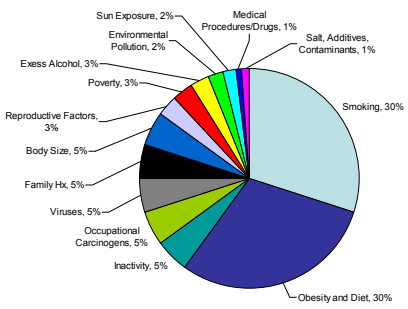
Cancer Prevention: From Research To the Dinner Table

Lindsey French, RD
Huntsman Cancer Institute

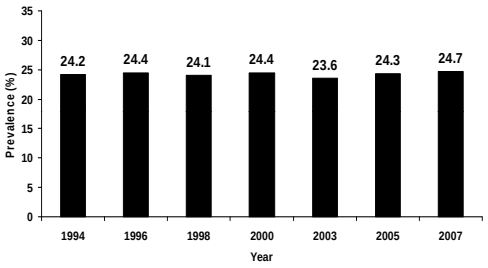
Cancer Causes

Harvard Report on Cancer Prevention



Trends in Consumption of Five or More Recommended Vegetable and Fruit Servings for Cancer Prevention,

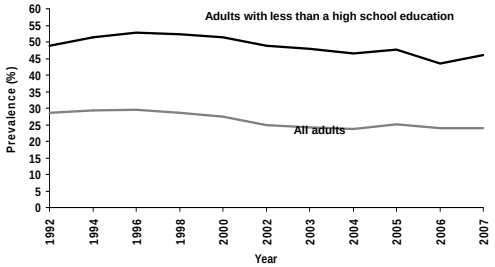
Adults 18 and Older, US, 1994-2007



Note: Data from participating states and the District of Columbia were aggregated to represent the United States.
Source: Behavioral Risk Factor Surveillance System CD-ROM (1984-1995, 1996, 1998) and Public Use Data Tape (2000, 2003, 2005, 2007), National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 1997, 1999, 2000, 2001, 2004, 2006, 2008.

Trends in Prevalence of No Leisure-Time Physical Activity

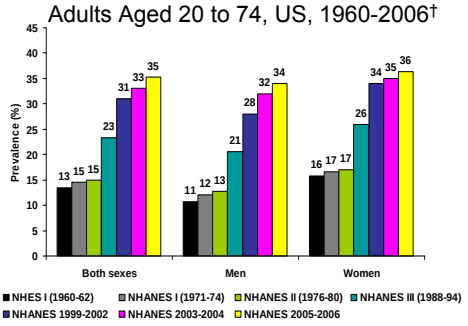
by Educational Attainment, Adults 18 and Older, US, 1992-2007



Note: Data from participating states and the District of Columbia were aggregated to represent the United States. Educational attainment is for adults 25 and older.
Source: Behavioral Risk Factor Surveillance System CD-ROM (1984-1995, 1996, 1998) and Public Use Data Tape (2000, 2002, 2004, 2005, 2006, 2007), National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 1997, 1999, 2000, 2001, 2003, 2005, 2006, 2007, 2008.

Trends in Obesity* Prevalence (%), By Gender,

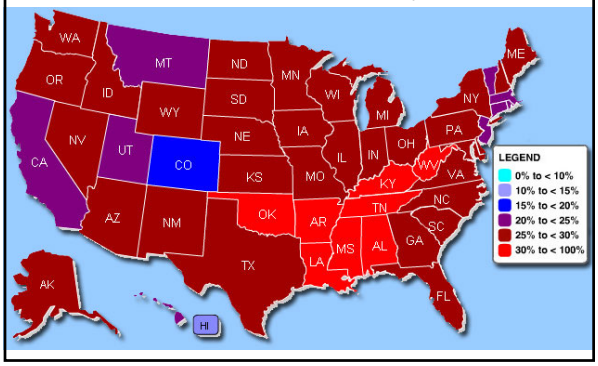
Adults Aged 20 to 74, US, 1960-2006†



*Obesity is defined as a body mass index of 30 kg/m² or greater. † Age adjusted to the 2000 US standard population. Source: National Health Examination Survey 1960-1962, National Health and Nutrition Examination Survey, 1971-1974, 1976-1980, 1988-1994, 1999-2002, National Center for Health Statistics, Centers for Disease Control and Prevention, 2002, 2004. 2003-2004, 2005-2006: National Health and Nutrition Examination Survey Public Use Data Files, 2003-2004, 2005-2006, National Center for Health Statistics, Centers for Disease Control and Prevention, 2006, 2007.

2009 US Obesity Rates by State

American Institute for Cancer Research. www.airc.org.



Cancer Sites Linked to Overweight/Obesity

- Esophagus
- Gallbladder
- Pancreas
- Liver
- Colon
- Rectum
- Post-menopausal Breast
- Endometrial
- Aggressive Prostate
- Non-Hodgkin's Lymphoma
- Leukemia
- Multiple Myeloma
- Renal*
- Melanoma
- Thyroid

The Clinical Guide to Oncology Nutrition/Oncology Nutrition DPG. 2nd ed. 2006. American Dietetic Association.
*Renal, thyroid, and melanoma cited by Wolin, Carson, and Colditz.

Obesity and Cancer

Wolin, K.Y., Carson,K, Colditz, G.A. Obesity and Cancer. *The Oncologist* 2010; 15:556:565.

- 20% cancer cases caused by obesity
- Complicates chemo dosing & tx toxicity
- Poor treatment outcomes
- Higher mortality rates
- Less disease free time for survivors
- Current Research
  - What is the underlying biology of the relationship between obesity and the various cancer sites?

Hormones, Growth Factors, and Cytokines, Oh My!

- Blood glucose & Insulin (c-peptide)
  - ↑ Colon, Prostate, Endometrial
  - ? Kidney and Pancreatic
- Estrogen
  - ↑ Endometrial and Breast
  - ? Colon
- Leptin
  - ↑ Colorectal and Prostate
- TNF, Interleukin, C-RP
  - ↑ Pro-inflammatory factors produced by adipocytes
- Insulin-like growth factor

World Cancer Fund &American Institute for Cancer Research 2nd Report on Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective. P. 39. Washington DC AICR 2007.

Table 1. RR for cancer per 5 kg/m2 higher BMI and most likely causal mechanism: Males

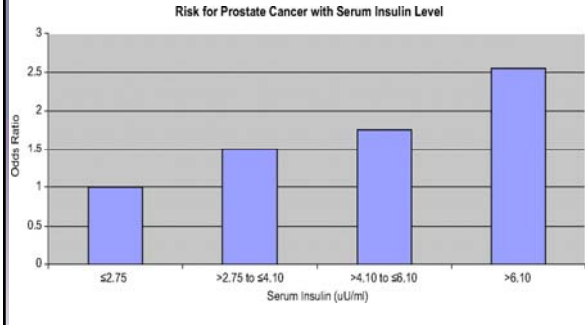
Table 1. RR for cancer per 5 kg/m^2 higher BMI and most likely causal mechanism: Males

Cancer type	RR	Causal mechanism
Esophageal adenocarcinoma	1.52[a]	Reflux esophagitis and chronic irritation
Thyroid	1.33[c]	Unknown
Colon	1.24[a]	Insulin
Renal	1.24[a]	In part though hypertension
Liver	1.24	Fatty liver cirrhosis
Malignant melanoma	1.17[b]	?
Multiple myeloma	1.11[a]	Inflammatory pathways—IL-6
Rectum	1.09[a]	?
Gallbladder	1.09	Chronic secretion-gallstones and irritation
Leukemia	1.08[b]	?
Pancreas	1.07	Possible insulin pathway
Non-Hodgkin's lymphoma	1.06[a]	Inflammatory pathways—IL-6
Prostate[a]	1.03	?
Lung	0.76[a]	Smoking leads to leanness and causes lung cancer
Esophageal squamous	0.71[a]	Smoking leads to leanness and causes squamous esophageal cancer

Shown is the RR for a five-point greater BMI—for example, the RR linked to a BMI of 28 compared with a BMI of 23, or a BMI of 32 compared with a BMI of 27.
[a]$p < .0001$.
[b]$p < .01$.
[c]$p < .05$.
[d]Biased to null because this includes predominantly low-grade lesions.
Abbreviations: BMI, body mass index; IL, interleukin; RR, relative risk.
Based on Figure 3 of Renehan AG, Tyson M, Egger M et al. Body-mass index and incidence of cancer: A systematic review and meta-analysis of prospective observational studies. Lancet 2008;371:569–578.

Wolin, K. Y. et al. Oncologist 2010;15:556-565

Figure 3. Serum insulin and risk for prostate cancer



Wolin, K. Y. et al. Oncologist 2010;15:556-565

Table 2. RR for cancer per 5 kg/m2 higher BMI and most likely causal mechanism: Females

Table 2. RR for cancer per 5 kg/m^2 higher BMI and most likely causal mechanism: Females

Cancer type	RR	Causal mechanism
Endometrium	1.59[a]	Endogenous estrogen
Gallbladder	1.59[c]	Chronic secretion-gallstones and irritation
Esophageal adenocarcinoma	1.51[a]	Reflux esophagitis and chronic irritation
Renal	1.34[a]	In part through hypertension
Leukemia	1.17[c]	Unknown
Thyroid	1.14[b]	Unknown
Breast (postmenopausal)	1.12[c]	Endogenous estrogen
Pancreas	1.12[c]	Possible insulin pathway
Multiple myeloma	1.11[a]	Inflammatory pathways—IL-6
Colon	1.09[a]	Insulin
Non-Hodgkin's lymphoma	1.07	Inflammatory pathways—IL-6
Liver	1.07	Fatty liver cirrhosis
Breast (premenopausal)	0.92[b]	Irregular menstrual cycles, hormones
Lung	0.8[c]	Smoking leads to leanness and causes lung cancer
Esophageal squamous	0.57[a]	Smoking leads to leanness and causes squamous esophageal cancer

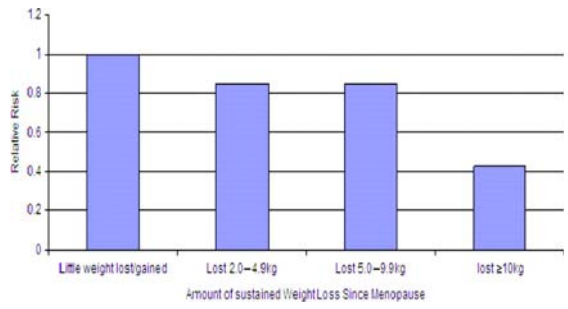
RR for a five-point greater BMI—for example, the RR linked to a BMI of 28 compared with a BMI of 23, or a BMI of 32 compared with a BMI of 27.
[a] $p < .0001$.
[b] $p < .01$.
[c] $p < .05$.
Abbreviations: BMI, body mass index; IL, interleukin; RR, relative risk.
Based on Figure 4 of Renehan AG, Tyson M, Egger M et al. Body-mass index and incidence of cancer: A systematic review and meta-analysis of prospective observational studies. Lancet 2008;371:569–578.

Wolin, K. Y. et al. Oncologist 2010;15:556-565

Breast Cancer and Weight

- Risk of breast cancer ↓ 50% in women who lost >10kg and maintained (Eliassen et. al. 2006.)
- Nutrition goals during tx focus on avoiding weight gain
- Nutrition goals after tx focus on weight loss and building lean mass
- Physical activity and wt. loss reduce risk of recurrence

Figure 4. Sustained weight loss and breast cancer risk in postmenopausal women who never used postmenopausal hormones



The Oncologist

Wolin, K. Y. et al. Oncologist 2010;15:556-565

Behavior Change Goals

- Focus on behavior changes that result in creating an energy deficit
- Help individuals find motivation
- Maintain progress and motivation
- Wolin recommends applying the "Five A's"
  - Assess, advise, agree, assist, arrange

Meet Sarah

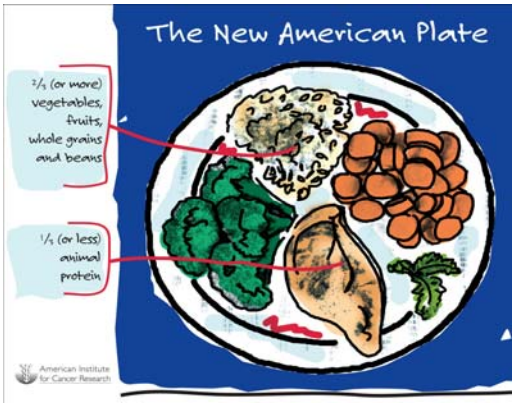
- 26 year-old teacher with back pain
- Started with lunch…
- Next dinner and sweets…
- Exercise
- Reinforcements
  - Consistent weight loss and shopping
- Continuous maintenance required

AICR Recommendations for Cancer Prevention

1. Be as lean as possible within the normal range of body weight.
2. Be physically active as part of every day life.
3. Eat a plant-based diet.
   - Get at least 5 servings per day of non-starchy vegetables and fruits.
   - Eat unprocessed grains and beans with each meal.

Eat a Plant Based Diet

Vitamins + Minerals + Phytochemicals = Anti-cancer Effects



Foods	Phytochemicals	Vitamins & Fiber	Antiox-idant Action	Enzyme Formation	Cancer Inhibitor
Cruciferous veg, broccoli, cauliflower, cabbage	Indoles, sulforaphane, isothiocynate	Folate, Vitamins A & C, Insoluble fiber			X
Allium veg, garlic, onion	Organosulfur compounds	Soluble and insoluble fiber	X		X
Berries, grapes, apples, nuts	Ellagic acid	Vitamins E & C, beta-carotene, Soluble fiber	X	X	X
Soybeans, beans, peas, lentils	Isoflavones (genistein), saponins, phytosterols	Soluble fiber			X
Citrus fruit	Terpenes, coumarins, flavanoids	Vitamin C, folate, Soluble fiber	X	X	X

Foods	Phytochemicals	Vitamins & Fiber	Antiox-idant Action	Enzyme Formation	Cancer Inhibitor
Carrots, yams, canteloupe, butternut squash	Beta-carotene	Soluble and Insoluble fiber	X	X	X
Flaxseed, whole wheat, barley, brown rice	Lignans	Soluble and insoluble fiber	X		X
Tomatoes, tomato products, red grapefruit	Lycopene	Vitamin C, Soluble fiber	X		
Green tea, grapes, cocoa beans	Polyphenols	Soluble fiber			X
Hot peppers	Capsaicin	Vitamin C	X		X

Tomato and Broccoli Study

- A lycopene supplement may not hurt you, but the whole tomato can help you more. A whole tomato may help you, but a tomato eaten with broccoli will help you more. Tomato with broccoli may help you, but a medley of different vegetables eaten together will bolster the body's different defenses against chronic disease."

--Jeff Prince, Vice-President for Education at AICR

AICR Recommendations for Cancer Prevention

4. Limit consumption of energy dense foods, avoid sugary drinks, and fast foods.
5. Limit intake of red meat (<18oz per week) and avoid processed meats.
6. Limit alcohol intake.
   - Men: 2 drinks or less per day
   - Women: 1 drink or less per day
7. Limit consumption of salt and avoid moldy grains and legumes.
8. Aim to meet nutrient needs through diet alone.

Recommendations for Special Populations

9. Mothers to breastfeed and children to be breastfed.
10. Cancer survivors should aim to follow the recommendations for nutrition, physical activity, and weight.

Physical Activity & Colon Cancer

Physical Activity, Sedentary Behavior, and the Risk of Colon and Rectal Cancer in the NIH-AARP Diet and Health Study.

- 488,720 Subjects age 50-71, 7 year follow up
- Observed 18% lower risk of colon cancer exercising 5x per week Vs. rarely/never
  - Men "significant decrease" (p= 0.001, 95% CI)
  - Women "suggested decrease" (p=0.376, 95% CI)
- Inverse relations with low and moderate-vigorous intensity
- Positive association with sedentary behavior and colon cancer

Study Conclusion

"*Engaging in physical activity of any intensity is associated with reductions in colon and rectal cancer risk. Conversely, time spent sedentary is associated with increased colon cancer risk.*"

Physical Activity, Sedentary Behavior, and the Risk of Colon and Rectal Cancer in the NIH-AARP Diet and Health Study.

Exercise as often as possible as intensely as possible.

Hot Topics: Vitamin D

- Research and Review of RDAs
  - Current RDA: adults 50-70 200 IU; >70 400IU
- Colon cancer risk reduced with adequacy
- Emerging evidence suggests protection against cancer, metabolic syndrome, diabetes, HTN, MS, and others
- Questions remain…
  - How much? For whom?
  - Consequences of high Vitamin D status?

Vitamin D: Where do we go from here?

References

American Institute for Cancer Research. www.airc.org.

Doll R, Peto R. The Causes of Cancer: Quantitative Estimates of Avoidable Risks of Cancer in the United States Today. New York: Oxford University Press, 1981:1-115.

Eliassen AH, Colditz GA, Rosner B et al. Adult weight change and risk of postmenopausal breast cancer. JAMA 2006;296:193–201.

"Harvard Report on Cancer Prevention, Vol. I: Causes of Human Cancer" (1996), Vol. 7, pp. 53–55. Accessed 10/2/10 on-line at http://www.health.harvard.edu/newsletters/Harvard_Mens_Health_Watch/2009/April/The-10-commandments-of-cancer-prevention

Howard, R.A., et. al. Physical Activity, Sedentary Behavior, and the Risk of Colon and Rectal Cancer in the NIH-AARP Diet and Health Study. Cancer Causes Control. (2008).

Oncology Nutrition Dietetic Practice Group. The Clinical Guide to Oncology Nutrition/Oncology Nutrition DPG. 2nd ed. 2006. American Dietetic Association.

Toner, C.D. et. Al. The Vitamin D and Cancer Conundrum: Aiming at a moving target. J Amer Dietetic Assoc. 2010.

Wolin, K.Y., Carson,K, Colditz, G.A. Obesity and Cancer. *The Oncologist* 2010; 15:556:565.

World Cancer Fund &American Institute for Cancer Research 2nd Report on Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective. P. 39. Washington DC AICR 2007.