

Physical Activity in Cancer Prevention: Support and Context for the Issue



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Creating a Culture of Prevention
Through Physical Activity

*The Role of Physical Activity in Cancer Prevention
and Health Promotion in Youth*



DELAWARE
CANCER
CONSORTIUM

**What does cancer have to do with
youth?**

**Isn't cancer mainly a disease of older
adults???**

US Cancer Incidence Rates by Age

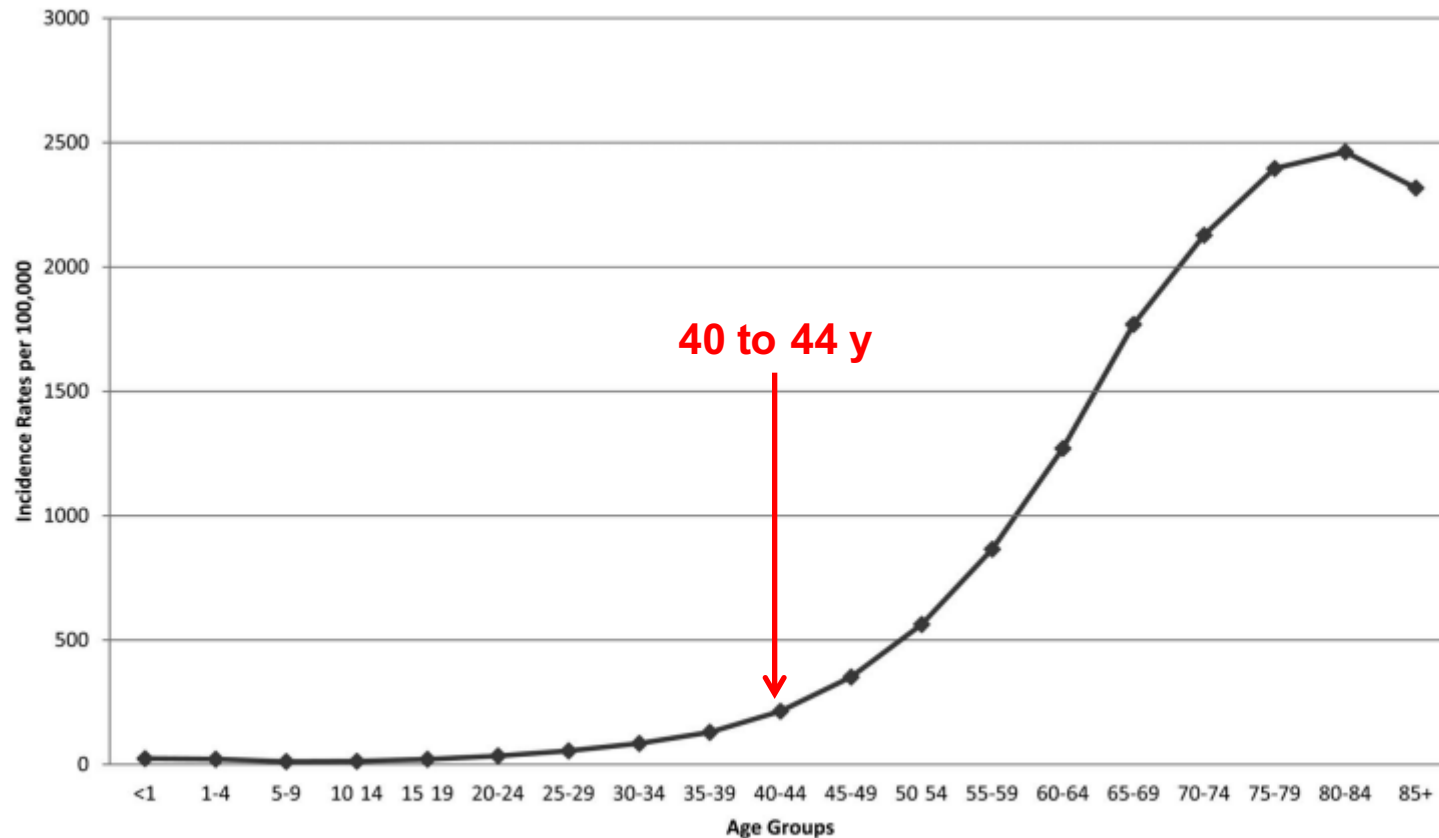


FIGURE 1. Age-specific (Crude) SEER U.S. incidence rates (IRs) of all cancer sites combined, all ages, all races, both sexes 2000 to 2010. X-axis: age group; Y-axis: IR per 100,000. Cancer sites include invasive cases only. Incidence source: SEER 18 areas.⁴

US Cancer Mortality Rates by Age

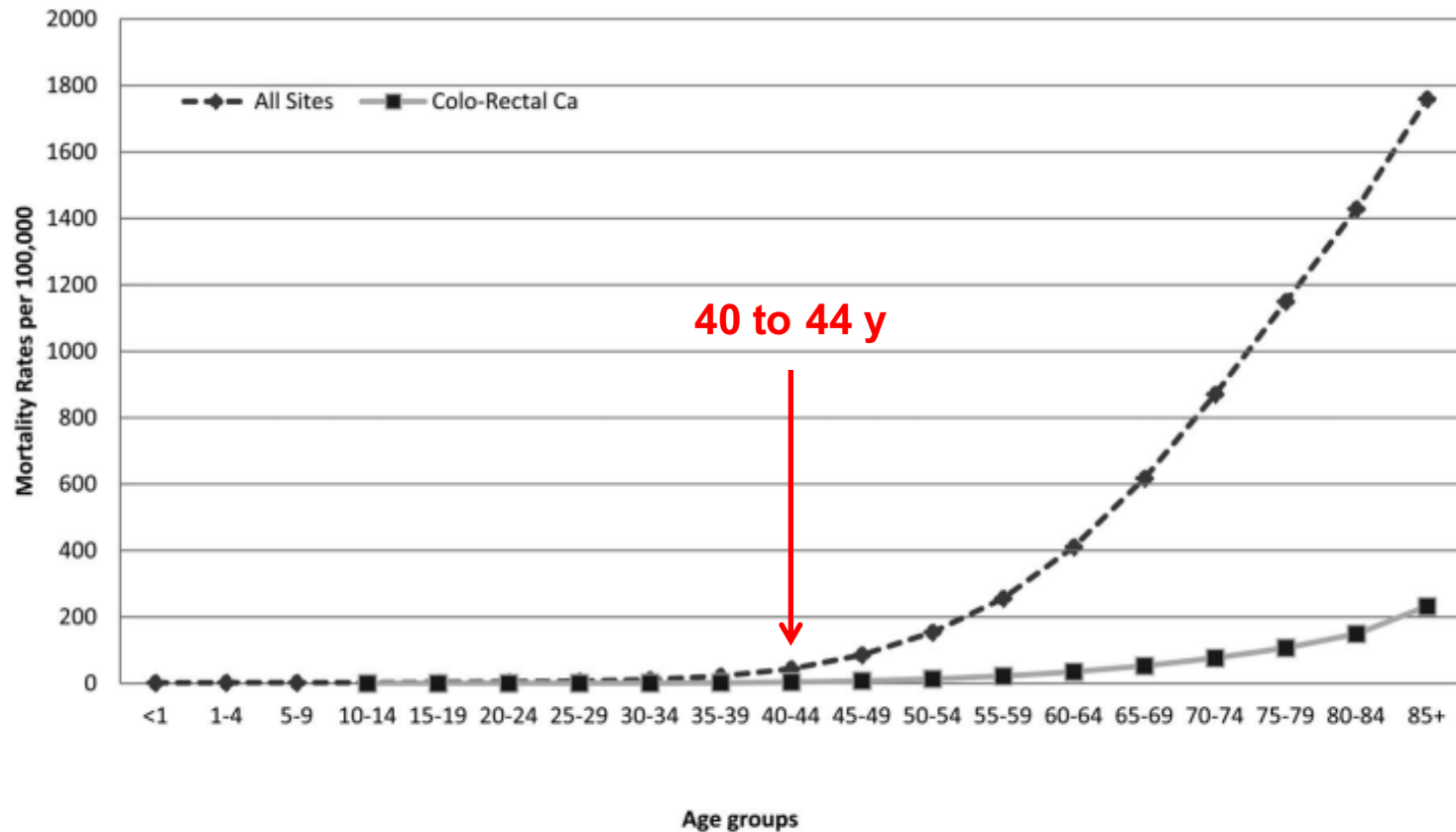


FIGURE 3. Age-specific (Crude) SEER U.S. mortality rates of all cancer sites combined and colorectal cancer, all ages, all races, both sexes 2000 to 2010. X-axis: age groups; Y-axis: mortality rates per 100,000. Cancer sites include invasive cases only. Mortality source: U.S. mortality files, National Center for Health Statistics, Centers for Disease Control and Prevention.⁶ IR, incidence rates.

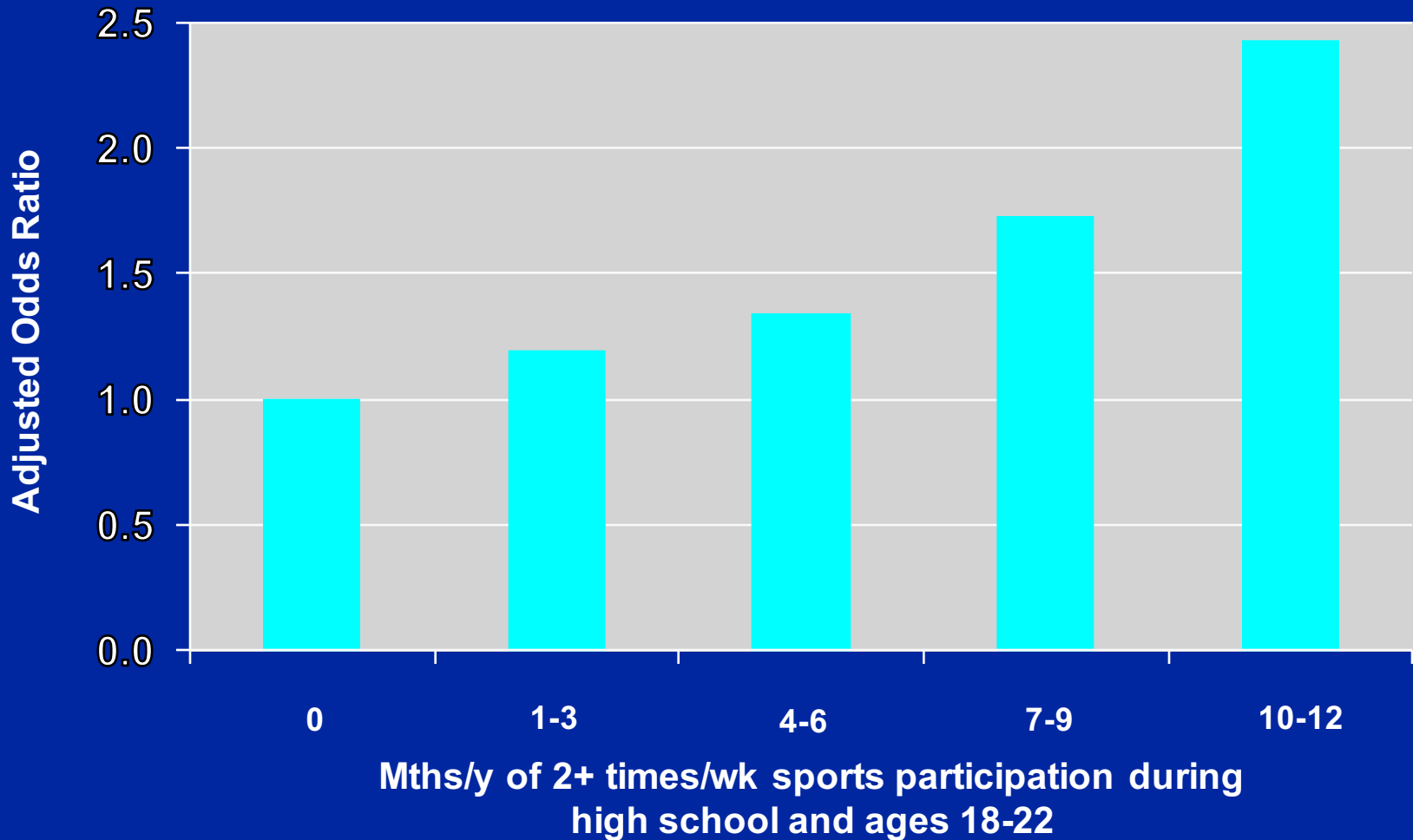
Tracking of Physical Activity from Childhood to Adulthood: A Review

Risto Telama

LIKES Research Institute, Jyväskylä,
Department of Sport Sciences, University of Jyväskylä, Finland

“ ... physical activity appears to track reasonably well in the longer term, for example from adolescence to adulthood”

Likelihood of Fulfilling PA Guidelines as Older Adult

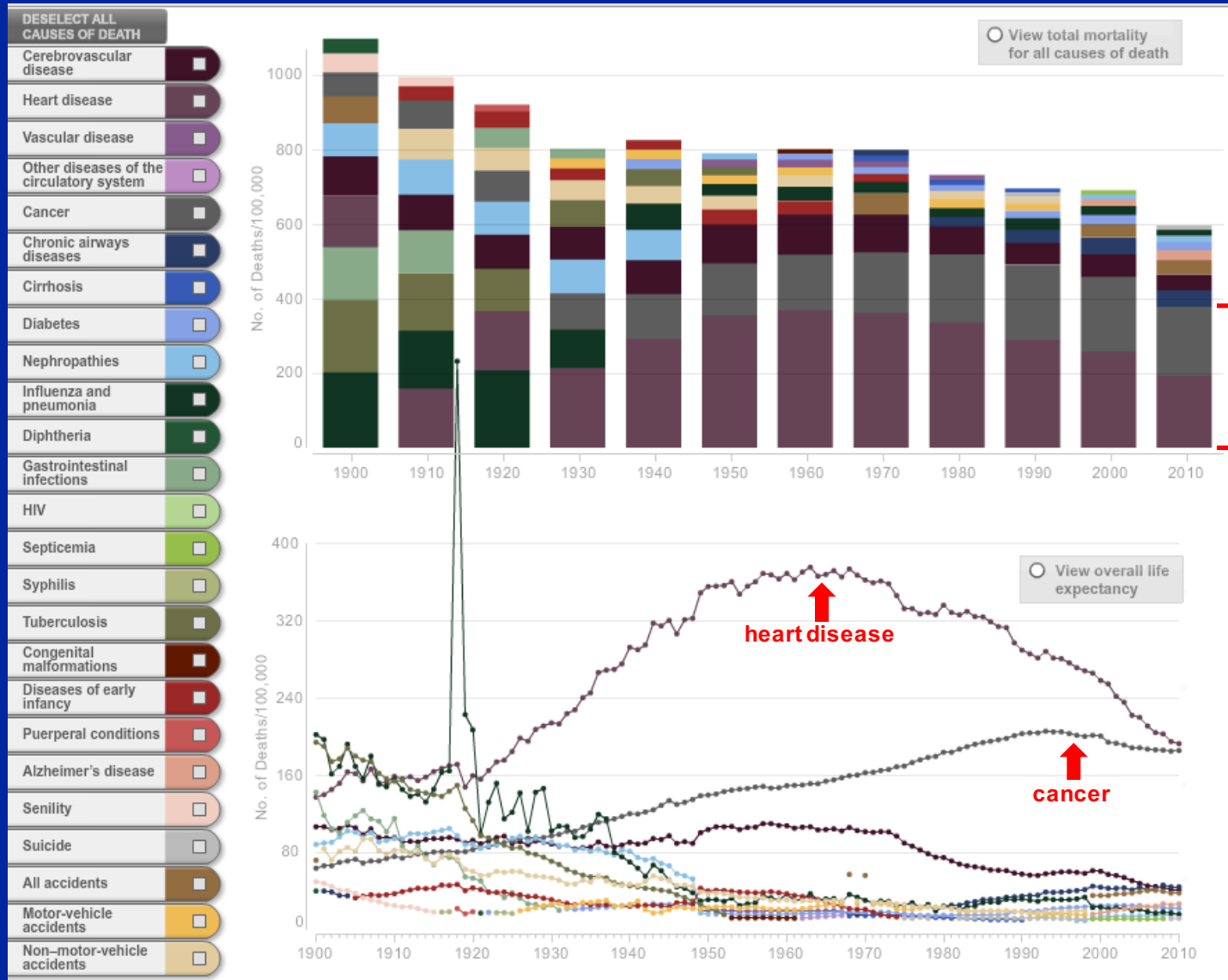


Topics Covered

- 1. Importance of cancer**
- 2. How active (or inactive) are we?**
- 3. Research on physical activity and cancer prevention**

Importance of Cancer

Top 10 Causes of Death, USA, 1900-2010



heart disease and cancer

Table 1. Leading Causes of Death Worldwide by Income Level, 2012 (Thousands)

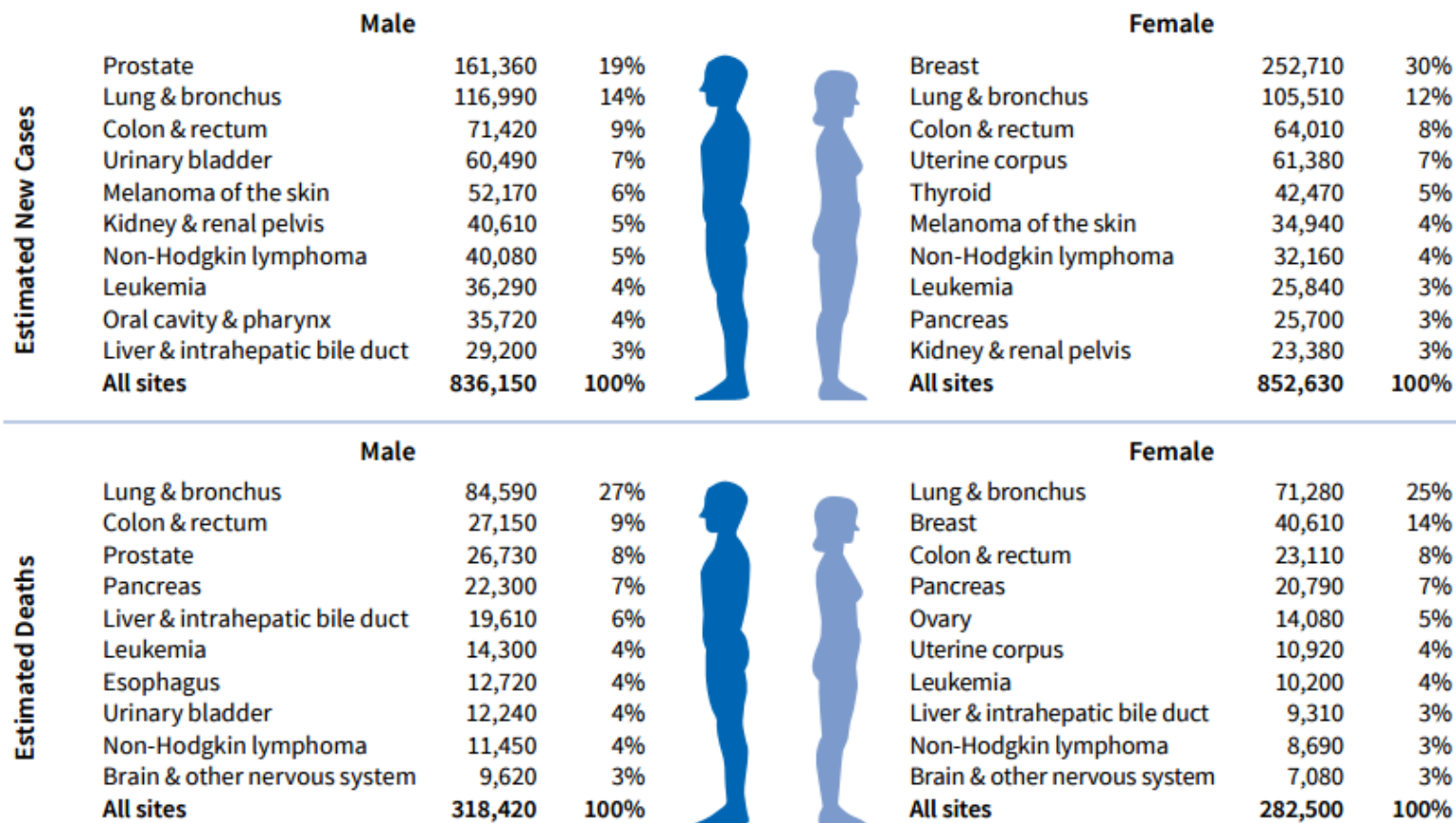
	Worldwide			Low- and Middle-income			High-income		
	Rank	Deaths	%	Rank	Deaths	%	Rank	Deaths	%
Cardiovascular diseases	1	17,513	31%	1	13,075	30%	1	4,438	38%
Malignant neoplasms	2	8,204	15%	3	5,310	12%	2	2,894	25%
Infectious and parasitic diseases	3	6,431	12%	2	6,128	14%	7	303	3%
Respiratory diseases	4	4,040	7%	4	3,395	8%	3	645	6%
Unintentional injuries	5	3,716	7%	5	3,212	7%	5	504	4%
Respiratory infections	6	3,060	5%	6	2,664	6%	6	396	3%
Digestive diseases	7	2,263	4%	7	1,748	4%	4	515	4%
Diabetes mellitus	8	1,497	3%	8	1,243	3%	9	254	2%
Intentional injuries	9	1,428	3%	9	1,185	3%	10	243	2%
Genitourinary diseases	10	1,195	2%	10	935	2%	8	260	2%
Nutritional deficiencies	11	559	1%	11	534	1%	14	25	0%
Congenital anomalies	12	556	1%	12	515	1%	13	42	0%
Maternal conditions	13	296	1%	13	293	1%	16	3	0%
Musculoskeletal diseases	14	216	0%	14	158	0%	12	58	1%
Other neoplasms	15	193	0%	15	116	0%	11	77	1%
All causes		55,843			44,172			11,671	

Source: World Health Organization Global Health Observatory Data Repository, Mortality and Global Health Estimates 2012. apps.who.int/gho/data/?theme=main. Accessed August 24, 2014.

American Cancer Society, Inc., Surveillance Research, 2015

Leading Cancer Types (New Cases and Deaths) by Sex, US 2017

Figure 3. Leading Sites of New Cancer Cases and Deaths – 2017 Estimates



Estimates are rounded to the nearest 10, and cases exclude basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder.

©2017, American Cancer Society, Inc., Surveillance Research

Behaviors that ↓ Cancer Risk

- Don't smoke
- **Be physically active (today's topic)**
- Eat a healthy diet (if you drink, limit alcohol intake)
- Maintain a healthy weight

100-Year-Old Sets World Record at Penn Relays

Ida Keeling runs a 1:17 in the 100-meter dash, setting new mark for centenarians.

By [Derek Call](#) SUNDAY, MAY 1, 2016, 12:01 PM



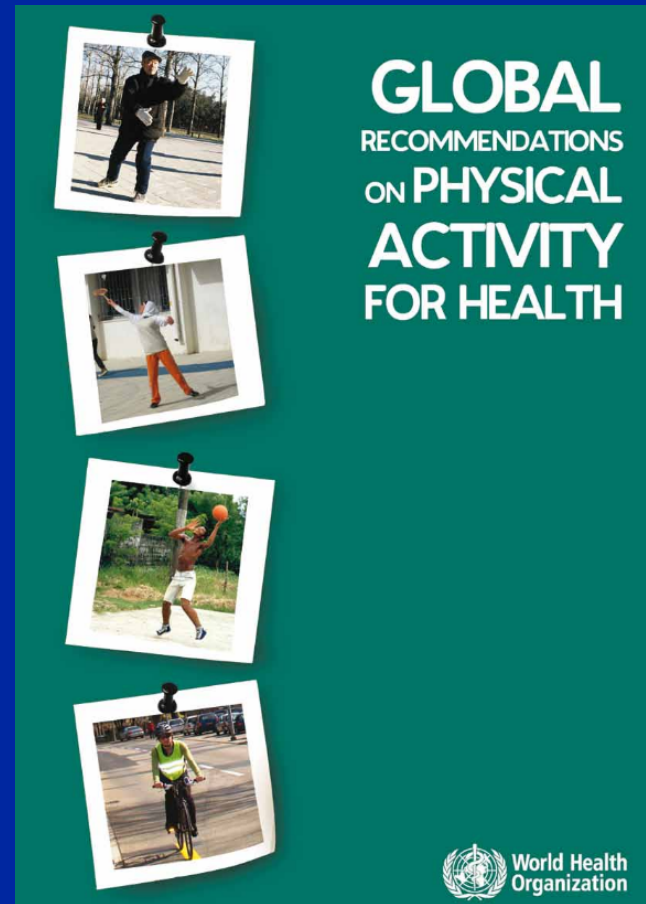
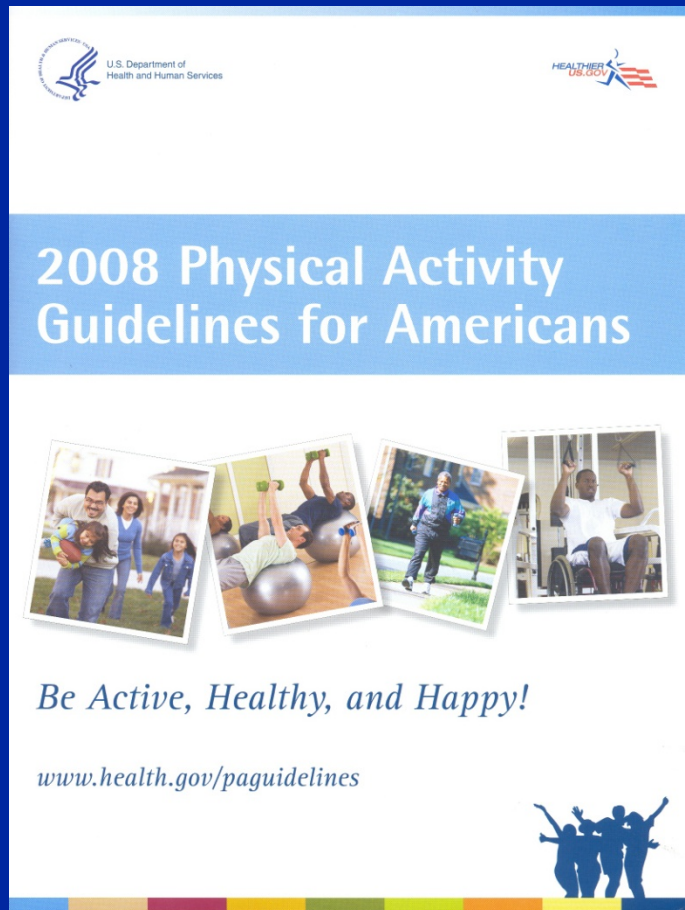
Ida Keeling of Bronx, NY,
age 100 y (2016)

Roger Gentilhomme of Falmouth, MA,
age 100 (2009)



How Active are We?

- US federal government published comprehensive Physical Activity Guidelines for Americans for the first time in 2008
- Similar recommendations from WHO in 2010



Key Guidelines – Children and Adolescents (6-17 y)

- **1 hour or more of daily physical activity that is at least moderate:**
 - **Most of the 1 or more hours a day should be either moderate- or vigorous-intensity aerobic physical activity**
 - **Do vigorous-intensity physical activity at least 3 days a week**

Key Guidelines – Children and Adolescents (6-17 y)

- As part of 1 or more hours of daily physical activity, include muscle-strengthening activities at least 3 days a week**
- As part of 1 or more hours of daily physical activity, include bone-strengthening activities at least 3 days a week**
- It is important to encourage young people to participate in physical activities that are age appropriate, enjoyable, and offer variety**

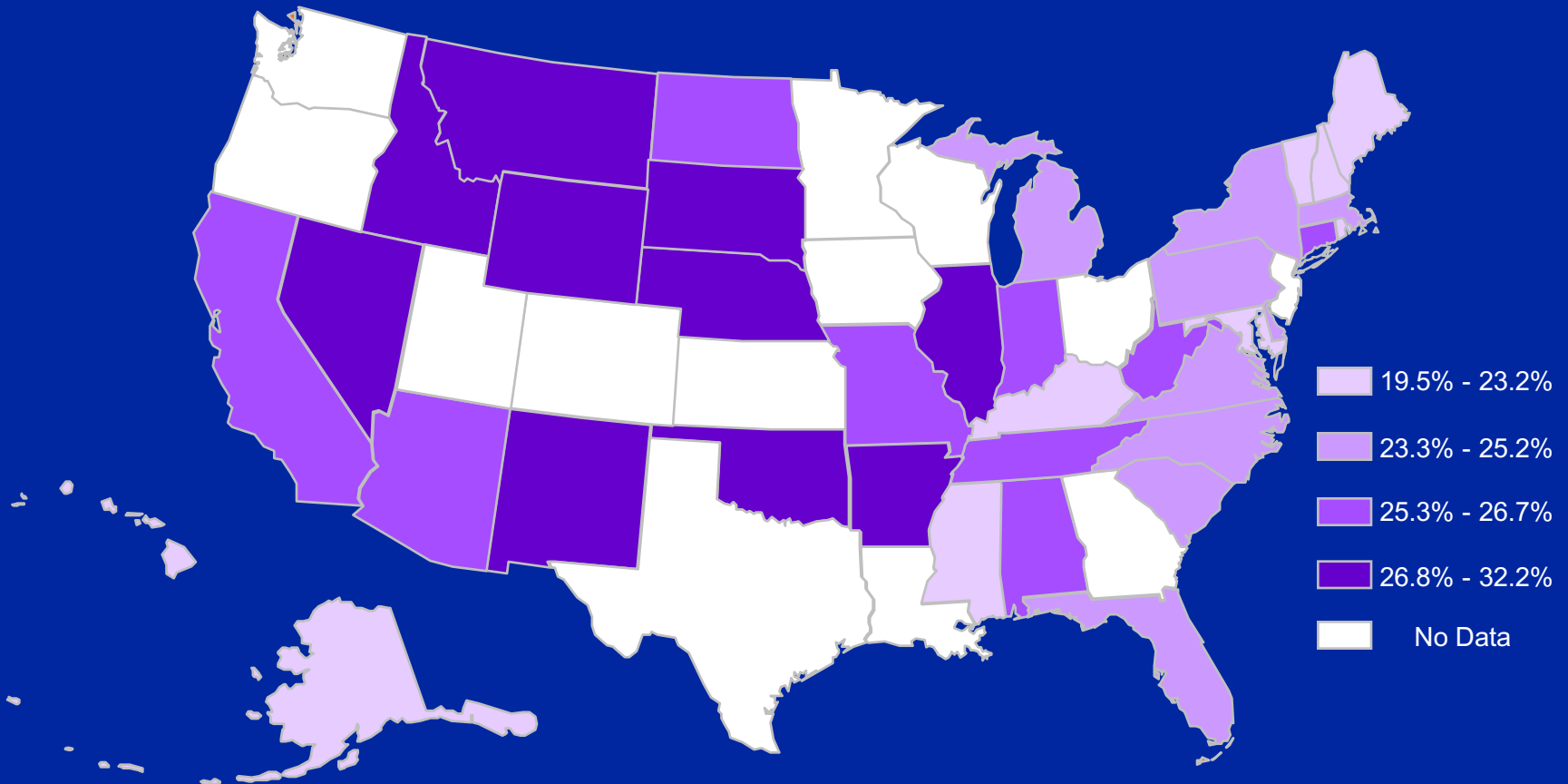
Key Guidelines – Adults

- **Minimum levels a week:**
 - **2 hours and 30 minutes (150 minutes) moderate-intensity aerobic activity; or**
 - **1 hour and 15 minutes (75 minutes) vigorous-intensity aerobic activity; or**
 - **An equivalent combination**
- **Muscle-strengthening activities that involve all major muscle groups should be performed on 2 or more days of the week**

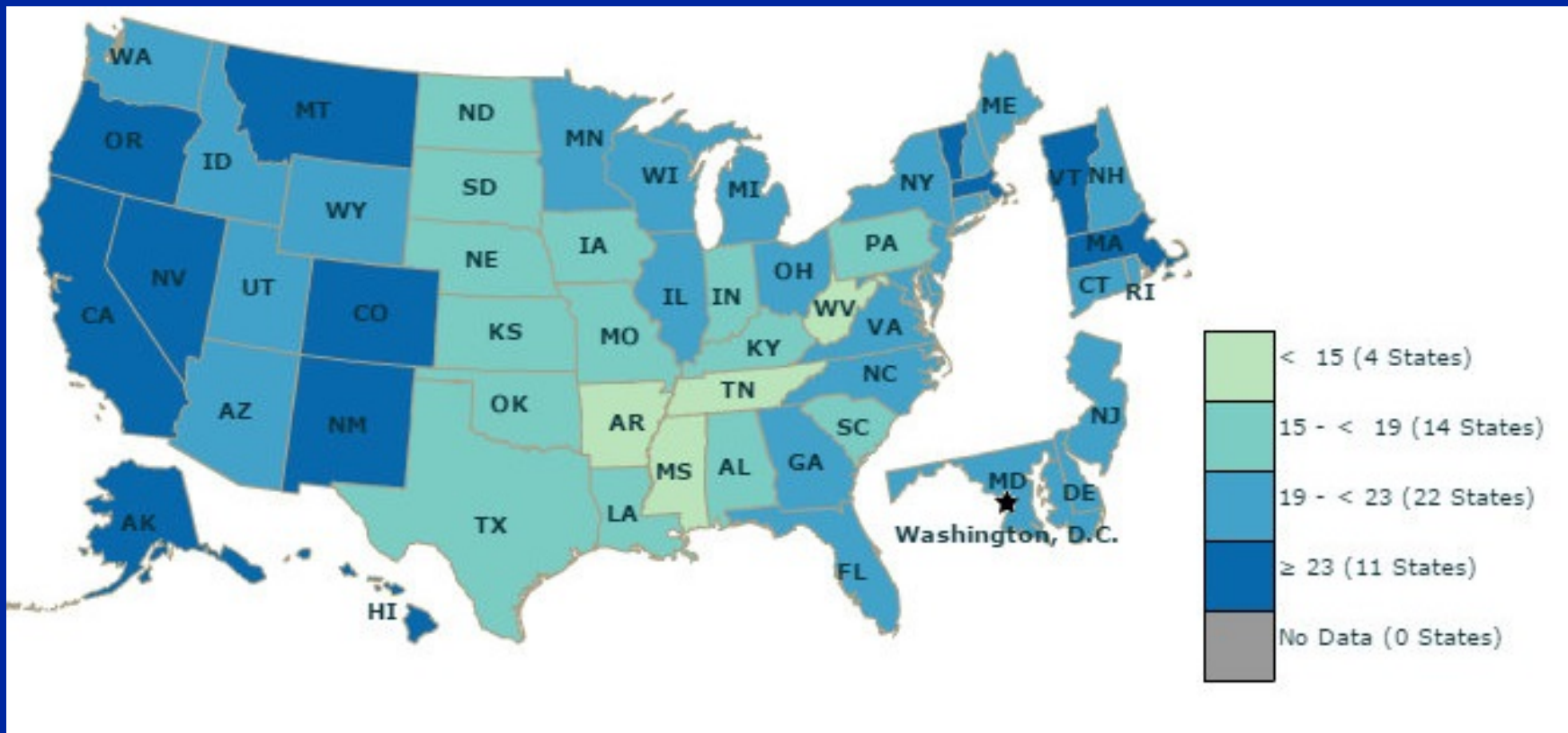
Physical Activity Surveillance

- **Several health surveys monitor physical activity in US; examples include -**
- **Youth Risk Behavior Surveillance System (YRBSS)**
- **Behavioral Risk Factor Surveillance System (BRFSS)**
- **National Health Interview Survey (NHIS)**
- **National Health and Nutrition Examination Survey (NHANES)**

% of US high school students physically active for 60+ min/day on all 7 days



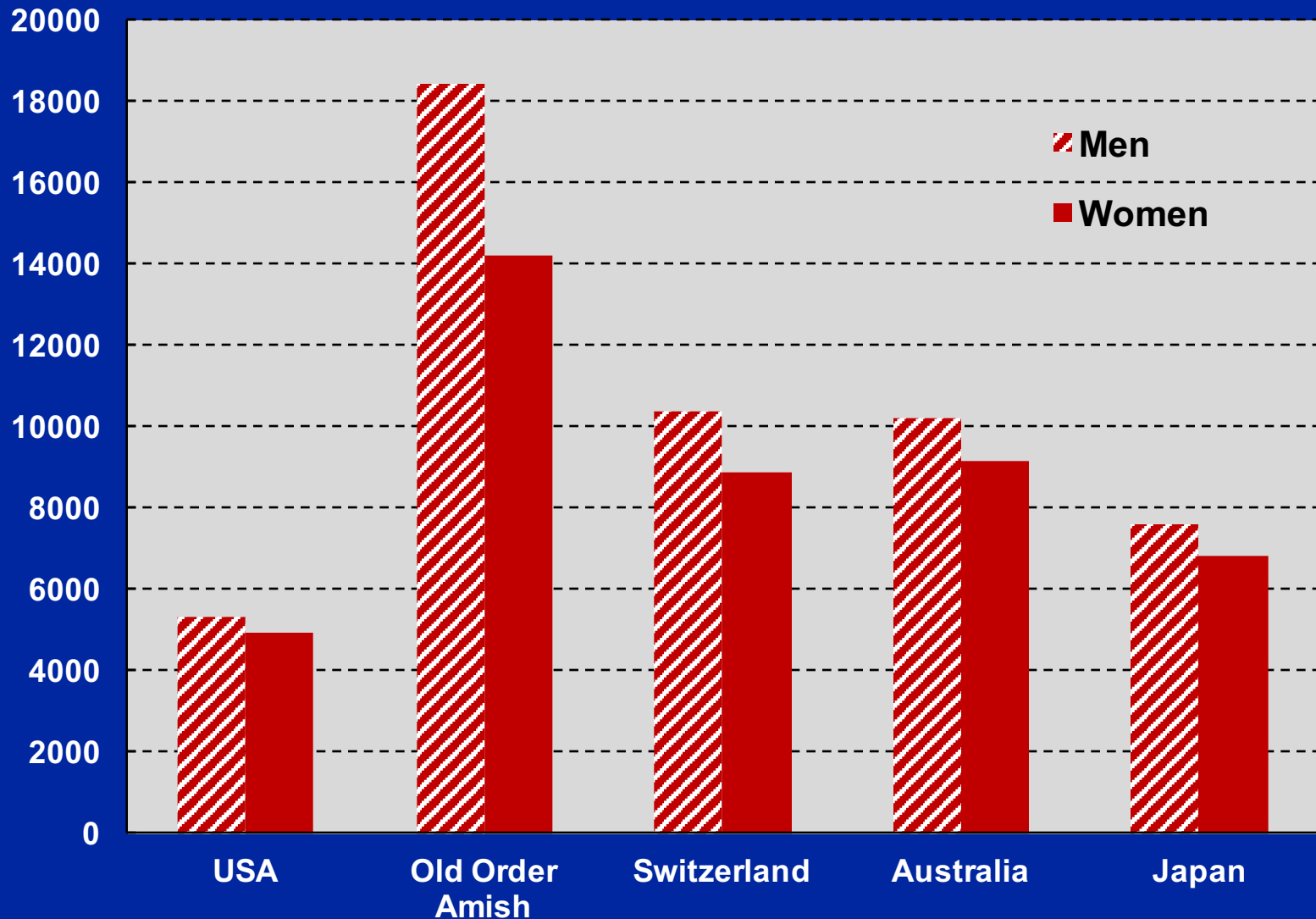
% of US adults meeting aerobic and muscle strengthening recommendations



BRFSS 2013 data:

150 min/wk moderate-intensity or 75 min/wk vigorous-intensity aerobic activity or equivalent PLUS muscle strengthening activities 2+ days/wk

How Many Steps Per Day in Adults?



Research on Physical Activity and Cancer Prevention

Physical Activity and Health Studies: Brief History

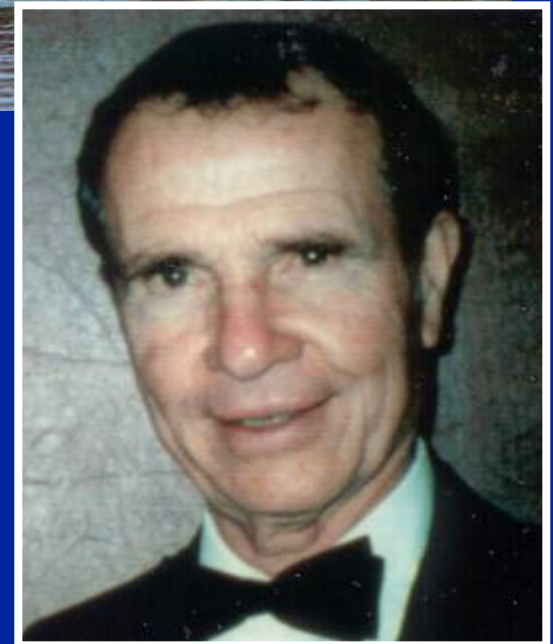
- **Benefits of physical activity for health known for a long time (as far back as 2500 BC)**
- **First physical activity and cancer prevention studies published in 1922**
- **Not much further work until mid-1980's**
- **1st official recognition of role of PA in cancer prevention in 2002: International Agency for Research on Cancer (IARC) and American Cancer Society (ACS)**

Early studies of health benefits focused on heart disease

Ralph Paffenbarger, Jr. (1922-2007)
Studies of Harvard alumni



Jerry Morris (1910-2009)
Studies of London busmen



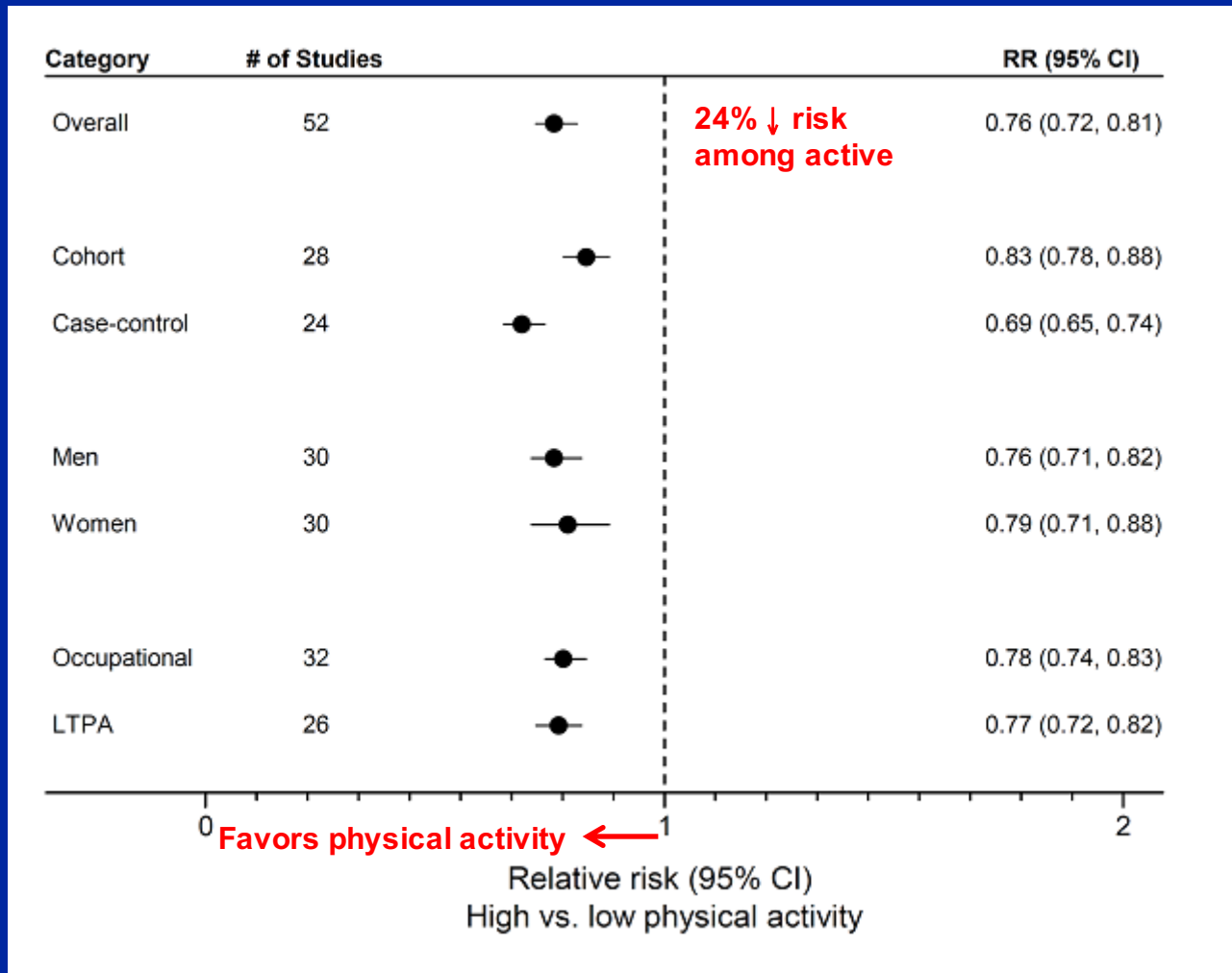
2017 Totality of Evidence on ↓ Cancer Risk with Physical Activity

Convincing	Colon; female breast
Probable	Endometrium; kidney
Uncertain – may be confounded	Lung; melanoma (increased risk)
Substantial effect unlikely	Pancreas; prostate; rectum
Suggestive – but limited evidence	Many other cancers

Physical Activity and Colon Cancer Prevention

- **>50 studies have examined this topic**
- **Studies conducted in North America, Europe, Asia, and Australia**
- **Studies consistently show lower risk of colon cancer in active men and active women, compared to inactive**
- **Risk is ~20-30% lower among those active**

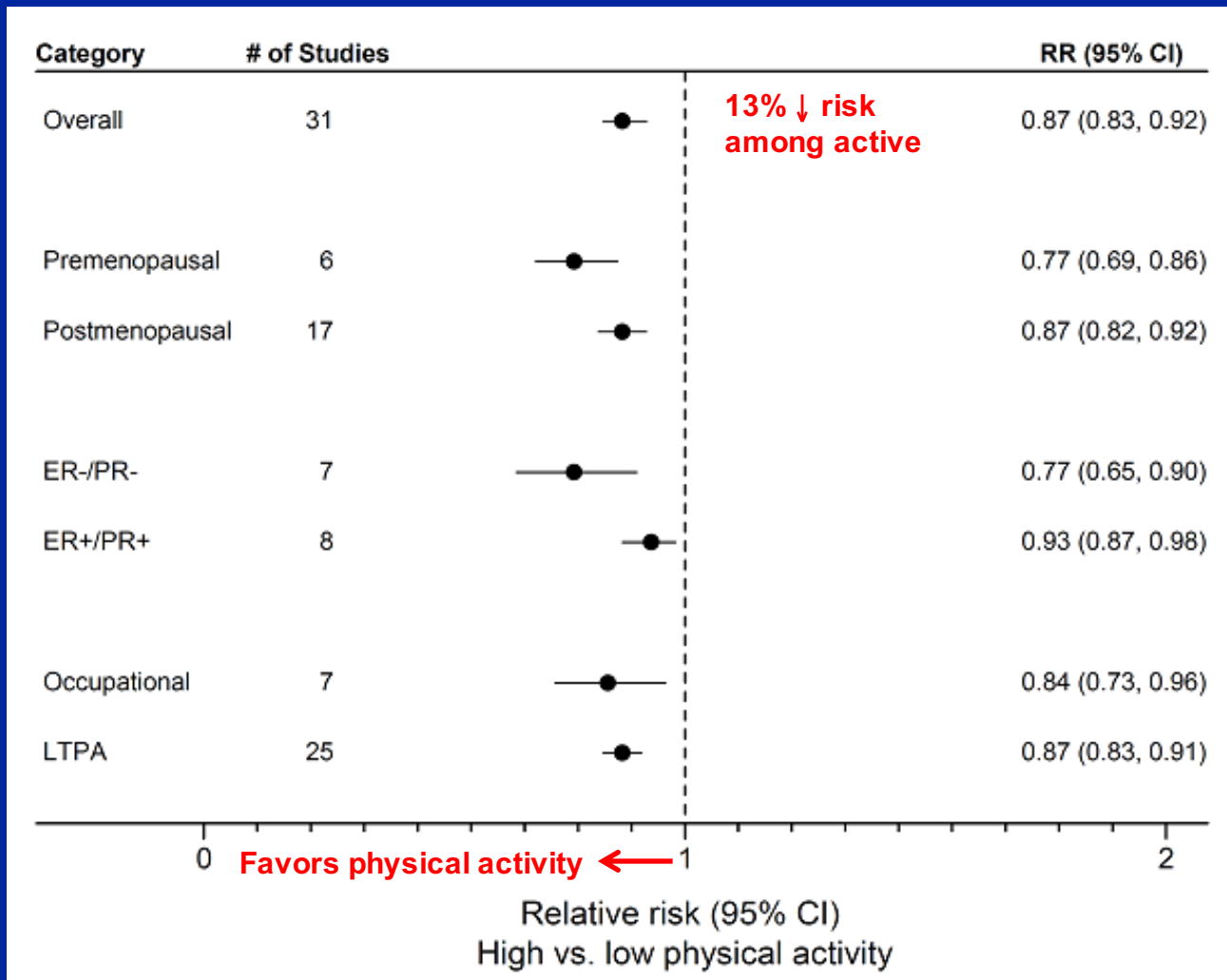
Physical Activity and Colon Cancer Prevention



Physical Activity and Breast Cancer Prevention

- **>75 studies have examined this topic (female breast cancer)**
- **Studies conducted in North America, Europe, Asia, and Australia**
- **Overall, data show show lower risk of breast cancer in women, compared to inactive**
- **Risk is ~20% lower among those active**

Physical Activity and Breast Cancer Prevention



Data for prospective cohort studies:
Wu et al, Breast Cancer Res Treat
2013;137:869-82

Cancer Epidemiology and Prevention, 4th edition (in press)



PHYS ED

Exercise Tied to Lower Risk for 13 Types of Cancer

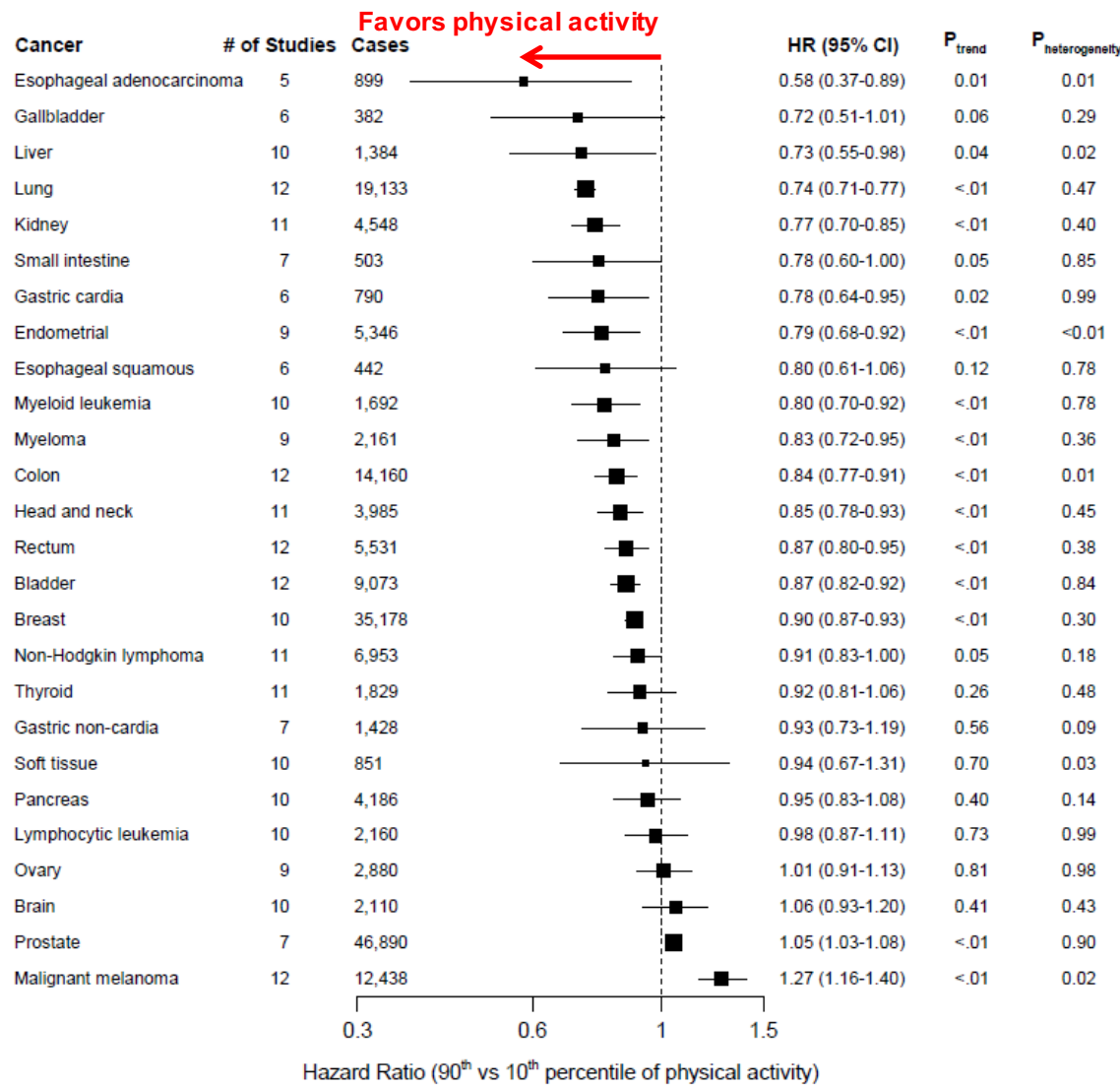
By GRETCHEN REYNOLDS MAY 18, 2016 5:31 AM 90



Getty Images

Physical Activity and Risk of Cancer

Figure 1. Summary multivariable* hazard ratios (HR) and 95% confidence intervals (CI) for a higher (90th percentile) versus lower (10th percentile) level of leisure-time physical activity by cancer type†

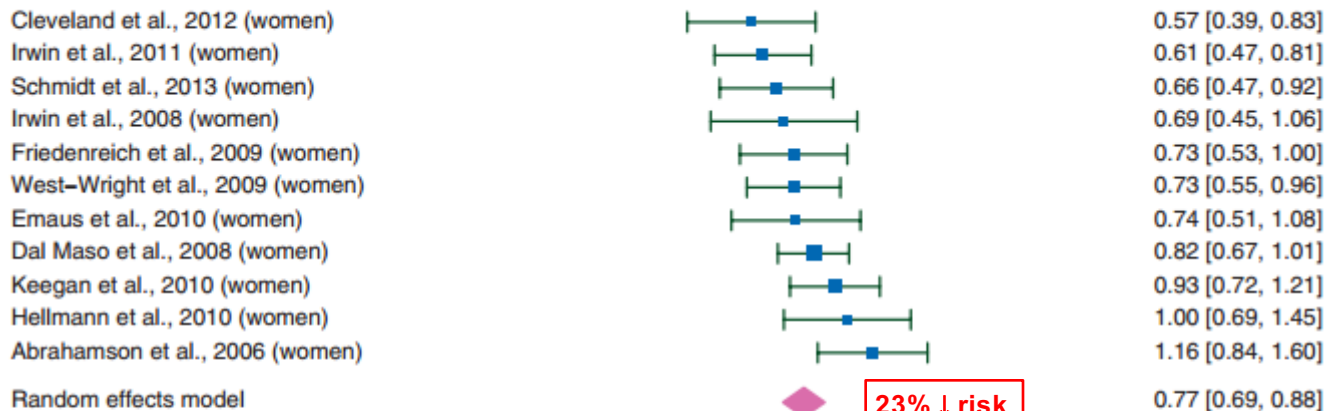


Physical Activity in Cancer Survivors

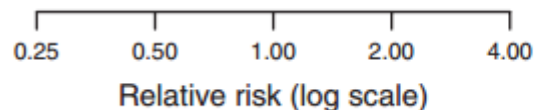
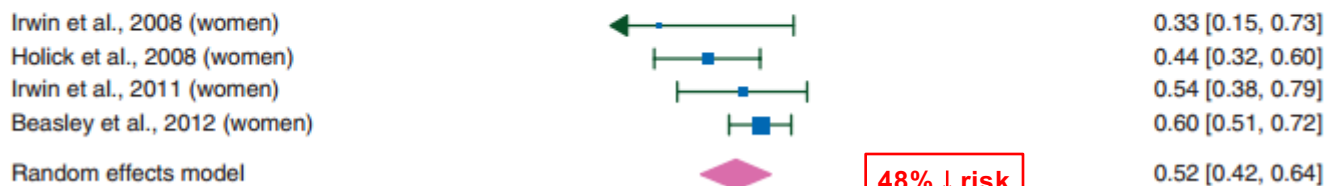
- **Early diagnosis and improved treatment have led to large numbers of people living with a cancer diagnosis (US 2014: 14.5 M)**
- **Exercise prior to treatment is prescribed as “prehab” to enhance physical fitness and coping with treatment**
- **Cancer rehab: exercise during and after treatment to reduce fatigue, enhance function, and improve quality of life**
- **Recent studies indicate physical activity can improve survival in cancer patients**

Physical Activity and Mortality: Breast Cancer Survivors

Breast cancer (pre-diagnosis PA)



Breast cancer (post-diagnosis PA)

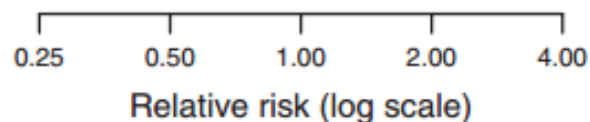
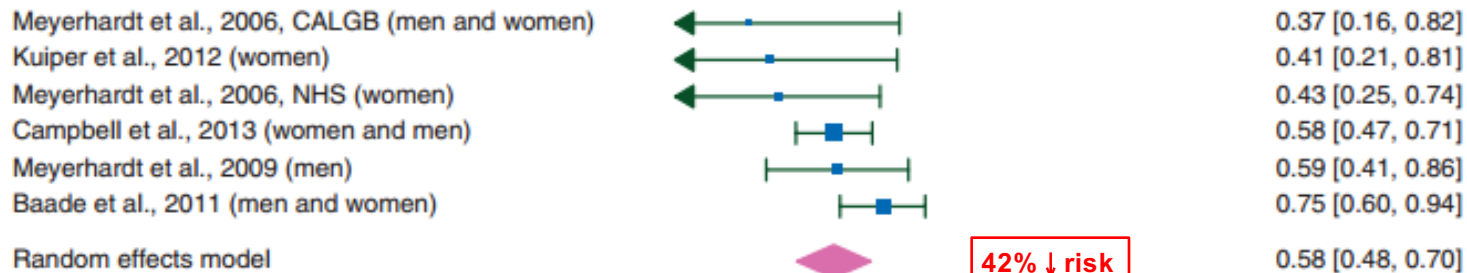


Physical Activity and Mortality: Colorectal Cancer Survivors

Colorectal cancer (pre-diagnosis PA)



Colorectal cancer (post-diagnosis PA)



Killer Chairs

Standing more, even at a desk job, could lower risk for obesity, illness and death, studies suggest

Scientific American Nov 2014



Sedentary Behavior and Cancer Risk

Cancer Incidence

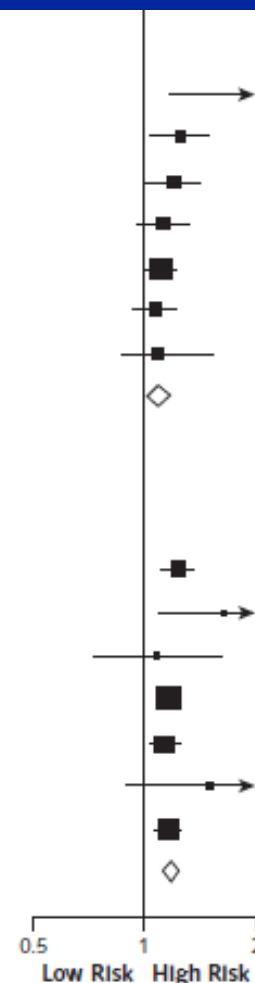
Friberg et al, 2006 (41)	Sweden	1.800 (1.142–2.836)	2.534	0.011
Howard et al, 2008 (42)	United States	1.240 (1.026–1.498)	2.228	0.026
Zhang et al, 2004 (43)	China	1.190 (1.000–1.416)	1.960	0.050
George et al, 2010 (44)	United States	1.120 (0.954–1.315)	1.383	0.167
Hildebrand et al, 2013 (45)	United States	1.100 (1.010–1.198)	2.188	0.029
Teras et al, 2012 (46)	United States	1.066 (0.923–1.232)	0.867	0.386
Peplonska et al, 2008 (47)	Poland	1.100 (0.803–1.506)	0.594	0.552
Knapp–Hartung estimator		1.13 (1.05–1.21)		
Heterogeneity ($I^2 = 0.00$; $P = 0.39$; $Q = 6.355$)				

13% ↑ risk

Cancer mortality

Seguin et al, 2014 (32)	United States	1.220 (1.097–1.357)	3.674	0.000
Campbell et al, 2013 (40)	United States	1.620 (1.073–2.446)	2.294	0.022
Katzmarzyk et al, 2009 (27)	Canada	1.070 (0.716–1.600)	0.330	0.742
Patel et al, 2010 (30)	United States	1.146 (1.062–1.236)	3.521	0.000
Matthews et al, 2012 (29)	United States	1.120 (1.016–1.235)	2.275	0.023
Dunstan et al, 2010 (24)	Australia	1.480 (0.880–2.490)	1.478	0.140
Kim et al, 2013 (36)	United States	1.149 (1.063–1.241)	3.517	0.000
Knapp–Hartung estimator		1.16 (1.10–1.22)		
Heterogeneity ($I^2 = 0.23$; $P = 0.54$; $Q = 5.039$)				

16% ↑ risk



How Much Physical Activity is Needed For Cancer Prevention?



American
Cancer
Society®

American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention

Be physically active

- Adults should get at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity activity each week (or a combination of these), preferably spread throughout the week.
- Children and teens should get at least 1 hour of moderate or vigorous intensity activity each day, with vigorous activity on at least 3 days each week.
- Limit sedentary behavior such as sitting, lying down, watching TV, and other forms of screen-based entertainment.
- Doing some physical activity above usual activities, no matter what one's level of activity, can have many health benefits.

TABLE 2. American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Survivors

Achieve and maintain a healthy weight.

- If overweight or obese, limit consumption of high-calorie foods and beverages and increase physical activity to promote weight loss.

Engage in regular physical activity.

- Avoid inactivity and return to normal daily activities as soon as possible following diagnosis.
- Aim to exercise at least 150 minutes per week.
- Include strength training exercises at least 2 days per week.

Achieve a dietary pattern that is high in vegetables, fruits, and whole grains.

- Follow the American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention.

Conclusions

- **Cancer is a leading cause of death**
- **Being active can ↓ risks of developing colon, breast, endometrial and kidney cancers, and possibly other cancers**
- **Physical activity also may improve survival among persons living with cancer**
- **Although cancer is mainly a disease of older adults, because physical activity tracks over time, it is important to promote physical activity in youth**