Reducing your risk of cancer

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Strategies

• For reducing cancer risk in people at average risk
Overarching messages
Focus on cancer risk behaviors for which evidence is strong

• For example, lifestyle factors:
  – Cigarette smoking
  – Overweight and obesity
  – Physical inactivity
  – Suboptimal diet

• De-emphasize controversial factors
  – See “Hoax” on SKCCC website:
    http://www.hopkinsmedicine.org/kimmel_cancer_center/news_events/featured/cancer_update_email_it_is_a_hoax.html

• De-emphasize quick fixes
  – e.g., “magic pills”
Focus on common cancer risk behaviors

Proportion of cancer risk attributable to certain exposures in developed countries

- Tobacco: 30%
- Diet/Obesity/Inactivity: 35%
- Environmental: 6%
- Occupation: 4%
- Infection: 10%
- Reproduction: 7%
- Medical: 1%
- Other: 3%
- Strong heredity: 1%

Adapted from Doll and Peto. JNCI 1981; 66:1191-1308
Target cancer risk behaviors that are risk behaviors for major chronic diseases

• Risk factors for cardiovascular disease and diabetes
  – Cigarette smoking
  – Overweight and obesity
  – Inactivity
  – Suboptimal diet

• Choose healthy aging as the goal
Identify your cancer risk behaviors and thus, your cancer risk

• Use a risk calculator
  – http://www.yourdiseaserisk.wustl.edu/

• Risk calculators
  – walk you through your cancer risk behaviors and family and medical histories, and
  – generate an estimate of your cancer risk relative to the typical risk in the general population.
Identify your cancer risk behaviors and thus, your cancer risk

Cancer—Uterine cancer

Results: Uterine cancer
Compared to a typical woman your age, your risk is above average

Screening Tip
There is no good screening test for uterine cancer.

Above average risk doesn’t mean you’ll definitely get cancer. It’s just an estimate based on your risk factors, some of which you may not be able to change. If you have any concerns, talk to a doctor.

Your risk is above average

Watch Your Risk Drop
You have 1 thing you can do to lower your risk. To see what your risk could be, click on a box and watch your risk drop:

- Achieve and maintain a healthy weight. [Tips]

Uterine cancer has few controllable risk factors. But it’s still important to know your risk and how these factors relate to it. Choose a healthy lifestyle to protect against uterine cancer as well as other diseases.

Keep up the good work!
You’re already doing these things to lower your risk

- You haven’t taken postmenopausal estrogen alone (without progesterone). [More]
Identify your cancer risk behaviors and thus, your cancer risk

**Weight**

*Try to achieve and maintain a healthy weight. It's one of the best things you can do for your health.*

The best way to lose weight is to be physically active. A lot of things count as physical activity, like walking, jogging, or dancing—whatever you enjoy! Try to get at least 30 minutes a day. Make it a fun part of your normal routine.

To see where you fall on the weight range, click here.

Don't feel like you have to tackle losing weight alone. Losing weight and maintaining a healthy weight can be difficult. Talk to a doctor or other health care provider for advice. And remember: small changes can make a big difference over time.

Maintaining a healthy weight lowers your risk of several cancers like colon, breast, kidney, uterine, pancreatic, and esophageal cancer. It also lowers your risk of heart disease, diabetes, and stroke.

To learn more about eating well and exercising visit these websites:

*Fitness Center*
*American Heart Association*

*Fit Forever*
*American Heart Association*

*Healthy Eating Tips*
*Centers for Disease Control and Prevention*
Identify your cancer risk behaviors and thus, your cancer risk

Post-Menopausal Hormones

Avoiding post-menopausal hormones lowers your risk.

Post-menopausal hormones can contain different hormones that are similar to the female reproductive hormones, estrogen and progesterone. After menopause, a woman’s body stops making these hormones in large quantities. For women who are going through (or have already gone through) menopause, post-menopausal hormones can help decrease symptoms, like hot flashes and vaginal dryness, and also protect against osteoporosis and colon cancer. The hormone estrogen is especially important in osteoporosis prevention because it can reduce bone loss and increase bone density. It has also been proven to reduce the risk of fractures in women after menopause.

However, post-menopausal hormones aren’t right for everyone because they also have some significant risks, like increasing the risk of breast cancer and cancer of the uterus. And, although post-menopausal hormones were once thought to lower the risk of heart disease, it is now unclear exactly how they affect the risk of the disease. Talk to a doctor to see how post-menopausal hormones might affect you.

To find out more about menopause and post-menopausal hormones:

- Hormones After Menopause
- National Institute on Aging
- Menopausal Hormone Replacement Therapy
- National Cancer Institute
Engage family and friends

- In efforts to reduce cancer risk and enhance healthy aging
  - Support and team effort
  - Benefits you and them
What are the major cancer risk behaviors?
1. Cigarette smoking and use of other tobacco products

- If you smoke, quit.

- Cigarette smoking causes many cancers
  - Lung
  - Kidney
  - Cervix
  - Bladder
  - Pancreas
  - Esophageal
  - Stomach
  - Laryngeal
  - Leukemia
  - Oral
Cigarette smoking and use of other tobacco products

- Cigarette smoking causes many health problems beyond cancer
  - Cardiovascular disease
  - Respiratory disease
  - Cataract
  - Reduced fertility
  - Pregnancy complications
  - Increase fetal death and stillbirth
  - Hip fracture
  - Low bone density in post-menopausal women
Why repeat the ‘don’t smoke’ message?

• Despite overwhelming evidence that smoking causes innumerable diseases:

  – 20.6% of US adults currently smoke

  – 17.2% of high school students currently smoke

  – 5.2% of middle schoolers currently smoke

http://www.cdc.gov/nchs/data/nhis/earlyrelease/earlyrelease201006.pdf#page=52
http://www.cdc.gov/tobacco/data_statistics/fact_sheets/youth_data/tobacco_use/index.htm#estimates
“Required Warnings for Cigarette Packages and Advertisements”

http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm260181.htm

Family Smoking Prevention and Tobacco Control Act of 2009

Implementation of warning labels: Sept 2012
What are the benefits of quitting smoking?

• Immediate and long term benefits
  – For example,
    • Risk of lung and other smoking-associated cancers decreases
    • 10 years after quitting risk of lung cancer is half that of someone who keeps smoking

How to quit smoking

• Information:
  – http://www.smokefree.gov/
  – http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm198176.htm
Exposure to other people’s cigarette smoke is a risk factor for cancer

- **40.1%** of US nonsmokers are exposed to second hand smoke.  
  [Link](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5935a4.htm?s_cid=mm5935a4_w)

- Nonsmoking spouses of smokers have a **20-50%** higher lung cancer risk than nonsmoking spouses of nonsmokers

- **3,400** nonsmokers die of lung cancer each year because of second hand smoke  
  [Link](http://www.cancer.org/cancer/cancercauses/tobaccocancer/secondhand-smoke)
2. Excess body fatness and weight gain

• If you are overweight or obese, lose weight.
• Maintain a healthy weight.

• Body fatness increases the risk of many cancers:
  – Breast in post-menopausal women
  – Endometrium
  – Esophagus
  – Pancreas
  – Colorectum
  – Kidney

http://www.dietandcancerreport.org/downloads/chapters/chapter_06.pdf
Overweight and obesity are associated with increased cancer risk - Women

Relative Risk

Overweight

Obese

Endometrial

Breast

Ovarian

Overweight and obesity are associated with increased cancer risk - Women

Overweight and obesity are associated with increased cancer risk - Men

How does body fatness influence cancer risk?

Many cancers

↑ Overall and central adiposity → Metabolic Hormonal Inflammatory Perturbations → ↑ Cancer

Esophageal cancer (adenocarcinoma)

↑ Overall and central adiposity → Reflux → Esophageal cell damage → ↑ Cancer
Measuring body fatness

• Body mass index

  – BMI = weight in kg / square of height in m
    • http://www.nhlbisupport.com/bmi/
    • http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html

  – Categories (BMI in kg/m²)
    • Underweight: less than 18.5
    • Normal weight: 18.5 to less than 25
    • Overweight: 25 to less than 30
    • Obese: 30 or more

Goal
“BMI Visual Graph”

Measuring body fatness

• Waist circumference
  – Normal waist
    • Women: 35” or smaller
    • Men: 40” or smaller
  – Too large
    • Women: larger than 35”
    • Men: larger than 40”

Goal
Fat around the middle and risk of colorectal cancer

• Large waist circumference (central adiposity) is a risk factor for colorectal cancer.

http://www.dietandcancerreport.org/downloads/chapters/chapter_06.pdf
Why repeat the body fatness message?

- **63.4%** of American adults are overweight or obese
  
  [Link to CDC data](http://apps.nccd.cdc.gov/brfss/list.asp?cat=OB&yr=2009&qkey=4409&state=All)

- **27.8%** of high school students are overweight or obese
  
  [Link to CDC data](http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5905a1.htm)
Excess body fatness is a risk factor for premature death

Figure 1. Multivariate Relative Risk of Death from All Causes among Men and Women According to Body-Mass Index, Smoking Status, and Disease Status.

The four subgroups are mutually exclusive. Nonsmokers had never smoked. The reference category was made up of subjects with a body-mass index of 23.5 to 24.9.

Statin drug use is inversely associated with risk of aggressive prostate cancer

Same association for long-term use and high-grade disease

Platz EA et al. JNCI 2006; 98:1818-1825. PMID: 17179483
Cholesterol may underlie the association between statins and aggressive prostate cancer

Association between low plasma cholesterol (<25th percentile) and high- and low-grade prostate cancer restricted to men with organ-confined disease, HPFS


Figure 1. Association between serum cholesterol concentration (mg/dL) and Gleason 8 to 10 prostate cancer, placebo arm of the PCPT. The association was estimated using restricted cubic splines with three knots (arrows), truncating at the 2.5 percentile and 97.5 percentile, and adjusting for age, race, family history, BMI, diabetes, regular aspirin use, and history of heart attack. The P value for the test of association was 0.015.
Guidelines in the context of cancer

• Strive to keep BMI well within the normal range.

• World Cancer Research Fund / American Institute for Cancer Research

How to lose weight

• Information:
  – http://www.cancer.org/Healthy/EatHealthyGetActive/TakeControlofYourWeight/index
  – http://www.aicr.org/site/PageServer?pageName=reduce_weight_home
Proportion of cancer deaths that could be avoided if US adults were not overweight/obese

**Table 4. Estimated Population Attributable Fraction According to Body-Mass Index for Mortality from Cancer in U.S. Men and Women.**

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<td>25.0–29.9</td>
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<td>28.8</td>
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<td>35.0–39.9</td>
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<td>≥40.0</td>
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<td>7.9</td>
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<td><strong>Total population attributable fraction</strong></td>
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**Subjects who never smoked**

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<tr>
<td>25.0–29.9</td>
<td>42.1</td>
<td>1.11</td>
<td>4.0</td>
<td>28.8</td>
<td>1.14</td>
<td>3.3</td>
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<td>6.8</td>
<td>22.5</td>
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<td>6.1</td>
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<tr>
<td>35.0–39.9†</td>
<td>12.8</td>
<td>1.31</td>
<td>3.4</td>
<td>10.7</td>
<td>1.40</td>
<td>3.5</td>
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<td>≥40.0</td>
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<td>7.9</td>
<td>1.88</td>
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<td>14.2</td>
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<td></td>
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<td>19.8</td>
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3. Physical inactivity and sedentary behaviors

• Increase physical activity and reduce sedentary time.

• More physical activity is associated with a LOWER risk of cancer of the:
  – Colon
  – Breast in post-menopausal women
  – Endometrium
How does inactivity influence cancer risk?

Inactivity $\rightarrow$ ↑ Body fatness $\rightarrow$ ↑ Cancer

↑ Insulin
Inactivity $\rightarrow$ resistance, inflammation $\rightarrow$ ↑ Cancer
Physical activity has many health benefits

- Lower risk of:
  - Premature death
  - Coronary heart disease, stroke, type 2 diabetes, osteoporosis, and depression
  - Hypertension and elevated cholesterol
- Increases fitness and functional capacity
- Reduces depression
- Enhances cognitive function
- Reduces risk of falls

http://www.health.gov/paguidelines/guidelines/chapter2.aspx
Physical activity and sedentary behaviors

• What counts as physical activity?
  – Leisure time activities, including walking
  – Walking and biking for transportation
  – Household and yard work, including washing car
  – Workplace activity

• What counts as vigorous physical activity?
  – For example, running, aerobics, tennis playing, bicycling, swimming

• What are sedentary behaviors?
  – Sitting while reading, watching TV/DVDs, using a computer, driving
How inactive are we?

• **24.2%** of US adults **did not participate in any physical activities in the past month**

• **70.8%** of US adults **did not participate in 20 or more minutes of vigorous physical activity on 3 or more days of the week.**

http://apps.nccdc.cdc.gov/brfss/list.asp?cat=EX&yr=2009&qkey=4347&state=All
Physical activity guidelines for Americans

• “All adults should avoid inactivity.
  – Some physical activity is better than none.
  – Adults who participate in any amount of physical activity gain some health benefits.”

Physical activity guidelines for Americans

• “For substantial health benefits, adults should do aerobic physical activity
  – at least 2.5 hours / week of moderate-intensity,
  – at least 1.25 hours / week of vigorous-intensity, or
  – An equivalent combination of moderate- and vigorous intensity activity
  – Aerobic activity should be performed in episodes of at least 10 minutes, and preferably, it should be spread throughout the week.”

Physical activity guidelines for Americans

• “For additional and more extensive health benefits, adults should increase their aerobic physical activity to
  – 5 hours / week of moderate intensity,
  – 2.5 hours / week of vigorous intensity, or
  – An equivalent combination of moderate- and vigorous-intensity activity.
  – Additional health benefits are gained by engaging in physical activity beyond this amount.”

Physical activity guidelines for Americans

• “Adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.”
How to increase physical activity

• Information:
  – http://www.cancer.org/Healthy/EatHealthyGetActive/GetActive/index
4. Alcohol drinking

- Minimize the amount and frequency of alcohol drinking.

- Alcohol increases the risk of cancers of the:
  - Mouth, pharynx, larynx
  - Esophagus
  - Colorectum in men and probably in women
  - Liver
  - Breast in post-menopausal women
Alcohol drinking increases the risk of breast cancer: even 1 drink per day

Alcohol drinking

• 5.1% of US adults are heavy drinkers
  – Women: 1+ drink per day
  – Men: 2+ drinks per day

• 15.5% of US adults are binge drinkers
  – Women: 4+ drinks on one occasion
  – Men: 5+ drinks on one occasion

http://apps.nccd.cdc.gov/brfss/list.asp?cat=AC&yr=2009&qkey=7307&state=All
5. Red meat and processed meat

• Reduce consumption of red and processed meat.
  – Replace with beans and other nonmeat proteins

• Higher consumption of red and processed meat is associated with a higher risk of:
  – Colorectal cancer
Proportion of colon cancer risk that is potentially preventable in the population

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Sub-optimal level</th>
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<tbody>
<tr>
<td>Obesity</td>
<td>&gt; 25 kg/m²</td>
</tr>
<tr>
<td>Inactivity</td>
<td>&lt; 15 MET-hours/week</td>
</tr>
<tr>
<td>Smoking</td>
<td>&gt; 3 packyears</td>
</tr>
<tr>
<td>Alcohol</td>
<td>&gt; 15 g/day or former drinker</td>
</tr>
<tr>
<td>Red meat intake</td>
<td>&gt; 2 servings/week</td>
</tr>
<tr>
<td>Folic acid intake</td>
<td>&lt; 100 μg from supplement</td>
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</tbody>
</table>

If everyone had ‘good’ levels:

6. Overexposure to the sun

• Avoid being overexposed to the sun and sun burn.

• Overexposure to the sun causes:
  – Squamous cell skin cancer
  – Basal cell skin cancer
  – Melanoma

http://en.wikipedia.org/wiki/Pyrimidine_dimers
Overexposure to the sun

- Ultraviolet light from the sun causes DNA damage called thymidine dimers, which lead to mutations.

  [Link to source](http://faculty.quinnipiac.edu/health/biology/buckley/bi_571/DNA_repair/sld049.htm)

- Sunlight also ages the skin.

  [Image of DNA damage and repair process]

  Dimer formed between adjacent thymidine residues along a DNA strand.
Should the sun be avoided altogether?

• Some exposure to the sun may be helpful for avoiding vitamin D levels that are too low.

• Vitamin D is needed for bone health.
  – New recommendations for vitamin D intake for Americans were released in November 2010

• Low vitamin D may increase the risk of some cancers
  – But the evidence is insufficient at this time for making vitamin D recommendations for cancer
    • http://www.cancer.gov/cancertopics/factsheet/prevention/vitamin-D
7. Hormone replacement therapy

• Talk to your doctor about the benefits versus risks.

• Hormone replacement therapy causes
  – Breast cancer
  – Endometrial cancer (estrogen without progesterone)
Hormone replacement therapy and breast cancer risk

Writing Group for the Women's Health Initiative Investigators


16608 postmenopausal women aged 50-79 years, followed median of 5.2 years

Hormone replacement therapy

• For information:
  – http://www.fda.gov/ForConsumers/ByAudience/ForWomen/ucm118624.htm
Other medications: Should aspirin be taken to prevent cancer?

- The U.S. Preventive Services Task Force—“recommends against the routine use of aspirin and nonsteroidal anti-inflammatory drugs (NSAIDs) to prevent colorectal cancer in individuals at average risk for colorectal cancer.”

Effect of daily aspirin on long-term risk of death due to cancer: analysis of individual patient data from randomised trials

Peter M Rothwell, F Gerald R Fowkes, Jill F F Belch, Hisao Ogawa, Charles P Warlow, Tom W Meade

*Lancet* 2011; 377: 31-41
Published Online
December 7, 2010
DOI:10.1016/S0140-6736(10)62110-1
Long-term, daily aspirin use is associated with a lower risk of cancer death.

Figure 3: Effect of allocation to aspirin versus control on 20-year risk of death due to any solid cancer stratified by scheduled duration of trial treatment in three trials with long-term follow-up \(^{15-19}\).

Continuous variable interaction, \(p=0.01\).

8. Infectious agents

• Human papillomavirus (HPV) causes cervical cancer.

• Hepatitis B virus causes liver cancer.
  – http://www.cancer.gov/cancertopics/wyntk/liver/page4

• *Helicobacter pylori* causes stomach cancer.
HPV and cervical cancer

• Two FDA-approved HPV vaccines
  – Both approved for females 9 to 26 years old
  – One approved for males 9 to 26 years old

• For information on HPV, screening, and vaccination:
  – http://www.cdc.gov/std/HPV/STDFact-HPV.htm
  – http://www.cancer.gov/cancertopics/factsheet/Prevention/HPV-vaccine
Screening for cervical cancer

• Screen for pre-malignant cervix changes
  – US Preventive Services Task Force
    • strongly recommends screening for cervical cancer in women who have been sexually active and have a cervix.

• recommends against routinely screening women older than age 65 for cervical cancer if they have had adequate recent screening with normal Pap smears and are not otherwise at high risk for cervical cancer.

http://www.uspreventiveservicestaskforce.org/uspstf/uspscerv.htm
Does screening prevent cancer?

• Depends on the type of screening.

• Yes
  – Pap smear – detects premalignant cervical lesions, which can be removed
  – Colonoscopy – detects premalignant adenomas, which can be removed
Does screening prevent cancer?

• Depends on the type of screening.

• No
  – Mammograms detect breast cancer – detects cancers earlier than they would otherwise be detected
  • Benefit – earlier detection means earlier treatment leading to better prognosis

  – PSA screening detects prostate cancer – detects cancers earlier than they would otherwise be detected
  • Benefit / risk complex and may depend on age and comorbidities
What about cell phones?
INTERNATIONAL AGENCY FOR RESEARCH ON CANCER

PRESS RELEASE
N° 208

31 May 2011

IARC CLASSIFIES RADIOFREQUENCY ELECTROMAGNETIC FIELDS AS POSSIBLY CARCINOGENIC TO HUMANS

Lyon, France, May 31, 2011 -- The WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency electromagnetic fields as possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer, associated with wireless phone use.

Background
Over the last few years, there has been mounting concern about the possibility of adverse health effects resulting from exposure to radiofrequency electromagnetic fields, such as those emitted by wireless communication devices. The number of mobile phone subscriptions is estimated at 5 billion globally.

From May 24–31 2011, a Working Group of 31 scientists from 14 countries has been meeting at IARC in Lyon, France, to assess the potential carcinogenic hazards from exposure to radiofrequency electromagnetic fields. These assessments will be published as Volume 102 of the IARC Monographs, which will be the fifth volume in this series to focus on physical agents, after Volume 55 (Solar Radiation), Volume 75 and Volume 78 on ionizing radiation (X-rays, gamma-rays, neutrons, radio-nuclides), and Volume 80 on non-ionizing radiation (extremely low-frequency electromagnetic fields).
IARC’s Classification of biological, physical, and chemical agents with respect to carcinogenicity

- **Group 1**: Carcinogenic to humans
- **Group 2A**: Probably carcinogenic to humans
- **Group 2B**: Possibly carcinogenic to humans
- **Group 3**: Not classifiable as to its carcinogenicity to humans
- **Group 4**: Probably not carcinogenic to humans

http://monographs.iarc.fr/ENG/Classification/index.php
What about cell phones?

• WHO’s Key Fact List:
  • Mobile phone use is ubiquitous with an estimated 4.6 billion subscriptions globally.
  
  • The electromagnetic fields produced by mobile phones are classified by the International Agency for Research on Cancer as **possibly** carcinogenic to humans.
  
  • Studies are ongoing to more fully assess potential long-term effects of mobile phone use.
  
  • WHO will conduct a formal risk assessment of all studied health outcomes from radiofrequency fields exposure by 2012.

A few words about strategies

- For reducing cancer risk in people at higher than average risk
- For reducing cancer burden and enhancing the lives of cancer survivors
Following the recommendations for healthy aging is a good start

- Women and men at high risk of cancer or who have had cancer are still at risk for cardiovascular disease, stroke, diabetes, and other common chronic diseases just like other people who have not had cancer.
Strategies for reducing the risk of specific cancers in high-risk women

• Often involve personalized medical decision-making
  – Weigh the risks versus the benefits

• For example, women at high risk for breast cancer and their doctors may discuss the risks and benefits of
  – Chemoprevention with drugs
  – Surgery to remove the breasts
  – Surgery to remove the ovaries (pre-menopausal women)
Strategies for reducing risk of breast cancer in high-risk women

• Information:

  – http://www.cancer.gov/cancertopics/pdq/prevention/breast/healthprofessional#Section_186

Strategies for reducing cancer burden and enhancing the lives of cancer survivors

• Active area of research
  – Prevention of cancer recurrence
  – Improving and maintaining overall well-being of cancer survivors

• Information for the men in your lives:
  – Two examples of work from my group
Men who gain weight have a higher risk of recurrence, JHH 1993-2006

Men who smoke have a higher risk of prostate cancer recurrence

Adjusted for body mass index and physical activity 1 year after surgery, age, race/ethnicity, family history, pre-operative PSA, year of surgery, stage, surgical margins, and grade

For reducing cancer burden and enhancing the lives of cancer survivors

• Information on survivorship:
Take home messages

• Focus on cancer risk behaviors for which evidence is strong
• Focus on common cancer risk behaviors
• Target your cancer risk behaviors that are risk behaviors for major chronic diseases
• Identify your cancer risk behaviors and thus, your cancer risk
• Engage your family and friends