do not add up the chance of dying from everything combined, because there are many other causes of death besides the ones listed here.

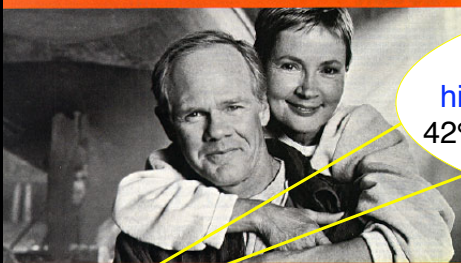
Take home lessons

What is the risk?

- Understand the outcome and consider how bad it is.
- Learn the chance of the outcome, to whom it applies and when.
- Get context by comparing this risk to others.

Part 2 Can risk be reduced?

How will you take care of your high cholesterol and heart disease?



We rescued this old boat years ago. My plan was to fix her up and spend our retirement sailing. Then I had a heart attack. I was worried we'd never set sail. It turns out my cholesterol was high. I began exercising and eating better, but my cholesterol was still too high. So I asked my doctor about adding ZOCOR. ZOCOR is an effective medicine that along with diet and exercise can significantly lower total cholesterol. A clinical study among people with high cholesterol and heart disease found 42% fewer deaths from heart attack among those taking ZOCOR by reducing the risk of a heart attack. ZOCOR can help people with high cholesterol and heart disease live longer. Important considerations: ZOCOR is a prescription medicine and isn't right for everyone, including women who are nursing or pregnant or who may become pregnant, anyone with liver problems, and people who are allergic to any ingredients of ZOCOR. Unexplained muscle pain or weakness could be a sign of a rare but serious side effect and should be reported to your doctor right away. Your doctor may do blood tests before and during treatment with ZOCOR to check for liver problems. To avoid serious side effects, discuss with your doctor medicines or food you should avoid while on ZOCOR (see details immediately following this ad). Ask your doctor if ZOCOR is right for you. For more information call 1-800-787-0995 or visit www.zocor.com.

For more info, please visit the additional information on ZOCOR (rosuvastatin calcium) tablet, 42% cholesterol lower in 11/2, 221 (ZOCOR) is 18, 7, 223 (rosuvastatin).



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ZOCOR
(ROSUVASTATIN)

It's your future. Be there.

“A clinical study among people with high cholesterol and heart disease found 42% fewer deaths from heart attack among those taking Zocor.”

Fewer than what?

"Relative risk reduction" is ~~hard~~ like a sale

EXTREMELY FANCY STORE

42% OFF

On selected items!

Would you go if selected items were....

Things like TV's, washing machines?
save \$100's

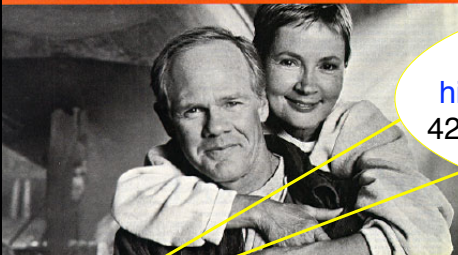
Things like a pack of gum?
save pennies

"42% of what" matters!


know the REGULAR price!

Part 2 Can risk be reduced?

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It's your future. Be there.

"A clinical study among people with high cholesterol and heart disease found 42% fewer deaths from heart attack among those taking Zocor."

Chance of heart attack death in next 5 years

Zocor	No Zocor
5.0%	8.5%

Take home lessons


What is the risk?

Understand the outcome and consider how bad it is.
Learn the chance of the outcome, to whom it applies and when.
Get context by comparing this risk to others.

Can risk be reduced?

To understand the size of the risk reduction, get the chance of the outcome with and without the intervention.

Part 3 Does risk reduction have downsides?



*If you care about breast cancer,
care more about
being a 1.7 than
a 36B.*

Women taking Nolvadex were 2 to 3 times more likely to develop uterine cancer or blood clots in the lungs and legs...

...Stroke, cataracts, and cataract surgery were more common with Nolvadex.

STUDY FINDINGS: NOLVADEX VERSUS PLACEBO

13,000 women at high risk of getting breast cancer were given either NOLVADEX or a sugar pill for 5 years. Here's what happened:

What were NOLVADEX's side effects?

Life threatening side effects

More women had a blood clot in their leg or lungs
(additional 0.5% due to drug)

0.5%
5 in 1000

1.0%
10 in 1000

More women got invasive uterine cancer
(additional 0.6% due to drug)

0.5%
5 in 1000

1.1%
11 in 1000

Symptom side effects

More women had hot flashes
(additional 12% due to drug)

68%
680 in 1000

80%
800 in 1000

More women had vaginal discharge
(additional 20% due to drug)

35%
350 in 1000

55%
550 in 1000

More women had cataracts needing surgery
(additional 0.8% due to drug)

1.5%
15 in 1000

2.3%
23 in 1000

Bottom Line

No difference in deaths from all causes combined

About 1.2% in both groups
12 in 1000

Take home lessons

What is the risk?

Understand the outcome and consider how bad it is.

Learn the chance of the outcome, to whom it applies and when.

Get context by comparing this risk to others.

Can risk be reduced?

To understand the size of the risk reduction, get the chance of the outcome with and without the intervention.

What are the downsides?

Understand the downsides and weigh them against the benefit.

Part 4 Developing a healthy skepticism

Can you believe the numbers?

Where are they from (observational studies vs. randomized trials)?

Are the findings preliminary (scientific meeting reports)?

Who is behind the numbers (conflicts of interest)?

Special Topic: The benefit of early detection

Misleading use of survival statistics

Los Angeles Times

Study calls for routine CT scans for smokers:

Imaging can detect lung cancer early, boosting survival rates.

90% vs. 5% survival

"Imaging yields a 10-year survival rate of more than 90%, researchers said. Currently, about 5% of the 174,000 lung cancer patients diagnosed each year survive 10 years..."

October 26, 2006, A18

Understand the statistics

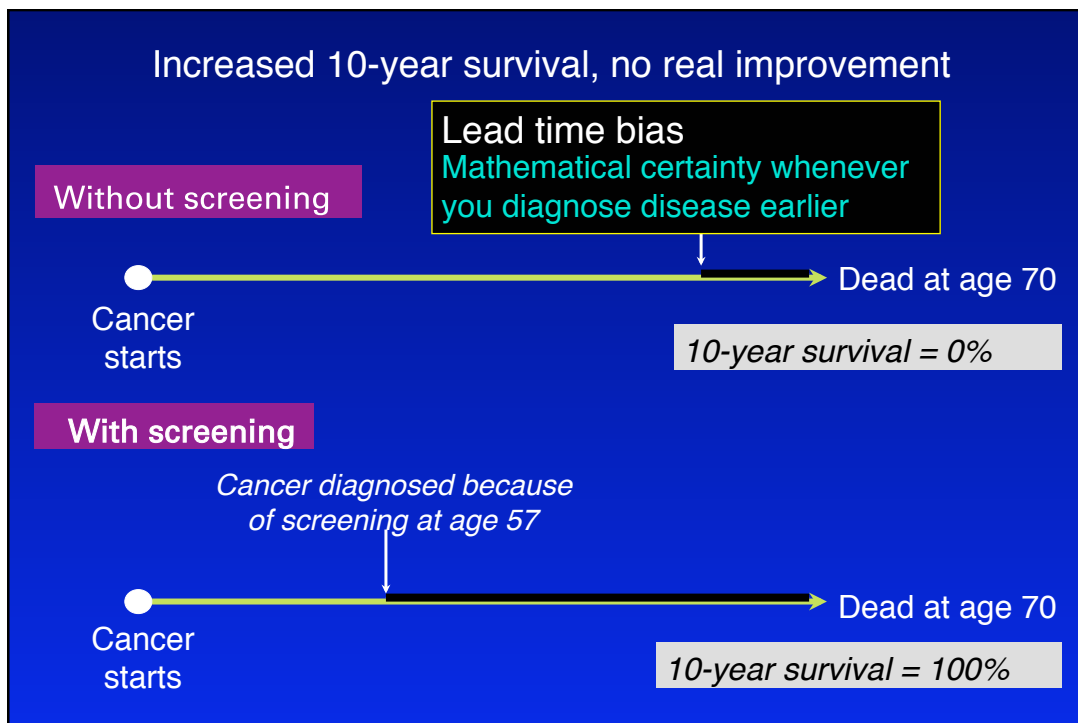
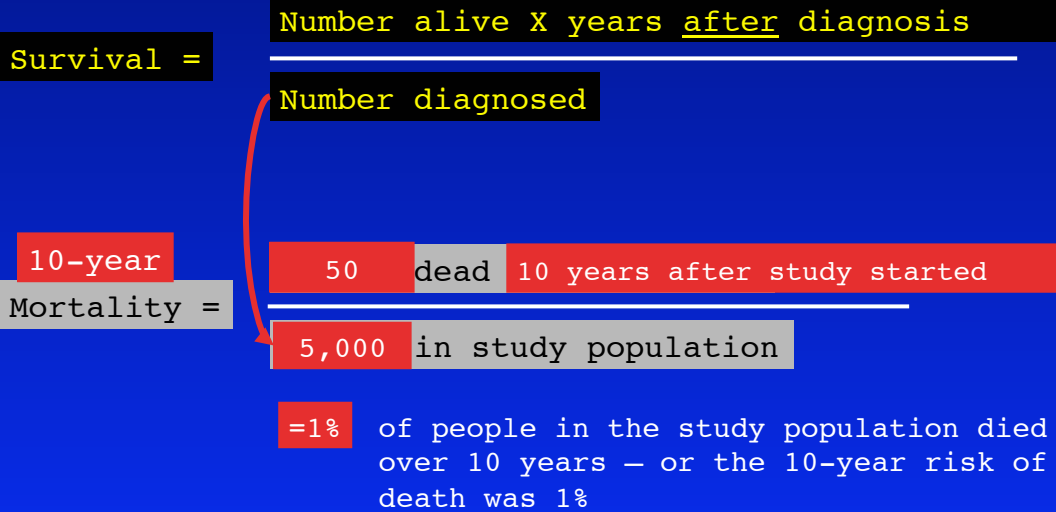
It is tempting to assume that:

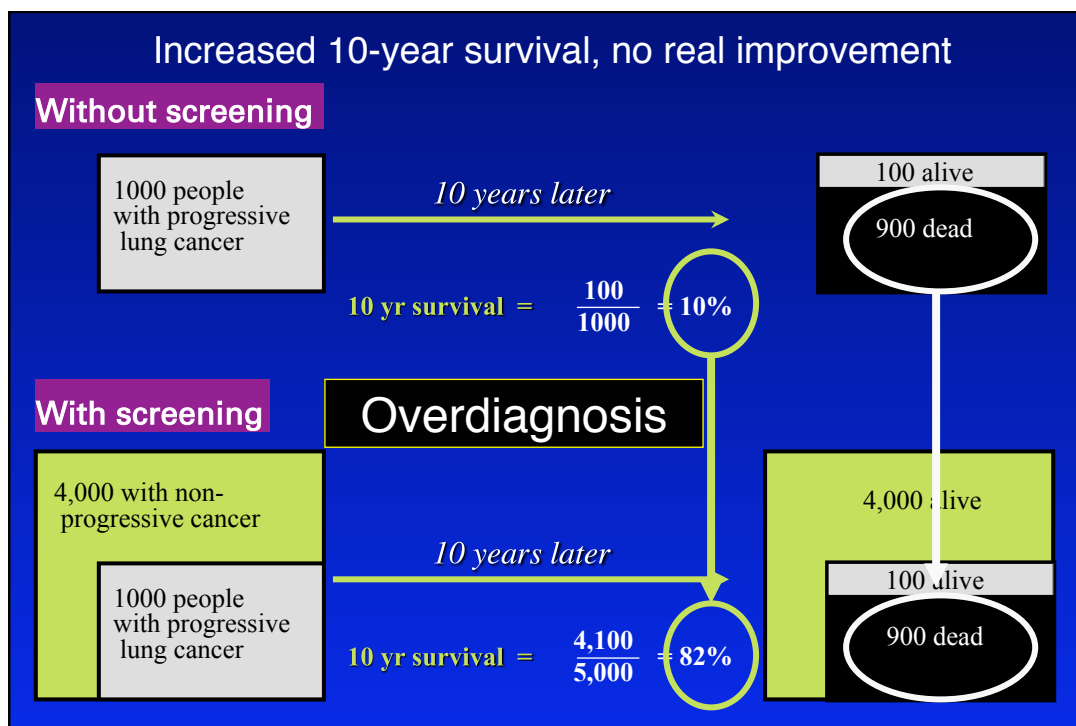
~~$$\text{survival} = (1 - \text{mortality})$$~~

Understand the statistics

$$\begin{array}{l}
 \text{10-year} \\
 \text{Survival} = \frac{100 \text{ alive 10 years after diagnosis}}{1,000 \text{ diagnosed}} \\
 = 10\% \text{ of people diagnosed with lung cancer} \\
 \text{are alive 10 years later}
 \end{array}$$

Understand the statistics





Take home lessons

What is the risk?

Understand the outcome and consider how bad it is
Find out the chance of experiencing the outcome over what time
Get context by comparing this risk to others

Can risk be reduced?

To understand the size of the risk reduction, get the chance of the outcome with and without the intervention.

What are the downsides?

Understand the downsides and weigh them against the benefit.

Develop a healthy skepticism

Don't take improved survival with screening as evidence that screening works (i.e. lower mortality)

Talk outline

I. Know your chances: *A curriculum*

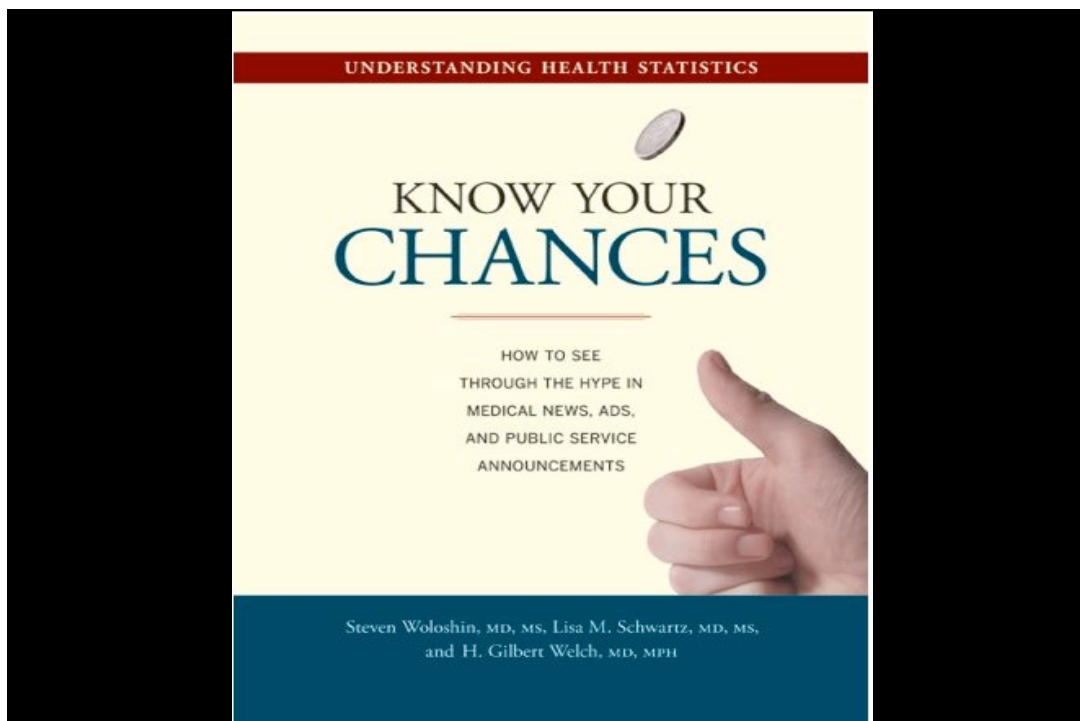
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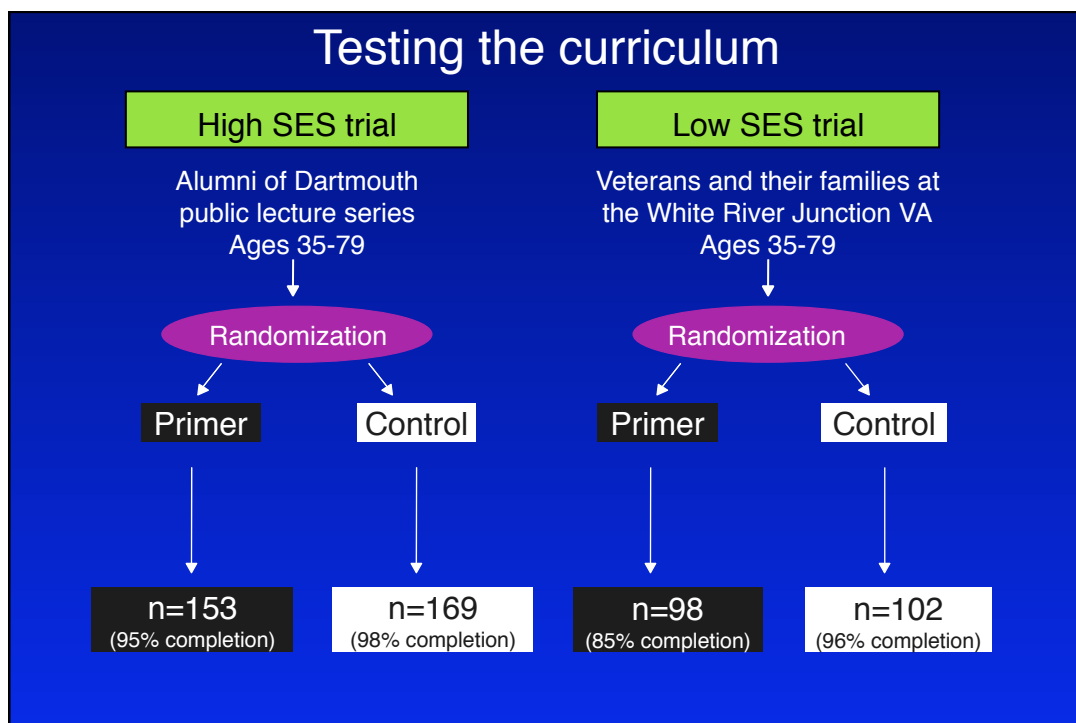
Part 2 Can risk be reduced?

Part 3 Does risk reduction have downsides?

Part 4 Developing a healthy skepticism

II. Testing "Know Your Chances"





The control booklet

The cover features the title "The Pocket Guide to Good Health for Adults" and the U.S. Department of Health and Human Services logo. It includes images of a doctor and a family.

General information about risk
(and reducing risk with prevention/screening)

- No training on how to interpret data
- Similar to primer in length
(70 page booklet) and reading level

Primary outcome measure: *Medical data interpretation scores*

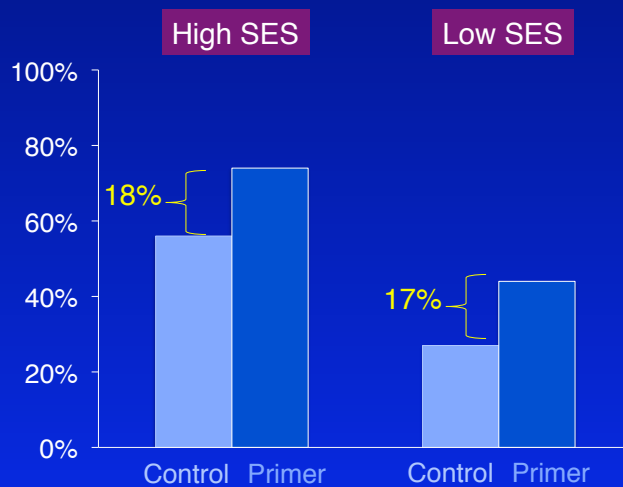
18-item test developed at same time as primer and validated in separate study. Scored on a 0-100 scale.

Asks people to interpret real world information (e.g. drug ads, news stories).

Tests the same skills as the primer - but requires respondent to apply skills with variety of messages that DO NOT appear in the primer.

* Med Decis Making. 2005; 25:290-300.

Did the curriculum work? *Percent with a passing score (≥ 75)*



Ann Intern Med 2007

Summary

The magnitude of the effect is in line with successful educational interventions like use of practice exams prior to standardized testing.

Curriculum improved data interpretation skills in both the high and low SES populations.