

Cancer Control in the 21st Century and Disparities in Health

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JOHNS HOPKINS
M E D I C I N E

Disclosures

- Employment:
 - Johns Hopkins University
- Consulting
 - National Institutes of Health
 - Centers for Disease Control
 - Department of Defense

HOW WE DO HARM

A DOCTOR BREAKS RANKS

ABOUT BEING SICK

IN AMERICA



OTIS WEBB BRAWLEY, M.D.

with Paul Goldberg

The Leading Causes of Death in US

1) Heart disease:	647,457	23.1%
2) Cancer:	599,108	21.7%
3) Accidents (unintentional injuries):	169,936	5.9%
4) Chronic lower respiratory diseases:	160,201	5.6%
5) Stroke (cerebrovascular diseases):	146,383	5.2%
6) Alzheimer's disease:	121,404	4.2%
7) Diabetes:	83,564	2.9%
8) Influenza and pneumonia:	55,672	1.9%
9) Renal disease:	50,633	1.8%
10) Intentional self-harm (suicide):	47,173	1.6%

CDC Vital Statistics Report

<https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm>

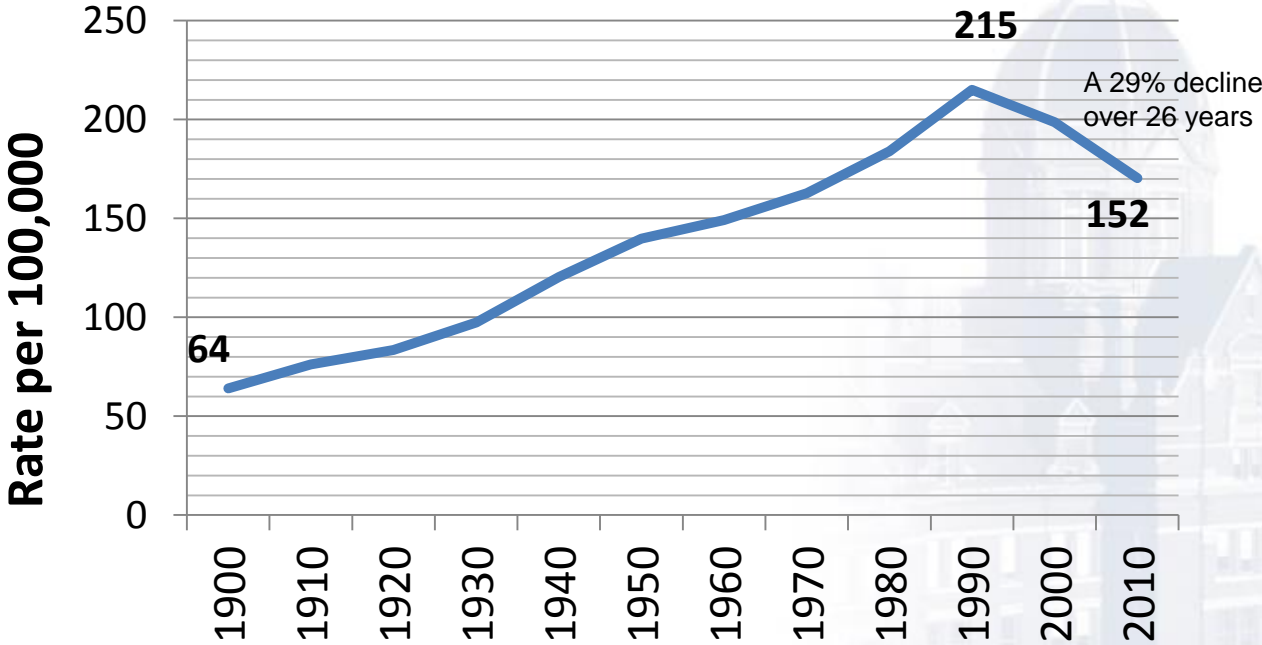
The Leading Causes of Death in US

- Cardiovascular death rates have been declining faster than cancer death rates
- Cancer will become the most common cause of death in the US within the next five to ten years.

CDC Vital Statistics Report
<https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm>

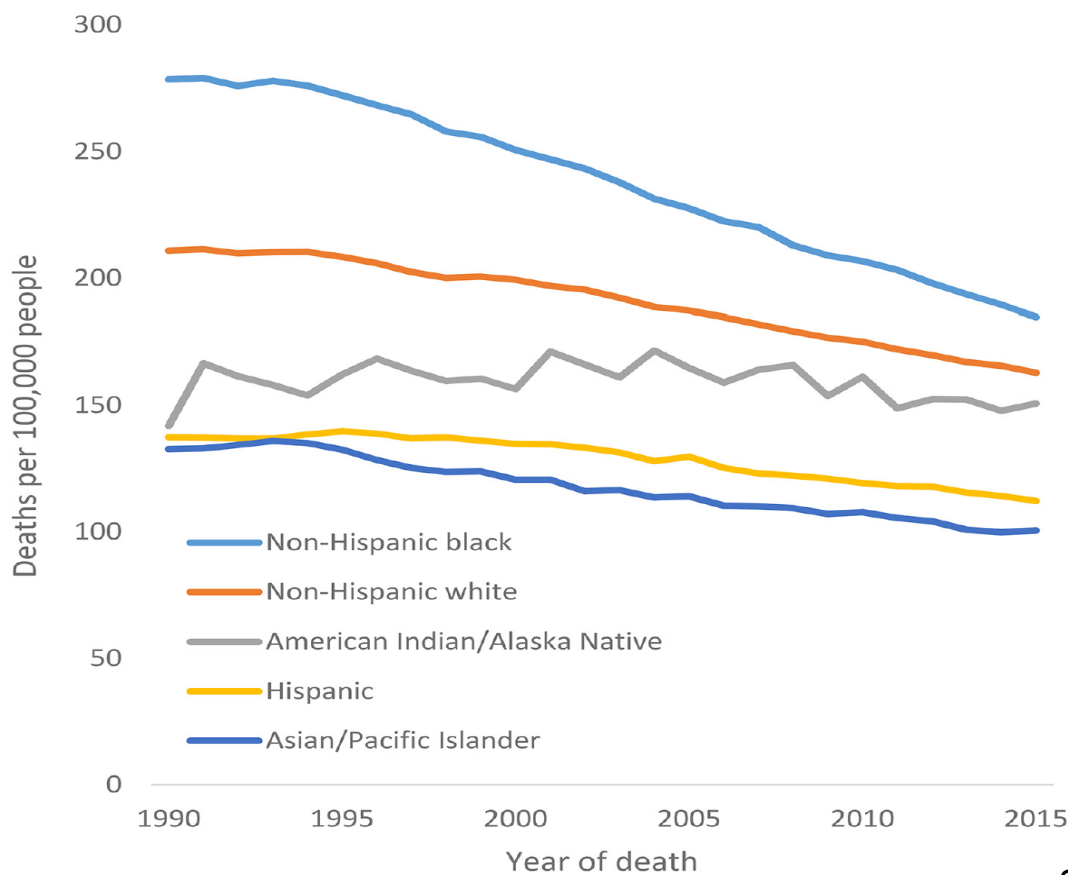
US Cancer Death Rate

1900 to 2017



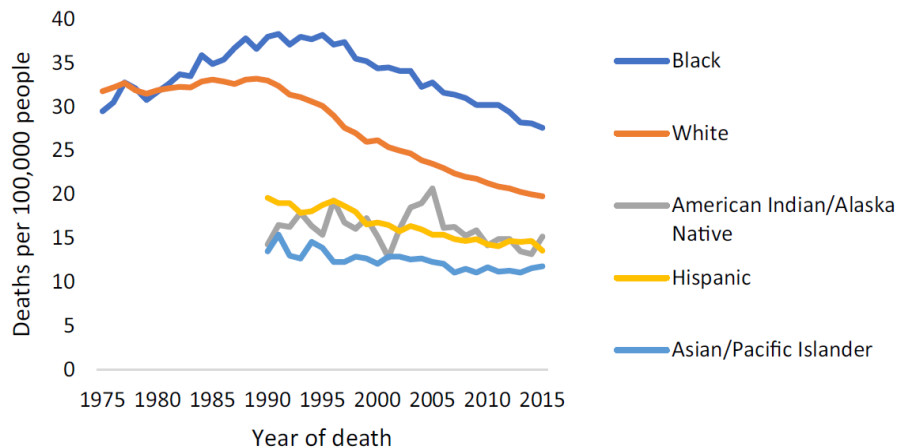
Age Adjusted to 2000 Standard
1900-1970, US Public Health Service, Vital Statistics of the US, Vol. 1 and Vol 2;
1971-2020, US National Center for Health Statistics, Vital Statistics of the U.S

Cancer Mortality by Race/Ethnicity from 1990 to 2017

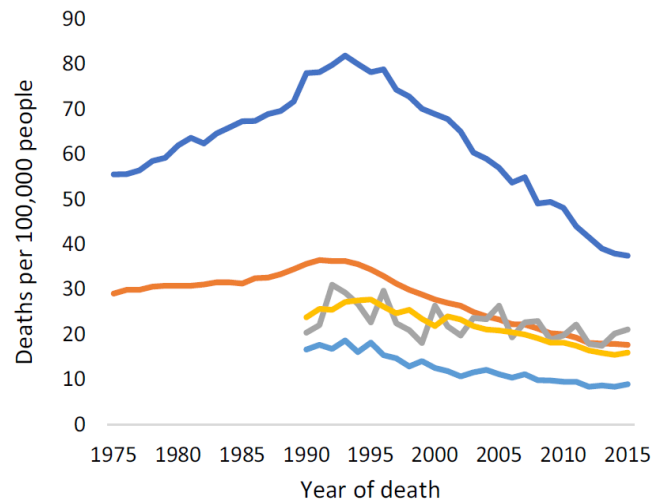


Siegel, et al. CA 2018;68:329-339

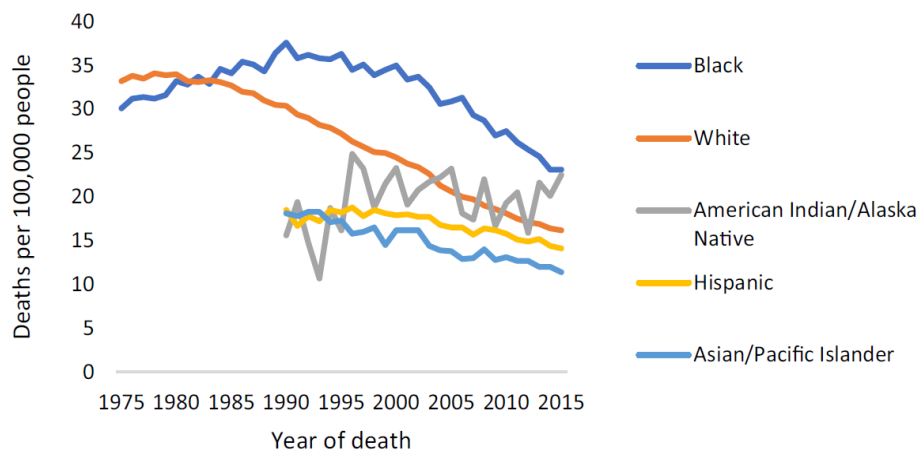
A. Female Breast



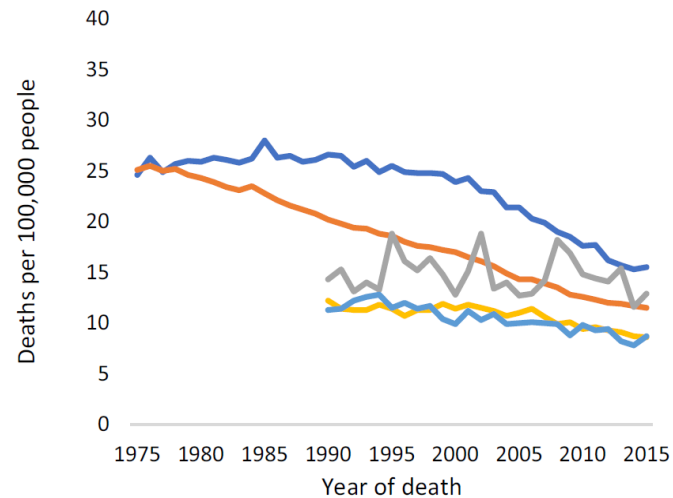
B. Prostate



C. Male Colorectum



D. Female Colorectum



Race

Defined by US Office of Management and Budget before every decennial census.

- White
- Black
- Asian
- Pacific Islander
- Native American/Alaskan Native

In US population data Ethnicity is defined as Hispanic or non-Hispanic

Race

Defined by US Office of Management and Budget every ten years.

- Sociopolitical and not biologic according to OMB definition
- Rejected by Anthropological community as non-scientific
- Race changes over time*

Clinical Trials

-Much discussion of diversity in clinical trials

-Much (not all) of this discussion is political and not scientific

- NIH Revitalization of 1993 calls for valid subset analysis among the races and ethnicities
- This call is “non-scientific” as subset analysis are not statistically significant by nature.

-Clinical trials participation should be encouraged as especially participation in NCI sponsored clinical trials provides greater assurance of high-quality care.

Clinical Trials

- Race is not a biologic categorization
- Race is a sociopolitical construct
- Area of geographic origin can be a biologic categorization, but *Ancestry.Com* has demonstrated this can be very complicated.

A Note on Clinical Variation

There is variation among populations, but race is not the appropriate way to categorize populations, e.g.:

- Forms of G6PD deficiency is more common amongst people originating in the Mediterranean, certain areas of Africa, India and the middle east.
- The HLA-B*1502 allele is common among people living within 150 kilometers of the Thai-Burmese border. They have a Stevens-Johnson reaction to Carbamazepine (Tegretol)
- The sickle cell mutation has a prevalence among people originating in southern Greece, Southern Italy, the middle east and has a higher prevalence in Sub Saharan Africa

Clinical Trials

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 - Subset analysis are not statistically significant by nature.
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Cancer Control in the 21st Century

The development and use of tailored drugs will have to rely on response rate in 30 to 50 person phase II studies as a surrogate for improvement in survival.

From the scientific standpoint there will be less emphasis on racial differences and more emphasis on genomic targets and markers of drug metabolism.

Why the Decline in Cancer Death Rates?

- Wise early detection (especially colorectal, breast, cervix)
- Prevention (especially tobacco control)
- Improvements in cancer treatment

Cancer Screening

- Can be beneficial! Can be harmful!
- Often both and only a good randomized clinical trial can disclose the net benefit to the population (risk/benefit ratio).
- Need to follow good science.

Potentials for Cancer Prevention

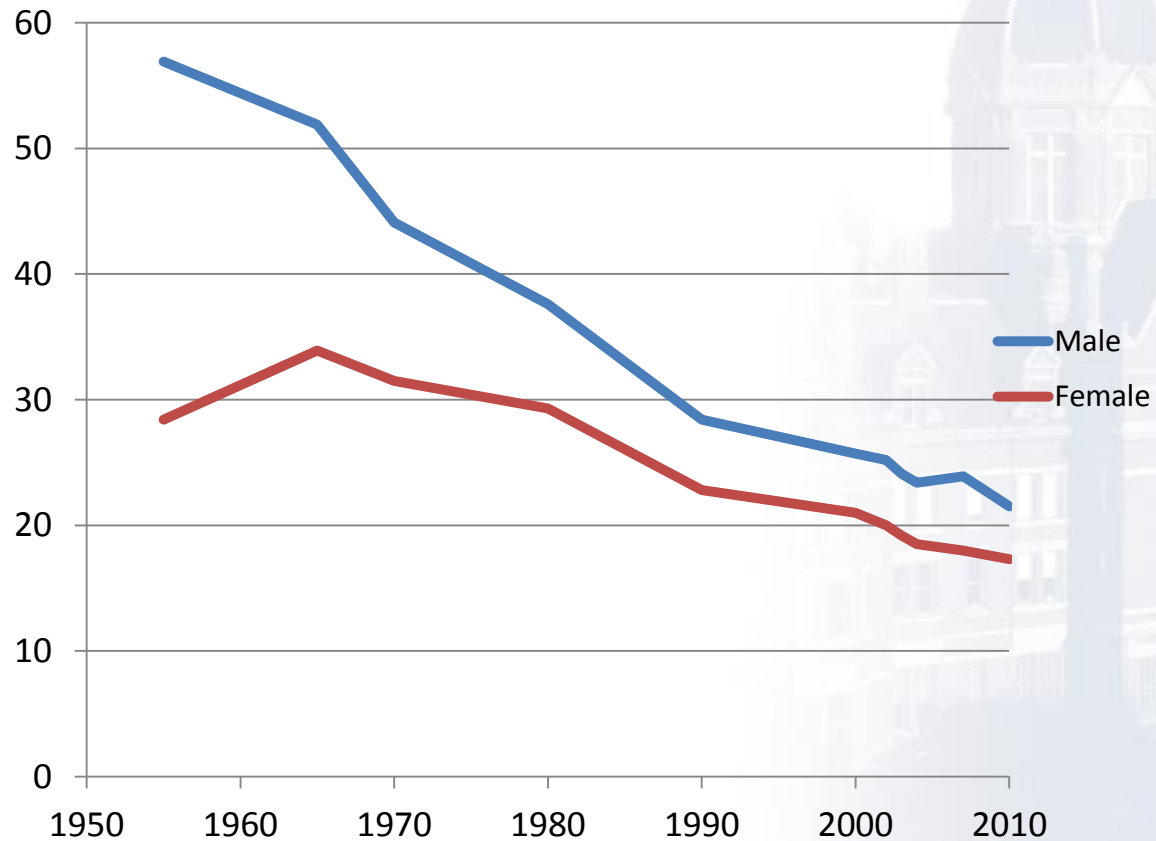
Cause	% cancer caused	Deaths in United States [‡]	Magnitude of possible reduction (%)	Period of time (years)	Evidence example
Smoking	33%	188,744	75%	10–20	Utah vs Kentucky
Overweight/obesity	20%	114,390	50%	2–20	Bariatric surgery
Hereditary factors (*)	16%	91,520	50%	2–10	Oophorectomy; MRI; Tamoxifen; Colonoscopy
Diet	5%	28,600	50%	5–20	Folate , colorectal cancer
Lack of exercise	5%	28,600	85%	5–20	Adolescent activity
Occupation	5%	28,600	50%	20–40	Asbestos
Viruses	5%	28,600	100%	20–40	Liver cancer, HPV vaccine
Alcohol	3%	17,200	50%	5–20	Regulation
UV and ionizing radiation	2%	11,400	50%	5–40	Medical exposures
Prescription drugs	1%	5,720	50%	2–10	Hormone therapy
Reproductive factors	3%	17,200	0	N/A	N/A
Pollution	2%	11,400	0	N/A	N/A

We could reduce cancer deaths 60% by paying attention to known risk factors

Modified from Colditz, *Sci Trans Med* 4:127,2012

(*) JNCI 89:287,1997
JAMA 2016 315:68-76

U.S. Smoking Prevalence by Gender 1955-2010



Causes of Cancer Mortality Increases

Tobacco is still the leading cause of cancer in the US. Cancers due to tobacco use (other than bladder) are declining significantly more so in men than women.

Weir HK, Thompson TD, Soman A, Møller B, Leadbetter S, White MC. [Meeting the Healthy People 2020 objectives to reduce cancer mortality.](#) *Preventing Chronic Disease* 2015;12:140482.

Weir HK, Thompson TD, Soman A, Møller B, Leadbetter S. [The past, present, and future of cancer incidence in the United States: 1975 through 2020.External](#) *Cancer* 2015;121(11):1827–1837.

Smoking Prevalence by gender and Age 2017

- Males -15.8%
- Females -12.2%

- Age 18-24 -10.4%
- Age 25-44 -16.1%
- Age 45-64 -16.5%
- Age 65 and older - 8.2%

CDC, MMWR 2019

Smoking Prevalence by Race 2017

	Female	Male
NH White	16.0%	17.3%
Black	13.5%	20.9%
Native American	24.0%	19.0%
Asian Pacific Islanders	2.6%	12.0%
Hispanic	7.1%	13.1%

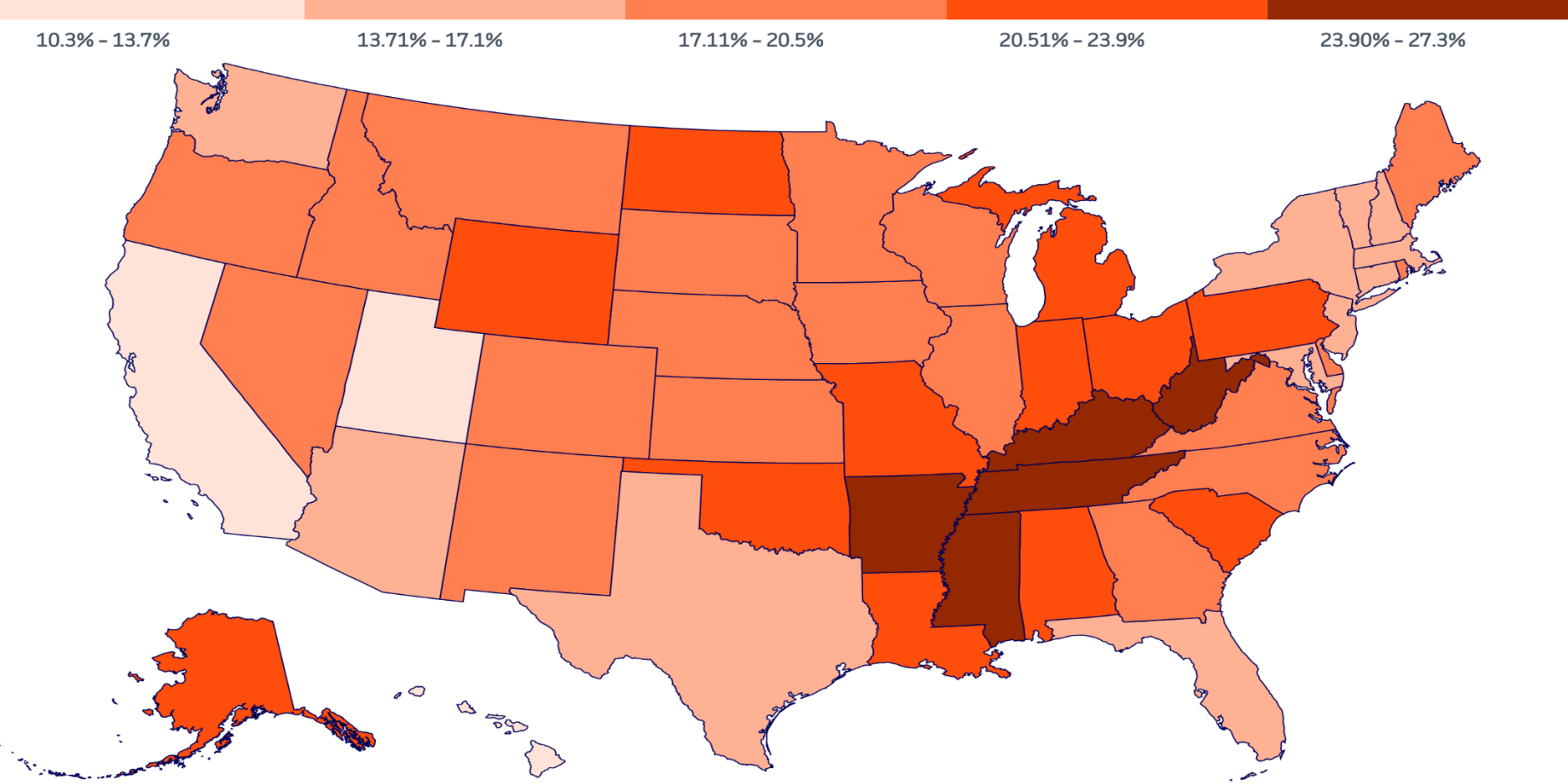
CDC, MMWR 2018

Smoking Prevalence by Educational Attainment 2017

CDC, MMWR 2019

Current tobacco use, 18 years and older, 2013

Smoked 100 cigarettes in entire lifetime and currently smoke



Data Source: Behavioral Risk Factor Surveillance System (BRFSS), Centers for Disease Control and Prevention, 2013

© 2016 American Cancer Society

Causes of Cancer Mortality Increases

Cancers caused by infection

- Liver cancer deaths expected to go up 50% due to HCV and HBV.
- Head and neck cancer deaths increasing by 30% due to HPV.

Prevention of cancer is clearly a need in the future!

Weir HK, Thompson TD, Soman A, Møller B, Leadbetter S, White MC. [Meeting the Healthy People 2020 objectives to reduce cancer mortality](#). *Preventing Chronic Disease* 2015;12:140482.

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Causes of Cancer Mortality Increases

Energy balance (overweight, obesity, too many calories, lack of exercise)

- 2/3 of adults and 1/3 of children are overweight or obese
- Weight related cancers are expected to increase 30 to 40% by 2030

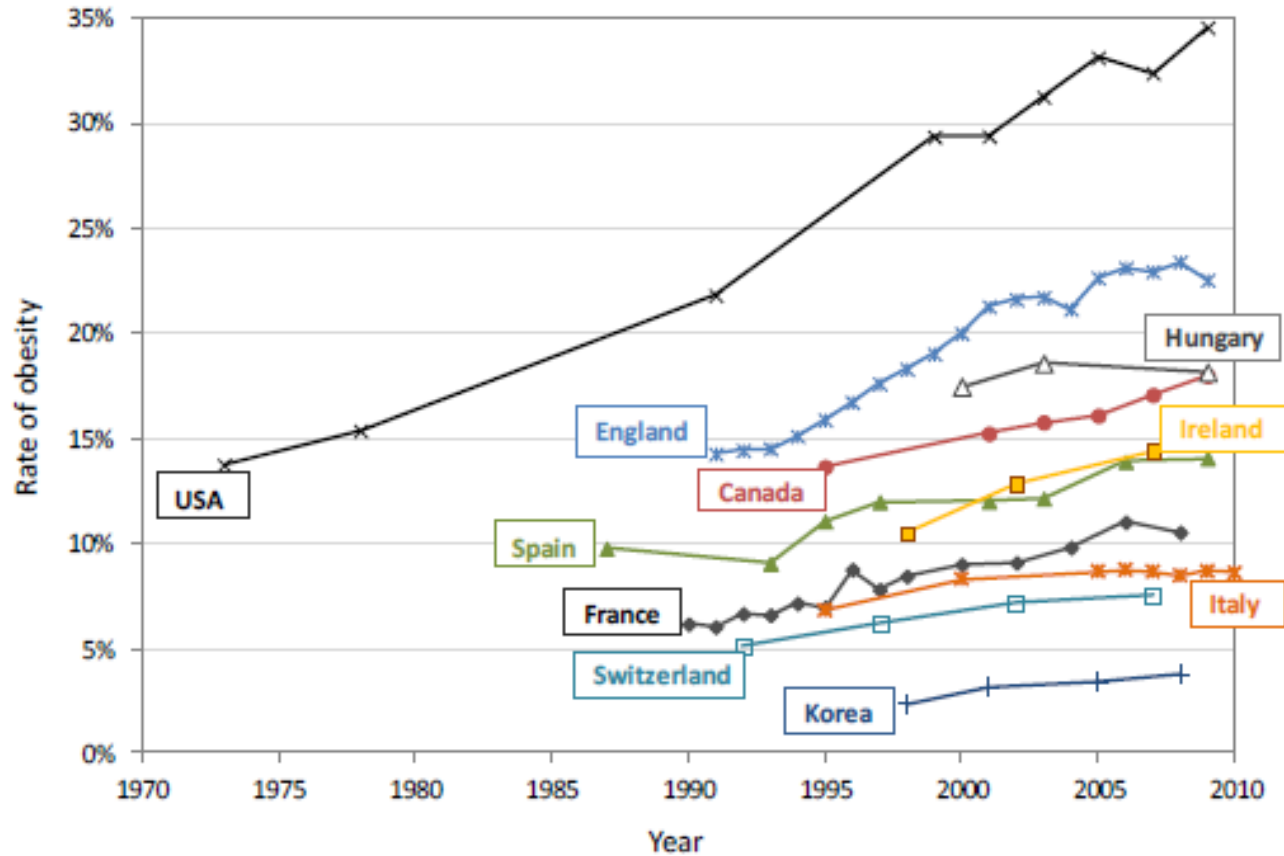
With the decline in tobacco use energy balance will become leading cause of cancer in the US.

Prevention of cancer is clearly a need in the future!

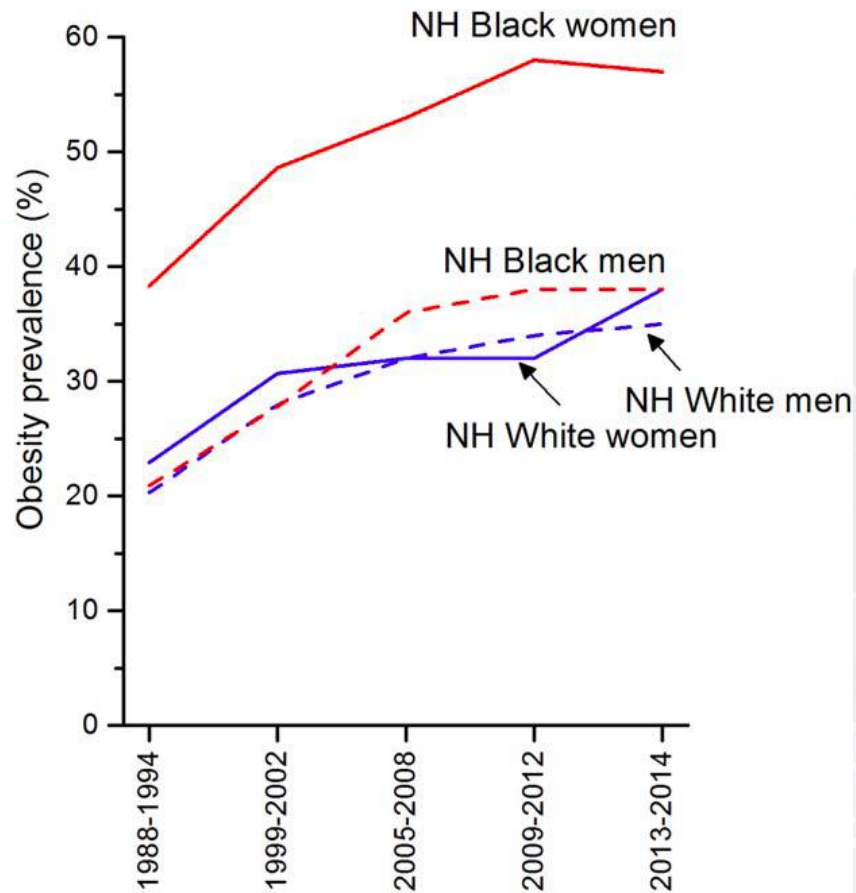
Weir HK, Thompson TD, Soman A, Møller B, Leadbetter S, White MC. [Meeting the Healthy People 2020 objectives to reduce cancer mortality](#). *Preventing Chronic Disease* 2015;12:140482.

Weir HK, Thompson TD, Soman A, Møller B, Leadbetter S. [The past, present, and future of cancer incidence in the United States: 1975 through 2020.External](#) *Cancer* 2015;121(11):1827–1837.

US Continues to Lead the World in Obesity Rates



OECD Obesity Update 2012



Trends in Adult Obesity (Body Mass Index 30 kg/m²) Prevalence (%) by Sex and Race/Ethnicity, United States, 1988 to 2014.

NH indicates non-Hispanic.

Sources: 1988-2012: Health, United States, 2014: With Special Feature on Adults Ages 55-64. 2013-2014: Centers for Disease Control and Prevention. National Health and Nutrition Examination Survey, 2014. Public use data file.

BREAST CANCER

Breast Cancer

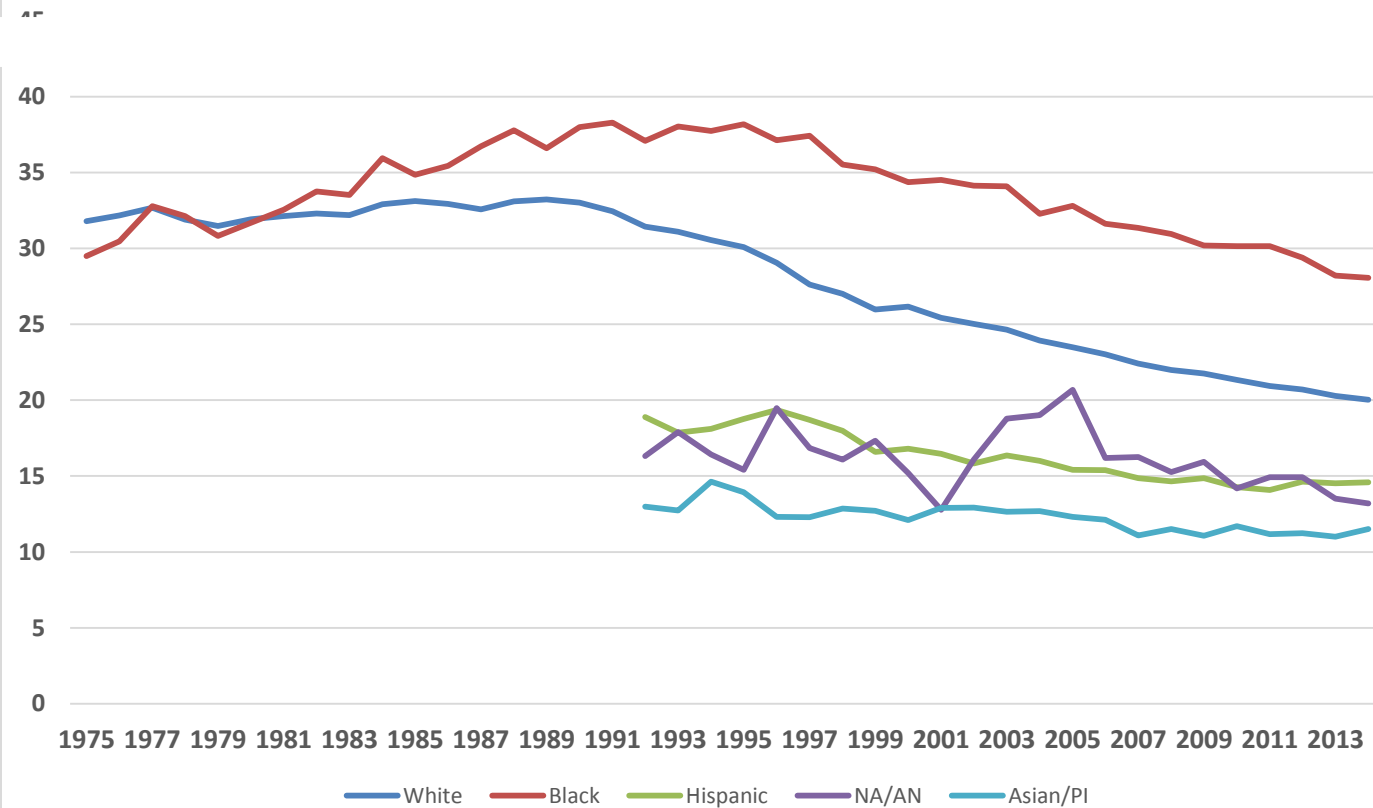
In 2019,

269,000 Diagnosed and 42,300 Deaths

There has been a 40% decline in age-adjusted female mortality from 1990 to 2016

Screening is attributed with 40% to 50% of the decline.

Breast Cancer Mortality 1975-2015 SEER Data, Age Adjusted to year 2000 Standard



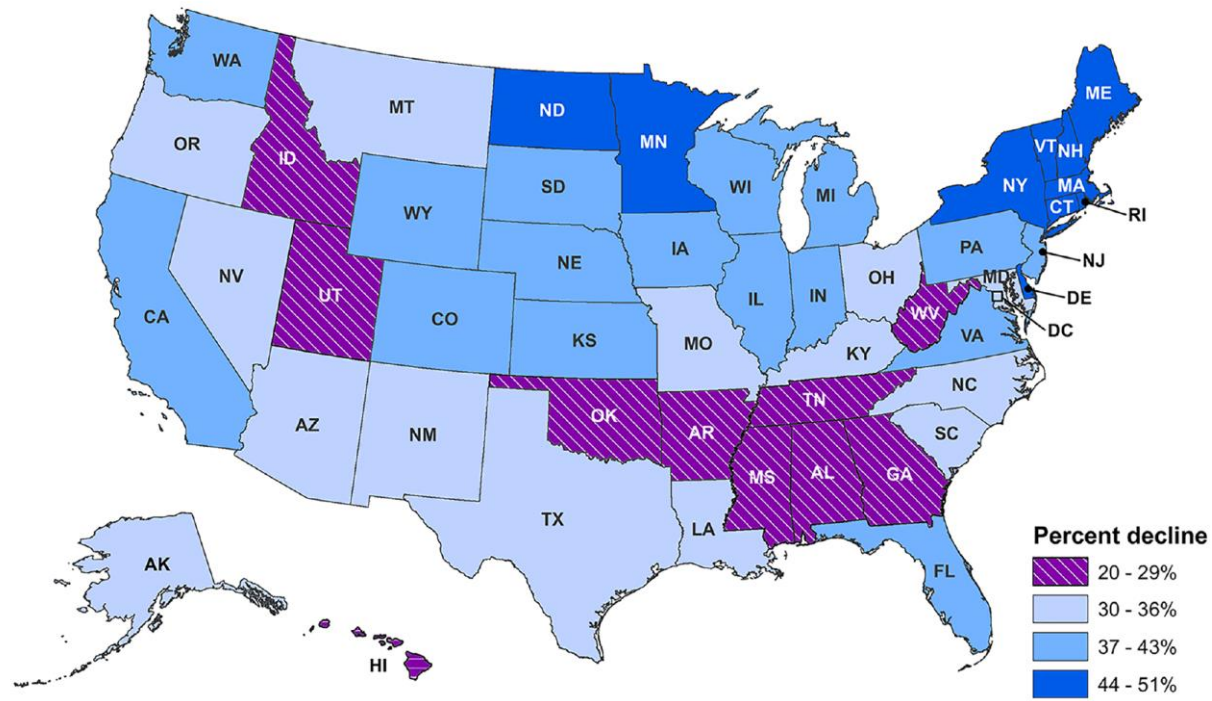
Siegel, et al. CA 2018;68:329-3

Breast Cancer The Reality

There are seven states where B-W mortality differences are no longer statistically significant.

DeSantis et al, CA, 2017

Breast Cancer Mortality Decline from 1988-90 to 2013-2015 by State



Breast Cancer

Strategies to Reduce Cancer Mortality

Fact: 40% of women with Bca get less than optimal therapy

CISNET Modeling of outcomes from 2013 to 2025

- With current breast cancer screening and treatment patterns, there will be 50,100 to 57,400 deaths in 2025
- With guideline appropriate screening of all women 40 and above and current treatment patterns there will be 5100 to 6100 fewer deaths
- With all women receiving appropriate therapy and no change in screening rates there would be 11,400 to 14,500 fewer deaths
- If all women received appropriate screening and treatment there would be 18,100 to 20,400 fewer deaths

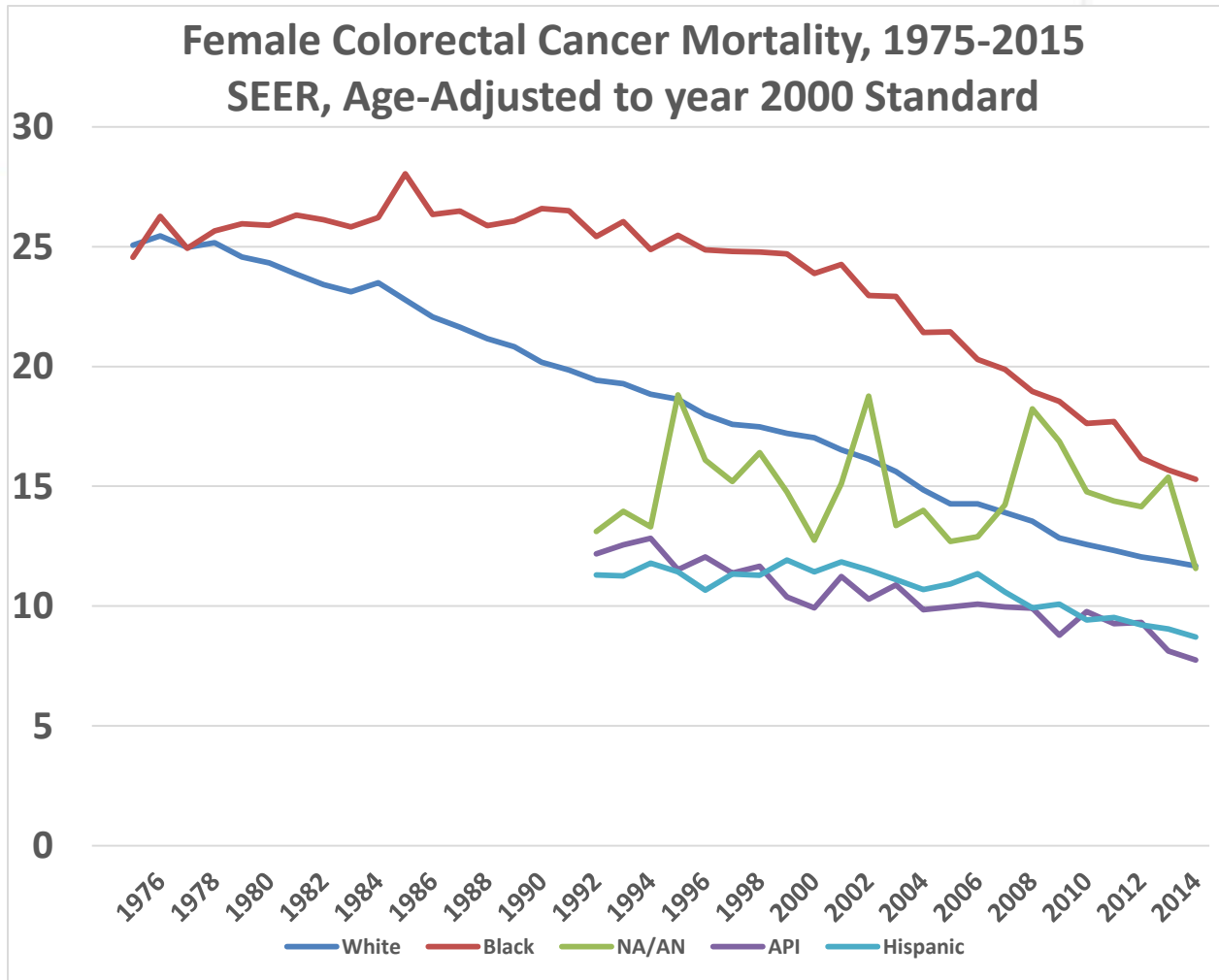
Mandelblatt et al, Cancer, 2013

COLON CANCER

Colon and Rectal Cancer

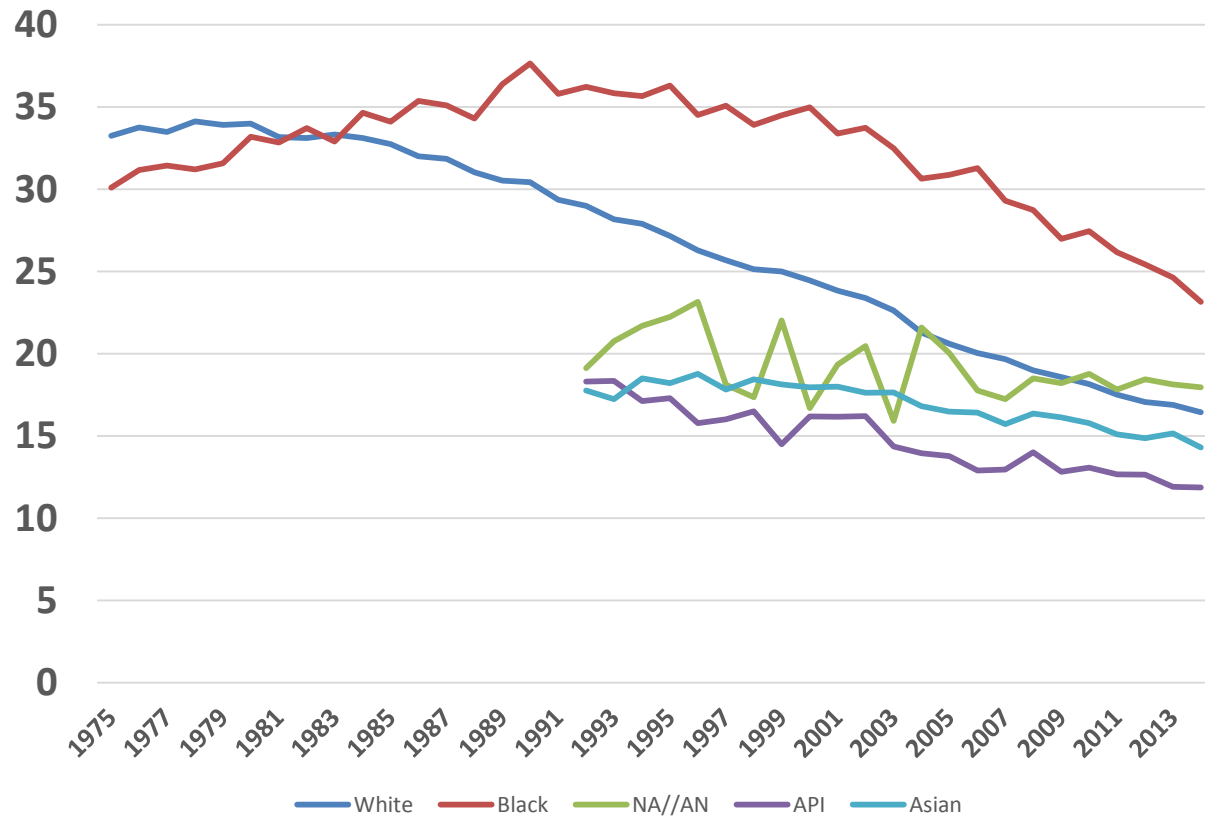
In 2019,

- Diagnosed: 101,400 colonic and 44,200 rectal
- 51,000 Americans will die of colon and rectal cancer.
- Among the US Population as a whole, there has been a 50% decline in age-adjusted death rate since 1980.
- Screening is attributed with about 2/3 of the decline.



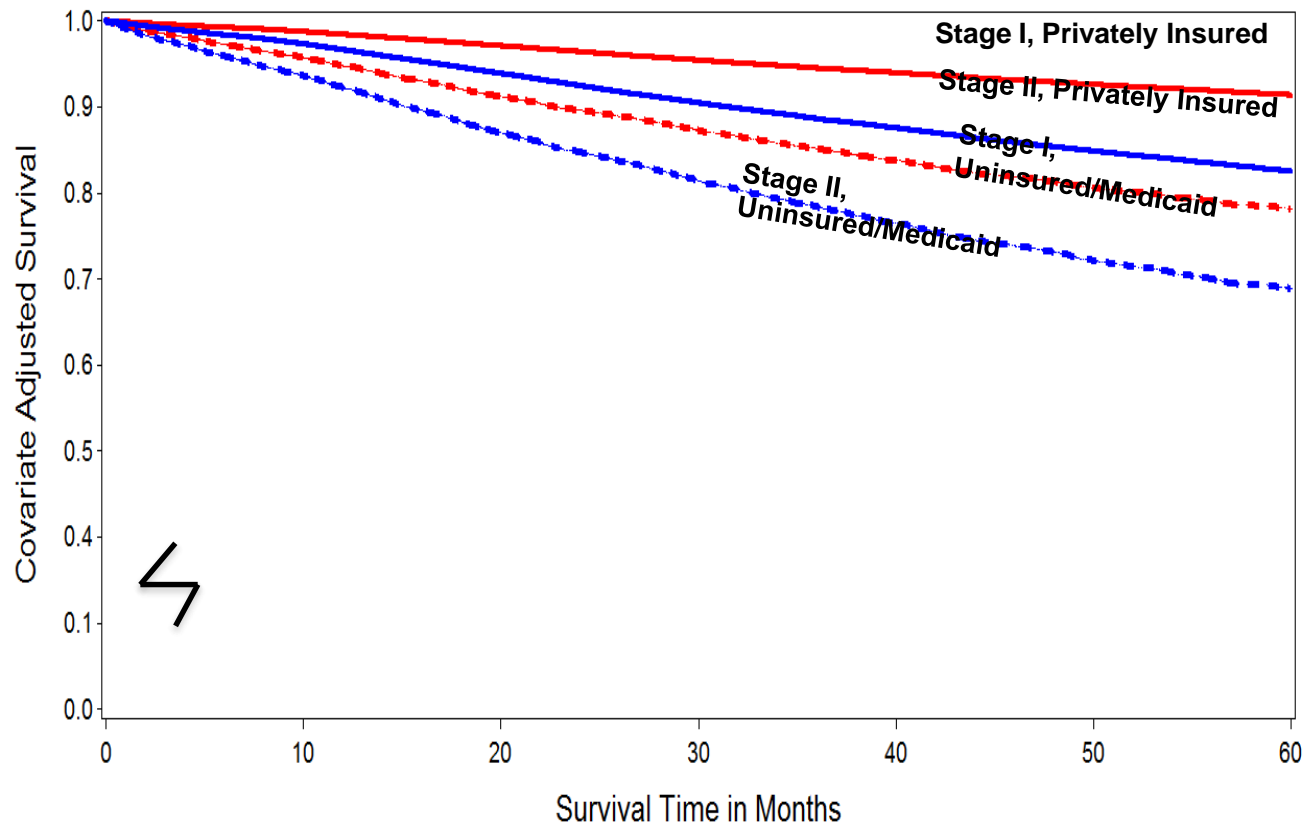
Siegel, et al. CA 2018;68:329-33

Male Colorectal Cancer Mortality 1975-2015 SEER, Age-Adjusted to year 2000 Standard

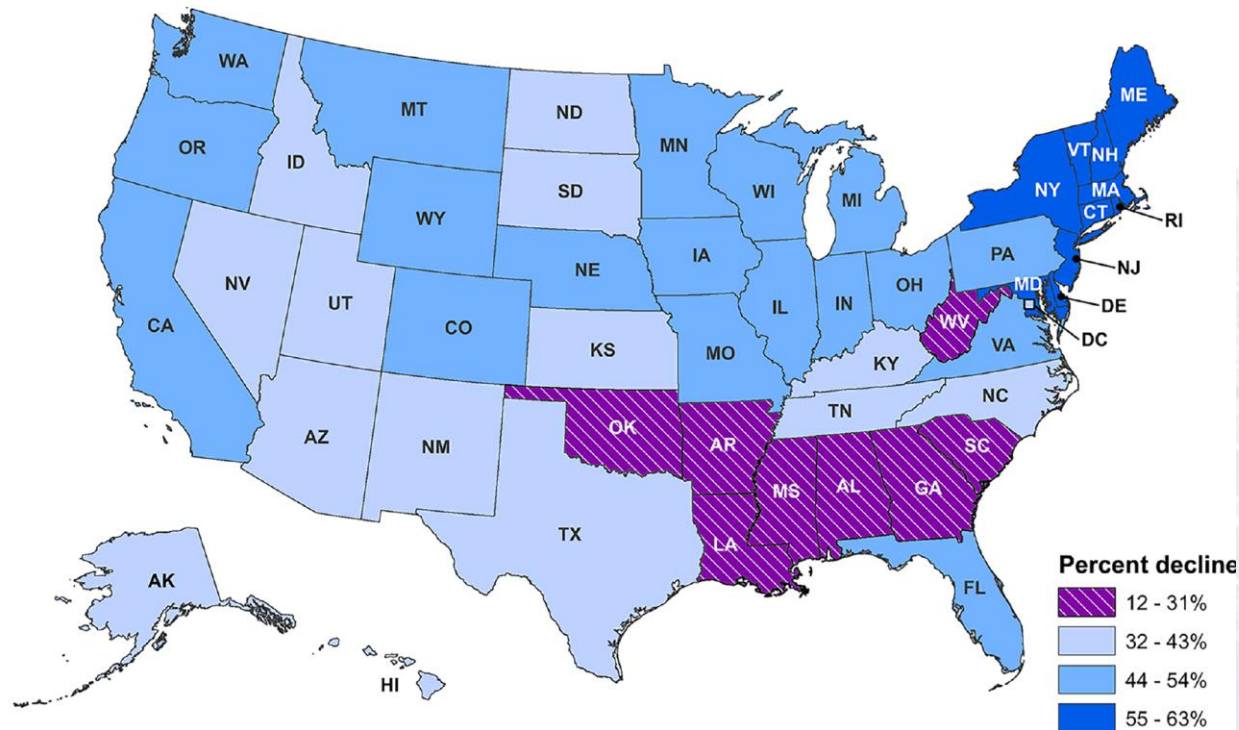


Siegel, et al. CA 2018;68:329-339

Adjusted Colorectal Cancer Survival by Stage and Insurance Status, among White Patients 18-64 years Diagnosed from 1999-2000, NCDB



Colorectal Cancer Mortality Decline from 1980-82 to 2013-2015 by State



Siegel, et al. CA 2018;68:329-339

Colon Cancer Quality of Surgery

A minimum of 12 lymph node should be examined in an adequate colorectal cancer pathology specimen

-About half of all colorectal cancer patients have 12 or more LN examined.

-Hispanics, Blacks and the poor have higher odds of receiving an inadequate dissection.

-Inadequate examination is associated with hospital where care was received.

-Inadequate staging leads to some of the talk that colorectal cancer is more aggressive among Blacks!!!

- Rhoads et al, Cancer 2012 Jan 15;118(2):469-77

Causes of Colorectal Cancer Disparities

Differences in:

- Prevalence of screening
- In quality of screening
- In proportion treated
- Quality of treatment

- Differences by:

- Race
- Socioeconomic Status
- Region of Residence

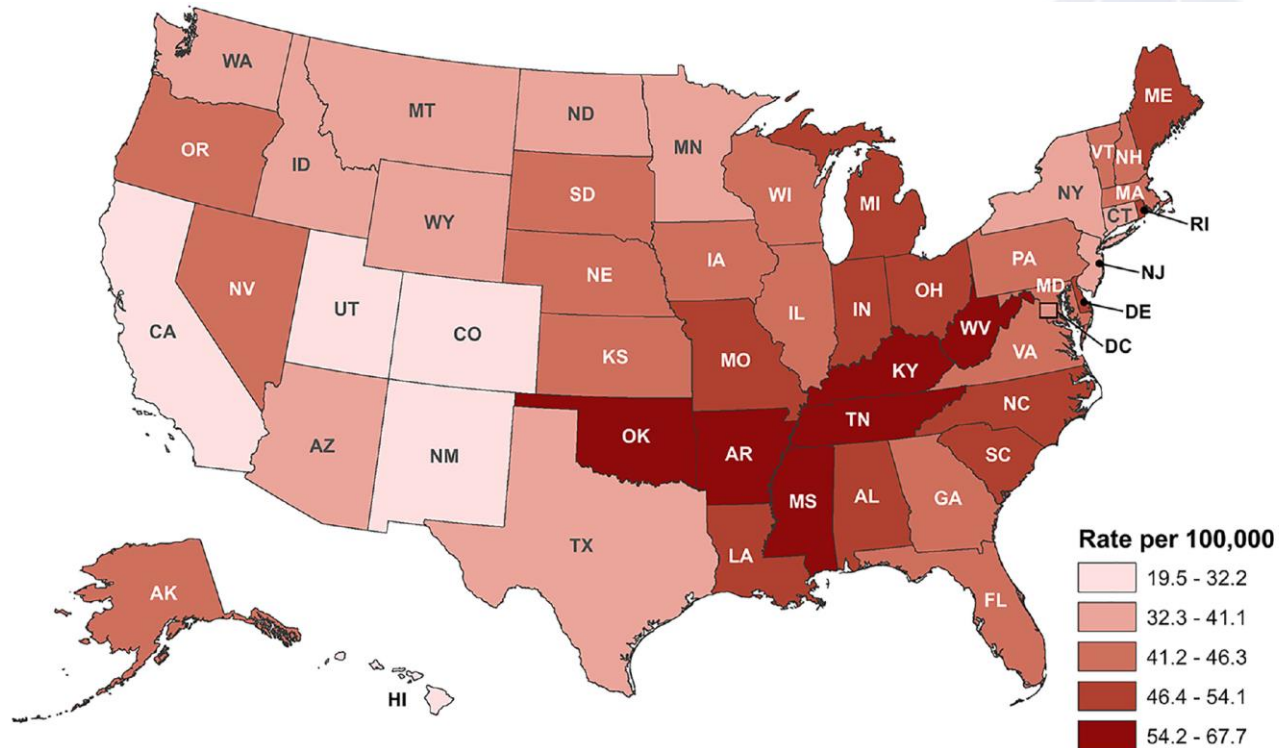
LUNG CANCER

The American Cancer Society estimates that in 2019:

About 234,000 Americans will be diagnosed with lung cancer (121,680 in men and 112,350 in women)

There will be about 154,050 deaths from lung cancer (83,550 in men and 70,500 in women)

Lung Cancer Mortality Rates 2011 to 2015 by State



Data source: Smoking: Behavioral Risk Factor Surveillance System (BRFSS), Centers for Disease Control and Prevention Mortality: National Center for Health Statistics.

Cancer Health Disparities State by State

Age Adjusted Cancer Mortality Rate 2015:

- 125 deaths per 100,000 in Utah
- 195 deaths per 100,000 in Kentucky

The difference is heavily influenced by lung, colon and breast cancer differences.

The National Lung Screening Trial

- **Nearly 54,000 at high risk enrolled in the trial**
 - age 55 and above
 - 30 pack year or greater history of smoking; if quit, did so less than 15 years prior to trial entry
 - Reasonable health
- **Subjects prospectively randomized to chest X-ray (sham) or low dose spiral CT (LDCT) yearly for three years**
 - Done at 30 sites with lung cancer expertise
 - Analysis 10 years from start of screening showed LDCT associated with a 20% reduction in relative risk of death

The National Lung Screening Trial: A Closer Look

- **In this high risk group, the benefit/risk ratio of 5.4 lives saved for:**
 - Every 2 people with a complication due to an invasive procedure
 - Every 1 life lost prematurely due to diagnostic procedures
- This study was done in 30 of the best hospitals in the country
 - Results may differ as LDCT screening is adopted at other facilities.
 - The benefit-risk ratio may decrease

An Efficient Lung Cancer Screening Program

Assuming the same quality as the 30 NLST Hospitals

- Approximately 160,000 Americans currently die of lung cancer every year.
- A screening program has potential of preventing 8,000 to 10,000 deaths per year!!!
- If done well screening would lead to 1,500 to 1,850 deaths secondary to diagnostic interventions (bronchoscopy, biopsy, etc.).

Lung Cancer Screening Recommendations

Six Respected Groups Recommend the Doctor “Consider” spiral CT for those:

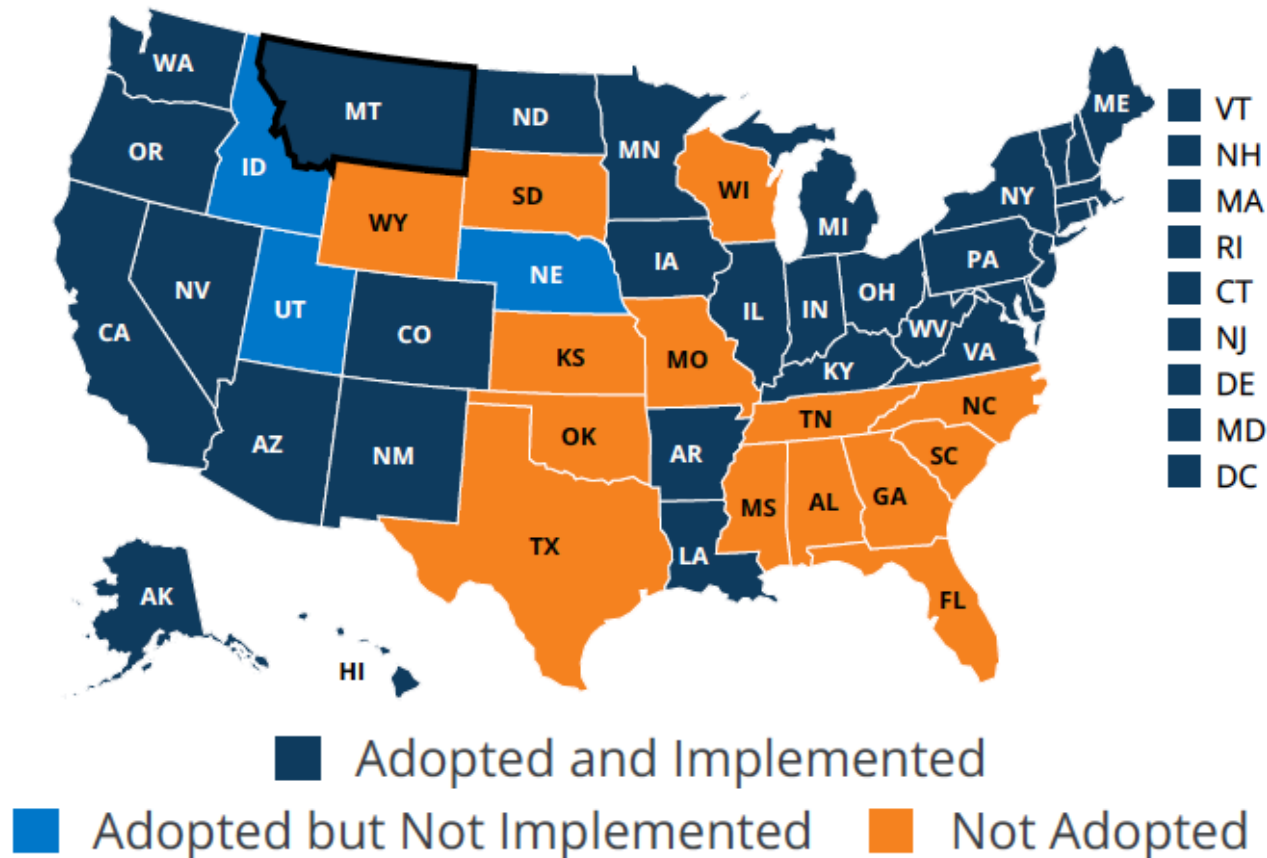
- Healthy aged 55 years and above,
- H/O 30 pack years of smoking or more,
- If quit smoking did so less than 15 years ago,
- Who understand that there are risks of unnecessary diagnostic procedures and even death associated with screening.

Wender et al, CA Cancer J Clin 2013

The Most Important Question in Cancer Control

- How Can We Provide Adequate High Quality Care (to Include Preventive Services) to Populations That So Often Do Not Receive It?
 - Unnecessary care interferes with institutional abilities to provide necessary care.
 - State by state disparities are increasing with the Affordable Care Act!!

State Medicaid Expansion Plans as of mid 2019



THE TRUE COST OF AMERICAN HEALTHCARE (FROM A CANCER DOC!)

Applying Known Science (Prevention and Treatment)

Fact:

College educated Americans have a much lower risk of cancer death compared to non college educated. This is true among all races and ethnicities.

Siegel, et al. CA
2018;68:329-339

Applying Known Science (Prevention and Treatment)

- It is estimated that about 600,000 Americans will die of cancer this year.
- If all Americans had the cancer death rate of college educated Americans, 22% would not die.
- More than one in five cancer deaths (132,000 Americans) would not occur!

Siegel, et al. CA
2018;68:329-339

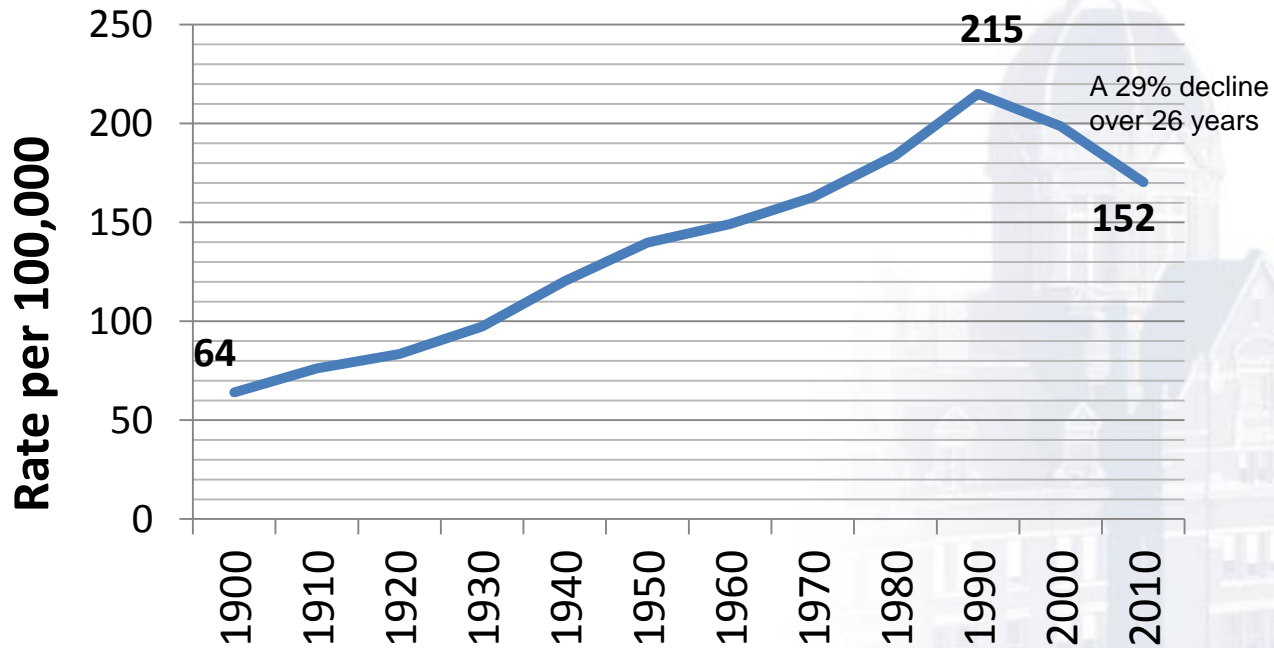
Applying Known Science (Prevention and Treatment)

- At least 132,000 (22% of the more than 600,000) deaths per year are preventable if all Americans received known medical prevention and treatment.
- The majority of these preventable deaths are among white Americans.
- The issue of disparities in health are not just a racial minority health issue.

Siegel, et al. CA
2018;68:329-339

US Cancer Death Rate

1900 to 2017

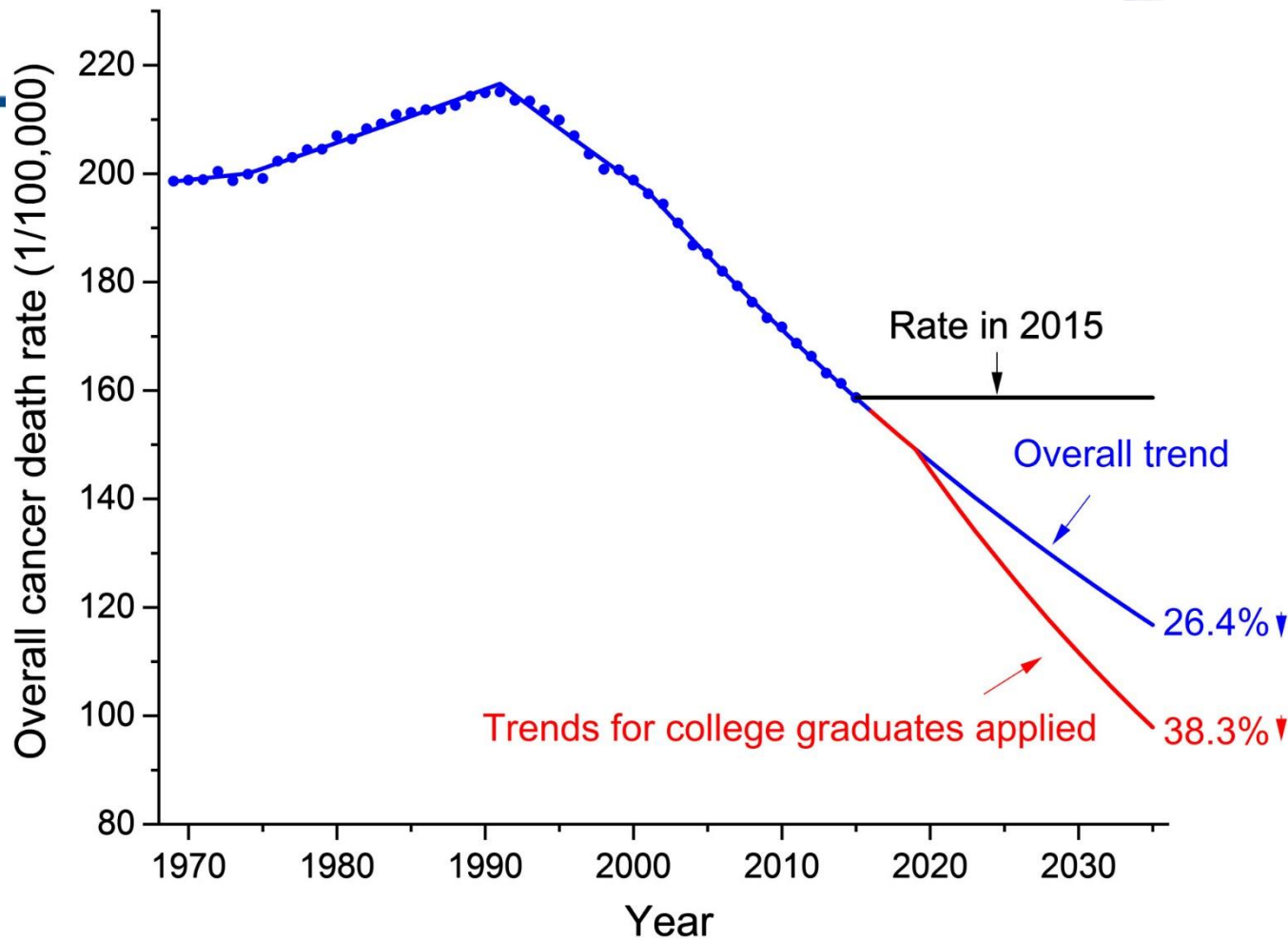


Age Adjusted to 2000 Standard

1900-1970, US Public Health Service, Vital Statistics of the US, Vol. 1 and Vol 2;

1971-2020, US National Center for Health Statistics, Vital Statistics of the U.S

The 2035 challenge goal on cancer mortality reduction



Cancer Control in the 21st Century

The cancer control focus should be on:

- Disease prevention:

 - Smoking

 - Diet and Exercise

 - Alcohol avoidance

 - Vaccination

- Getting optimal basic care to all people!

 - Appropriate screening

 - Appropriate treatment

Importantly!!!

The estimate does not involve a break-through drug.

It is achieved through getting current prevention and treatment to all.

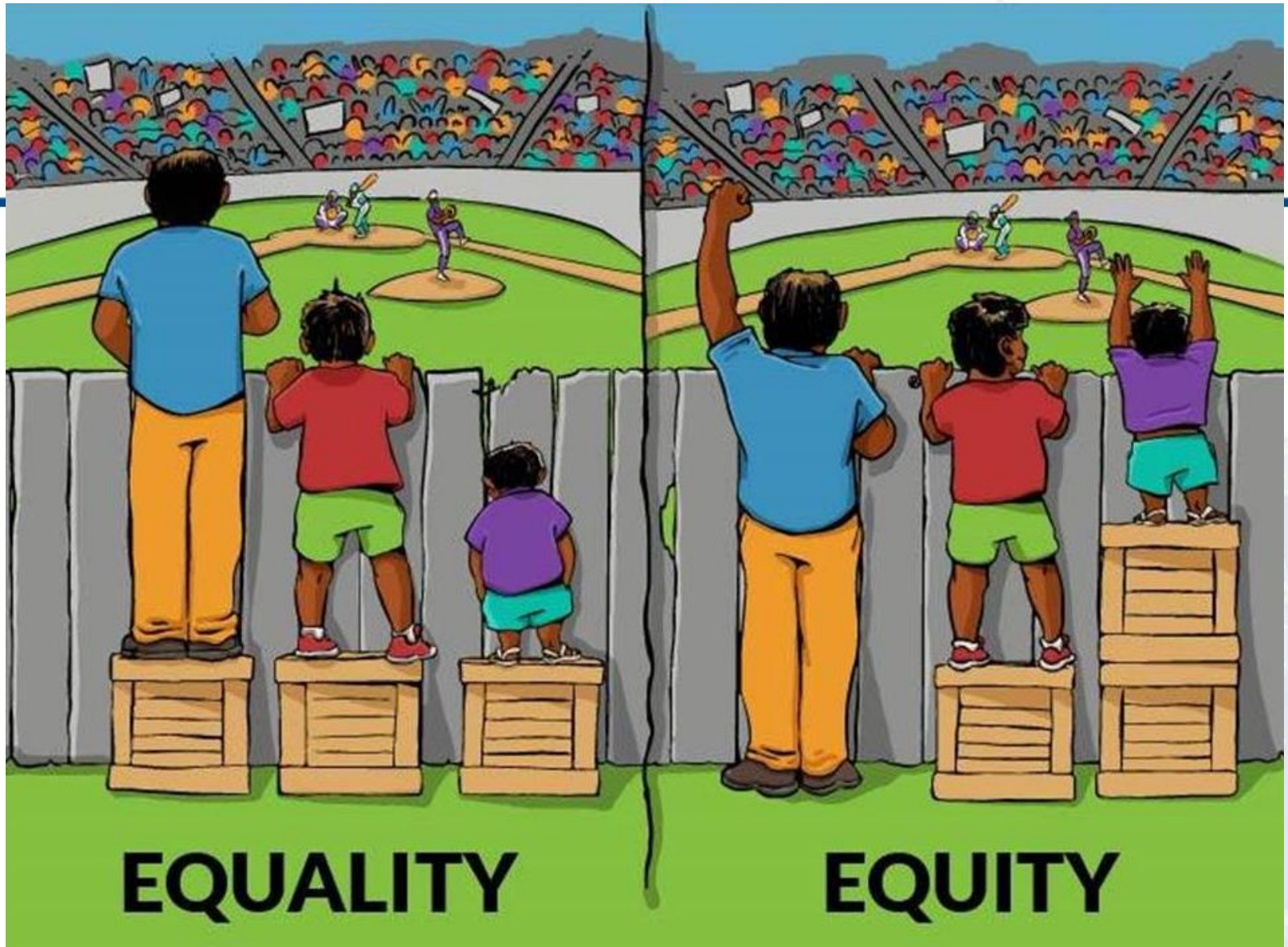
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Scientific Progress

Population disparities always increase when there is scientific progress in medicine:

- This was seen when there were improvements in screening and treatment of breast and colorectal cancer.
- It is occurring as we move into the era of precision medicine and immunotherapy.
- New preventive interventions are less likely to cause significant disparate outcome.



The Johns Hopkins Medical Institutions

