Cancer Control in the 21st Century and Disparities in Health

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Disclosures

• Employment:
  – Johns Hopkins University

• Consulting
  – National Institutes of Health
  – Centers for Disease Control
  – Department of Defense

March 26, 2020
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%

March 26, 2020

CDC Vital Statistics Report
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
US Cancer Death Rate
1900 to 2017

A 29% decline over 26 years

Age Adjusted to 2000 Standard
Cancer Mortality by Race/Ethnicity from 1990 to 2017

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

- 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
  - 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.
Cancer Control in the 21\textsuperscript{st} 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

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

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


(*) JNCI 89:287,1997
JAMA 2016 315:68-76
U.S. Smoking Prevalence by Gender 1955-2010

Graph showing the smoking prevalence for males and females from 1950 to 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.


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

<table>
<thead>
<tr>
<th>Race</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH White</td>
<td>16.0%</td>
<td>17.3%</td>
</tr>
<tr>
<td>Black</td>
<td>13.5%</td>
<td>20.9%</td>
</tr>
<tr>
<td>Native American</td>
<td>24.0%</td>
<td>19.0%</td>
</tr>
<tr>
<td>Asian Pacific Islanders</td>
<td>2.6%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>7.1%</td>
<td>13.1%</td>
</tr>
</tbody>
</table>

CDC, MMWR 2018
Smoking Prevalence by Educational Attainment 2017

- HS dropout: 23.1%
- GED: 36.8%
- HS Grads: 18.7%
- Associates Degree: 15.5%
- Undergraduate Degree: 7.1%
- Graduate Degree: 4.1%

CDC, MMWR 2019
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!


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!


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.

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

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

- White
- Black
- NA/AN
- API
- Hispanic

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

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

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

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

CT: computed tomography
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

LDCT: low dose spiral CT
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/0 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

- **Adopted and Implemented**
- **Adopted but Not Implemented**
- **Not Adopted**

Map showing the states with Medicaid expansion plans as of mid 2019.
THE TRUE COST OF AMERICAN HEALTHCARE (FROM A CANCER DOC!)
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

Rate per 100,000

Age Adjusted to 2000 Standard
The 2035 challenge goal on cancer mortality reduction

Overall cancer death rate (1/100,000)

Year


Rate in 2015
Overall trend
26.4%
Trends for college graduates applied
38.3%

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.
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!!
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.
EQUALITY

EQUITY
The Johns Hopkins Medical Institutions