

Improving population health through cancer prevention

We already know how to prevent most cancer.

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Disclosures

No Relevant Financial Relationships with Commercial
Interests

Learning objectives

Goal

- Improve population health through greater awareness and use of prevention strategies against cancer

Objective

- At the end of this activity, the participant will identify evidence-based prevention strategies for cancer prevention
- Recognize barriers to implementing prevention and
- Change practice to advance cancer prevention

Return to Hopkins is always exciting

At the end of last month I had the opportunity to retitle my talk:

- “Plan A” should be prevention and early detection
- “Plan B” (therapy for advanced cancers) should be necessary only when plan A fails
- But we need to implement Plan A!

Implementing Plan A:

“To make it viable we need government and philanthropic organizations to dedicate much greater fraction of resources to this cause, with long term consideration in mind.”

- Vogelstein Science 2013

A growing population, or preventing cancer will not put anyone in the room out of a job

Today: 315,6310,054 (April 7, 2013)

- 1 birth every 8 sec
- 1 immigrant (net) every 39 sec
- 1 death every 13 sec

Net increase 1 person every 14 sec

- www.census.gov/population

Aging US population

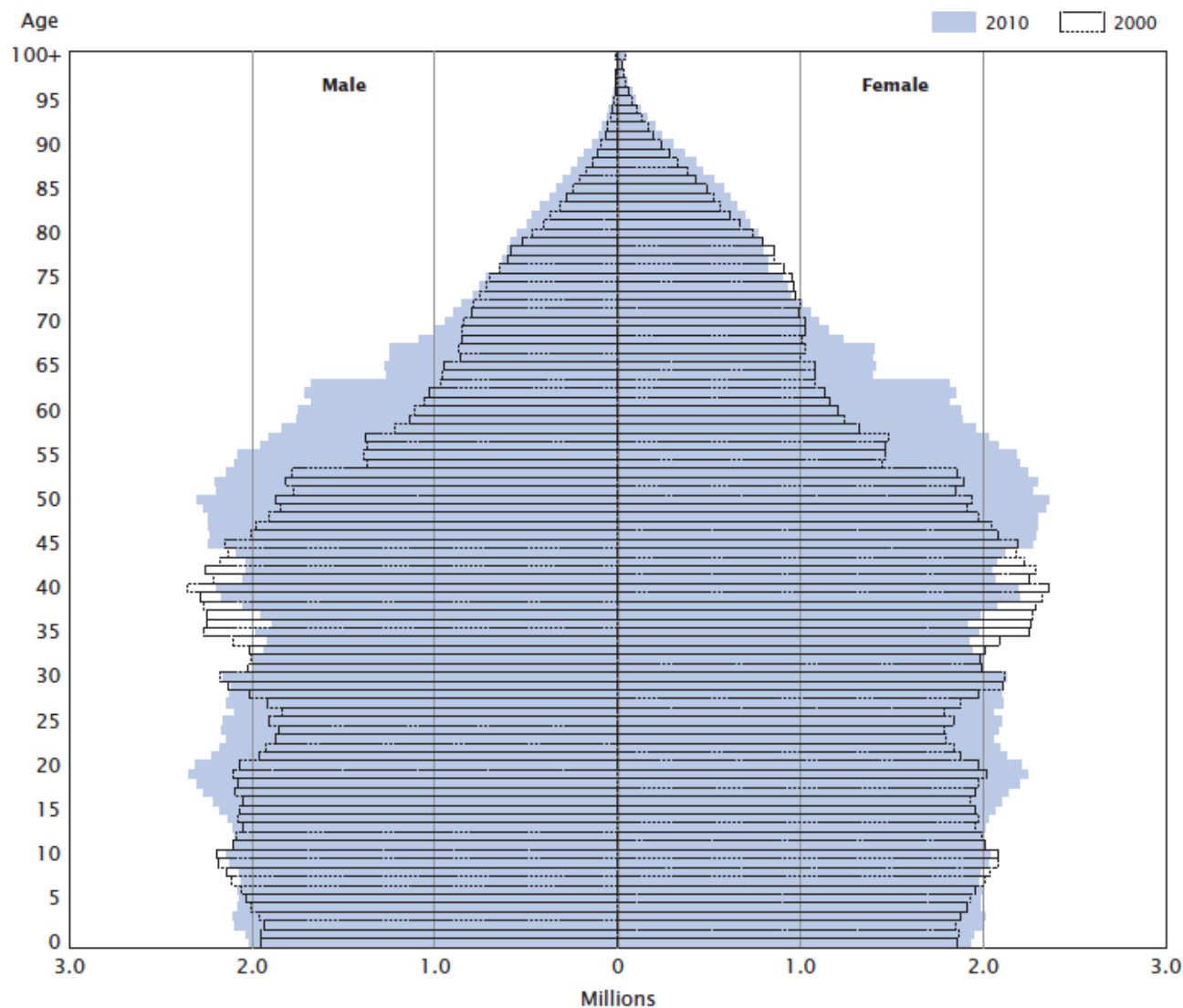
Over 65 rising from 13% in 2012 to more than 20% of pop. in 2050

Cancer burden

- Assume incidence per 100,000 holds steady at each age
- Number of new cancer cases will double by 2050 simply due to aging population

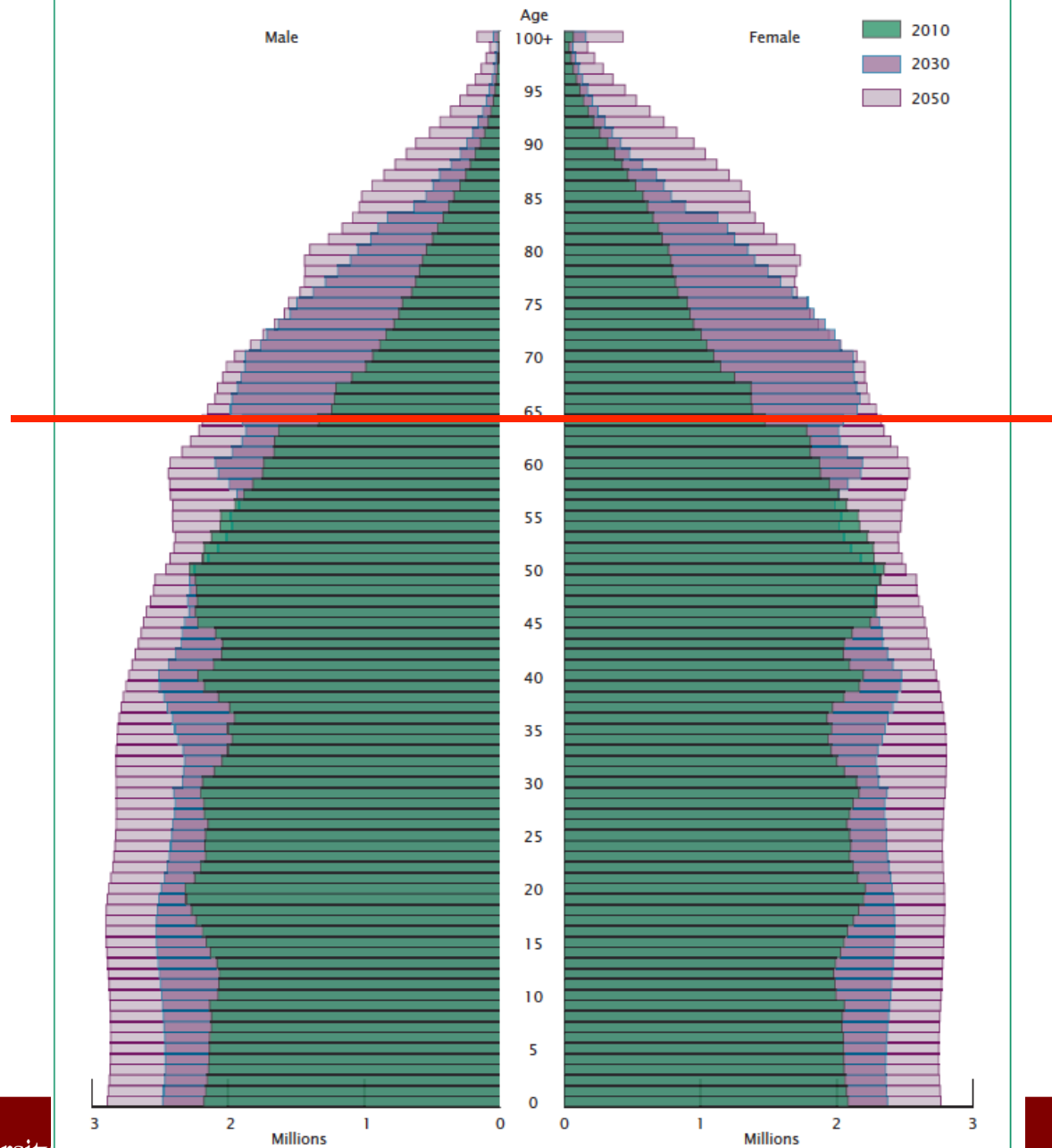
Figure 2.
Population by Age and Sex: 2000 and 2010

(For information on confidentiality protection, nonsampling error, and definitions, see www.census.gov/prod/cen2010/doc/sf1.pdf)

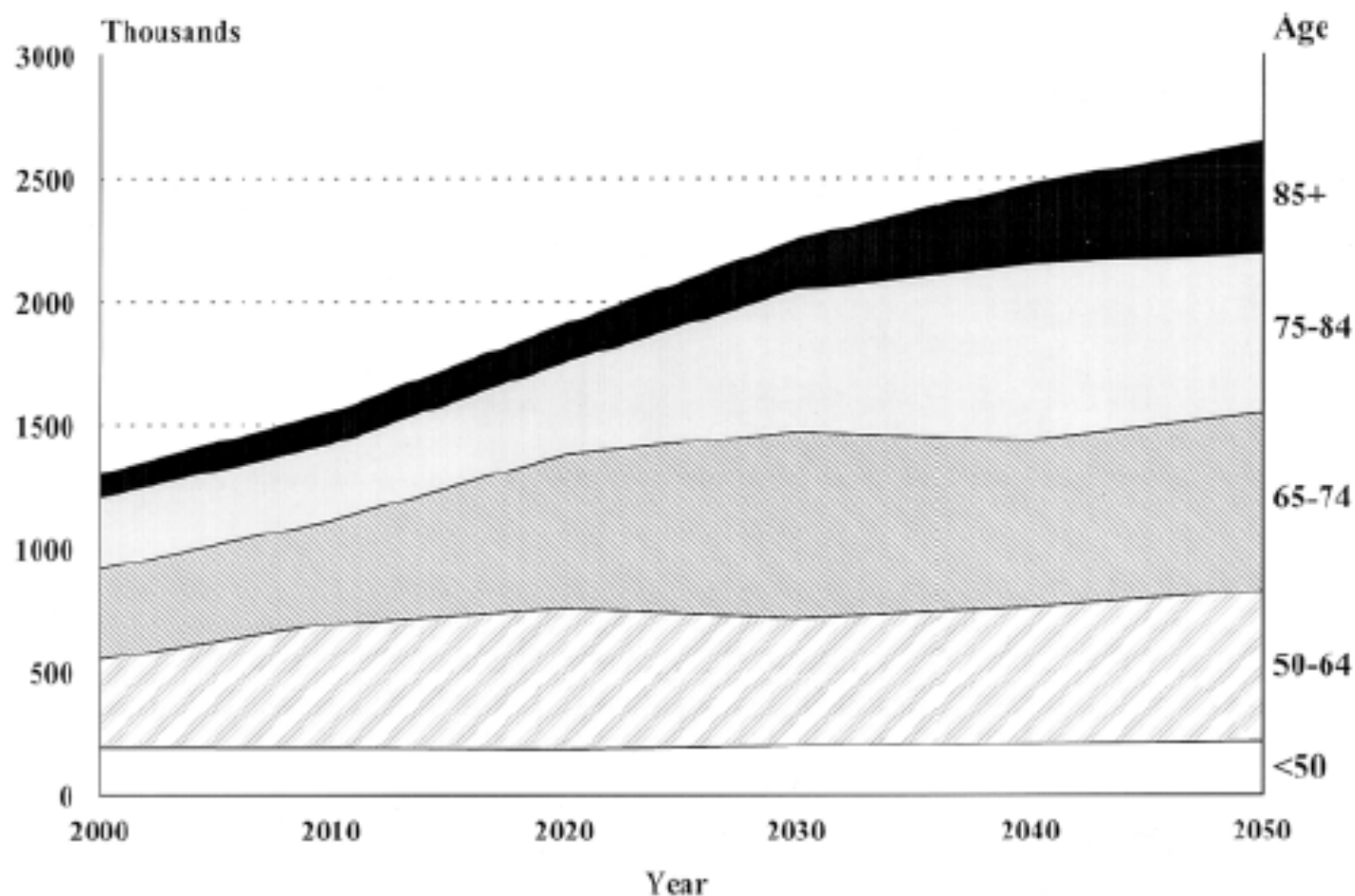


Sources: U.S. Census Bureau, *Census 2000 Summary File 1* and *2010 Census Summary File 1*.

Figure 1.
Age and Sex Structure of the Population for the United States: 2010, 2030, and 2050



Projected number of cases, USA



Edwards, et al. Cancer 2002

New cases, women: 2012

Cancer	New Cases	
Breast	226,870	51.5%
Lung	109,690	
Colorectal	70,140	
Uterus	47,130	
Lymphoma	36,070	
Thyroid	43,210	
Melanoma	32,000	
Kidney	24,520	
Ovary	22,280	
TOTAL	790,740	

Cancer Facts and Figures, 2012

Why are we not preventing cancer now?

Multiple barriers:

- Skepticism that cancer can be prevented
- Short term focus of cancer research
- Interventions deployed too late in life
- Research focused on treatment not prevention
- Debates among scientists
- Societal factors ignored
- Lack of transdisciplinary training
- Complexity of implementation

Colditz et al Sci Transl Med 2012: March 28

Overcoming obstacles of skepticism and time frame

- Must counter skepticism that cancer can be prevented
 - Goals of prevention: risk marker, premalignant lesion, invasive disease, death
 - Avoid exposure vs. remove later in life
 - Can we intervene if we don't have the pathway defined?
- Take into account time frame of cancer development

Long history of prevention

- Pott P, SCC scrotum described in chimney sweeps based on clinic experience 1775
 - Chimney Sweeper's act of 1788 passed by Parliament preventing employment of children under 8; age then increased until 1875 use of young climbing boys forbidden
- Cook J. Capt. 1768 -1780
 - 3 voyages, 3 men lost to scurvy cf standard 50%
 - British navy adopted citrus in 1795
- Given this type of evidence why do we still take so long to get from discovery to delivery?

Complexity of prevention

- Success requires more than a “finite medical intervention” to achieve prevention in the broader community and improve population health
- Interplay of individual behavior, social circumstances, behavior, genetics, and health care system

What Potentially Influences Cancer?

Genetic factors

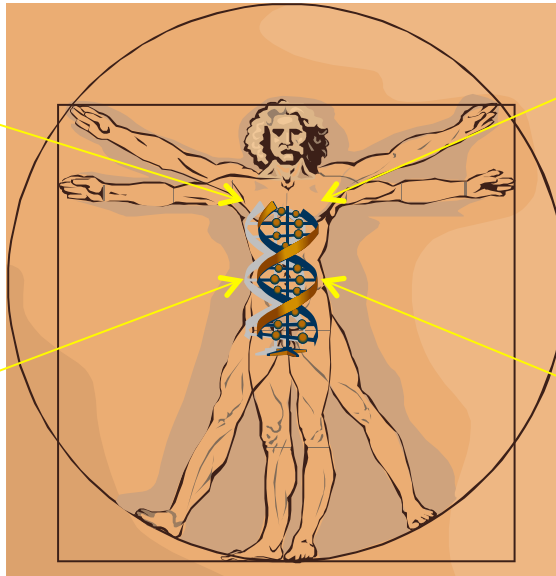
telomere length
Inherited mutations
sporadic mutations

Macro-level factors

crime
poverty
availability of services

Individual-level factors

diet
health behaviors



Demographic factors

age
gender
ancestry

Complexity of implementing prevention

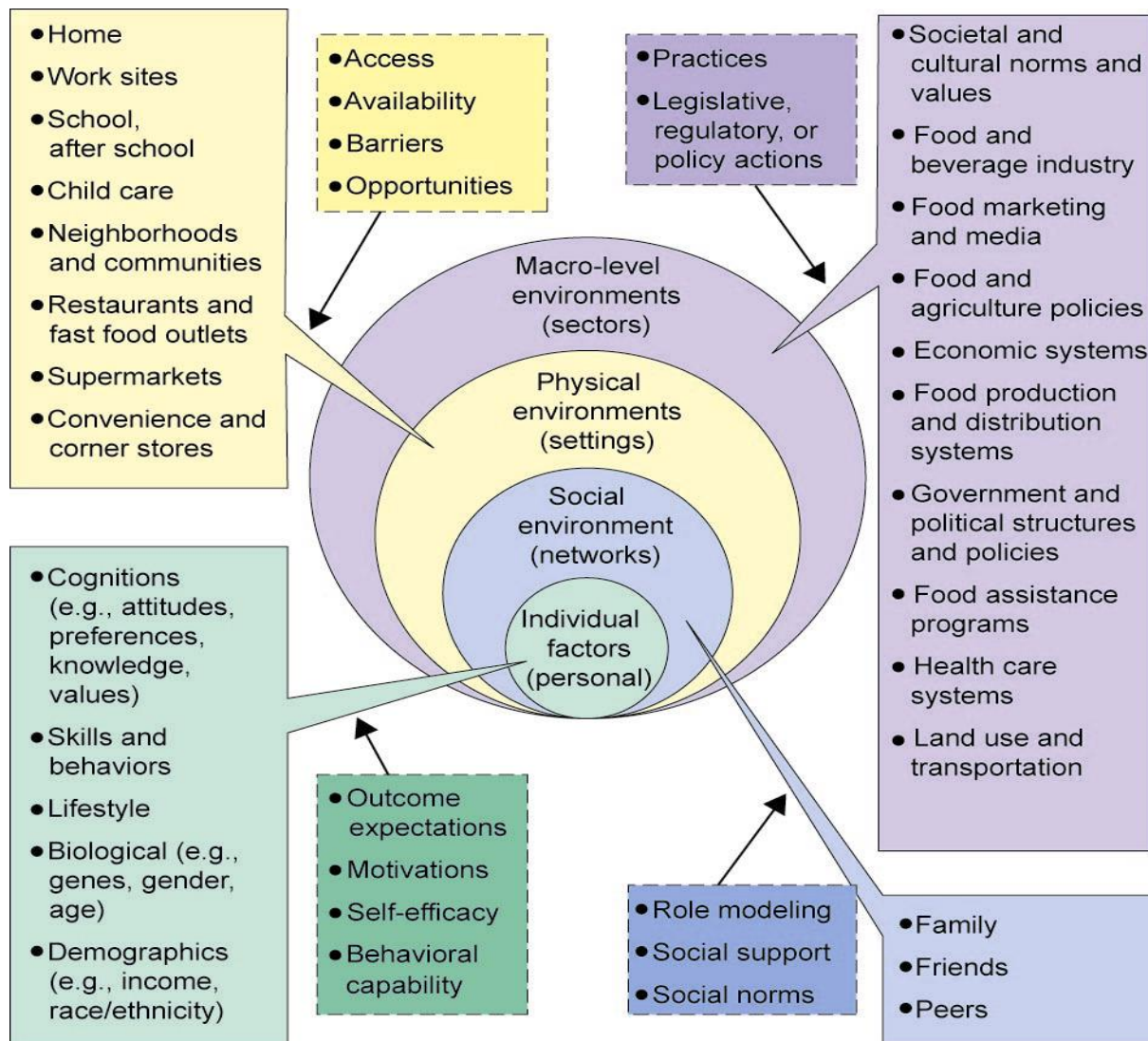
“MANY problems are so complex that even if we had the money to fix them, we wouldn’t know how to do it.”

“But some problems are frustrating in another way: we know how to fix them and we can afford to fix them, but we drop the ball.”

- Richard Thaler, Shifting our retirement savings into automatic.
New York Times April 6, 2013

The New York Times

Sunday, April 7, 2013 Last Update: 7:20 AM ET



AR Story M, et al. 2008.
 Annu. Rev. Public Health. 29:253–72

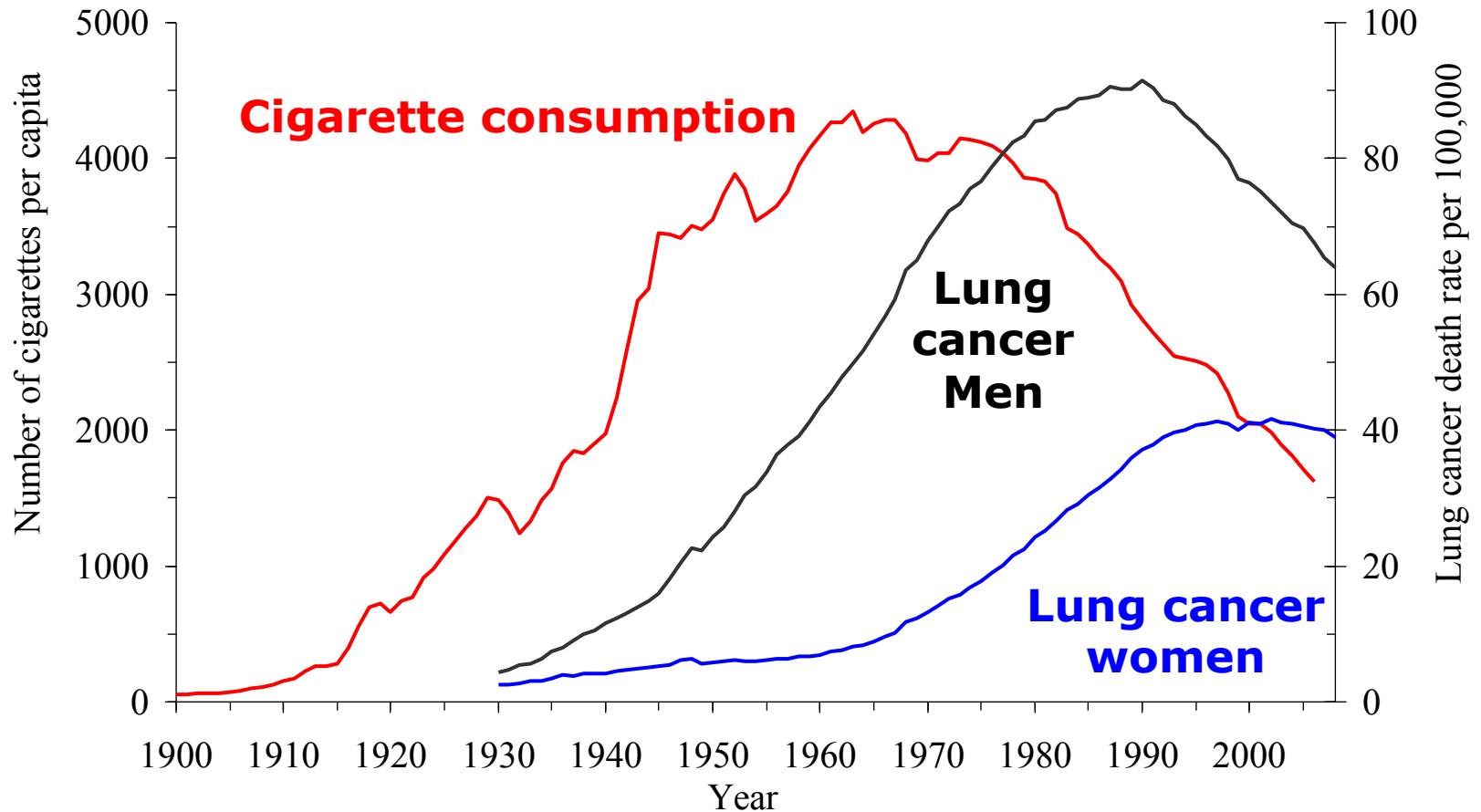
Annual Reviews

Public health benefits

1. Lie in the future
2. Beneficiaries generally unknown
3. Public has no idea what public health programs do. Thus, when people benefit from prevention they don't recognize they have been helped
4. Opposition to public health approaches that require societal change

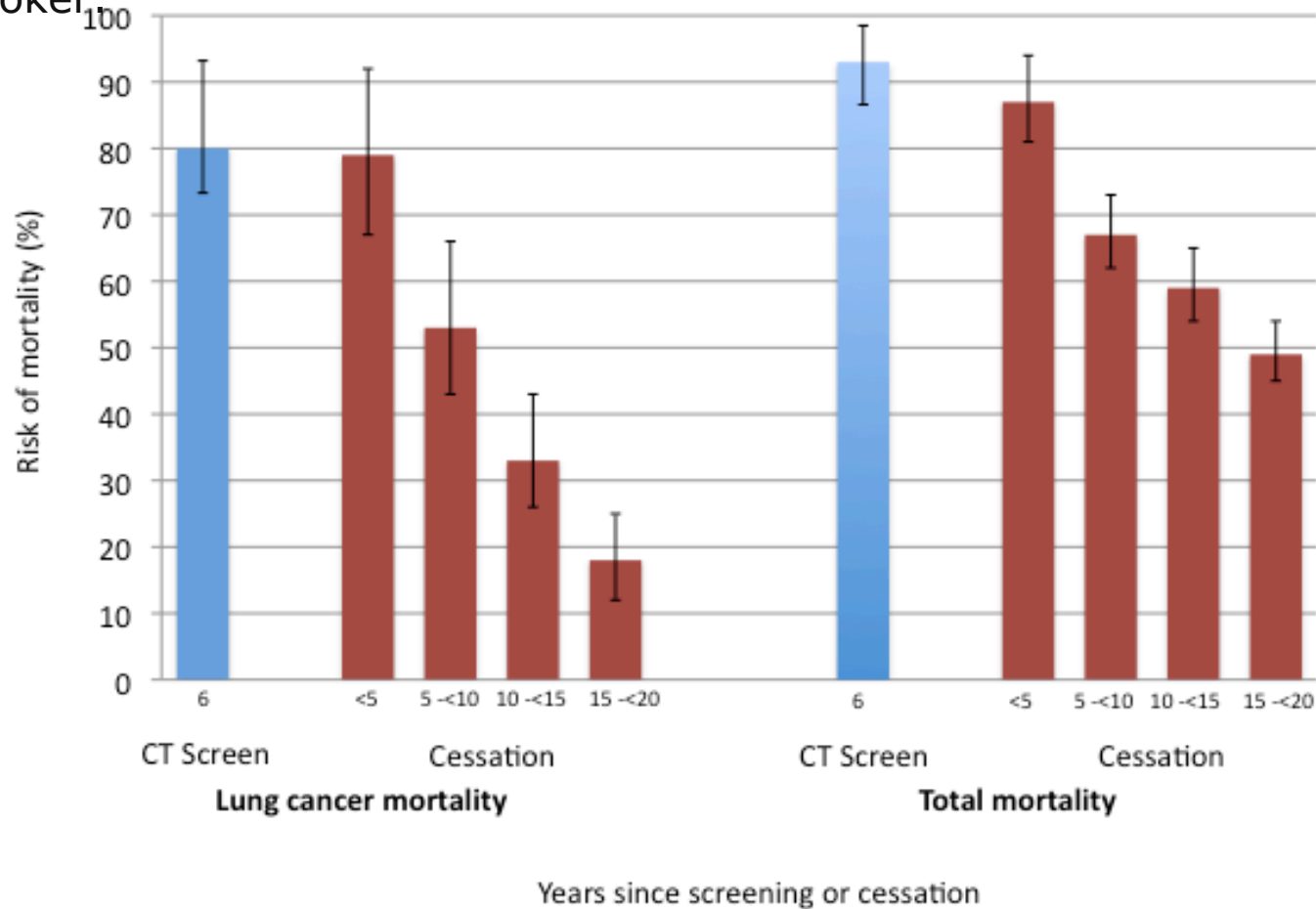
Hemenway D. Why we don't spend enough on public health. NEJM 2010

Trends in smoking and lung cancer, USA



Time course: lung & total mortality

Current smoker:
continuing



Sources: Kenfield et al, 2008; Aberle et al, 2011

Time frame for cancer development

- We look in the wrong places.. Under the lamp post
- End result intervention too late in life...

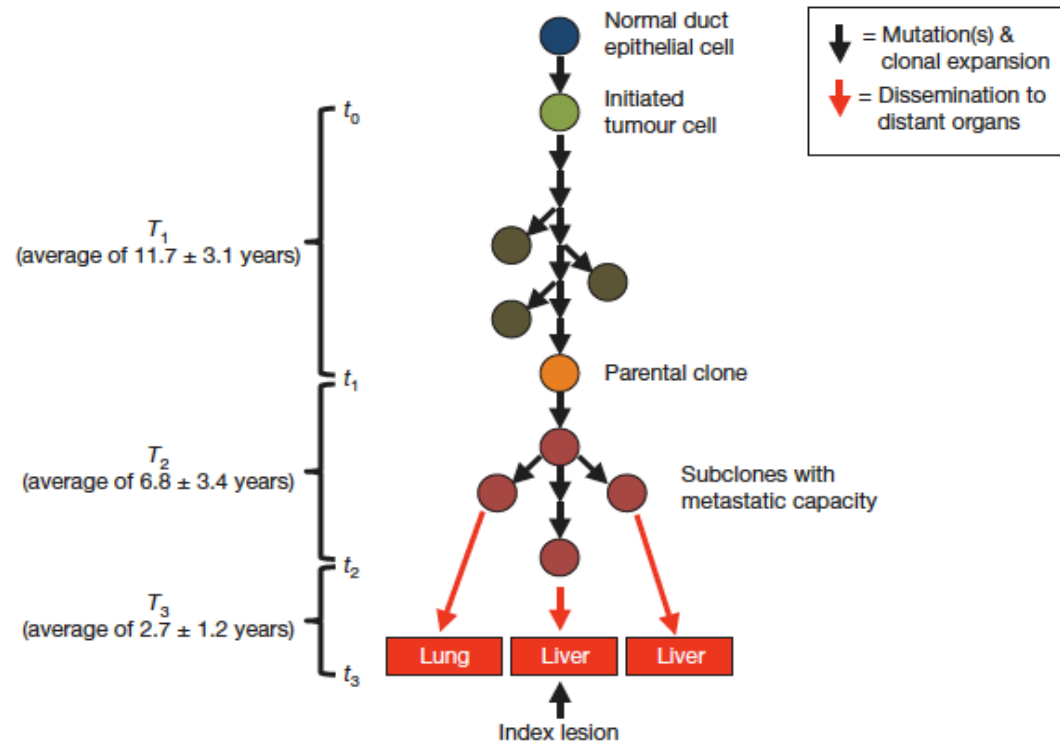


Figure 3 | Schema of the genetic evolution of pancreatic cancer.

Tumorigenesis begins with an initiating mutation in a normal cell that confers a selective growth advantage. Successive waves of clonal expansion occur in association with the acquisition of additional mutations, corresponding to the progression model of pancreatic intraepithelial neoplasia (PanIN) and time T_1 . One founder cell within a PanIN lesion will seed the parental clone and hence initiate an infiltrating carcinoma (end of T_1 and beginning of T_2). Eventually,

the cell that will give rise to the index lesion will appear (end of T_2 and beginning of T_3). Unfortunately, most patients are not diagnosed until well into time interval T_3 when cells of these metastatic subclones have already escaped the pancreas and started to grow within distant organs. The average time for intervals T_1 , T_2 and T_3 for all seven patients is indicated in the parentheses at left (see also Supplementary Table 6).

Lifestyle: high income countries

Cause	% cancer caused	Magnitude possible reduction	Time (yrs)
Smoking	33		
Overweight/obesity	20		
Diet	5		
Lack of exercise	5		
Occupation	5		
Viruses	5-7		
Family history	5		
Alcohol	3		
UV/ionizing radiation	2		
Reproductive	3		
Pollution	2		

Lifestyle: high income countries

Cause	% cancer caused	Magnitude possible reduction	Time (yrs)
Smoking	33	75%	
Overweight/obesity	20	50%	
Diet	5	50%	
Lack of exercise	5	85%	
Occupation	5	50%	
Viruses	5-7	100%	
Family history	5	50%	
Alcohol	3	50%	
UV/ionizing radiation	2	50%	
Reproductive	3	0	
Pollution	2	0	

Tobacco control: population wide strategies

MPOWER

- **M**onitor tobacco use and prevention policies
- **P**rotect people from tobacco smoke
- **O**ffer help to quit tobacco use
- **W**arn about the dangers of tobacco
- **E**nforce bans on tobacco advertising, promotion, and sponsorship
- **R**aise taxes on tobacco

Implement Framework Convention on Tobacco Control

Lifestyle: high income countries

Cause	% cancer caused	Magnitude possible reduction	Time (yrs)
Smoking	33	75%	10-20
Overweight/obesity	20	50%	2-20
Diet	5	50%	5-20
Lack of exercise	5	85%	5-20
Occupation	5	50%	20-40
Viruses	5-7	100%	20-40
Family history	5	50%	2-10
Alcohol	3	50%	5-20
UV/ionizing radiation	2	50%	2-10
Reproductive	3	0	N/A
Pollution	2	0	N/A

Infections

- Helicobacter pylori
- HPV
- Hepatitis B
- Hepatitis C
- Epstein-Barr virus
- HTLV
- Human herpes virus 8
- *Schistosoma haematobium*
- *Opisthorchis viverrini*
- High income countries 7.4%
- Low and middle income countries 23% of cancer
- 2 million cases/yr (16%)
 - de Martel et al, Lancet Oncology, 2012

Medical interventions proven to prevent cancer

Intervention	Target	Magnitude of reduction	Time (yrs)
Aspirin	Colon mortality	40%	20+
SERMs	Breast incidence	40-50%	5+
Salpingo oophorectomy	Familial breast ca	50%	3+
Screening for colorectal ca	Colon ca mortality	30-40%	10
Viruses	Cervical ca incidence	50-100%	20+
	Liver ca incidence	70-100%	20+
Mammography	Breast ca mortality	30%	10-20
Serial CT lung	Lung ca mortality	20%	6+

Reducing colorectal cancer mortality

Massachusetts colorectal cancer work group formed in 1997

- Academic medical/public health centers
- State department of public health
- ACS (New England Region)
- Support from Mass Medical Society

Undertook broad range of education and outreach to providers and the public to facilitate CRC screening in primary care

Colorectal Cancer Screening and Prevention in Massachusetts (1994 – 2010)

Harvard Center for Cancer Prevention Activities

Mortality

Naishadham et al (2011): Colorectal cancer mortality in Massachusetts (link):

27.5
(per 100,000)

Research

Winawer et al: *Colorectal cancer screening: clinical guidelines and rationale* (link).

HCCP survey: *A Study of the Policies and Practices of Massachusetts Health Plans Regarding Coverage for Colorectal Cancer Screening.*

Research

Kavanagh et al: *Screening endoscopy and risk of colorectal cancer in United States men* (link).

Outreach

Colorectal Cancer report mailed to all health care providers in state (link).

1994

1997

1998

1999

Screening

Prevalence of ever having a sigmoidoscopy or colonoscopy (age 50+) in Massachusetts:

41%

Partnerships

Creation of Mass. Colorectal Cancer Working Group – Partnership of HCCP, state government, NGOs, health insurers, med centers, and universities.

Outreach

Screening & prevention pocket card developed and mailed to all primary care providers in state.

Recommendations

Harvard Report on Cancer Prevention (Vol 3): Prevention of Colon Cancer in the US (link).

Colorectal Cancer Screening and Prevention in Massachusetts (1994 – 2010)

Harvard Center for Cancer Prevention Activities

Outreach & Education

Screening & prevention brochures (6th grade reading level; in 8 languages) mailed to all primary care providers and available for bulk order:

You Can Prevent Colorectal Cancer (links: English, Spanish, Khmer, Russian)

Take Control: Get Screened for Colorectal Cancer (links: English, Spanish, Chinese, French)

Research

Wei et al (w/ HCCP, Dartmouth, ACS): *Study of targeted office systems in primary care to improve screening rates* (link).

Recommendations

HCCP/Mass Colorectal Cancer Working Group: *Colorectal Cancer – a risk management guide for health care professionals* (link).

2000

2001

2002

2003

Research

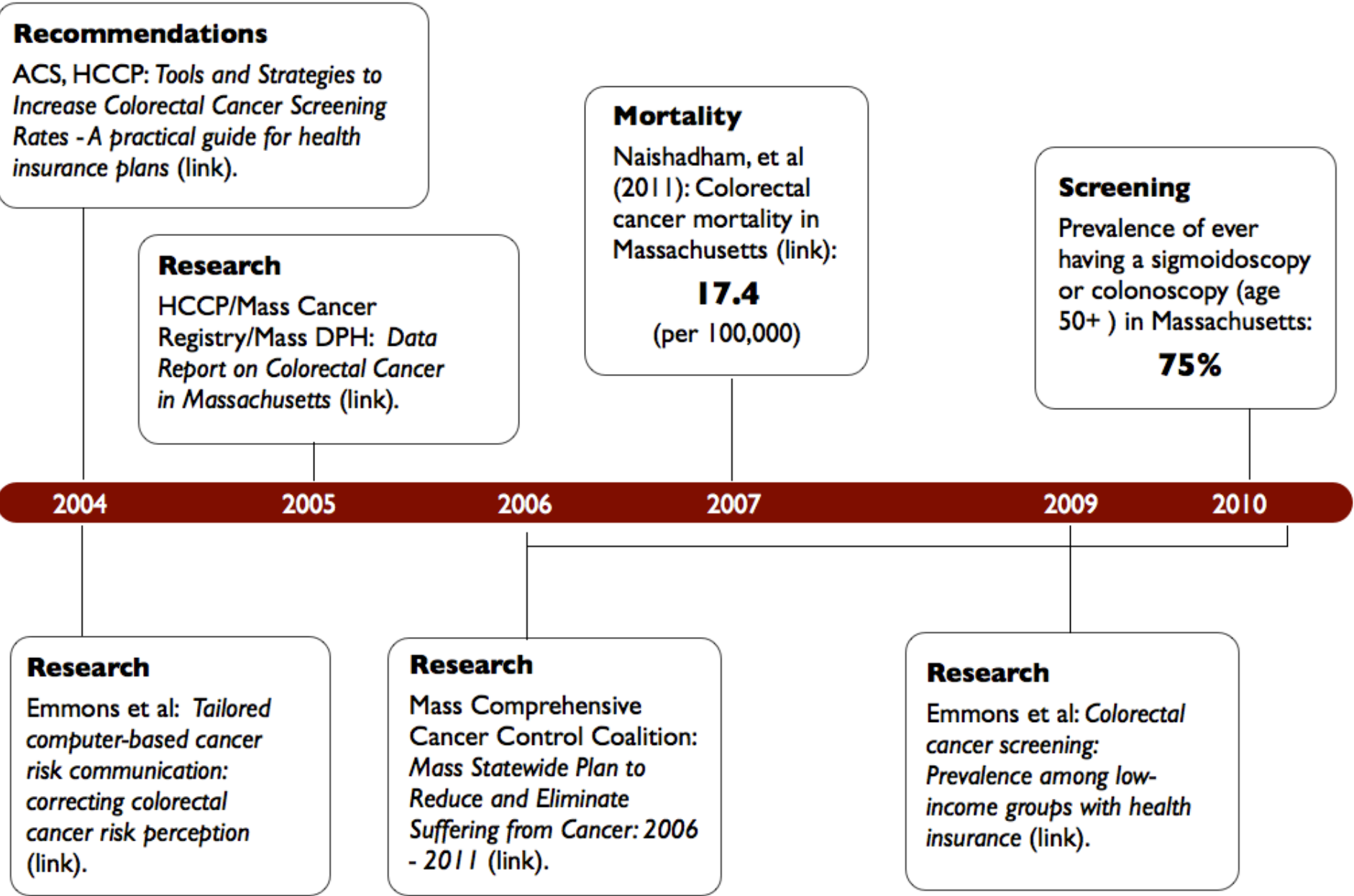
Frazier et al: *Cost-effectiveness of screening for colorectal cancer in the general population* (link).

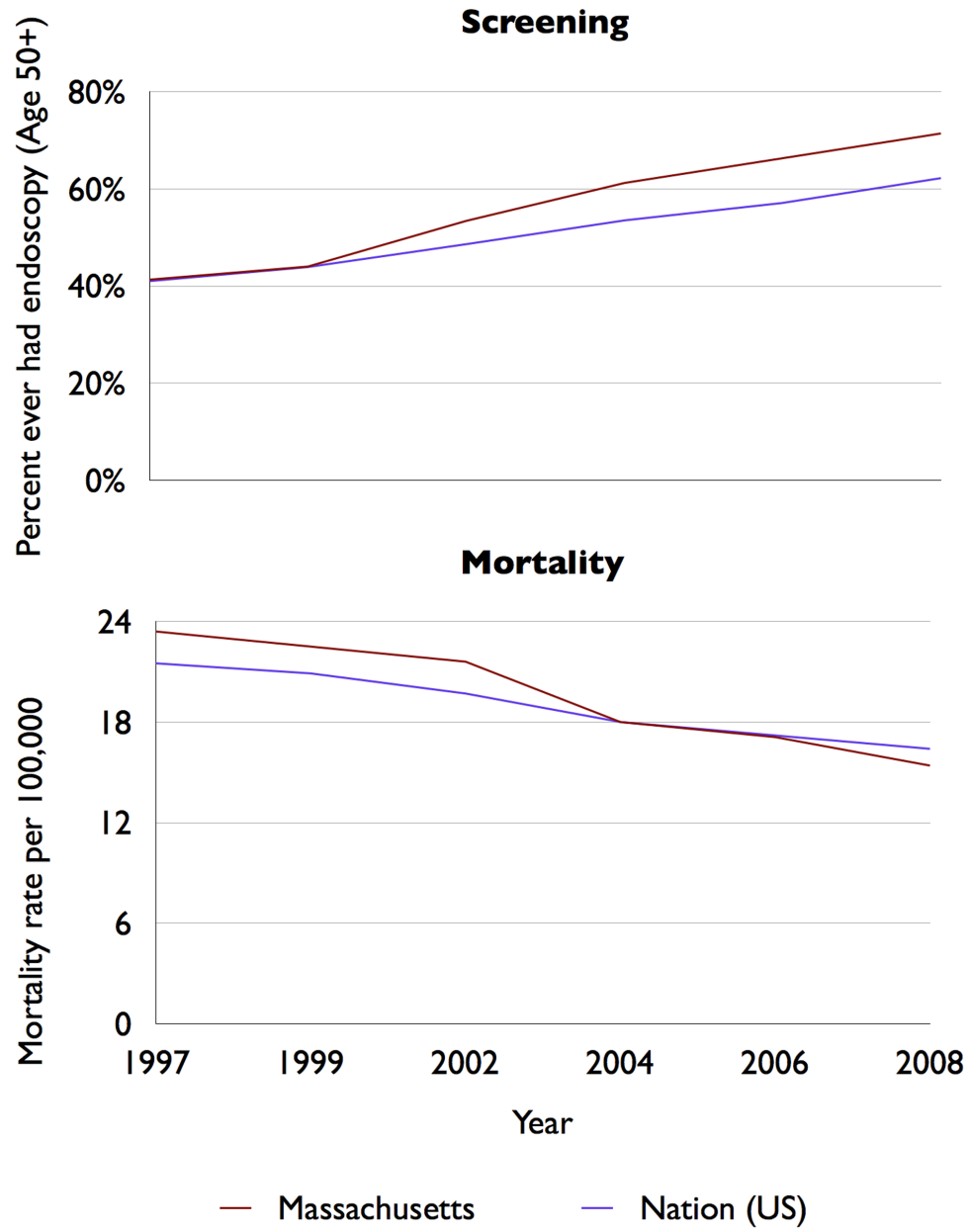
Outreach & Education

- ▶ ACS/HCCP hosted conferences for providers and legislators across state.
- ▶ Information and guidelines resource for health plans across state.
- ▶ City of Boston population wide mailing of cancer prevention brochure, with emphasis on low income neighborhoods.
- ▶ Western Massachusetts communication campaign.

Colorectal Cancer Screening and Prevention in Massachusetts (1994 – 2010)

Harvard Center for Cancer Prevention Activities



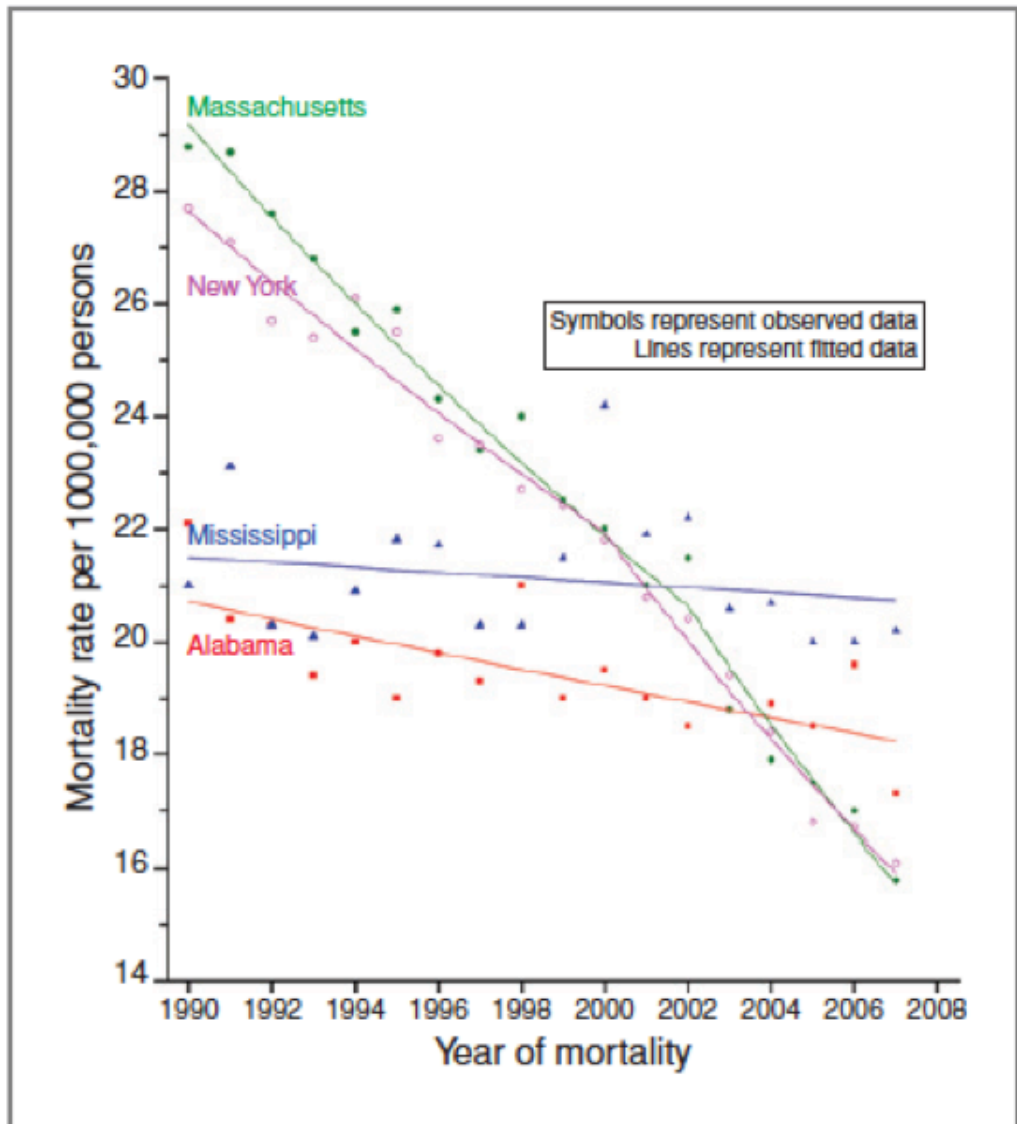


Sources:

National Vital Statistics System: State Cancer Profiles. Data accessed 2012

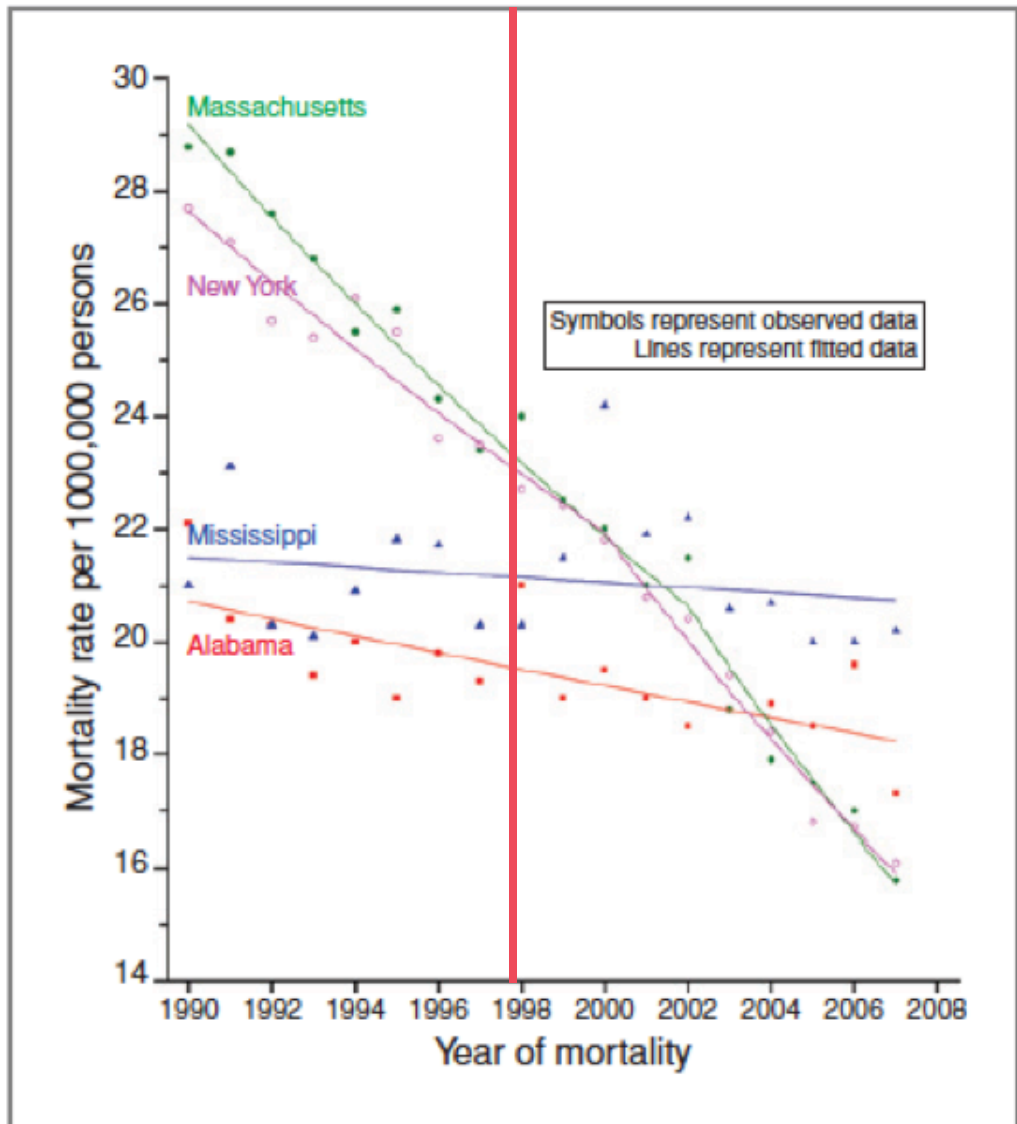
BRFSS: Prevalence and Trends Data accessed 2012

Trends: CRC mortality



Naishadham et al
CEBP 2011

Trends: CRC mortality



Naishadham et al
CEBP 2011

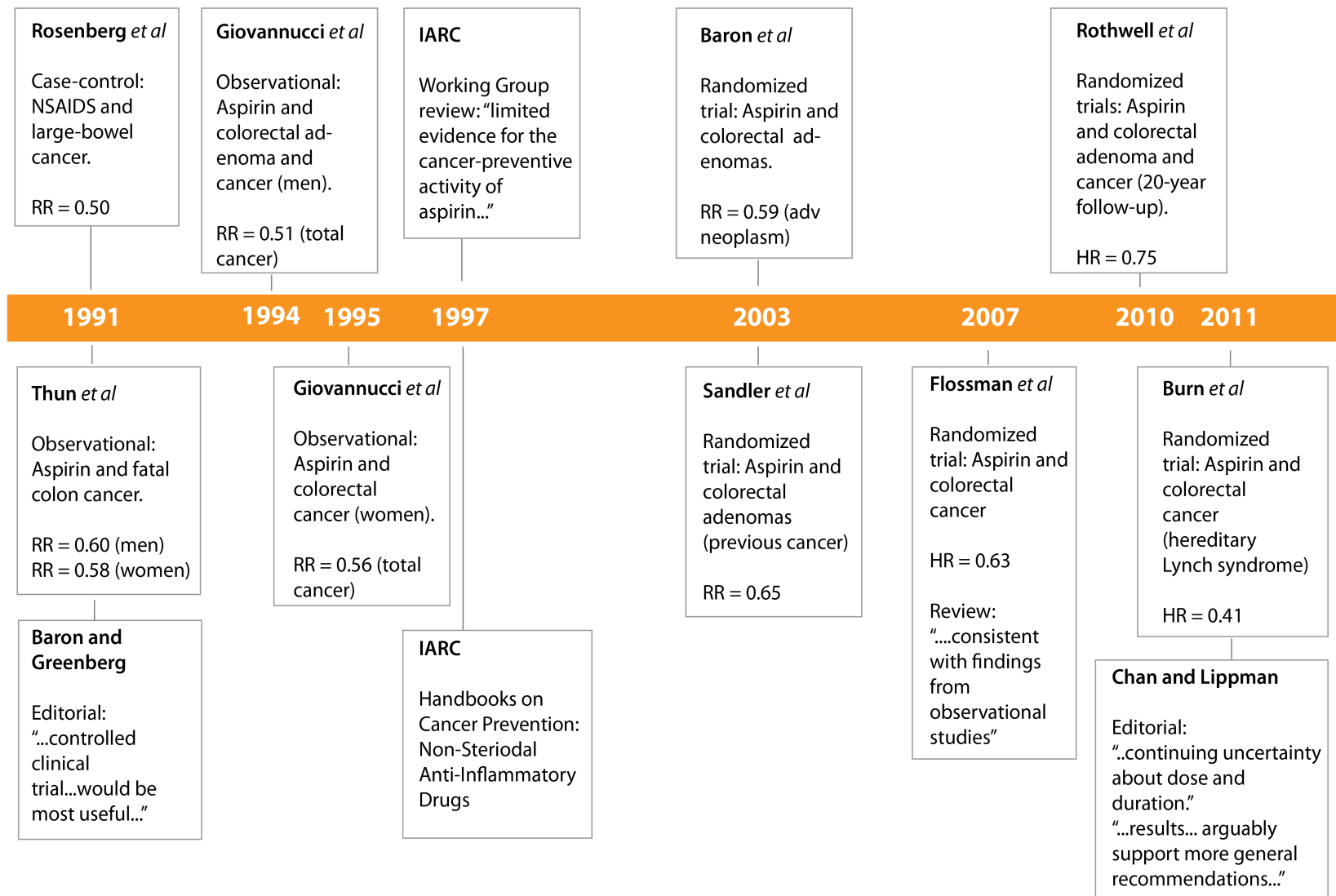
Using epidemiologic data to guide and sustaining social change

- Common agenda
- Shared measurement system
- Mutually reinforcing activities
- Continuous communication and
- A backbone support organization

Kania et al 2011 Stanford Social Innovation Review

Debates among scientists

- Magnitude of benefit
- Underlying pathway necessary for inference of causation
- Precision of measure.
- Etc etc
- But recommendation for action is to the very people who report things in surveys, from census to NHANES etc



Lifestyle/risk
accumulates during
early years...

Cancer begins,
undetected,
in midlife

DIAGNOSIS &
TREATMENT

Medical care
may be powerless
to stop the disease

Current obstacles to cancer prevention

SOCIETY

Families and communities largely shape one's lifestyle from adolescence into early adulthood, when cancer risks accumulate. Despite this fact, our society views cancer as but a distant threat, an older person's disease.

RESEARCH

Studies of the causes, biology and treatment of cancer are generally too brief, fragmentary and isolated. But full exploration of the disease's decades-long origins requires years of data. Human impatience impedes more comprehensive research.

MEDICINE

Cancer medicine is mostly a crisis response: Screenings and histories are typically done near age 50, emphasizing high-risk individuals. Late interventions, costly technologies and reactive therapies too often fail to stem cancer's fatal progression.

Lifestyle/risk
accumulates during
early years...

Cancer begins,
undetected,
in midlife

DIAGNOSIS &
TREATMENT

Medical care
may be powerless
to stop the disease

Teens

20s

30s

40s

50s

60s



Commitment to change

- Through our relationships, advocacy and support of social programs, we can make a profound difference.
- Simply practicing the 8 basic ways to live healthier promises more than preventing just cancer. It offers a much broader hope for revitalizing society



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BARNES-JEWISH HOSPITAL • WASHINGTON UNIVERSITY SCHOOL OF MEDICINE

A National Cancer Institute Comprehensive Cancer Center



8 WAYS TO PREVENT CANCER

8 WAYS to Stay Healthy & Prevent Cancer

- 1 Maintain a healthy weight
- 2 Exercise regularly
- 3 Don't smoke
- 4 Eat a healthy diet
- 5 Drink alcohol only in moderation
- 6 Protect yourself from the sun
- 7 Avoid sexually transmitted infections
- 8 Get screening tests



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Why are we not preventing cancer now?

Multiple barriers:

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- Lack of transdisciplinary training
- Complexity of implementation

Colditz et al Sci Transl Med 2012: March 28



*Scientific
Knowledge*

Political Will

Health

Social strategy

Provider
Regulations
Community

Atwood, Colditz, Kawachi, AJPH 1997; 87: 1603-1606.

6 Protect yourself from the sun

Message

- Avoid too much sun.
- Skin damage starts early in childhood, so it's especially important to protect children.



6 Protect yourself from the sun

Tips

- If UV index is above 3 protection is needed. Avoid direct sunlight between 10:00 a.m. and 4:00 p.m.
 - Use hats, long-sleeve shirts, and sunscreens with SPF15 or higher, broad spectrum.
- Don't use sun lamps or tanning booths.



7 Avoid sexually transmitted infections

- Among other problems, sexually transmitted infections—like human papillomavirus (HPV)—are linked to a number of different cancers.
- Infection with HPV (human papilloma virus) causes cervical cancer, head and neck, anus

7 Avoid sexually transmitted infections

Take home message

- Protecting yourself from sexually transmitted infections can lower your cancer risk.
- From 2007, 12-13 year olds covered through Immunise Australia



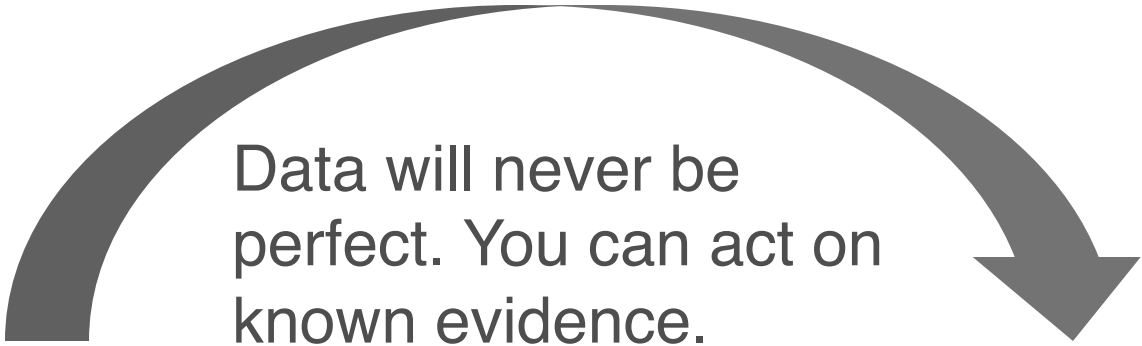
Information Line
1800 671 811



**Epidemiologic
Evidence**

**Real World
Application**

When and How
Do We Bridge the
Gap
Between Data and
Application?



Data will never be perfect. You can act on known evidence.

Epidemiologic Evidence

Create cross-discipline teams

Think about end user, even during manuscript development

Use varied modalities

Real World Application

Why are we not preventing cancer now?

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Colditz et al Sci Transl Med 2012: March 28



How much physical activity do you need?

Regular physical activity helps improve your overall health and fitness, and reduces your risk for many chronic diseases.

Fitting regular exercise into your daily schedule may seem difficult at first, but the *2008 Physical Activity Guidelines for Americans* are more flexible than ever, giving you the freedom to reach your physical activity goals through different types and amounts of activities each week. It's easier than you think!

Physical Activity Guidelines

Children



6 to 17 years of age

[\(/physicalactivity/everyone/guidelines/children.html\)](http://physicalactivity/everyone/guidelines/children.html)

[\(/physicalactivity/everyone/guidelines/children.html\)](http://physicalactivity/everyone/guidelines/children.html)

Adults



18 to 64 years of age

[\(/physicalactivity/everyone/guidelines/adults.html\)](http://physicalactivity/everyone/guidelines/adults.html)

Older Adults



[\(/physicalactivity/everyone/guidelines/olderadults.html\)](http://physicalactivity/everyone/guidelines/olderadults.html)

65 years of age or older

[\(/physicalactivity/everyone/guidelines/olderadults.html\)](http://physicalactivity/everyone/guidelines/olderadults.html)

If you are a healthy pregnant or postpartum woman, physical activity is good for your overall health. See our section on **Healthy Pregnant or Postpartum Women** [\(/physicalactivity/everyone/guidelines/pregnancy.html\)](http://physicalactivity/everyone/guidelines/pregnancy.html).



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Videos



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EVERYTHING YOU NEED TO REACH YOUR GOALS

FIND A GYM

FIND A CLASS



GOLD'S GYM

F

STRONGER *with*
COMMUNITY

JOIN AND SHARE



Our societal obligation

- As cancer prevention scientists, we must accept responsibility for cancer prevention.
- Prioritize studies that will identify key points for intervention to maximize prevention.
- Move beyond obstacles to implement prevention of cancer here and throughout the world.

“In the beginning of every enterprise we should know, as distinctly as possible, what we propose to do, and the means of doing it... We desire to lay the foundation and to mature some parts of the plan. Those who come after us must finish the work.”

William Greenleaf Eliot, co-founder

Washington University in St Louis

1854



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