



Family history, genetic testing, & public health practice: The role of social and behavioral sciences

**10th Anniversary of Public Health Genomics
Centers for Disease Control, January 23, 2008**

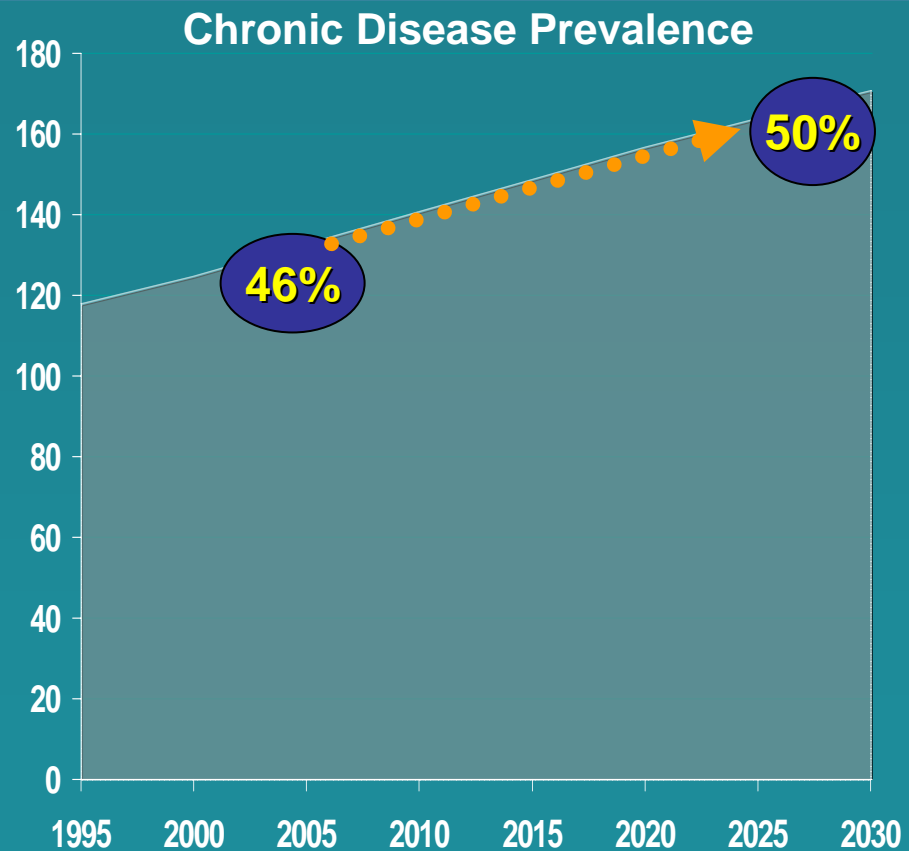
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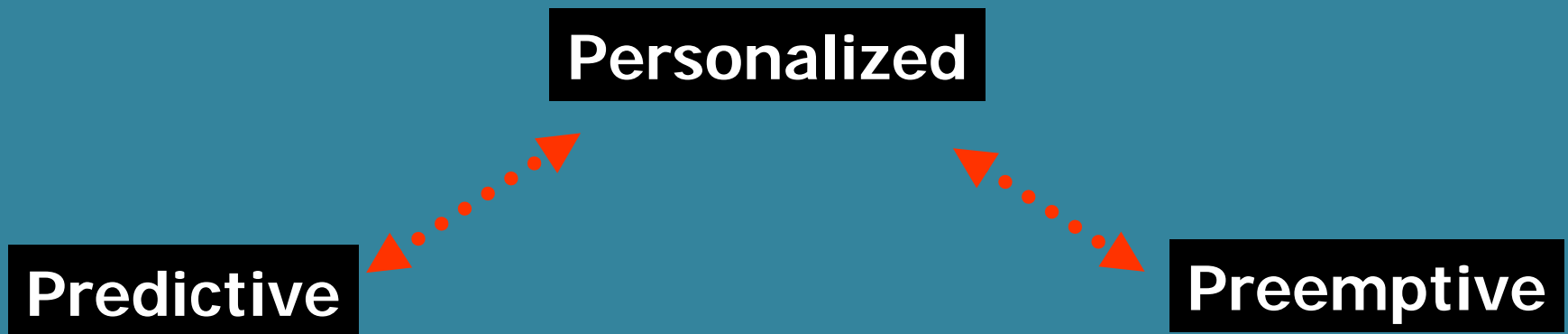


Decade Ahead: 2008.....2018

- **Using genomics to reduce burden of common health conditions**
 - Primary prevention of common disease
- **Important role for social & behavioral research**
- **Challenges for next steps**



Transform Medicine Through Discovery



Applying genomics to public health challenges

- Common chronic disease
- Prevention=behavior change
- Genetic service delivery \neq public health intervention
- More promise than products
- Research to shape not just translate new discovery
- Address widespread disparities

❖ **Personalization:**

Using genomic risk in behavior change interventions

❖ **Preemption:**

Effective clinical integration

Personalization



Behavioral Adherence

Primary Prevention

- Guidelines well established
- Behavioral risk factors well established (smoking, poor diet, inactivity)
- Evidence-based interventions

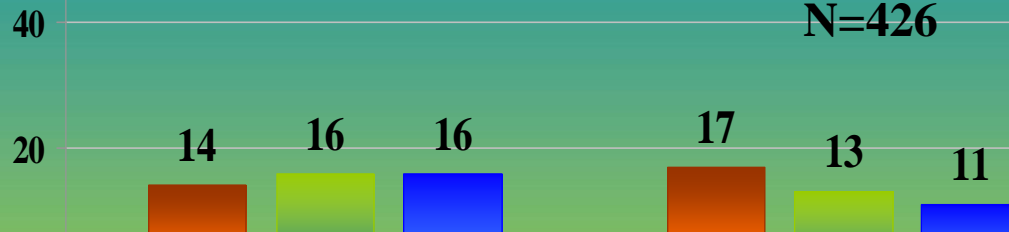
Know what to do....challenge is how to get people to do it!

Genetic feedback effects on smoking cessation

Percent not smoking

CYP2D6

N=426



2 months

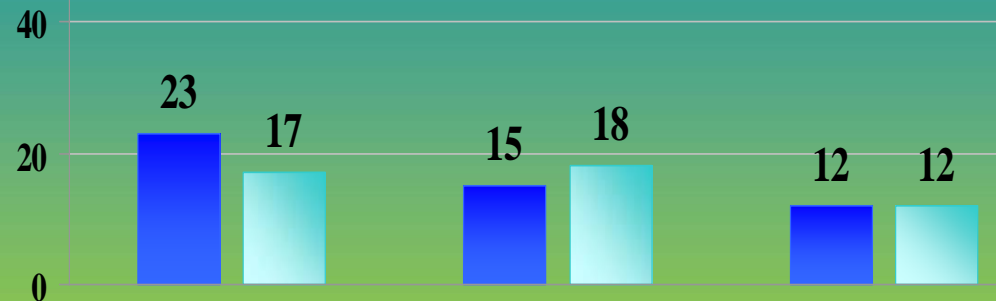
■ Cessation control

Lerman et al., 1997; Audrain

Percent not smoking

GSTM1

N=308



6 months

12 months

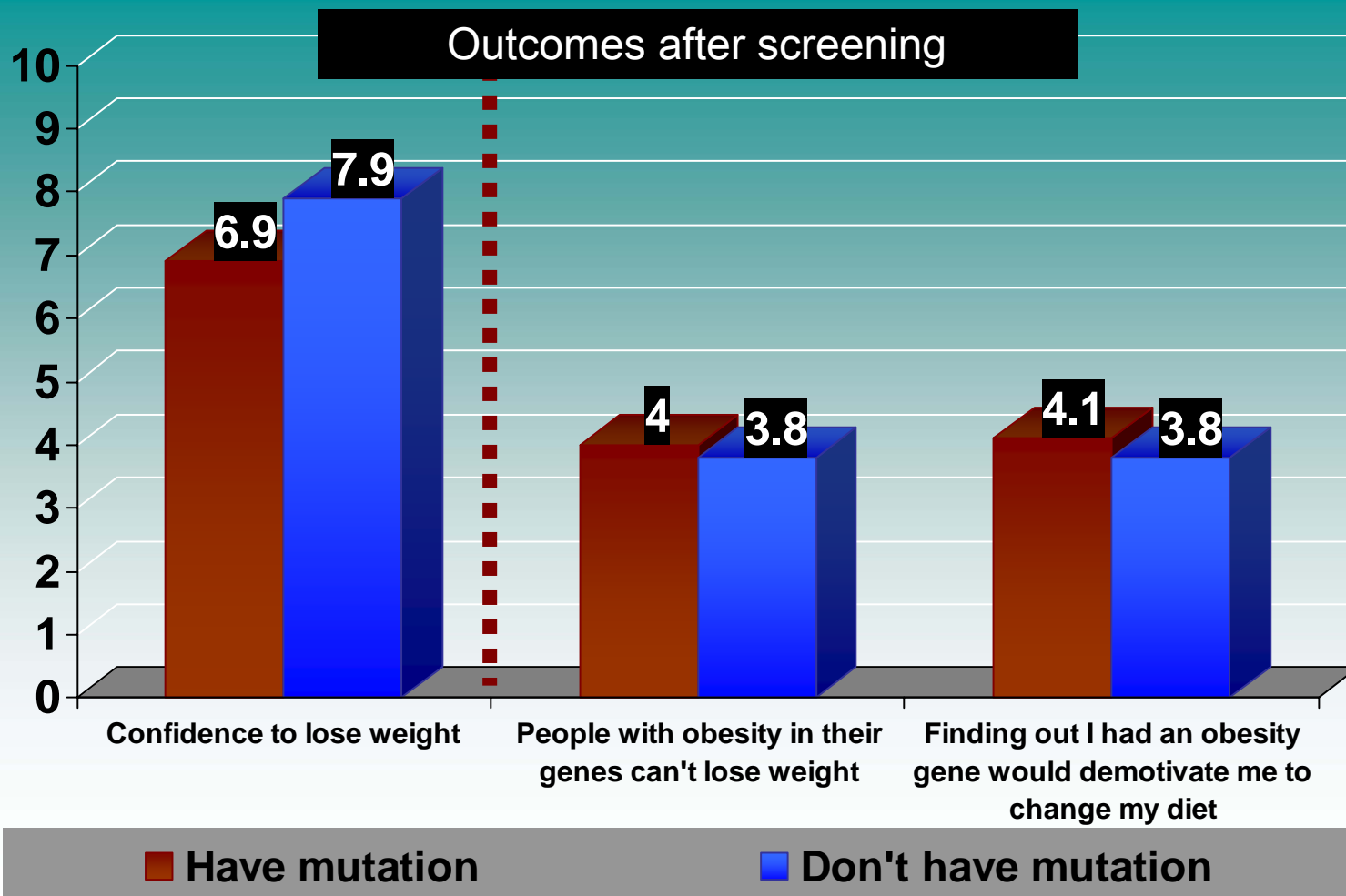
Continuous

■ Missing ■ Present

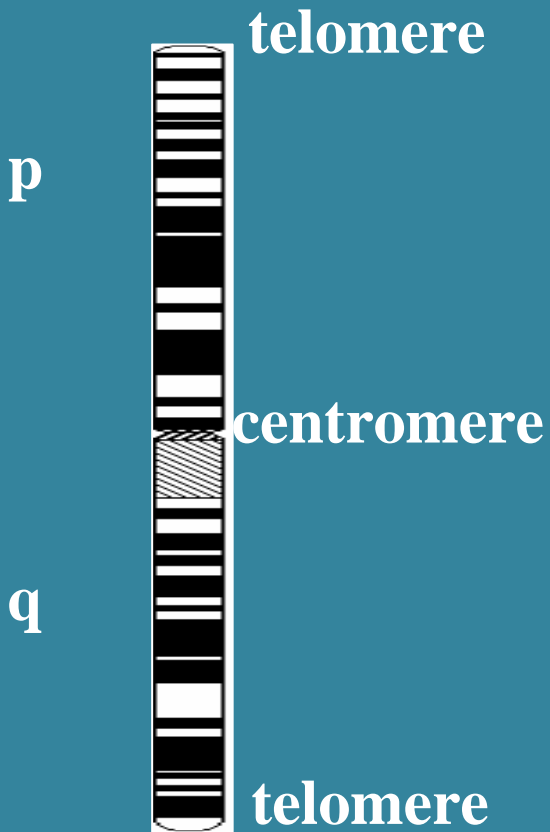
McBride, Bepler et al., 2002

Confidence & Attitudes about Weight Management by Mutation Status

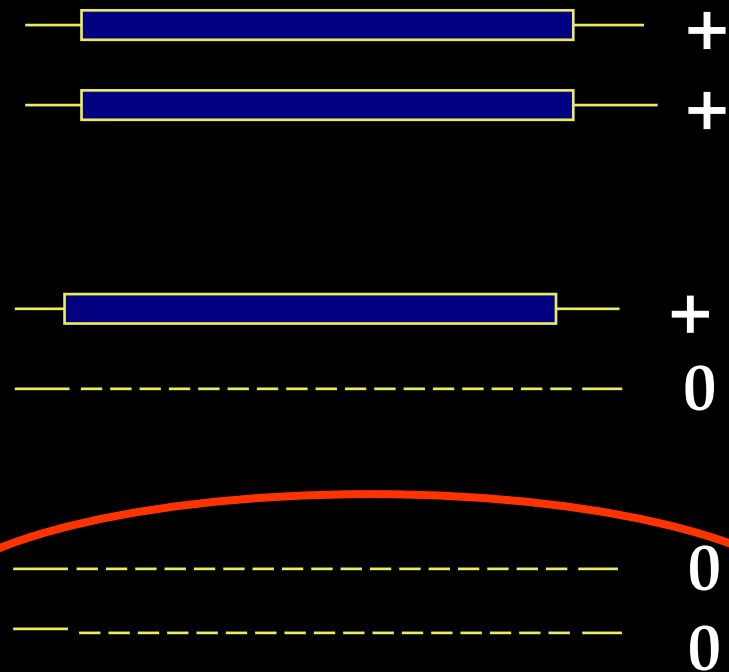
Obese Women (N=30)



Chromosome 1p13.3

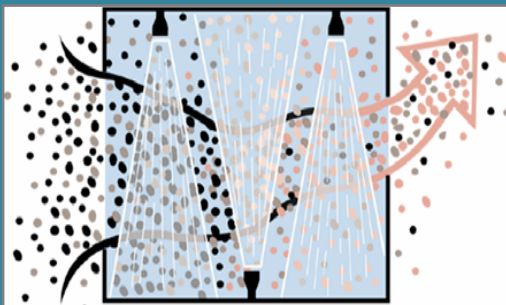


GSTM1

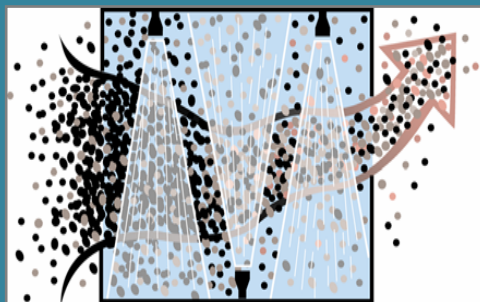


50% population has 0/0 genotype

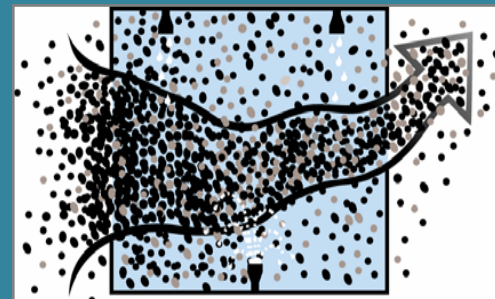
What is understanding?



“Your body works like a chemical wash - each cell uses enzymes like strong detergents to clean up most chemicals”



“Your result shows that you have the enzyme to help you clean up some of the chemicals in cigarette smoke.”



“Your result shows that you do not have the enzyme. The harmful chemicals coming into your body may not be getting cleaned up very well.”

Percent

100

64

48

38

50

0

Accurate recall

Accurate interpretation

Accurate comprehension

Accuracy of understanding by test result

GSTM1 is:	Inaccurate recall	Inaccurate interpretation	Inaccurate comprehension
➤ Missing	56 ^{***}	65 [*]	79
Present	26	49	54

*** p<.001; * p<.05

Personalization → **Risk reduction**

Context

Genetic communication

Comprehension & acceptance

Recall of risk

Risk reduction

Behavior

**Informed
decision-making**

Cognitive capabilities

Dispositional factors

Motivations

Attitudes, beliefs, affect,

Hypothetical & Actual Interest in Genetic Testing

Hypothetical Vignette Method

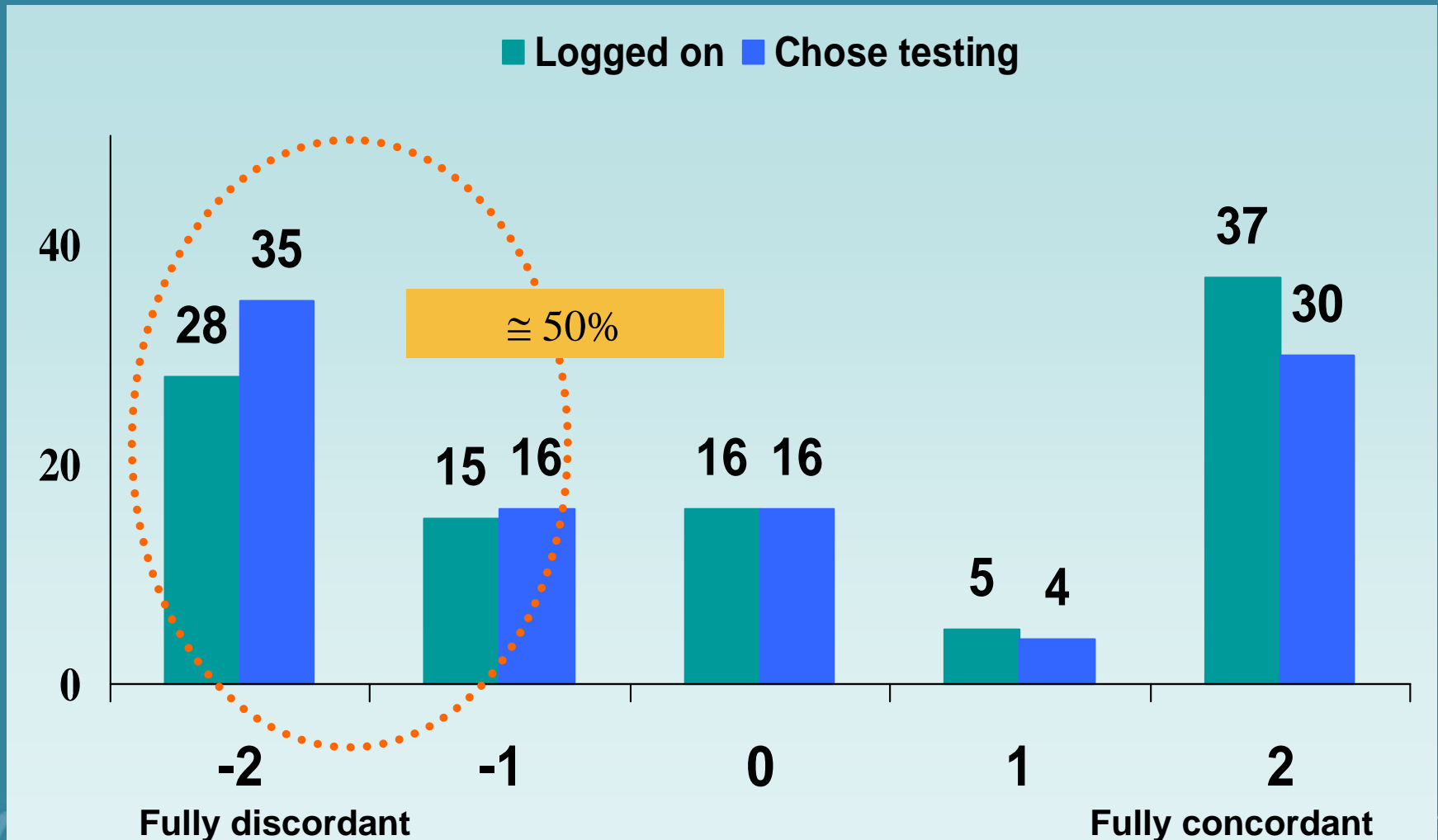
“If a free test was available that could tell you whether you had a gene that gave you a higher than average chance of getting lung cancer, which of the following describes whether you would want to be tested in the next 6 months?” *Definitely not, Probably not, Possibly, Probably, Definitely would*

Actual behavior

- Logged On
- Chose testing
- Concordance score for each with hypothetical interest
- Range:

-2 _____ -1 _____ 0 _____ 1 _____ +2
Fully Discordant Fully Concordant

Concordance between interest in hypothetical test & behavior (N=116)





Welcome to the
FAMILY RISK AND LUNG CANCER STUDY

Thank you for Participating!



Behavioral outcomes

Objective observation of how
individuals engage with information

NEXT

Cigarette smoke contains about 4,000 harmful chemicals. At least 50 are known to cause cancer.

Benzo(a)pyrene

A chemical that damages your genes so that your body can not stop the growth of tumors that can lead to lung and other cancers.

Arsenic

a poison used to kill rats, and DDT used to kill insects are just two of the chemicals that you breathe in when you smoke.

Nicotine

The chemical that causes addiction.

Carbon monoxide (CO)

A poisonous gas that makes it harder for the blood to carry oxygen to the body's organs.

Adapted from a poster by the
National Anti-Smoking Society of Fiji

Acetone
Paint stripper

Naphthylamine
Used to make dye
and rubber

Methanol
Rocket fuel

***Pyrene**
Smoke of burning garbage

Napthalene
Mothballs

***Cadmium**
Used in car batteries

Carbon Monoxide
Car Exhaust

***Benzo(a)pyrene**
Made by burning insecticide

***Vinyl Chloride**
Used to make plastics

Hydrogen Cyanide
Poison used in gas chambers

***Toluidine**
Used as a base in dyes

Ammonia
Floor cleaner

Urethane
Used to make adhesives

Toluene
Industrial solvent

Arsenic
Ant poison

Phenol
Found in fertilizer

Butane
Lighter fuel

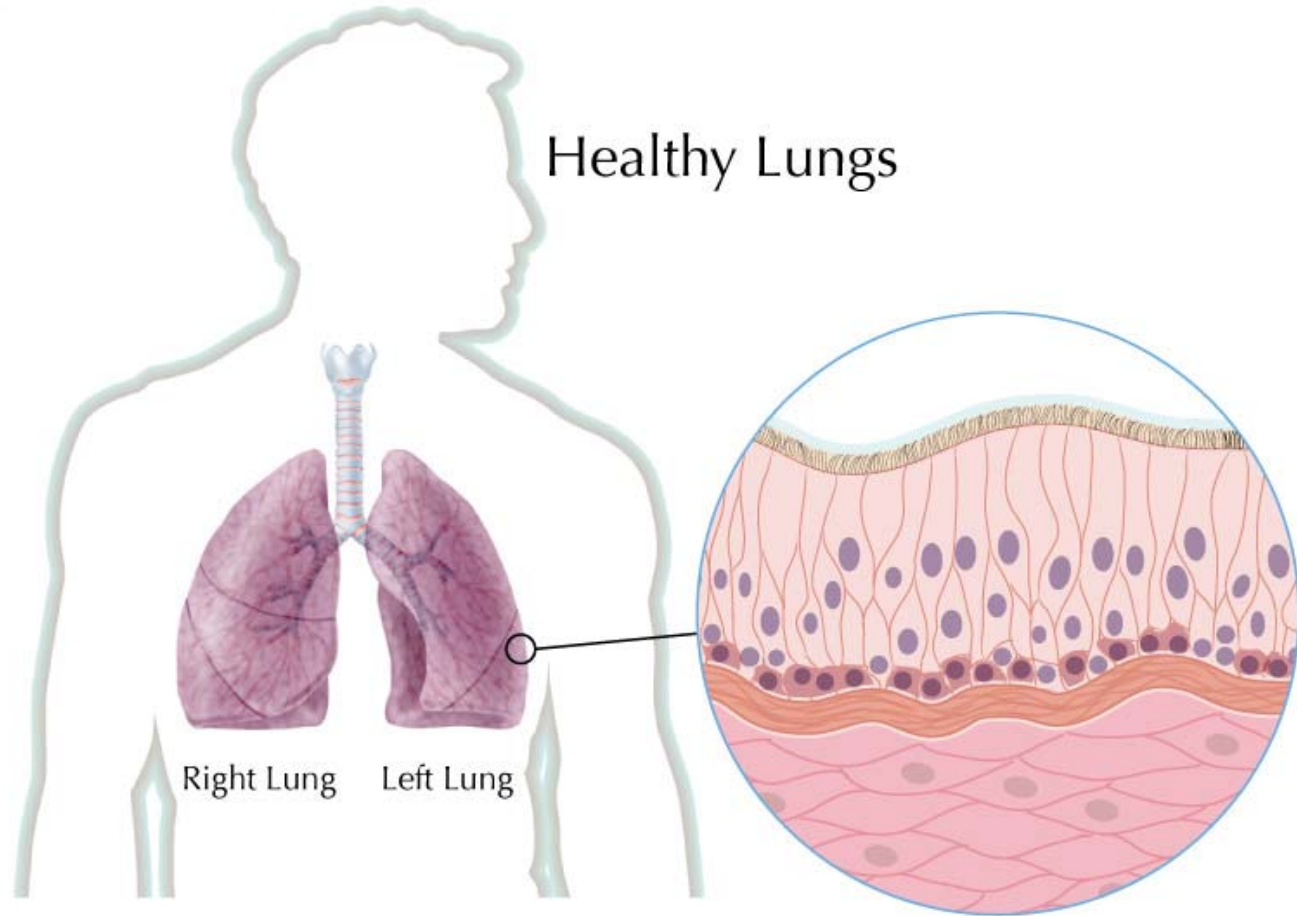
***Polonium-210**
Used in nuclear weapons production

DDT
Insecticide



* Known cancer-causing substances

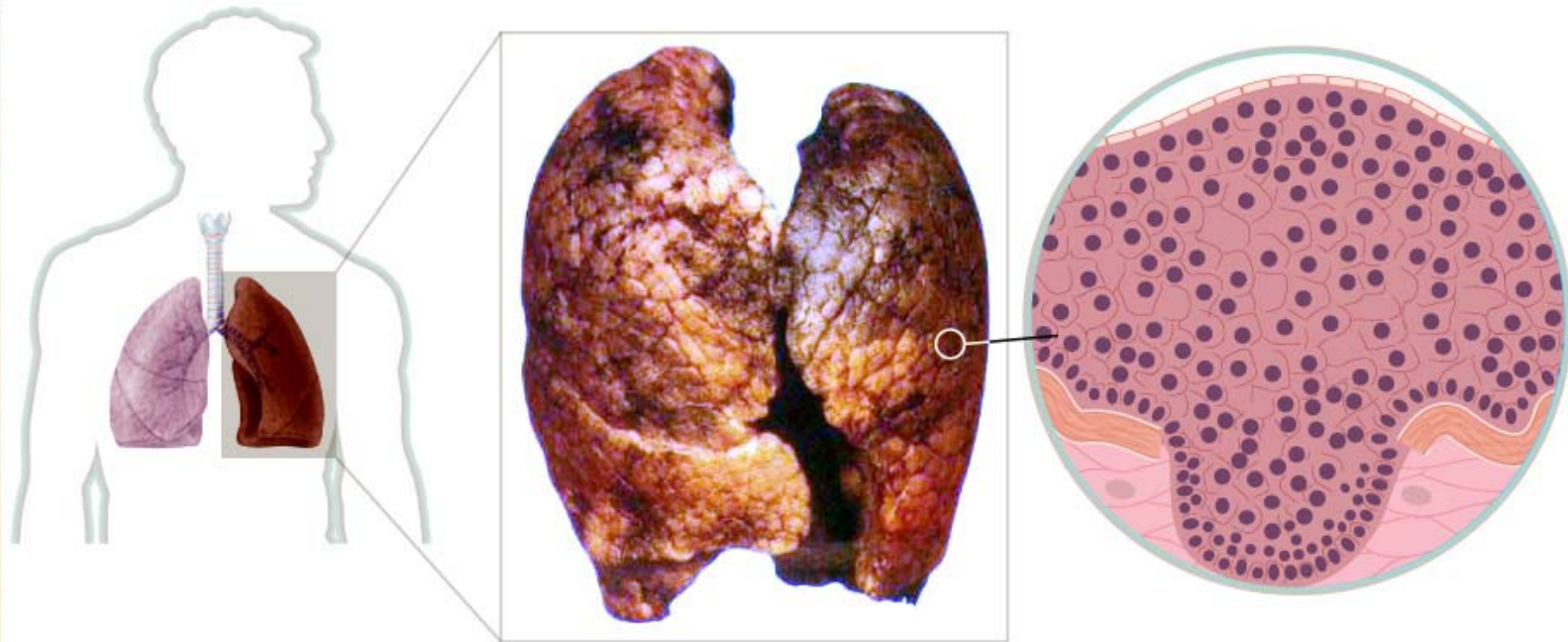
NEXT



Cells are in all parts of our lungs. Healthy cells in your lungs divide in a controlled and orderly way.

NEXT

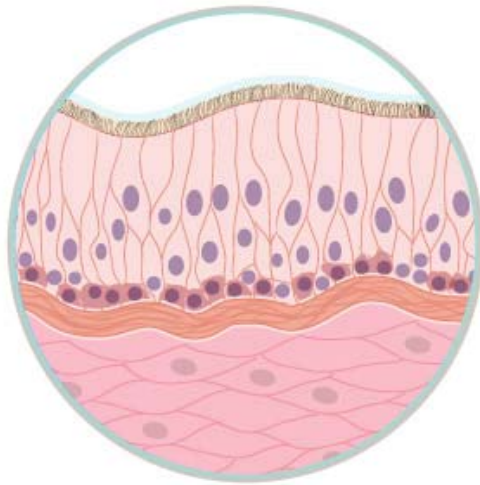
What Is Lung Cancer?



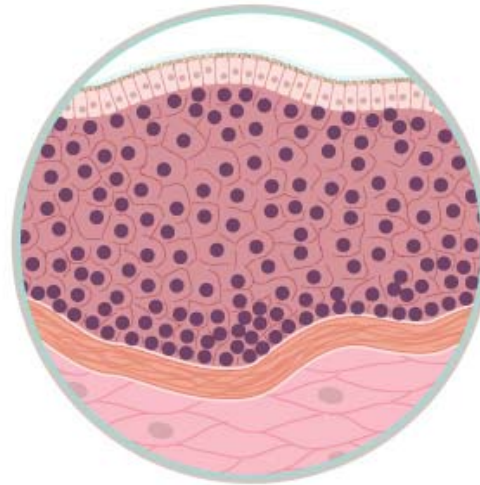
Lung cancer happens when these cells become abnormal and grow quickly.

NEXT

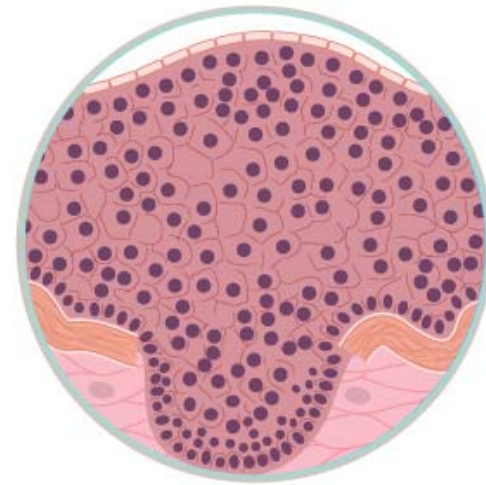
Here's how it works...



Healthy
Lung cells



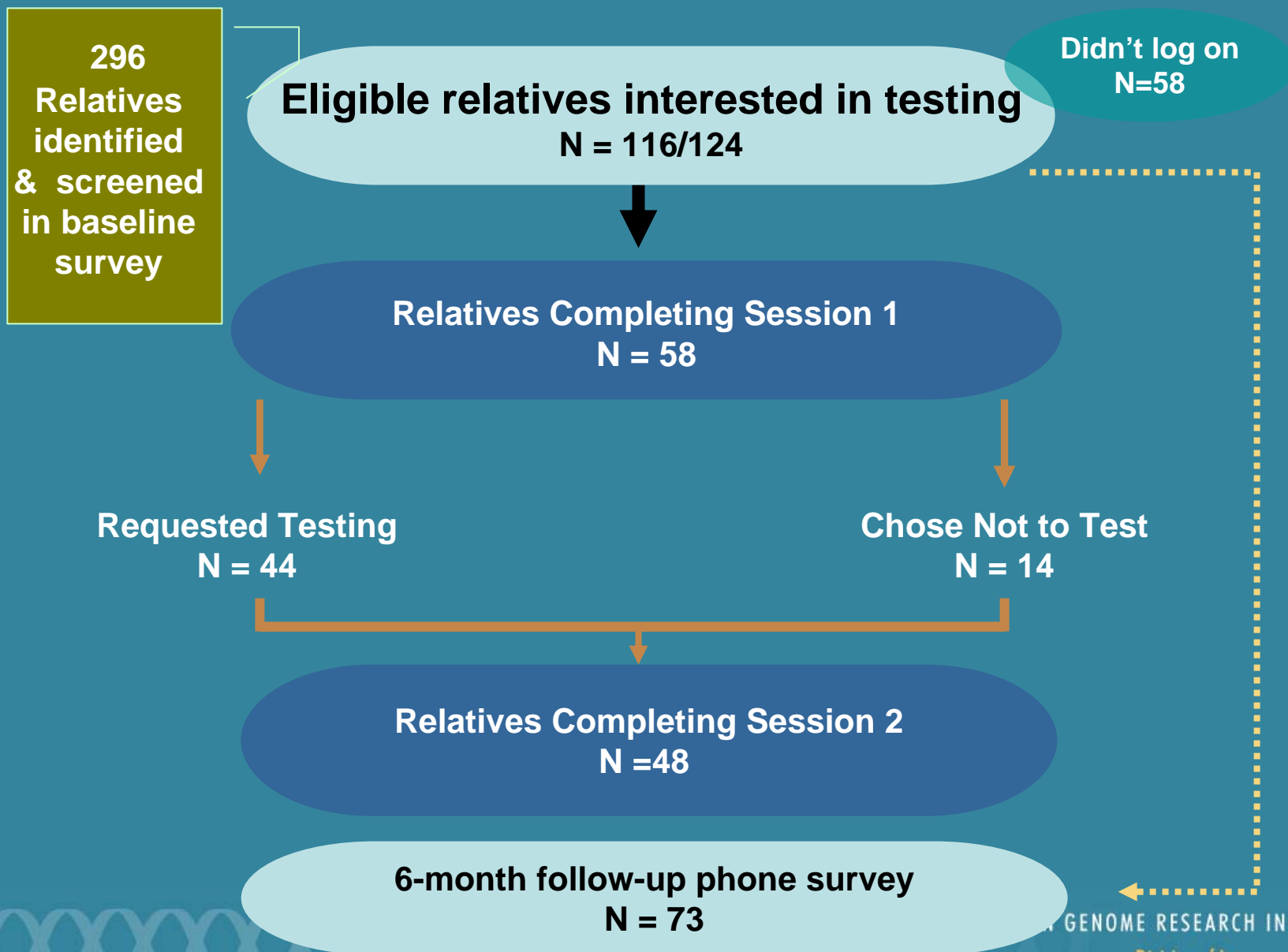
At first, the
abnormal cells
(shown in dark purple)
grow slowly.



Repeated exposure to
chemicals in cigarette
smoke, over a number
of years can increase
the number of these
abnormal cells.

NEXT

Family Risk Participation

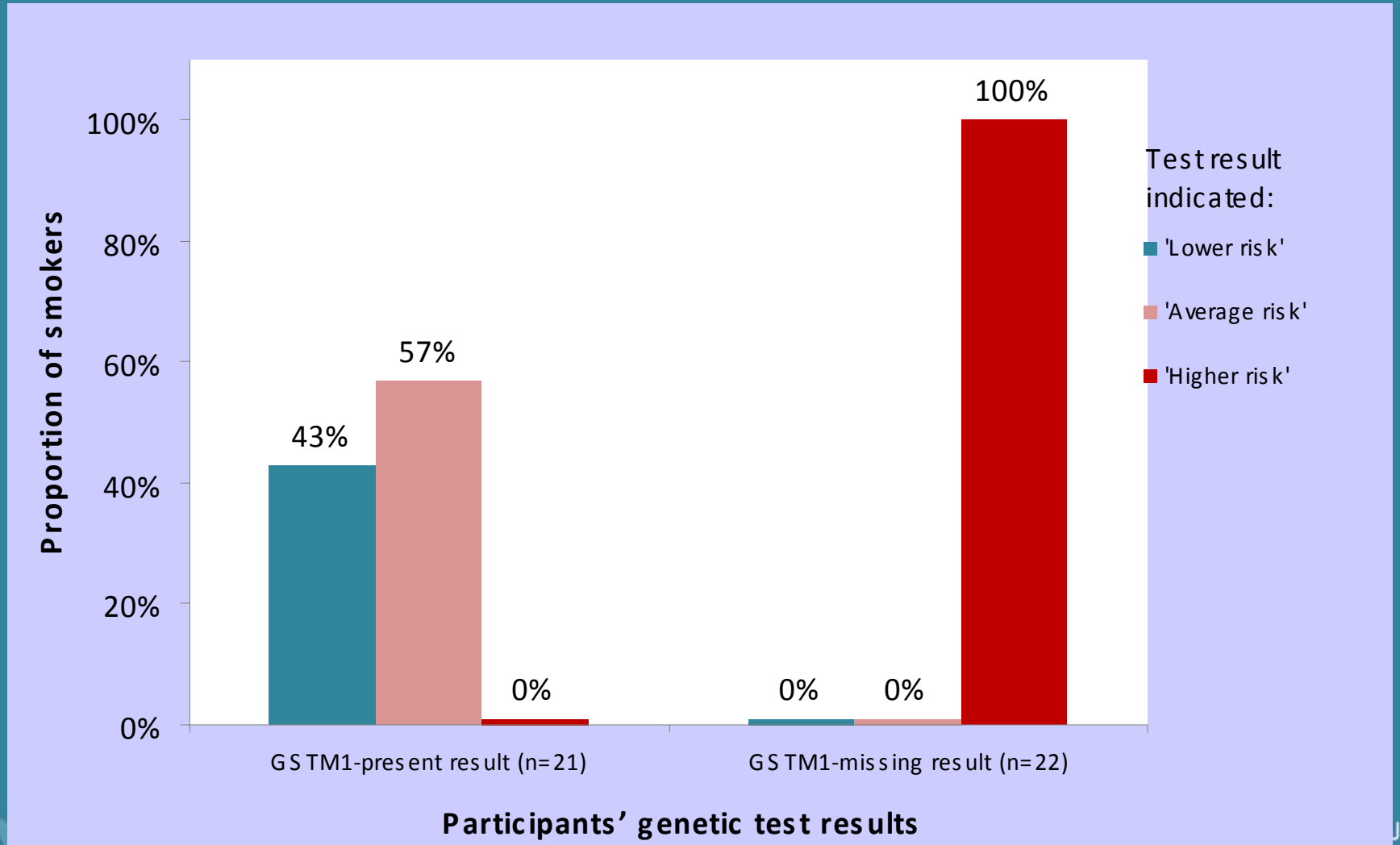


Predictors of who logged on

	OR	95% CI
Motivated to quit smoking	1.71	(1.22, 1.67)**
Aware of cancer genetic testing	3.14	(1.28, 3.87)*
Daily internet use	1.39	(1.17, 1.95)**

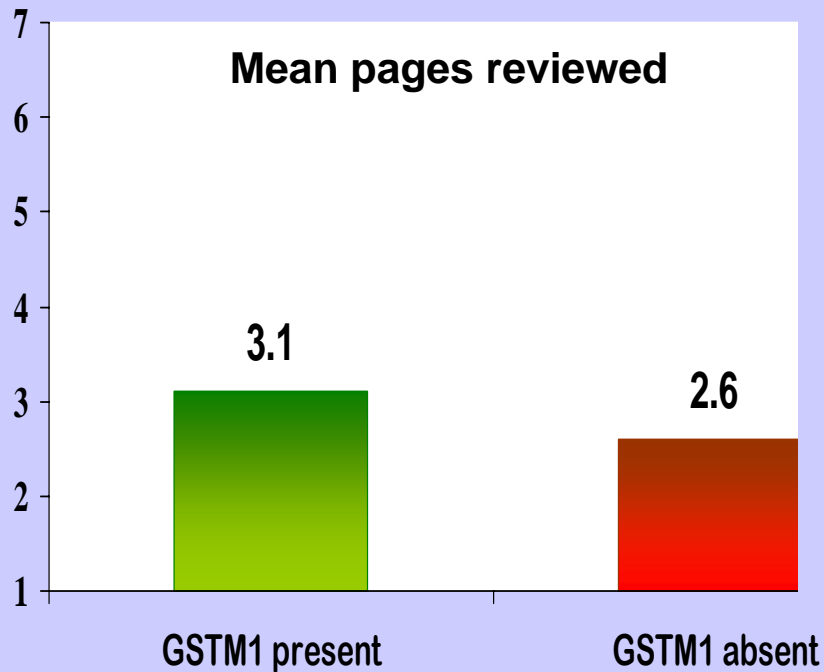
* $p < .05$. ** $p < .01$.

Interpretation of test results

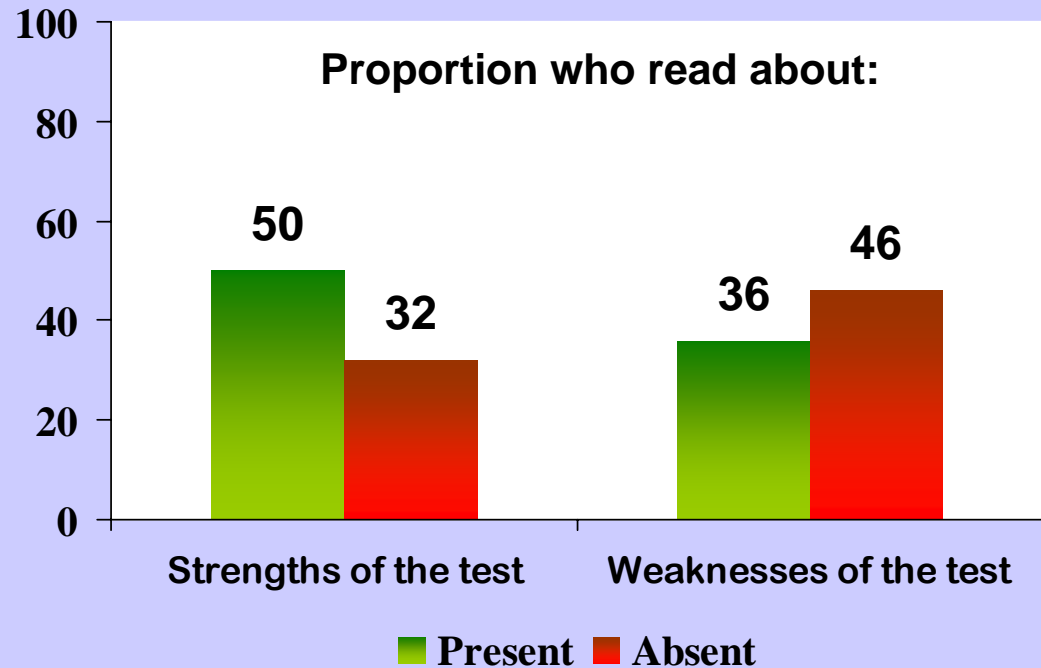


Review of test information by result

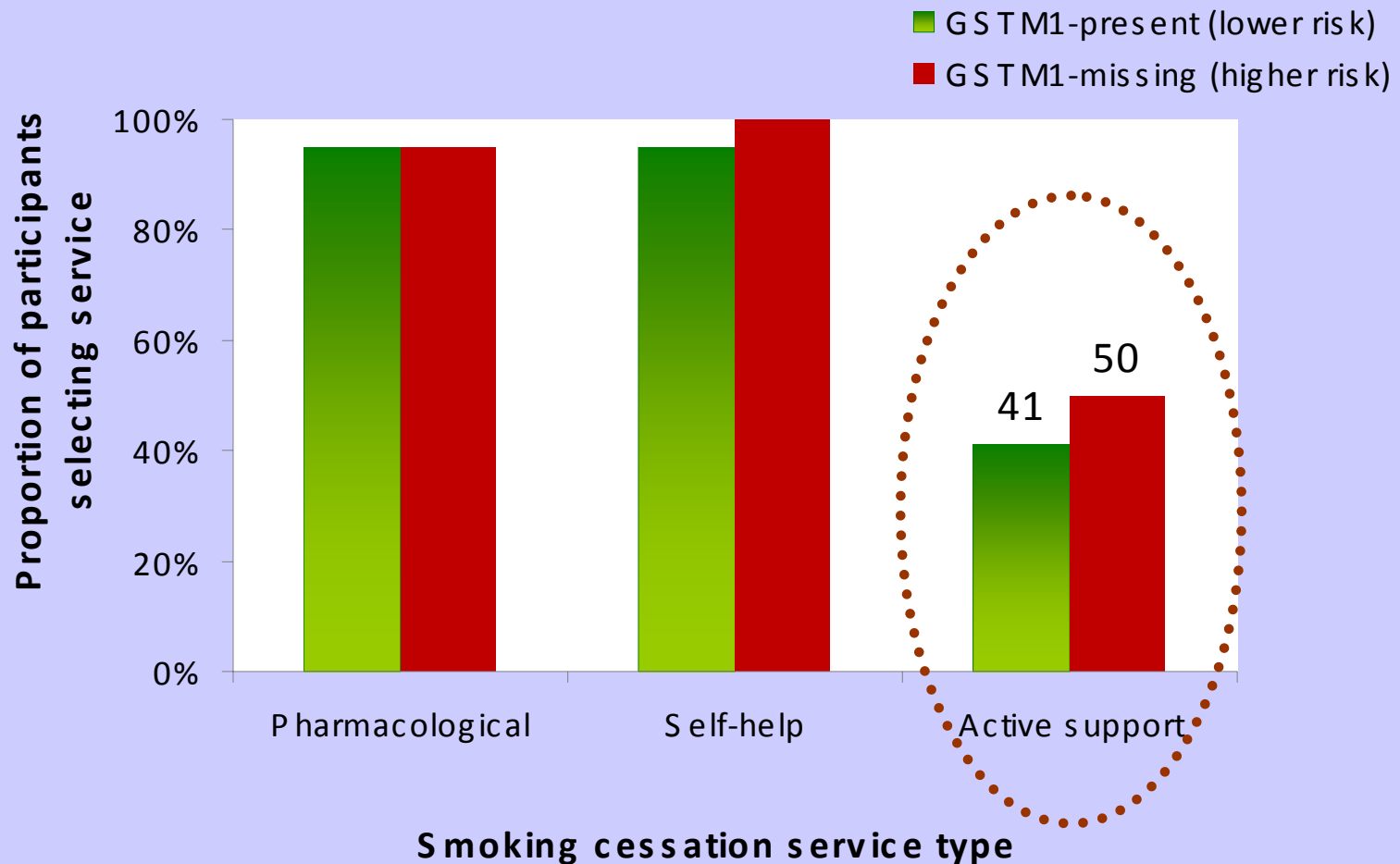
Mean pages reviewed



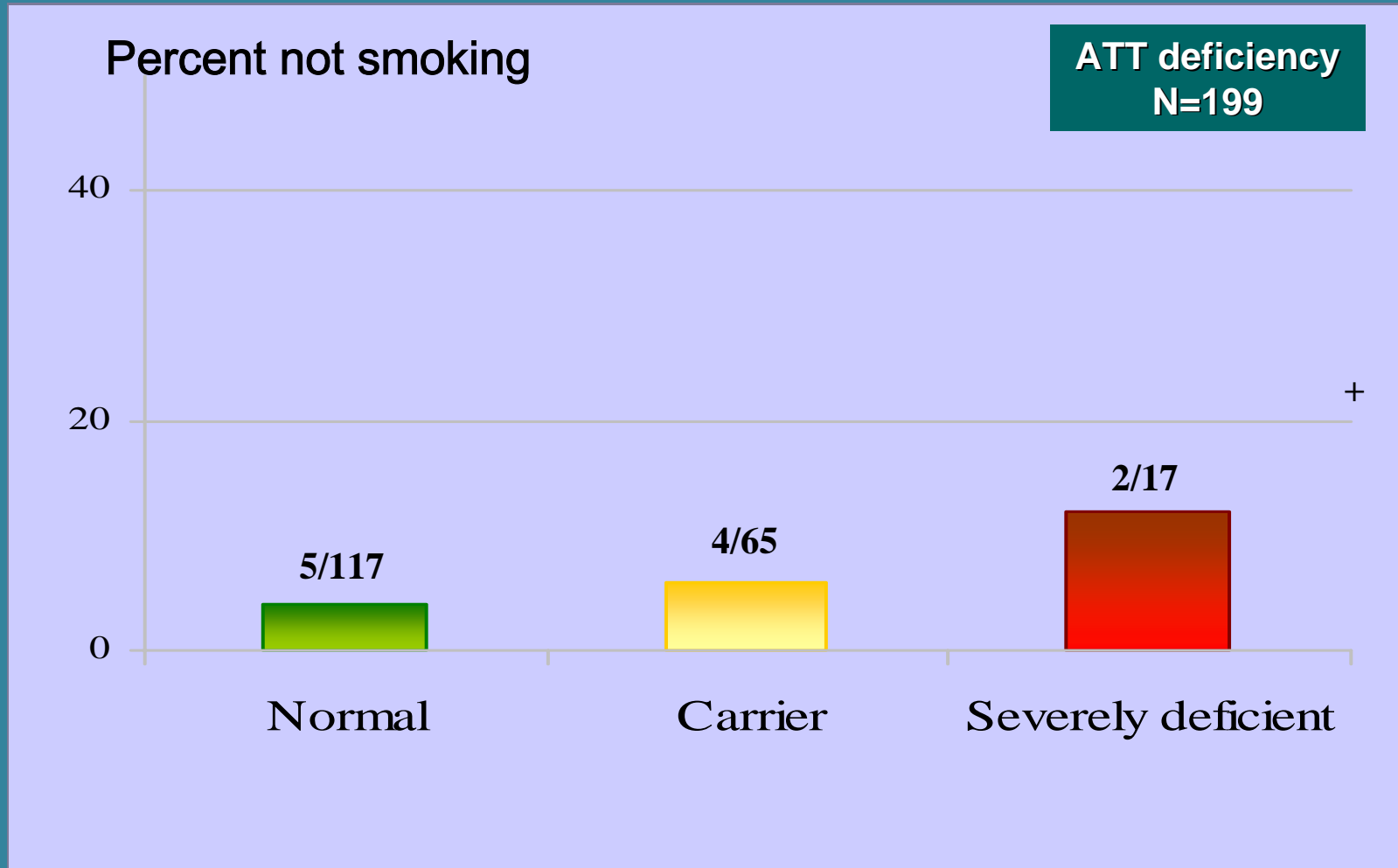
Proportion who read about:



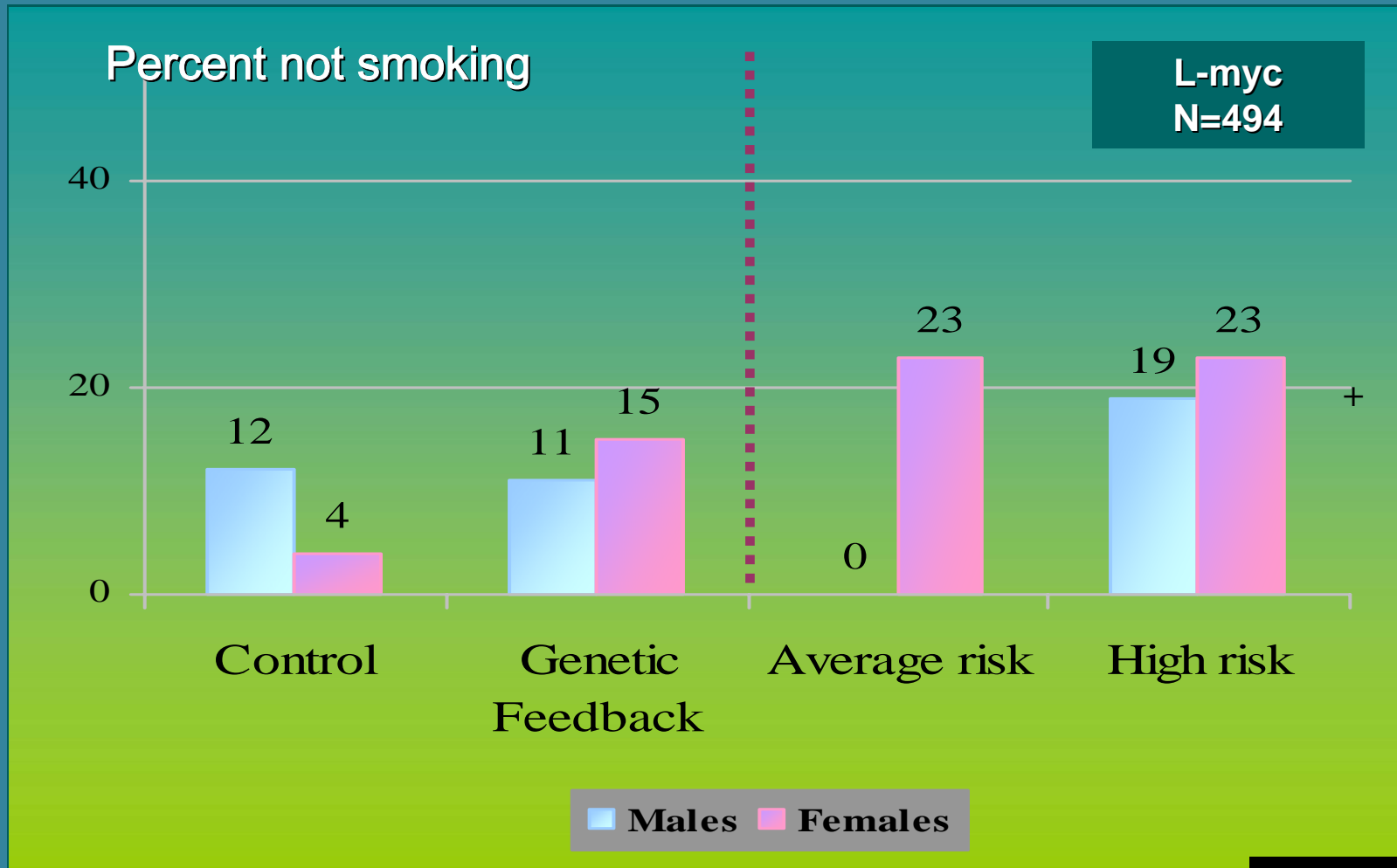
Uptake of offered cessation services



Genetic feedback effects on smoking cessation



Genetic feedback effects on smoking cessation



Ito et al., 2006

NATIONAL HUMAN GENOME RESEARCH INSTITUTE

Division of Intramural Research

Combined effect of genetic variants

	<u>Marker</u>	<u>Function</u>
Type 2 Diabetes	PPAR gamma KCNJ11 TCF7L2	Fat cell development Insulin regulation
Myeloid leukemia	CYP1A1 CYP1B1	Phase I enzymes activating environmental carcinogens

Weedon et al., 2006; Vineis et al., 2007

Preemptive

THE U.S. SURGEON GENERAL'S FAMILY HISTORY INITIATIVE

BEFORE YOU START

Gathering What You Need To Create Your Own Family Health Portrait



Knowing your family's health history can save your life and the lives of those you love.

Tracing the illnesses suffered by your parents, grandparents, and your doctor predict the disorders to which you may be susceptible. This information can help you and your family healthy. To help you organize your family health history, the U.S. Surgeon General has developed an online tool called My Family Health Portrait, which is available at <https://familyhistory.hhs.gov>.

Before you start using this tool, you will need to talk to your family members to gather more details about their health histories. It is important to plan and conduct those important conversations.

Getting Ready

Make a list of relatives.

Write down the names of the blood relatives that you know. The most important relatives to talk to are your parents and your children. Next should be grandparents, uncles, aunts, half-brothers or half-sisters. It is also helpful to include cousins.

Prepare your questions.

Write out your questions ahead of time because it will be easier to ask them.

Among the questions to ask are:

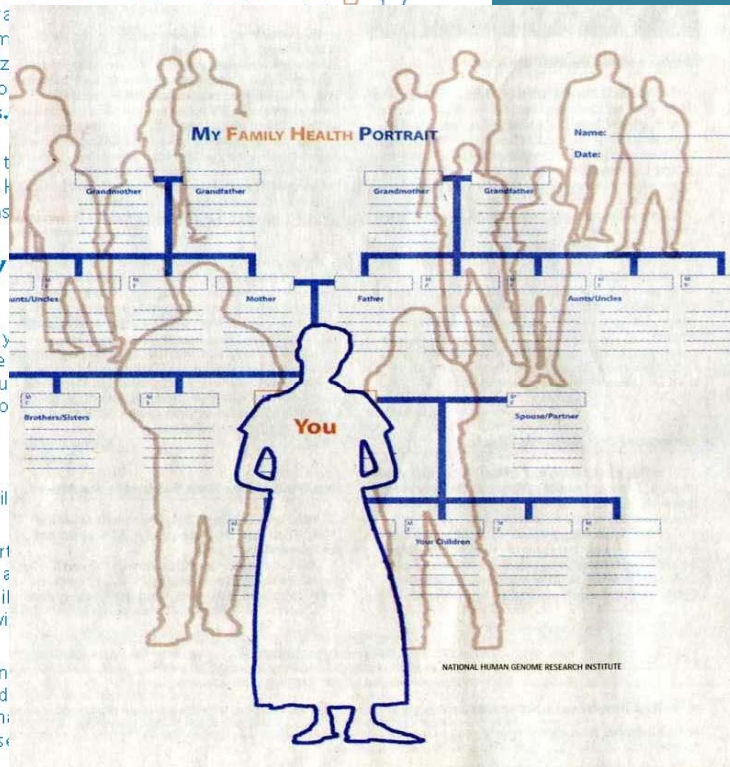
- Do you have any chronic illnesses, such as heart disease, diabetes, or high blood pressure?
- Have you had any other serious illnesses, such as cancer, stroke, or Alzheimer's disease?
- How old were you when you developed these illnesses?
- Have you or your partner had any difficulties with pregnancy or childbirth?
- What medications are you currently taking?

Also ask questions about other relatives, both living and deceased.

- What is our family's ancestry - what country did we come from?
- Did anyone in our family have learning or developmental disabilities? When did they die? How old were they when they died? What caused their death?

Find a good time to talk.

Consider talking with your relatives when your family is together in a relaxed setting. A good time may be at reunions, cookouts or holidays, such as Thanksgiving. If it's not possible to talk to your relatives in person, you can also talk with them over the telephone, or send them questions by mail or e-mail.



Family History Assessment

Clinical Integration

Counseling

- Tobacco cessation
- Physical activity
- Lap/shoulder belt
- Bike/motorcycle helmet use
- Problem drinking
- Driving while intoxicated
- Limit fat & cholesterol
- Adequate calcium intake
- STD prevention
- Contraception
- Smoke detector
- Safe storage of firearms
- Visits to dental providers
- Floss

Screening

- Blood pressure
- Pap test
- Mammogram
- CBE
- Height & Weight
- Total blood cho
- FOBT
- Sigmoidoscopy
- Problem drinkin
- Rubella serolog
- Vision screening
- Asses for hearing impairment

Chemoprevention

- Multivitamin use
- Hormone prophylaxis

- **Family history taking**
- **Counseling re: genetic testing & interpretation of results**
- **Arranging referral**

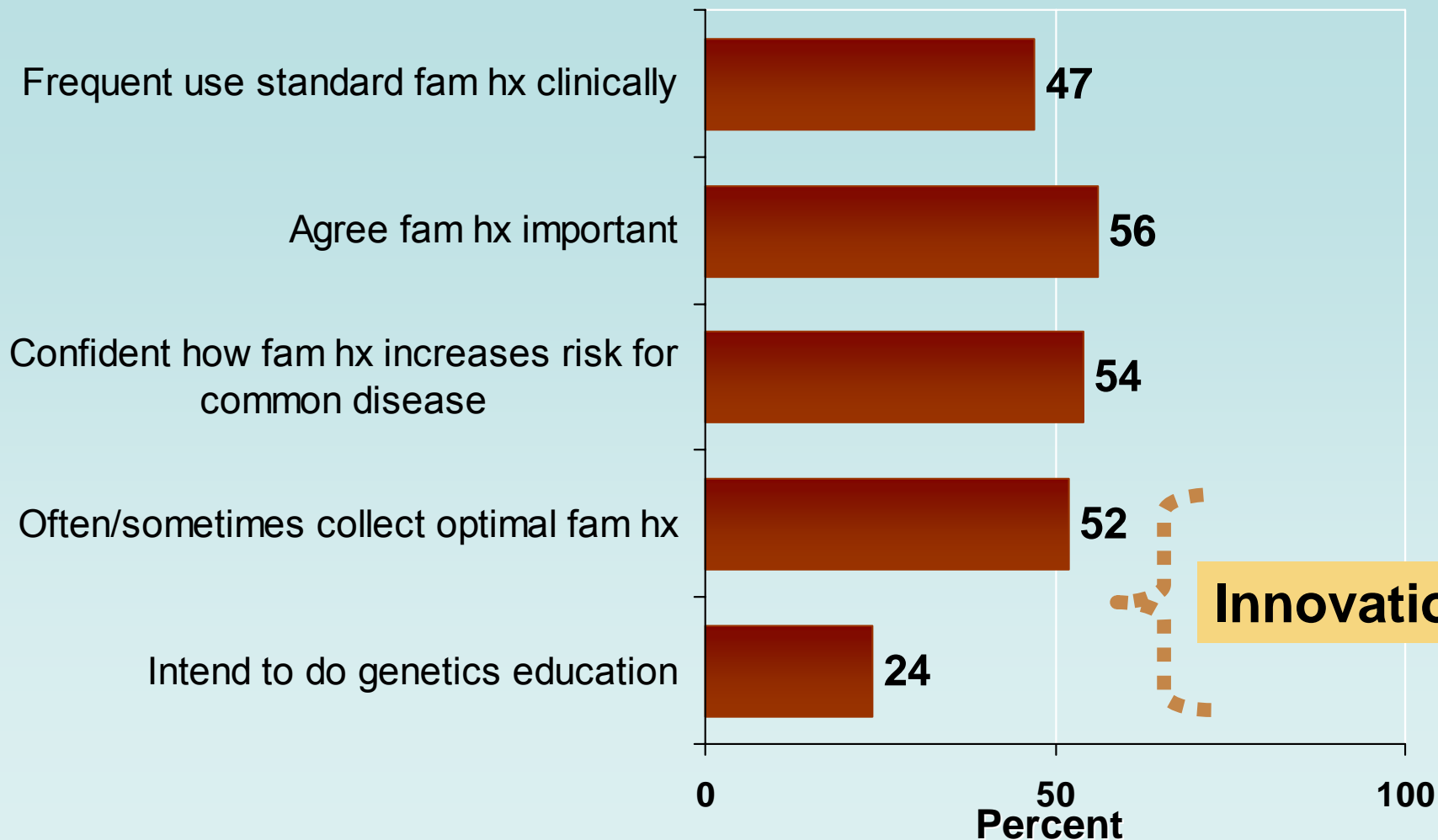
Total hours per day

7.4

Yarnall et al, AJPH, 2003

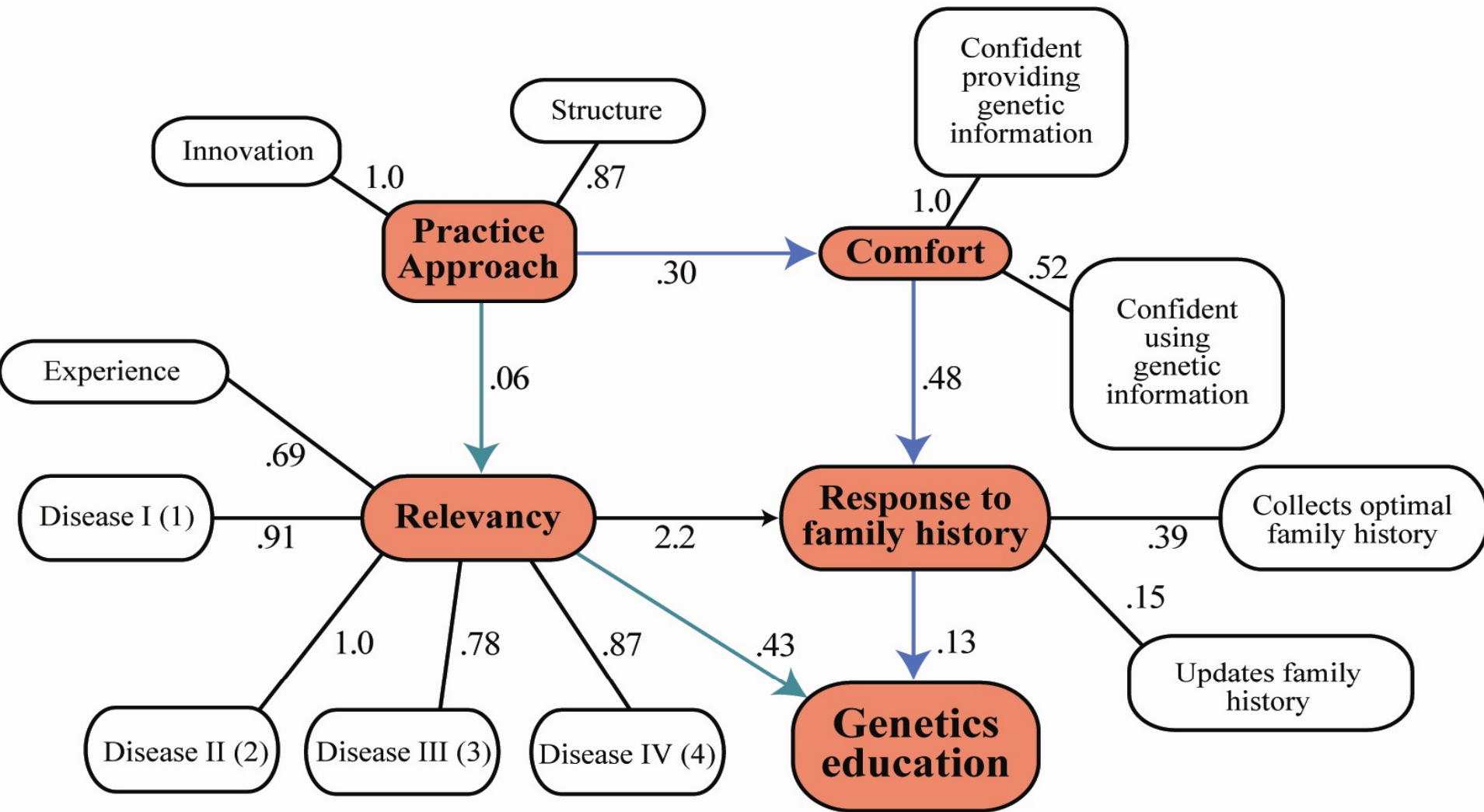
Division of Intramural Research

Family Physicians' Views (N=1042)



Innovations

Figure 2: Structural Model to Predict Uptake of Genetics Education



Disease I=liver, lung, and cervical cancer
 Disease II=breast, colon, and ovarian cancer
 Disease III= addiction, Alzheimer's, asthma, and biopolar disorder
 Disease IV=coronary heart disease, diabetes, obesity, and stroke

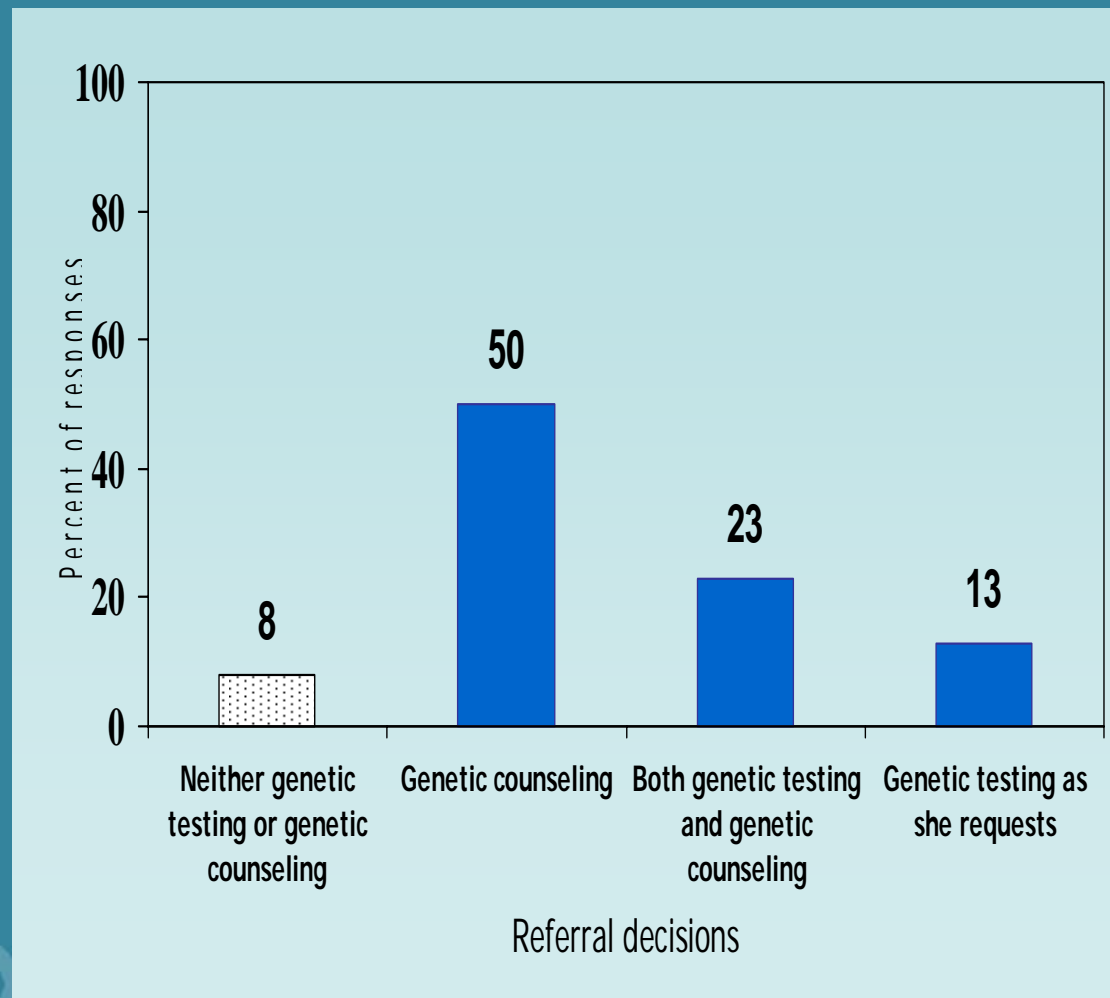
Pathway 1 ←

Pathway 2 ←

Too Many Referrals of Low-risk Women for BRCA1/2 Genetic Services by Family Physicians?

White et al., *Cancer Epi & Biomarkers* under review

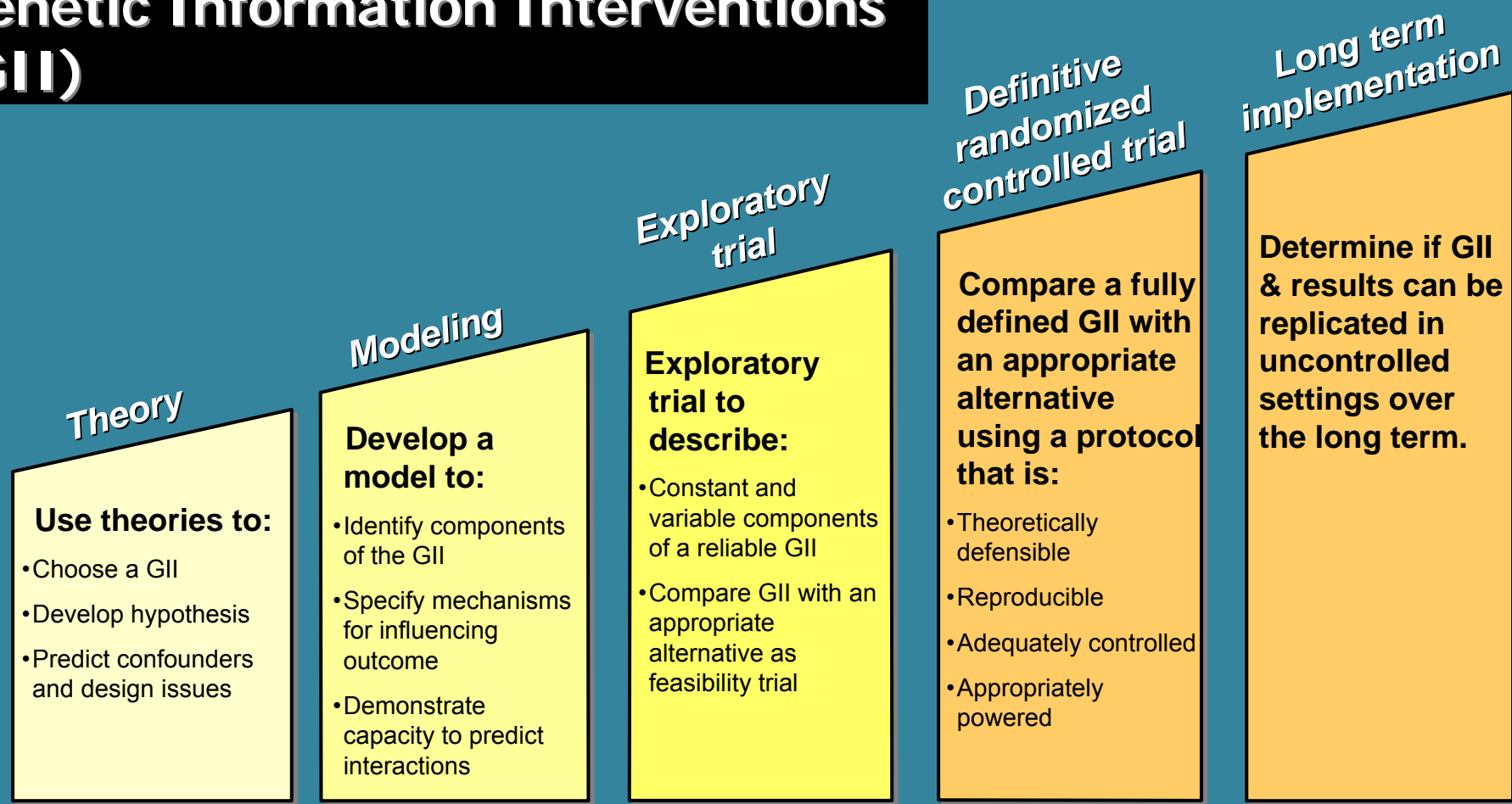
- **2x2x2 Factorial Design**
- **Terry presents:**
 - White vs. black
 - High worry vs. Not high
 - Insured vs. not mentioned
- **Terry is not appropriate for referral**



Immediate challenges to take on.....

- ❖ Attracting social, behavioral, public health scientists to the field
- ❖ Openness to returning test results in the context of research protocols
- ❖ Test prototypes for research
- ❖ Increasing rigor of science in social & behavioral science related to genomics

Phased Research Agenda for Genetic Information Interventions (GII)



Preparation

Phase I

Phase II

Phase III

Phase IV



Continuum of increasing evidence for the Genetic Information Interventions

Translators...

- Bench science sets priorities
- Interpret & disseminate discoveries
- Passive role

Trail-blazers...

- Actively participate in directing research priorities
- Anticipate clinical & behavioral challenges