Evidence Portfolio – Cancer Subcommittee, Question 1

What is the relationship between physical activity and specific cancer incidence?

a. Is there a dose-response relationship? If yes, what is the shape of the relationship?
b. Does the relationship vary by age, sex, race/ethnicity, socio-economic status, or weight status?
c. Does the relationship vary by specific cancer subtypes?
d. Is the relationship present in persons at high risk, such as those with familial predisposition to cancer?

Sources of Evidence: Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports

Conclusion Statements and Grades

BLADDER CANCER

Strong evidence demonstrates that greater amounts of physical activity are associated with reduced risk of developing bladder cancer. **PAGAC Grade: Strong.**

Moderate evidence indicates a dose-response relationship between increasing physical activity levels and decreasing risk of bladder cancer. **PAGAC Grade: Moderate.**

Limited evidence suggests that the effects of physical activity on bladder cancer risk are lower for men than for women. **PAGAC Grade: Limited.** Insufficient evidence is available to determine whether the effects of physical activity on risk of bladder cancer differ by specific age, race/ethnicity, socioeconomic groups, or weight status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity are similar for all types of bladder cancer. **PAGAC Grade: Not assignable**

Insufficient evidence is available to determine whether the effects of physical activity on bladder cancer risk differ in individuals at elevated risk of bladder cancer. **PAGAC Grade: Not assignable.**

BRAIN CANCER

Insufficient evidence is available to determine whether a relationship between physical activity and overall brain cancer incidence exists. **PACAC Grade: Not assignable.** Limited evidence suggests that physical activity decreases the risk of certain types of brain cancer. Specifically, a reduced risk is observed for glioma and meningioma. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether a dose-response relationship exists between physical activity and brain cancer incidence. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the relationship between physical activity and brain cancer incidence varies by age, sex, race/ethnicity or socioeconomic status because these factors have yet to be examined in the studies conducted to date. **PAGAC Grade: Not assignable.** Insufficient evidence is available to determine whether the relationship between physical activity and brain cancer incidence varies by body mass index. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the relationship between physical activity and brain cancer incidence differs in individuals at high risk of brain cancer. **PAGAC Grade: Not assignable.**

BREAST CANCER

Strong evidence demonstrates that greater amounts of physical activity are associated with a lower risk of breast cancer. **PAGAC Grade: Strong.**

Strong evidence demonstrates that a dose-response relationship exists between greater amounts of physical activity and lower breast cancer risk. **PAGAC Grade: Strong.**

Moderate evidence indicates that greater amounts of physical activity are associated with a greater risk reduction in all women regardless of body mass index. **PAGAC Grade: Moderate.** Insufficient evidence is available to determine whether the amount of physical activity and risk of breast cancer incidence varies by age. **PAGAC Grade: Not assignable.** Limited evidence suggests that the relationship between physical activity and breast cancer does not vary by race/ethnicity. **PAGAC Grade: Limited.** Insufficient evidence is available to determine whether the relationship between physical activity and breast cancer varies by socioeconomic status. **PAGAC Grade: Not assignable.**

Limited, but inconsistent, evidence suggests that the relationship between physical activity and breast cancer varies by specific histologic types of breast cancers. **PAGAC Grade: Limited**.

Limited evidence suggests that the relationship between physical activity and breast cancer is apparent in women at increased breast cancer risk, as an enhanced effect of physical activity was associated with premenopausal breast cancer in women with a positive family history of breast cancer. **PAGAC Grade: Limited.**

COLON CANCER

Strong evidence demonstrates that greater amounts of recreational, occupational, or total physical activity are associated with a lower risk of developing colon cancer. **PAGAC Grade: Strong.**

Strong evidence demonstrates a dose-response relationship between increasing physical activity levels and decreasing risk of colon cancer. **PAGAC Grade: Strong.**

Strong evidence demonstrates that the effects of physical activity on colon cancer risk are evident in both men and women. **PAGAC Grade: Strong.** Insufficient evidence is available to determine whether the effects of physical activity on risk of colon cancer differ by specific age, race/ethnic, or socioeconomic groups in the United States. **PAGAC Grade: Not assignable.** Moderate evidence indicates that weight status does not affect the associations between physical activity and colon cancer risk. **PAGAC Grade: Moderate.**

Strong evidence demonstrates that greater amounts of physical activity are associated with a lower risk of developing both proximal and distal colon cancer. **PAGAC Grade: Strong.**

Insufficient evidence is available to determine whether the effects of physical activity on colon cancer risk differ in individuals at elevated risk of colon cancer. **PAGAC Grade: Not assignable.**

ENDOMETRIAL CANCER

Strong evidence demonstrates that greater amounts of physical activity are associated with a lower risk of endometrial cancer. **PAGAC Grade: Strong.**

Moderate evidence indicates that a dose-response relationship exists between greater amounts of physical activity and lower endometrial cancer risk. **PAGAC Grade: Moderate.**

Moderate evidence indicates that greater amounts of physical activity are associated with a greater risk reduction in women with a body mass index of greater than 25 kg/m^2 compared to women with a body mass index of less than 25 kg/m^2. **PAGAC Grade: Moderate.** Insufficient evidence is available to determine whether the association between physical activity and risk of endometrial cancer varies by age, race/ethnicity, or socioeconomic status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether specific histologic types of endometrial cancers modify the relationships between amounts of physical activity and risk of endometrial cancer. **PAGAC Grade: Not assignable.**

ESOPHAGEAL CANCERS

Strong evidence demonstrates that greater amounts of recreational, occupational, or total physical activity are associated with a lower risk of developing adenocarcinoma of the esophagus. **PAGAC Grade: Strong.**

Limited evidence suggests that greater amounts of physical activity are not associated with a lower risk of developing squamous cell carcinoma of the esophagus. **PAGAC Grade: Limited.**

Limited evidence suggests a dose-response relationship between physical activity and risk of adenocarcinoma of the esophagus. **PAGAC Grade: Limited.**

Available evidence is insufficient to determine whether the effects of physical activity on esophageal cancer risk differ by age, sex, race/ethnicity, weight status, socioeconomic status, or in individuals at elevated risk of esophageal cancer. **PAGAC Grade: Not assignable.**

GASTRIC CANCER

Strong evidence demonstrates that greater amounts of physical activity are associated with a lower risk of developing gastric cancer. **PAGAC Grade: Strong.**

Moderate evidence indicates that as levels of physical activity increase, risk of gastric cancer decreases. **PAGAC Grade: Moderate.**

Insufficient evidence is available on whether the effects of physical activity on gastric cancer risk vary by sex, age, race/ethnicity, socioeconomic groups, or weight status. **PAGAC Grade: Not assignable.**

Moderate evidence indicates that as levels of physical activity increase, the risk of both subtypes of gastric cancer—cardia and non-cardia adenocarcinoma—decreases. **PAGAC Grade: Moderate.**

Insufficient evidence is available to determine whether the effects of physical activity on gastric cancer risk differ in individuals at elevated risk of gastric cancer. **PAGAC Grade: Not assignable.**

HEAD AND NECK CANCERS

Limited evidence suggests that greater amounts of physical activity are associated with a lower risk of head and neck cancer incidence. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether a dose-response relationship exists between physical activity and head and neck cancer incidence. **PAGAC Grade: Not assignable.**

Limited evidence suggests that the relationship between physical activity and head and neck cancer incidence does not vary by age, sex, BMI, or smoking. **PAGAC Grade: Limited.** Insufficient evidence is available to determine whether this relationship varies by race/ethnicity or socioeconomic status because these factors have yet to be examined in the studies conducted to date. **PAGAC Grade: Not assignable.**

Limited evidence suggests that this relationship varies by specific types of head and neck cancers. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether the effects of physical activity on head and neck cancers differ in individuals at elevated risk of head and neck cancers. **PAGAC Grade: Not assignable.**

HEMATOLOGIC CANCERS

Limited evidence suggests a null relationship between physical activity and leukemia incidence. Limited evidence suggests that physical activity has a protective effect on lymphoma and myeloma such that greater amounts of physical activity reduce the risk of lymphoma and myeloma. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether a dose-response relationship exists between greater amounts of physical activity and reduced risk of hematologic cancers. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether sex modifies the relationship between physical activity and Hodgkin lymphoma, with a risk reduction observed with physical activity for females only. **PAGAC Grade: Not assignable.** Insufficient evidence is available to determine whether body mass index, smoking, or alcohol affect the relationship between physical activity and risk of developing other hematologic cancers, or whether this relationship varies by sex, age, race/ethnicity, or socioeconomic status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the relationship between physical activity varies by specific types of hematologic cancers. **PAGAC Grade: Not assignable**.

Insufficient evidence is available to determine whether the effects of physical activity on hematologic cancers differ in individuals at elevated risk of hematologic cancers. **PAGAC Grade: Not assignable**.

LUNG CANCER

Moderate evidence indicates that greater amounts of physical activity are associated with a lower risk of lung cancer. **PAGAC Grade: Moderate.**

Limited evidence suggests that a dose-response relationship exists between greater amounts of physical activity and lower lung cancer risk. **PAGAC Grade: Limited.**

Limited evidence suggests that the relationship between amount of physical activity and risk of lung cancer does not vary by age. **PAGAC Grade: Limited.** Limited evidence suggests that greater amounts of physical activity are associated with a greater risk reduction in females than in males. **PAGAC Grade: Limited.** Limited evidence suggests that greater amounts of physical activity are associated with a greater risk reduction in those with a body mass index of less than 25 kg/m^2 than in those with higher body mass index. **PAGAC Grade: Limited.** Insufficient evidence is available to determine whether this relationship varies by race/ethnicity or socioeconomic status because these factors have yet to be examined in the studies conducted to date. **PAGAC Grade: Not assignable.**

Limited evidence suggests that specific histologic types of lung cancers do not modify the relationships between amounts of physical activity and risk of lung cancer incidence. **PAGAC Grade: Limited.**

Moderate evidence indicates that greater amounts of physical activity are associated with a greater risk reduction in current and former smokers than in never smokers. **PAGAC Grade: Moderate.**

OVARIAN CANCER

Limited evidence suggests a weak relationship between greater levels of physical activity and lower risk of ovarian cancer. **PAGAC Grade: Limited.**

Limited evidence suggests that no dose-response relationship exists between greater amounts of physical activity and lower ovarian cancer risk. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether the relationship between physical activity and ovarian cancer is modified by age, race/ethnicity, socioeconomic status, or weight status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the relationship between physical activity is modified by specific histologic types of ovarian cancers. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity on ovarian cancer risk differ in individuals at elevated risk of ovarian cancer. **PAGAC Grade: Not assignable.**

PANCREATIC CANCER

Limited evidence suggests that greater amounts of physical activity are associated with a lower risk of developing pancreatic cancer. **PAGAC Grade: Limited.**

Limited evidence suggests that a dose-response association does not exist between physical activity and pancreatic cancer. **PAGAC Grade: Limited.**

Limited evidence suggests that the effects of physical activity on pancreatic cancer risk do not vary by sex. **PAGAC Grade: Limited.** Insufficient evidence is available to determine whether the effects of physical activity on pancreatic cancer risk vary by age, race/ethnicity, socioeconomic groups, or weight status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity on pancreatic cancer risk differ by cancer subtypes. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity on pancreatic cancer risk differ in individuals at elevated risk for pancreatic cancer. **PAGAC Grade: Not assignable.**

PROSTATE CANCER

Limited evidence suggests a weak relationship between greater levels of physical activity and lower prostate cancer risk. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether a dose-response relationship exists between higher levels of physical activity and lower prostate cancer risk. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the association between physical activity and prostate cancer varies by age, race/ethnicity, weight status, socioeconomic status, or smoking status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the relationship between physical activity and prostate cancer varies by tumor sub-type, as risk reductions were observed with increased levels of physical activity in both men with aggressive versus non-aggressive prostate cancer. **PAGAC Grade: Not assignable.**

RECTAL CANCER

Limited evidence suggests that greater amounts of physical activity are not associated with risk of developing rectal cancer. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether a dose-response relationship between increasing physical activity levels and decreasing risk of rectal cancer exists. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity on rectal cancer risk differ by sex, age, race/ethnicity, weight status, or socioeconomic groups in the United States. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity on rectal cancer risk differ by subtype of rectal cancer. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity on rectal cancer risk differ in individuals at elevated risk for rectal cancer. **PAGAC Grade: Not assignable.**

RENAL CANCER

Strong evidence demonstrates that greater amounts of physical activity are associated with reduced risk of developing renal cancer. **PAGAC Grade: Strong.**

Limited evidence suggests that a dose-response relationship exists between increasing physical activity levels and decreasing risk of renal cancer. **PAGAC Grade: Limited.**

Limited evidence suggests that the effects of physical activity on renal cancer risk are similar for men and women. **PAGAC Grade: Limited.** Limited evidence suggests that the effects of physical activity on renal cancer risk do not vary by weight status. **PAGAC Grade: Limited.** Insufficient evidence is available to determine whether the effects of physical activity on risk of renal cancer differ by specific age, race/ethnic, or socioeconomic groups. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity are similar for all subtypes of renal cancer. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity on renal cancer risk differ in individuals at elevated risk of renal cancer. **PAGAC Grade: Not assignable.**

THYROID CANCER

Moderate evidence indicates that greater amounts of physical activity are not associated with risk of developing thyroid cancer. **PAGAC Grade: Moderate.**

Insufficient evidence is available to determine whether physical activity levels and risk of thyroid cancer have a dose-response relationship. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the effects of physical activity on thyroid cancer differ by specific sex, age, race/ethnicity, or socioeconomic groups. **PAGAC Grade: Not assignable.** Insufficient evidence is available to determine whether weight status affects the association between physical activity and thyroid cancer risk. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the association of physical activity with thyroid cancer risk differs by subtype of thyroid cancer. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the association of physical activity with thyroid cancer risk differs in individuals at elevated risk of thyroid cancer. **PAGAC Grade: Not assignable.**

Description of the Evidence

An initial search for systematic reviews, meta-analyses, pooled analyses, and reports identified sufficient literature to answer the research question as determined by the Cancer subcommittee. Additional searches for original research were not needed.

Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and Reports

BLADDER CANCER

Overview

Three existing reviews were included: 1 meta-analysis,[1] 1 pooled analysis,[2] and 1 report.[3] The reviews were published from 2014 to 2017.

The meta-analysis included 15 studies and covered the following timeframe: 1975–November 2013.[1] The pooled analysis[2] included 12 studies that examined bladder cancer. The report[3] included 12 studies that examined bladder cancer.

Exposures

One review examined occupational and leisure-time physical activity, comparing high versus low levels of moderate and vigorous intensity physical activity.[1] The report[3] examined total and leisure-time physical activity, whereas the pooled analysis[2] was restricted to moderate or vigorous intensity leisure-time physical activity.

Outcomes

Included reviews examined bladder cancer risk.

BRAIN CANCER

Overview

Two existing reviews were included: 1 meta-analysis[4] and 1 pooled analysis.[2] The reviews were published in 2015 and 2016.

The meta-analysis included 6 studies[4] and the pooled analysis included 10 studies[2] that examined brain cancer. The meta-analysis covered an extensive timeframe: from inception to February 2015.[4]

Exposures

One review, Niedermaier et al[4] compared the highest versus lowest levels of physical activity provided by each of the included studies, and the Moore et al[2] review was restricted to moderate or vigorous intensity leisure-time physical activity.

Outcomes

Included reviews examined brain cancer risk.

BREAST CANCER

Overview

A total of 6 existing reviews were included: 4 meta-analyses[5-8] and 2 pooled analyses.[2, 9] The reviews were published from 2013 to 2016.

The meta-analyses included a range of 9 to 67 studies that examined breast cancer. The meta-analyses covered an extensive timeframe: from inception to December 2014,[5] inception to November 2014,[7] inception to November 2012,[8] and inception to July 2015.[6]

The pooled analyses included a range of 4 to 10 studies that examined breast cancer.

Exposures

Three reviews examined moderate-to-vigorous leisure-time physical activity,[2, 5, 6] and 2 reviews examined occupational and non-occupational physical activity.[7, 8] Gong et al[9] examined vigorous physical activity.

Outcomes

Included reviews examined breast cancer risk. Four reviews also examined different breast cancer subtypes.[5, 6, 8, 9]

COLON CANCER

Overview

A total of 11 existing reviews were included: 1 systematic review,[10] 7 meta-analyses,[5, 11-16] 1 pooled analysis,[2] and 2 reports.[17, 18]

The systematic review by Pham et al[10] included 8 studies and covered the following timeframe: inception to May 2011.

The meta-analyses included a range of 14 to 52 studies that examined colon cancer. The meta-analyses covered an extensive timeframe: from inception to December 2007,[12] inception to June 2009,[16]

inception to 2010,[15] inception to December 2014,[5] 1946 to January 2012,[11] 1966 to 2010,[13] and 1980 to February 2016.[14]

The pooled analysis[2] included 12 studies that examined colon cancer.

Exposures

Three reviews examined leisure-time physical activity,[2, 5, 12] and Robsahm et al[15] examined physical activity as lifetime, recreational, and occupational activity.

Outcomes

Included reviews examined colon cancer risk.

ENDOMETRIAL CANCER

Overview

A total of 5 existing reviews were included: 4 meta-analyses[5, 19-21] and 1 pooled analysis.[2] The reviews were published from 2010 to 2016.

The meta-analyses included a range of 9 to 33 studies that examined endometrial cancer. The meta-analyses covered an extensive timeframe: from inception to December 2009,[20] inception to September 2013,[19] inception to October 2014,[21] and inception to December 2014.[5]

The pooled analysis[2] included 9 studies that examined endometrial cancer.

Exposures

Leisure-time physical activity was assessed in 2 of the meta-analyses[5, 19] and in the pooled analysis.[2] Moore et al[20] examined recreational and occupational activity, and Schmid et al[21] assessed recreational, occupational, and household activity and walking in their review.

Outcomes

Included reviews examined endometrial cancer risk.

ESOPHAGEAL CANCERS

Overview

A total of 4 existing reviews were included: 3 meta-analyses[22-24] and 1 pooled analysis.[2] The reviews were published from 2014 to 2016.

The meta-analyses included a range of 9 to 24 studies that examined esophageal cancer. The meta-analyses covered an extensive timeframe: from inception to December 2013,[22] inception to May 2013,[23] and 1966 to 2013.[24]

The pooled analysis[2] included 6 studies that examined esophageal cancer.

Exposures

All of the meta-analyses examined recreational physical activity and/or occupational activity. The pooled analysis[2] examined moderate or vigorous intensity leisure-time physical activity.

Outcomes

Included reviews examined risk for esophageal cancers.

GASTRIC CANCER

Overview

A total of 6 existing reviews were included: 5 meta-analyses[22, 23, 25-27] and 1 pooled analysis.[2] The reviews were published from 2014 to 2016.

The meta-analyses included a range of 9 to 24 studies. The meta-analyses covered an extensive timeframe: inception to June 2015,[26] inception to December 2013,[22] inception to May 2013,[23] inception to July 2012,[25] and 1966 to 2013.[27]

The pooled analysis[2] included 7 studies that examined gastric cancer.

Exposures

One review[25] used the World Health Organization's physical activity recommendations to assess 4 different levels of physical activity ranging from insufficiently active to highly active. All other reviews examined leisure-time physical activity and/or occupational activity.

Outcomes

Included reviews examined gastric cancer risk and associations by cancer subtype (gastric cardia vs. non-cardia).

HEAD AND NECK CANCERS

Overview

Two pooled analyses were included.[2, 28] The pooled analyses were published in 2011 and 2016. The pooled analyses included 4 studies[28] and 12 studies[2] that reported on head and neck cancers.

Exposures

Both pooled analyses examined leisure-time physical activity.[2, 28]

Outcomes

Included reviews examined risk for all head and neck cancers.

HEMATOLOGIC CANCERS

Overview

A total of 5 existing reviews were included: 3 meta-analyses[5, 29, 30] and 2 pooled analysis.[2, 31] The reviews were published from 2013 to 2016.

The reviews included a range of 8 to 23 studies that reported on hematologic cancers. The meta-analyses covered an extensive timeframe: from inception to January 2013,[30] inception to June 2013,[29] and inception to December 2014.[5]

Exposures

Two of the meta-analyses[5, 29] and the 2 pooled analyses[2, 31] examined leisure-time physical activity. The remaining meta-analysis[30] examined both leisure-time and occupational physical activity.

Outcomes

Included reviews examined the risk of different hematologic cancers. Three reviews examined non-Hodgkin's lymphoma,[2, 29, 30] 2 reviews examined Hodgkin's lymphoma,[29, 30] 2 reviews examined

leukemia,[2, 29] 2 reviews examined all types of lymphoma combined,[29, 30] and 2 reviews reported separate results for multiple myeloma/myeloma.[2, 29] Liu et al[5] examined lymphoid neoplasms combined, Jochem et al[29] examined other rare types of hematologic cancers, and Aschebrook-Kilfoy et al[31] examined mycosis fungoides and Sezary syndrome.

LUNG CANCER

Overview

A total of 7 existing reviews were included: 6 meta-analyses[5, 32-36] and 1 pooled analysis.[2] The reviews were published from 2012 to 2016.

The meta-analyses included a range of 8 to 28 studies. The meta-analyses covered an extensive timeframe: from inception to November 2011,[33] inception to May 2012,[35] inception to January 2014,[36] inception to December 2014,[5] inception to May 2015,[32] and inception to September 2015.[34]

The pooled analysis[2] included 12 studies that examined lung cancer.

Exposures

Two of the reviews[35, 36] examined high versus low levels of any type of physical activity. The 4 remaining reviews[5, 32-34] and the pooled analysis[2] examined moderate or vigorous intensity leisure-time physical activity.

Outcomes

Included reviews examined lung cancer risk. Buffart et al[33] restricted their analysis to smokers only.

OVARIAN CANCER

Overview

A total of 4 existing reviews were included: 2 meta-analyses[5, 37] and 2 pooled analyses.[2, 38] The reviews were published from 2014 to 2016.

The meta-analyses included a range of 9 to 19 studies that examined ovarian cancer. The meta-analysis covered the following timeframes: from 1984 to June 2014[37] and inception to December 2014.[5]

Both pooled analyses[2, 38] included 9 studies each that examined ovarian cancer.

Exposures

Only leisure-time physical activity was assessed in 1 meta-analysis[5] and the 2 pooled analyses.[2, 38] Non-occupational physical activity was assessed in 1 meta-analysis.[37]

Outcomes

Included reviews examined ovarian cancer risk.

PANCREATIC CANCER

Overview

A total of 6 existing reviews were included: 1 systematic review,[39] 4 meta-analyses,[5, 40-42] and 1 pooled analysis.[2] The reviews were published from 2008 to 2016.

The systematic review included 18 studies and covered the following timeframe: 1966 to April 2008.[39]

The meta-analyses included a range of 26 to 30 studies. The meta-analyses covered an extensive timeframe: from inception to August 2014,[40] inception to July 2009,[42] and inception to December 2014.[5]

The pooled analysis[2] included 10 studies that examined pancreatic cancer.

Exposures

Different physical activity domains were assessed in 2 of the reviews[39, 42] including leisure, transport, occupational, and total activity. Behrens et al[40] assessed overall physical activity over time. The 2 remaining reviews[5, 41] and the pooled analysis[2] examined only moderate or vigorous intensity leisure-time physical activity.

Outcomes

Included reviews examined pancreatic cancer risk.

PROSTATE CANCER

Overview

A total of 3 existing reviews were included: 2 meta-analyses[5, 43] and 1 pooled analyses.[2] The reviews were published in 2011 and 2016.

The meta-analyses included a range of 18 to 43 studies that examined prostate cancer. The meta-analyses covered an extensive timeframe: from inception to May 2011[43] and inception to December 2014.[5]

The pooled analysis[2] included 7 studies that examined prostate cancer.

Exposures

Liu et al[43] assessed different domains of physical activity, including leisure, occupational, and total activity. Only leisure-time physical activity was assessed in the second meta-analysis by Liu et al[5] and the pooled analysis by Moore et al.[2]

Outcomes

Included reviews examined prostate cancer risk.

RECTAL CANCER

Overview

A total of 7 existing reviews were included: 1 systematic review,[10] 3 meta-analyses,[5, 12, 15] 1 pooled analysis,[2] and 2 reports.[17, 18] The reviews were published from 2011 to 2017.

The systematic review by Pham et al[10] included 8 studies and covered the following timeframe: inception to May 2011.

The meta-analyses included a range of 5 to 14 studies that examined rectal cancer. The meta-analyses covered an extensive timeframe: from inception to December 2007,[12] inception to 2010,[15] and inception to December 2014.[5]

The pooled analysis[2] included 12 studies that examined rectal cancer.

Exposures

Three reviews[2, 5, 12] assessed leisure-time physical activity. Robsahm et al[15] examined lifetime physical activity and also looked at recreational and occupational physical activity.

Outcomes

Included reviews examined rectal cancer risk.

RENAL CANCER

Overview

A total of 3 existing reviews were included: 1 meta-analysis,[44] 1 pooled analyses,[2] and 1 report.[45] The reviews were published from 2013 to 2017.

The meta-analysis by Behrens and Leitzmann[44] included 19 studies and covered an extensive timeframe: from inception to September 2012.

The pooled analysis[2] included 11 studies that examined renal cancer. The report included meta-analysis data from 12 studies.[45]

Exposures

Behrens and Leitzmann[44] and the World Cancer Research Fund International[45] examined total, occupational, and recreational physical activity, while Moore et al[2] examined moderate or vigorous intensity leisure-time physical activity.

Outcomes

Included reviews examined renal cancer risk.

THYROID CANCER

Overview

A total of 3 existing reviews were included: 1 meta-analysis[46] and 2 pooled analyses.[2, 47] The reviews were published from 2012 to 2016.

The meta-analysis by Schmid et al[46] included 13 studies and covered an extensive timeframe: from inception to October 2013.

The pooled analyses included 5[47] and 11 studies[2] that examined thyroid cancer.

Exposures

Schmid et al[46] examined total physical activity; Moore et al[20] examined moderate or vigorous intensity leisure time physical activity; and Kitahara et al[47] examined time spent in vigorous or strenuous leisure time or occupational activity.

Outcomes

Included reviews examined thyroid cancer risk.

Populations Analyzed

The table below list the populations analyzed in each article.

Table 1. Populations Analyzed by All Sources of Evidence

	Sex	Race/ Ethnicity	Age	Weight Status	Chronic Conditions	Other
Abioye, 2015			Adults			Smoking status
Aschebrook-Kilfoy, 2014				Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and obese (BMI: 30 and above)		Smoking status
Bao, 2008			Adults			
Behrens, 2013	Male, Female		Adults			
Behrens, 2014	Male, Female		Adults			
Behrens, 2015	Male, Female			Normal/Healthy weight (BMI: 18.5–24.9), Overweight and obese		Smoking exposure (high/low); Study location (North America, Europe, Asia)
Boyle, 2012			Adults			
Brenner, 2016	Male, Female		Adults			Smoking status
Buffart, 2014	Male, Female		Adults			Smoking status
Cannioto, 2016	Female		Adults	Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5–24.9), Overweight and obese		
Chen, 2014	Male, Female		Adults			
Farris, 2015	Male, Female		Adults (<50, 50–60, and >60)			
Gong, 2016	Female	Black or African American	Adults: <50 vs. >50	Normal/Healthy weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and obese (BMI: 30 and above)		Menopausal status (premenopausal/ postmenopausal)
Harriss, 2009	Male, Female					
Jochem, 2014	Male, Female		Adults			
Johnson, 2013			Adults	Normal/Healthy weight (BMI: 18.5–24.9),		Smoking status

	Sex	Race/ Ethnicity	Age	Weight Status	Chronic Conditions	Other
				Obese (BMI: 30 and above)		
Keimling, 2014	Male, Female		Adults			
Keum, 2014	Female		Adults			Smoking status, Hormone replacement therapy (HRT)
Kitahara, 2012	Male, Female		Adults	Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and obese (BMI: 30 and above)	Diabetes	Smoking status, Alcohol intake, education (high school or less, post-high school)
Kyu, 2016			Adults			
Liu, 2011		European, North American, American, Whites, Blacks, Canadian, Asia-Pacific	Adults <20; 20–45; 45–65; ≥65	Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and obese (BMI: 30 and above)		
Liu, 2016	Male, Female		Adults	Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5-24.9), Overweight (BMI: 25-29.9) and obese (BMI: 30 and above)		Smoking status, Menopausal status
Moore, 2010	Female		Adults			
Moore, 2016	Male, Female		Adults	Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5-24.9), Overweight (BMI: 25-29.9) and obese (BMI: 30 and above)		Smoking status
Neilson, 2016	Female		Adults			Menopausal status
Nicolotti, 2011	Male, Female		Adults <45; >45			
Niedermaier, 2015	Male, Female		Adults			
O'Rorke, 2010			Adults			
Pham, 2012			Adults			Residents of Japan

	Sex	Race/ Ethnicity	Age	Weight Status	Chronic Conditions	Other
Pizot, 2016	Female		Adults			
Psaltopoulou, 2016	Male, Female		Adults			
Robsahm, 2013			Adults			
Schmid, 2013	Male, Female					
Schmid, 2015	Female		Childhood (birth to 19 years), Adulthood (19 to 49 years), Older age (50 years or older)	Normal/Healthy weight (BMI: 18.5–24.9), Overweight and obese		Menopausal status (premenopausal/ postmenopausal)
Schmid, 2016	Male, Female		Adults			Smoking Status
Singh, 2014			Adults			
Singh, 2014	Male, Female		Adults			Study Location (Asian, Western)
Sun, 2012	Male, Female		Adults			
Vermaete, 2013			Adults			
WCRF, 2011			Not reported			
WCRF, 2015a			Not reported			
WCRF, 2015b			Not reported			
WCRF, 2017			Not reported			
Wolin, 2009	Male, Female		Adults			
Wu, 2013	Female		Adults	Normal/Healthy weight (BMI: 18.5–24.9), Overweight and obese		Menopausal status (postmenopausal, premenopausal), Study location (America, Europe, Asia)
Zhong, 2014	Female					
Zhong, 2016	Male, Female		Adults			Smoking status

Supporting Evidence

Existing Systematic Reviews, Meta-Analyses, and Pooled Analyses

Table 2. Existing Systematic Reviews, Meta-Analyses, and Pooled Analyses Individual Evidence Summary Tables

<table>
<tr><th colspan="2">Bladder, Brain, Breast, Colon, Endometrial, Esophageal, Gastric, Head and Neck, Hematologic, Lung, Ovarian, Rectal, Renal, Pancreatic, Prostate, and Thyroid Cancers</th></tr>
<tr><td colspan="2">Pooled Analysis
Citation: Moore SC, Lee IM, Weiderpass E, et al. Association of leisure-time physical activity with risk of 26 types of cancer in 1.44 million adults. JAMA Intern Med. 2016;176(6):816-825. doi:10.1001/jamainternmed.2016.1548.</td></tr>
<tr><td>Purpose: To determine the association of leisure-time physical activity (LTPA) with incidence of common types of cancer and whether associations vary by body size and/or smoking.</td><td rowspan="4">Abstract: IMPORTANCE: Leisure-time physical activity has been associated with lower risk of heart-disease and all-cause mortality, but its association with risk of cancer is not well understood. OBJECTIVE: To determine the association of leisure-time physical activity with incidence of common types of cancer and whether associations vary by body size and/or smoking. DESIGN, SETTING, AND PARTICIPANTS: We pooled data from 12 prospective US and European cohorts with self-reported physical activity (baseline, 1987-2004). We used multivariable Cox regression to estimate hazard ratios (HRs) and 95% confidence intervals for associations of leisure-time physical activity with incidence of 26 types of cancer. Leisure-time physical activity levels were modeled as cohort-specific percentiles on a continuous basis and cohort-specific results were synthesized by random-effects meta-analysis. Hazard ratios for high vs low levels of activity are based on a comparison of risk at the 90th vs 10th percentiles of activity. The data analysis was performed from January 1, 2014, to June 1, 2015. EXPOSURES: Leisure-time physical activity of a moderate to vigorous intensity. MAIN OUTCOMES AND MEASURES: Incident cancer during follow-up. RESULTS: A total of 1.44 million participants (median [range] age, 59 [19-98] years; 57% female) and 186932 cancers were included. High vs low levels of leisure-time physical activity were associated with lower risks of 13 cancers: esophageal adenocarcinoma (HR, 0.58; 95% CI, 0.37-0.89), liver (HR, 0.73; 95% CI, 0.55-0.98), lung (HR, 0.74; 95% CI, 0.71-0.77), kidney (HR, 0.77; 95% CI, 0.70-0.85), gastric cardia (HR, 0.78; 95% CI, 0.64-0.95), endometrial (HR, 0.79; 95% CI, 0.68-0.92), myeloid leukemia (HR, 0.80; 95% CI, 0.70-0.92), myeloma (HR, 0.83; 95% CI, 0.72-0.95), colon (HR, 0.84; 95% CI, 0.77-0.91), head and neck (HR, 0.85; 95% CI, 0.78-0.93), rectal (HR, 0.87; 95% CI, 0.80-0.95), bladder (HR, 0.87; 95% CI, 0.82-0.92), and breast (HR, 0.90; 95% CI, 0.87-0.93). Body mass index adjustment modestly attenuated associations for several cancers, but 10 of 13 inverse associations remained statistically significant after this adjustment. Leisure-time physical activity was</td></tr>
<tr><td>Total # of Studies: 12</td></tr>
<tr><td>Exposure Definition: LTPA of moderate intensity, defined as an intensity of 3 or more metabolic equivalents (METs), or vigorous intensity, defined as 6 or more METs. LTPA levels were harmonized by converting them to cohort-specific percentiles, with values from 0 (low activity) to 100 (high activity). If physical activity was based on categorical responses, the percentile at the category midpoint was assigned. For example, if 20% of participants indicated the lowest level of activity, they were assigned the 10th percentile.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Cancer risks: Incident first primary cancers were identified by follow-up questionnaires and review of medical records, cancer registry linkage, or both.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
</table>

	associated with higher risks of malignant melanoma (HR, 1.27; 95% CI, 1.16-1.40) and prostate cancer (HR, 1.05; 95% CI, 1.03-1.08). Associations were generally similar between overweight/obese and normal-weight individuals. Smoking status modified the association for lung cancer but not other smoking-related cancers. CONCLUSIONS AND RELEVANCE: Leisure-time physical activity was associated with lower risks of many cancer types. Health care professionals counseling inactive adults should emphasize that most of these associations were evident regardless of body size or smoking history, supporting broad generalizability of findings.
Populations Analyzed: Underweight (BMI: Below 18.5), Normal/Healthy weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: 30 and Above), Smoking status, Adults, Male, Female	**Author-Stated Funding Source:** Intramural Research Program of the National Institutes of Health

<table>
<tr><th colspan="2">Breast, Colon, Endometrial, Hematologic, Lung, Ovarian, Pancreatic, Prostate, and Rectal, Cancers</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Liu L, Shi Y, Li T, et al. Leisure time physical activity and cancer risk: evaluation of the WHO's recommendation based on 126 high-quality epidemiological studies. Br J Sports Med. 2016;50(6):372-378. doi:10.1136/bjsports-2015-094728.</td></tr>
<tr><td>Purpose: To summarize the current knowledge about the relationship between leisure time physical activity (LTPA) and cancer risk.</td><td rowspan="4">Abstract: BACKGROUND: The WHO has concluded that physical activity reduces the risk of numerous diseases. However, few systemic reviews have been performed to assess the role of leisure time physical activity (LTPA) in lowering the risk of cancer in a dose-dependent manner and furthermore the suitability of recommendation of physical activity by the WHO. METHODS: A systematic review and meta-analysis was designed to estimate cancer risk by LTPA in binary comparison and in a dose-dependent manner. MEDLINE and Web of Science were searched up to 30 December 2014 without language restrictions. Reference lists were reviewed for potential articles. RESULTS: A total of 126 studies were recruited into the meta-analysis. Overall, the total cancer risk was reduced by 10% in people who undertook the most LTPA as compared with those who did the least. Dose-response meta-analysis indicated that the current WHO recommendation (equal to an average of 10 metabolic equivalents of energy hours per week) induced a 7% (95% CI 5% to 9%) cancer reduction. Moreover, the protective role of LTPA against cancer becomes saturated at 20 metabolic equivalents of energy hours per week, with a relative risk of 0.91 (95% CI 0.88 to 0.93). Subanalyses results based on cancer types showed that LTPA only exhibited significant protection against breast cancer and colorectal cancer. CONCLUSIONS: Our meta-analysis indicates that the current WHO recommendation of physical activity can result in a 7% reduction in cancer risk, which is mainly attributed to its protective role against breast cancer and colorectal cancer. Furthermore, two-fold of current recommendation level is considered to give its saturated protection against cancer.</td></tr>
<tr><td>Timeframe: Inception–2014</td></tr>
<tr><td>Total # of Studies: 126</td></tr>
<tr><td>Exposure Definition: LTPA converted into metabolic equivalents of energy. The reported weekly hours were multiplied by 8 metabolic equivalents (METs) for vigorous activity, 4 METs for moderate activity, and 6 METs for moderate-to-vigorous activity. For each study, the median or mean level of LTPA was assigned to the corresponding relative risk. Dose-response was assessed by calculating 5th, 35th, 65th, and 95th percentile levels of LTPA.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Cancer risk
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults, Male, Female; Underweight (BMI: below 18.5), Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: 30 and above); Study location, Smoking status</td><td>Author-Stated Funding Source: National Natural Science Foundation of China</td></tr>
</table>

<table>
<tr><th colspan="2">Bladder Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Keimling M, Behrens G, Schmid D, Jochem C, Leitzmann MF. The association between physical activity and bladder cancer: systematic review and meta-analysis. Br J Cancer. 2014;110(7):1862-1870. doi:10.1038/bjc.2014.77.</td></tr>
<tr><td>Purpose: To quantify the relation of physical activity (PA) to bladder cancer risk.</td><td rowspan="5">Abstract: BACKGROUND: Physical activity may protect against bladder cancer through several biologic pathways, such as enhanced immune function and decreased chronic inflammation. Physical activity may also indirectly prevent bladder cancer by reducing obesity. A sizeable number of epidemiologic studies have examined the association between physical activity and bladder cancer, but the available evidence has not yet been formally summarised using meta-analysis. METHODS: We performed a systematic literature review and meta-analysis of English-language studies published from January 1975 through November 2013. We followed the PRISMA guidelines and used a random effects model to estimate the summary risk estimates for the association between physical activity and bladder cancer. RESULTS: A total of 15 studies with 5,402,369 subjects and 27,784 bladder cancer cases were included. High vs low levels of physical activity were related to decreased bladder cancer risk (summary relative risk (RR)=0.85, 95% confidence interval (CI)=0.74-0.98; I(2)=83%; P-value for heterogeneity across all studies<0.001). Results were similar for cohort studies (RR=0.89, 95% CI=0.80-1.00; I(2)=64%) and case-control studies (RR=0.71, 95% CI=0.43-1.16; I(2)=87%; P-value for difference=0.108) and they were comparable for women (RR=0.83, 95% CI=0.73-0.94; I(2)=0%) and men (RR=0.92, 95% CI=0.82-1.05; I(2)=67; P-value for difference=0.657). Findings were also comparable for recreational (RR=0.81, 95% CI=0.66-0.99; I(2)=77%) and occupational physical activity (RR=0.90, 95% CI=0.76-1.0; I(2)=76%; P-value for difference=0.374), and they were largely consistent for moderate (RR=0.85, 95% CI=0.75-0.98; I(2)=76%) and vigorous activity (RR=0.80, 95% CI=0.64-1.00;I(2)=87%; P-value for difference=0.535). CONCLUSIONS: Physical activity is associated with decreased risk of bladder cancer. Further studies are required to assess the relations of intensity, frequency, duration, and timing in life of physical activity to bladder cancer risk.</td></tr>
<tr><td>Timeframe: January 1975–November 2013</td></tr>
<tr><td>Total # of Studies: 15</td></tr>
<tr><td>Exposure Definition: Four PA components were assessed across studies: energy expenditure (metabolic equivalents of task [METs] per week, kilojoule (kJ)/minute, or weighted PA indexes); activity duration (hours/week or percentage of time spent physically active; activity frequency (times per week of PA); and qualitative assessments of PA (sedentary, light, moderate, or high PA). Dose-response was assessed by converting the PA cut points from each study to percentile cut points based on the reported PA group sizes. Percentiles ranged from 0 to 100, with 0 indicating the lowest and 100 indicating the highest PA level. Low vs. high PA compared and stratified analyses provided by PA intensity (moderate, vigorous), four PA components, PA type of assessment (self-reported, by proxy, interview), and timing in life of PA (recent, consistent, past). Effect size calculated for recreational and occupational PA.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Bladder cancer risk
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
<tr><th colspan="2">Brain Cancer</th></tr>
</table>

Meta-Analysis **Citation:** Niedermaier T, Behrens G, Schmid D, Schlecht I, Fischer B, Leitzmann MF. Body mass index, physical activity, and risk of adult meningioma and glioma: a meta-analysis. *Neurology*. 2015;85(15):1342-1350. doi:10.1212/WNL.0000000000002020.	
Purpose: To analyze body-mass index and physical activity (PA) in relation to risk of meningioma and glioma. **Timeframe:** Inception–2015 **Total # of Studies:** 13 **Exposure Definition:** PA: comparison between the highest and the lowest study-specific categories of physical activity. **Measures Steps:** No **Measures Bouts:** No **Examines HIIT:** No **Outcomes Addressed:** Relative risk of adult meningiomas or gliomas. **Examine Cardiorespiratory Fitness as Outcome:** No	**Abstract:** OBJECTIVE: Whether adiposity and lack of physical activity affect the risk for developing meningioma and glioma is poorly understood. Our objective was to characterize these associations in detail. METHODS: We conducted a systematic review and meta-analysis of adiposity and physical activity in relation to meningioma and glioma using cohort and case-control studies published through February 2015. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. RESULTS: We identified 12 eligible studies of body mass index (BMI) and 6 studies of physical activity, comprising up to 2,982 meningioma cases and 3,057 glioma cases. Using normal weight as the reference group, overweight (summary relative risk [RR] = 1.21, 95% confidence interval [CI] = 1.01-1.43) and obesity (RR = 1.54, 95% CI = 1.32-1.79) were associated with increased risk of meningioma. In contrast, overweight (RR = 1.06, 95% CI = 0.94-1.20) and obesity (RR = 1.11, 95% CI = 0.98-1.27) were unrelated to glioma. Similarly, dose-response meta-analyses revealed a statistically significant positive association of BMI with meningioma, but not glioma. High vs low physical activity levels showed a modest inverse relation to meningioma (RR = 0.73, 95% CI = 0.61-0.88) and a weak inverse association with glioma (RR = 0.86, 95% CI = 0.76-0.97). Relations persisted when the data were restricted to prospective studies, except for the association between physical activity and glioma, which was rendered statistically nonsignificant (RR = 0.91, 95% CI = 0.77-1.07). CONCLUSIONS: Adiposity is related to enhanced risk for meningioma but is unassociated with risk for glioma. Based on a limited body of evidence, physical activity is related to decreased risk of meningioma but shows little association with risk of glioma.
Populations Analyzed: Male, Female, Adult	**Author-Stated Funding Source:** University of Regensburg, Germany

<table>
<tr><th colspan="2">Breast Cancer</th></tr>
<tr><td colspan="2">Pooled Analysis
Citation: Gong Z, Hong CC, Bandera EV, et al. Vigorous physical activity and risk of breast cancer in the African American breast cancer epidemiology and risk consortium. Breast Cancer Res Treat. 2016;159(2):347-356. doi:10.1007/s10549-016-3936-3.</td></tr>
<tr><td>Purpose: To investigate the role of recent physical activity (PA) in the risk of breast cancer overall and by tumor estrogen receptor (ER) status in African American women.</td><td rowspan="4">Abstract: The relationship between physical activity and breast cancer risk has been extensively studied among women of European descent, with most studies reporting inverse associations. However, data on American women of African ancestry (AA) and by tumor subtypes are sparse. Thus, we examined associations of vigorous exercise and breast cancer risk overall, and by estrogen receptor (ER) status, in the African American Breast Cancer Epidemiology and Risk Consortium. We pooled data from four large studies on 2482 ER+ cases, 1374 ER- cases, and 16,959 controls. Multivariable logistic regression was used to compute odds ratios (OR) and 95 % confidence intervals (CI) for the risk of breast cancer overall, and polytomous logistic regression was used to model the risk of ER+ and ER- cancer. Recent vigorous exercise was associated with a statistically significant, modestly decreased risk for breast cancer overall (OR 0.88, 95 % CI 0.81-0.96) and for ER+ cancer (OR 0.88, 95 % CI 0.80-0.98), but not for ER- cancer (OR 0.93, 95 % CI 0.82-1.06). Overall, there was no strong evidence of effect modification by age, menopausal status, body mass index, and parity. However, our data were suggestive of modification by family history, such that an inverse association was present among women without a family history but not among those with a relative affected by breast cancer. Results from this large pooled analysis provide evidence that vigorous physical activity is associated with a modestly reduced risk of breast cancer in AA women, specifically ER+ cancer.</td></tr>
<tr><td>Total # of Studies: 4</td></tr>
<tr><td>Exposure Definition: Vigorous PA (average hours per week): self-reported using different questions per study. Data reported included participants' average number of hours of vigorous activity, type of physical fitness activities that were engaged in regularly on a weekly basis, and frequency of activity (converted the number of days of activity to hours per week by assuming that participants engaged in an average of 45 minutes of the reported activity each day). Or, participants reported any activities they participated in for at least 1 hour per week for at least 3 months. Data was combined assigning metabolic equivalent of energy expenditure (MET) value and average hours per week to compute vigorous activity, defined as activities with a MET value of 6.0 or greater. Assessed various categorizations of PA, including 0, <2, 2–6, and 7+ hours/week; categories were further collapsed down to 0, <2, and 2+ hours/week in models examining potential effect modification by several breast cancer risk factors.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Breast cancer: Immunohistochemistry results of breast cancer were obtained from hospital pathology records and cancer registry data and were used to classify cases as estrogen receptor (ER)+ and ER- breast cancer.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Normal/Healthy weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: 30 and above), Premenopause vs. postmenoupause, Female, Black or African American, Adults: <50 vs. >50</td><td>Author-Stated Funding Source: National Institutes of Health</td></tr>
</table>

<table>
<tr><th colspan="2">Breast Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Neilson HK, Farris MS, Stone CR, et al. Moderate-vigorous recreational physical activity and breast cancer risk, stratified by menopause status: a systematic review and meta-analysis. Menopause. 2017;24(3):322-344. doi: 10.1097/GME.0000000000000745.</td></tr>
<tr><td>Purpose: To estimate breast cancer risk associated with high versus low levels of moderate-to-vigorous recreational activity, separately for premenopausal and postmenopausal women.</td><td rowspan="4">Abstract: OBJECTIVE: Physical inactivity increases postmenopausal and possibly premenopausal breast cancer risk, although different biologic mechanisms are proposed. Our primary objective was to estimate breast cancer risk associated with high versus low levels of moderate-vigorous recreational activity, separately for premenopausal and postmenopausal women. METHODS: We conducted a systematic review of literature published to July 2015. Included reports were cohort or case-control studies relating moderate-vigorous recreational physical activity (metabolic equivalent >/=3.0) to breast cancer incidence, exclusively (>/=90%) in premenopausal or postmenopausal women. We appraised study quality and performed meta-analyses using random effects modeling. Subgroup meta-analyses were based on tumor subtype, race, body mass index, parity, hormone therapy use, family history of cancer, and statistical adjustment for body fatness. Dose-response relations were examined. RESULTS: Pooled relative risks (RRs, 95% CI) for women with higher versus lower levels of moderate-vigorous recreational activity were RR = 0.80 (0.74-0.87) and RR = 0.79 (0.74-0.84) for premenopausal (43 studies) and postmenopausal (58 studies) breast cancer, respectively, with high heterogeneity. Inverse associations were weaker among postmenopausal cohort studies (RR = 0.90 [0.85-0.95]) and studies that statistically adjusted for nonrecreational (eg, occupational, household) activity (RR = 0.91 [0.77-1.06] premenopausal, RR = 0.96 [0.86-1.08] postmenopausal). Risk estimates with versus without body fatness adjustment did not vary by menopause status, although other subgroup effects were menopause-dependent. Among studies of overweight/obese women, there was an inverse association with postmenopausal but not premenopausal breast cancer (RR = 0.88 [0.82-0.95] and RR = 0.99 [0.98-1.00], respectively). Dose-response curves were generally nonlinear. CONCLUSIONS: Although risk estimates may be similar for premenopausal and postmenopausal breast cancer, subgroup effects may be menopause-dependent.</td></tr>
<tr><td>Timeframe: Inception–July 2015</td></tr>
<tr><td>Total # of Studies: 67</td></tr>
<tr><td>Exposure Definition: Moderate-to-vigorous recreational physical activity (MVPA): MVPA defined as metabolic equivalent (MET) ≥ 3.0. Recreational: if the activity was not occupational or home oriented. Walking or bicycling to and from work qualified as MVPA. Compared women in the highest vs. the lowest activity category.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Breast cancer: first ever diagnosis of invasive (or nonspecific) breast cancer. Subgroups: tumor subtypes: tumor histology, pre- and post-menopausal, hormone therapy, family history, parity, oral contraception, BMI (above 25 and below 25), and race.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Pre- and post-menopausal status, Female, Adults</td><td>Author-Stated Funding Source: Health Senior Scholar Award from Alberta Innovates-Health Solutions, Alberta Cancer Foundation Weekend to End Women’s Cancers, Career Development Award in Prevention from the Canadian Cancer Society.</td></tr>
</table>

<table>
<tr><th colspan="2">Breast Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Pizot C, Boniol M, Mullie P, et al. Physical activity, hormone replacement therapy and breast cancer risk: a meta-analysis of prospective studies. Eur J Cancer. 2016;52:138-154. doi:10.1016/j.ejca.2015.10.063.</td></tr>
<tr><td>Purpose: To examine the association between physical activity (PA) and breast cancer risk in prospective studies, exploring the effect that breast cancer risk factors,especially hormone replacement therapy use, could have on this association.</td><td rowspan="5">Abstract: BACKGROUND: Lower risk of breast cancer has been reported among physically active women, but the risk in women using hormone replacement therapy (HRT) appears to be higher. We quantified the association between physical activity and breast cancer, and we examined the influence that HRT use and other risk factors had on this association. METHODS: After a systematic literature search, prospective studies were meta-analysed using random-effect models applied on highest versus lowest level of physical activity. Dose-response analyses were conducted with studies reporting physical activity either in hours per week or in hours of metabolic equivalent per week (MET-h/week). RESULTS: The literature search identified 38 independent prospective studies published between 1987 and 2014 that included 116,304 breast cancer cases. Compared to the lowest level of physical activity, the highest level was associated with a summary relative risk (SRR) of 0.88 (95% confidence interval [CI] 0.85, 0.90) for all breast cancer, 0.89 (95% CI 0.83, 0.95) for ER+/PR+ breast cancer and 0.80 (95% CI 0.69, 0.92) for ER-/PR- breast cancer. Risk reductions were not influenced by the type of physical activity (occupational or non-occupational), adiposity, and menopausal status. Risk reductions increased with increasing amounts of physical activity without threshold effect. In six studies, the SRR was 0.78 (95% CI 0.70, 0.87) in women who never used HRT and 0.97 (95% CI 0.88, 1.07) in women who ever used HRT, without heterogeneity in results. Findings indicate that a physically inactive women engaging in at least 150 min per week of vigorous physical activity would reduce their lifetime risk of breast cancer by 9%, a reduction that might be two times greater in women who never used HRT. CONCLUSION: Increasing physical activity is associated with meaningful reductions in the risk of breast cancer, but in women who ever used HRT, the preventative effect of physical activity seems to be cancelled out.</td></tr>
<tr><td>Timeframe: Inception–2014</td></tr>
<tr><td>Total # of Studies: 38</td></tr>
<tr><td>Exposure Definition: Physical activity: both occupational and nonoccupational. Reports included as metabolic equivalent (MET) hours/week with different references and ranks of activity, duration of PA per week or duration of PA per day. Subgroups: occupational and nonoccupational, metric for physical activity (MET, hours/week, or no quantitative measure).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Incident cases of breast cancer, presented as relative risks. Subgroups: menopausal status, hormonal status, period of study (before or after 1989), location of study, BMI adjusted.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Adults</td><td>Author-Stated Funding Source: International Prevention Research Institute</td></tr>
</table>

<table>
<tr><th colspan="2">Breast Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Wu Y, Zhang D, Kang S. Physical activity and risk of breast cancer: a meta-analysis of prospective studies. Breast Cancer Res Treat. 2013;137(3):869-882. doi:10.1007/s10549-012-2396-7.</td></tr>
<tr><td>Purpose: To assess the breast cancer risk for the highest vs. lowest categories of physical activity (PA) among adults.</td><td rowspan="4">Abstract: We conducted a meta-analysis to summarize the evidence from prospective studies regarding the association between physical activity and breast cancer risk. A comprehensive search was conducted to identify eligible studies. The fixed or random effect model was used based on heterogeneity test. The dose-response relationship was assessed by restricted cubic spline model and multivariate random-effect meta-regression. Overall, 31 studies with 63,786 cases were included, and the combined relative risk (RR) with 95 % CI of breast cancer was 0.88 (0.85-0.91). In subgroup analysis by activity type, data from 27 studies including 37,568 cases for non-occupational activity (including recreational activity and household activity) and seven studies including 28,268 cases for occupational activity were used, and the RR (95 % CI) of breast cancer was 0.87 (0.83-0.91) and 0.90 (0.83-0.97), respectively. The inverse association was consistent among all subgroups analyses. Stronger association was found for subjects with BMI <25 kg/m(2) [0.72 (0.65-0.81)], premenopausal women [0.77 (0.72-0.84)], and estrogen and progesterone receptor-negative breast cancer [0.80 (0.73-0.87)]. Dose-response analysis suggested that the risk of breast cancer decreased by 2 % (P < 0.00) for every 25 metabolic equivalent (MET)-h/week increment in non-occupational physical activity, 3 % (P < 0.00) for every 10 MET-h/week (roughly equivalent to 4 h/week of walking in 2 miles/h or 1 h/week of running in 6 miles/h) increment in recreational activity, and 5 % (P < 0.00) for every 2 h/week increment in moderate plus vigorous recreational activity, respectively. Physical activity could significantly reduce the risk of breast cancer.</td></tr>
<tr><td>Timeframe: Inception–2012</td></tr>
<tr><td>Total # of Studies: 31</td></tr>
<tr><td>Exposure Definition: PA: highest vs. lowest. Subgroup analysis was performed by type of PA categorized as occupational, nonoccupational (including recreational activity and household activity), recreational, household, and walking; by intensity of PA (moderate or vigorous); and the period of life during which PA was performed (<25 years, 25–50 years, >50 years, or throughout the follow-up). According to the metabolic equivalents (METs) assigned to each specific activity, we combined the intensity of activity reported as “high,” “active,” “strenuous,” or “vigorous” in the original studies as vigorous intensity. Dose-response analysis compared the 25th, 50th, and 75th percentiles of the levels of PA for nonoccupational activity (MET hours/week), recreational activity (MET hours/week), moderate plus vigorous activity (hours/week), and vigorous activity (hours/week).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Breast cancer relative risk. Subgroup analysis by estrogen receptor (ER) and progesterone receptor (PR) status (positive: ER+/PR+, or negative: ER-/PR-), tumor stage (in situ or invasive).
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Normal/Healthy weight (BMI: 18.5–24.9), Overweight and obese, Menopausal status (postmenopausal, premenopausal), Study location (America, Europe, Asia), Female, Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Colon Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Boyle T, Keegel T, Bull F, Heyworth J, Fritschi L. Physical activity and risks of proximal and distal colon cancers: a systematic review and meta-analysis. J Natl Cancer Inst. 2012;104(20):1548-1561. doi:10.1093/jnci/djs354.</td></tr>
<tr><td>Purpose: To investigate whether the association between physical activity (PA) and colon cancer differs by subsite.</td><td rowspan="5">Abstract: BACKGROUND: Although there is convincing epidemiological evidence that physical activity is associated with a reduced risk of colon cancer, it is unclear whether physical activity is differentially associated with the risks of proximal colon and distal colon cancers. We conducted a systematic review and meta-analysis to investigate this issue. METHODS: MEDLINE and EMBASE were searched for English-language cohort and case-control studies that examined associations between physical activity and the risks of proximal colon and distal colon cancers. A random-effects meta-analysis was conducted to estimate the summary relative risks (RRs) for the associations between physical activity and the risks of the two cancers. All statistical tests were two-sided. RESULTS: A total of 21 studies met the inclusion criteria. The summary relative risk of the main results from these studies indicated that the risk of proximal colon cancer was 27% lower among the most physically active people compared with the least active people (RR = 0.73, 95% confidence interval [CI] = 0.66 to 0.81). An almost identical result was found for distal colon cancer (RR = 0.74, 95% CI = 0.68 to 0.80). CONCLUSION: The results of this systematic review and meta-analysis suggest that physical activity is associated with a reduced risk of both proximal colon and distal colon cancers, and that the magnitude of the association does not differ by subsite. Given this finding, future research on physical activity and colon cancer should focus on other aspects of the association that remain unclear, such as whether sedentary behavior and nonaerobic physical activity are associated with the risk of colon cancer.</td></tr>
<tr><td>Timeframe: 1946–January 2012</td></tr>
<tr><td>Total # of Studies: 21</td></tr>
<tr><td>Exposure Definition: PA; domains (occupational, recreational, household, or two or more of these domains combined).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Colon cancer: proximal, distal
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Colon, Rectal Cancers</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Harriss DJ, Atkinson G, Batterham A, et al; Colorectal Cancer, Lifestyle, Exercise And Research Group. Lifestyle factors and colorectal cancer risk (2): a systematic review and meta-analysis of associations with leisure-time physical activity. Colorectal Dis. 2009;11(7):689-701. doi:10.1111/j.1463-1318.2009.01767.x.</td></tr>
<tr><td>Purpose: To undertake a systematic review and meta-analysis of prospective observational studies to quantify gender-specific risk of colon and rectal cancer associated with increased leisure time physical activity, and specifically, to explore the quantification of a dose–response relationship.</td><td rowspan="5">Abstract: OBJECTIVE: Increased physical activity may decrease the risk of colorectal cancer. As a prerequisite to the determination of lifestyle attributable risks, we performed a systematic review and meta-analysis of prospective observational studies to quantify gender-specific risk associated with increased leisure-time physical activity (LT-PA). METHOD: We searched MEDLINE and EMBASE (to December 2007), and other sources, selecting reports based on strict inclusion criteria. We used random-effects meta-analyses to estimate summary risk ratios (RR) and 95% confidence intervals (95% CI) for uppermost vs lowermost categories of physical activity. To investigate dose-response, we explored risks ratios as a function of cumulative percentiles of physical activity distribution. RESULTS: Fifteen datasets from 14 articles, including 7873 incident cases, were identified. For colon cancer, there were inverse associations with LT-PA for men (RR: 0.80; 95% CI: 0.67-0.96) and women (0.86; 0.76-0.98). LT-PA did not influence risk of rectal cancer. The dose-response analysis was consistent with linear pattern reductions in risk of colon cancer in both genders. There was evidence of moderate between-study heterogeneity but summary estimates were broadly consistent across potential confounding factors. CONCLUSION: Increased LT-PA is associated with a modest reduction in colon but not rectal cancer risk; a risk reduction, which previously may have been overstated. LT-PA only interventions in public health cancer prevention strategies are unlikely to impact substantially on colorectal cancer incidences.</td></tr>
<tr><td>Timeframe: Inception–2007</td></tr>
<tr><td>Total # of Studies: 14</td></tr>
<tr><td>Exposure Definition: Leisure time physical activity.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Incidence of colon cancer.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Male, Female</td><td>Author-Stated Funding Source: British Medical Association</td></tr>
</table>

<table>
<tr><th colspan="2">Colon Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Johnson CM, Wei C, Ensor JE, et al. Meta-analyses of colorectal cancer risk factors. Cancer Causes Control. 2013;24(6):1207-1222. doi:10.1007/s10552-013-0201-5.</td></tr>
<tr><td>Purpose: To explore associations between risk factors and colorectal cancer incidence.</td><td rowspan="4">Abstract: PURPOSE: Demographic, behavioral, and environmental factors have been associated with increased risk of colorectal cancer (CRC). We reviewed the published evidence and explored associations between risk factors and CRC incidence. METHODS: We identified 12 established non-screening CRC risk factors and performed a comprehensive review and meta-analyses to quantify each factor's impact on CRC risk. We used random-effects models of the logarithms of risks across studies: inverse-variance weighted averages for dichotomous factors and generalized least squares for dose-response for multi-level factors. RESULTS: Significant risk factors include inflammatory bowel disease (RR = 2.93, 95 % CI 1.79-4.81); CRC history in first-degree relative (RR = 1.80, 95 % CI 1.61-2.02); body mass index (BMI) to overall population (RR = 1.10 per 8 kg/m(2) increase, 95 % CI 1.08-1.12); physical activity (RR = 0.88, 95 % CI 0.86-0.91 for 2 standard deviations increased physical activity score); cigarette smoking (RR = 1.06, 95 % CI 1.03-1.08 for 5 pack-years); and consumption of red meat (RR = 1.13, 95 % CI 1.09-1.16 for 5 servings/week), fruit (RR = 0.85, 95 % CI 0.75-0.96 for 3 servings/day), and vegetables (RR = 0.86, 95 % CI 0.78-0.94 for 5 servings/day). CONCLUSIONS: We developed a comprehensive risk modeling strategy that incorporates multiple effects to predict an individual's risk of developing CRC. Inflammatory bowel disease and history of CRC in first-degree relatives are associated with much higher risk of CRC. Increased BMI, red meat intake, cigarette smoking, low physical activity, low vegetable consumption, and low fruit consumption were associated with moderately increased risk of CRC.</td></tr>
<tr><td>Timeframe: 1966–2010</td></tr>
<tr><td>Total # of Studies: 116 (21 for physical activity)</td></tr>
<tr><td>Exposure Definition: Studies reported different types of physical activity (PA), such as occupational, leisure, and commuting, and used different units of measure (e.g., minutes walking/day, times/week, kilocalories, PA score, metabolic equivalents). For the studies reporting multiple categories of PA such as occupational and household, we used the measure reporting the most amount of activity. For all studies included in the analysis of PA, we assigned a PA score to each activity category, assigning a value of 1 to the lowest activity category and 5 to the highest activity category, with activity categories assumed to be equally spaced.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Colorectal or colon cancer risk.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Normal/Healthy weight (BMI: 18.5–24.9), Obese (BMI: 30 and above), Smoking, Adults</td><td>Author-Stated Funding Source: National Colorectal Cancer Research Alliance</td></tr>
</table>

<table>
<tr><th colspan="2">Colon Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Kyu HH, Bachman VF, Alexander LT, et al. Physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events: systematic review and dose-response meta-analysis for the Global Burden of Disease Study 2013. BMJ. 2016;354:i3857. doi:10.1136/bmj.i3857.</td></tr>
<tr><td>Purpose: To quantify the dose-response associations between total physical activity (PA) and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events.</td><td rowspan="5">Abstract: OBJECTIVE: To quantify the dose-response associations between total physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events. DESIGN: Systematic review and Bayesian dose-response meta-analysis. DATA SOURCES: PubMed and Embase from 1980 to 27 February 2016, and references from relevant systematic reviews. Data from the Study on Global AGEing and Adult Health conducted in China, Ghana, India, Mexico, Russia, and South Africa from 2007 to 2010 and the US National Health and Nutrition Examination Surveys from 1999 to 2011 were used to map domain specific physical activity (reported in included studies) to total activity. ELIGIBILITY CRITERIA FOR SELECTING STUDIES: Prospective cohort studies examining the associations between physical activity (any domain) and at least one of the five diseases studied. RESULTS: 174 articles were identified: 35 for breast cancer, 19 for colon cancer, 55 for diabetes, 43 for ischemic heart disease, and 26 for ischemic stroke (some articles included multiple outcomes). Although higher levels of total physical activity were significantly associated with lower risk for all outcomes, major gains occurred at lower levels of activity (up to 3000-4000 metabolic equivalent (MET) minutes/week). For example, individuals with a total activity level of 600 MET minutes/week (the minimum recommended level) had a 2% lower risk of diabetes compared with those reporting no physical activity. An increase from 600 to 3600 MET minutes/week reduced the risk by an additional 19%. The same amount of increase yielded much smaller returns at higher levels of activity: an increase of total activity from 9000 to 12 000 MET minutes/week reduced the risk of diabetes by only 0.6%. Compared with insufficiently active individuals (total activity <600 MET minutes/week), the risk reduction for those in the highly active category (>/=8000 MET minutes/week) was 14% (relative risk 0.863, 95% uncertainty interval 0.829 to 0.900) for breast cancer; 21% (0.789, 0.735 to 0.850) for colon cancer; 28% (0.722, 0.678 to 0.768) for diabetes; 25% (0.754, 0.704 to 0.809) for ischemic heart disease; and 26% (0.736, 0.659 to 0.811) for ischemic stroke. CONCLUSIONS: People who achieve total physical activity levels several times higher than the current recommended minimum level have a significant reduction in the risk of the five diseases studied. More studies with detailed quantification of total physical activity will help to find more precise relative risk estimates for different levels of activity.</td></tr>
<tr><td>Timeframe: 1980–February 2016</td></tr>
<tr><td>Total # of Studies: 174 (19 for colon cancer)</td></tr>
<tr><td>Exposure Definition: PA in metabolic equivalent (MET) minutes/week were estimated from all included studies. Continuous and categorical dose-response between PA and outcomes conducted. Categorical compared insufficiently active (<600 MET minutes/week), low active (600–3,999 MET minutes), moderately active (4,000–7,999 MET minutes), and highly active (≥8,000 MET minutes).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of colon cancer. Pool relative risk estimated for analyses.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Bill and Melinda Gates Foundation</td></tr>
</table>

<table>
<tr><th colspan="2">Colon, Rectal Cancers</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Pham NM, Mizoue T, Tanaka K, et al; Research Group for the Development and Evaluation of Cancer Prevention Strategies in Japan. Physical activity and colorectal cancer risk: an evaluation based on a systematic review of epidemiologic evidence among the Japanese population. Jpn J Clin Oncol. 2012;42(1):2-13. doi:10.1093/jjco/hyr160.</td></tr>
<tr><td>Purpose: To assess the strength and consistency of the association between physical activity (PA) and colorectal cancer risk among the Japanese population.</td><td rowspan="5">Abstract: OBJECTIVE: Higher levels of physical activity have been consistently associated with a decreased risk of colon cancer, but not rectal cancer, in Western populations. The present study systematically evaluated epidemiologic evidence on the association between physical activity and colorectal cancer risk among the Japanese population. METHODS: Original data were obtained from MEDLINE searched using PubMed or from searches of the Ichushi database, complemented by manual searches. The associations were evaluated based on the strength of evidence, the magnitude of association and biologic plausibility. RESULTS: Two cohort studies and six case-control studies were identified. A weak to strong protective association between physical activity and colon cancer risk was observed in both cohort studies, showing a graded relationship, and among the majority of case-control studies, with some showing a dose-response relationship. The association observed in cohort studies was more consistent and stronger in men than in women and for proximal colon cancer than for distal colon cancer. A protective association with rectal cancer was found only in case-control studies, but the evidence was less consistent and weaker than that observed for colon cancer. CONCLUSIONS: Physical activity probably decreases the risk of colorectal cancer among the Japanese population. More specifically, the evidence for the colon is probable, whereas that for the rectum is insufficient.</td></tr>
<tr><td>Timeframe: Inception–2011</td></tr>
<tr><td>Total # of Studies: 8</td></tr>
<tr><td>Exposure Definition: PA: differed by study, including MET hours per day, hours per day, occupational PA, sports activity, physical exercise. Comparisons with the lowest PA as reference are presented.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Colorectal cancer: histoligically confirmed or patients undergoing surgery for a first diagnosis of colorectal cancer. Presented as odds ratio or relative risk. Subtypes: region of colon or rectum.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Japan residents, Adults</td><td>Author-Stated Funding Source: Third Term Comprehensive 10-year Strategy for Cancer Control from the Ministry of Health, Labour and Welfare, Japan.</td></tr>
</table>

<table>
<tr><th colspan="2">Colon, Rectal Cancers</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Robsahm TE, Aagnes B, Hjartaker A, Langseth H, Bray FI, Larsen IK. Body mass index, physical activity, and colorectal cancer by anatomical subsites: a systematic review and meta-analysis of cohort studies. Eur J Cancer Prev. 2013;22(6):492-505. doi:10.1097/CEJ.0b013e328360f434.</td></tr>
<tr><td>Purpose: To provide an overview of risk estimates for colorectal cancer by subsites according to body mass index and physical activity.</td><td rowspan="4">Abstract: Several studies report varying incidence rates of cancer in subsites of the colorectum, as an increasing proportion appears to develop in the proximal colon. Varying incidence trends together with biological differences between the colorectal segments raise questions of whether lifestyle factors impact on the risk of cancer differently at colorectal subsites. We provide an updated overview of the risk of cancer at different colorectal subsites (proximal colon, distal colon, and rectum) according to BMI and physical activity to shed light on this issue. Cohort studies of colorectal cancer, published in English throughout 2010, were identified using PubMed. The risk estimates from 30 eligible studies were summarized for BMI and physical activity. A positive relationship was found between BMI and cancer for all colorectal subsites, but most pronounced for the distal colon [relative risk (RR) 1.59, 95% confidence interval (CI) 1.34-1.89]. For the proximal colon and rectum, the risk estimates were 1.24 (95% CI 1.08-1.42) and 1.23 (95% CI 1.02-1.48), respectively. Physical activity was related inversely to the risk of cancer at the proximal (RR 0.76, 95% CI 0.70-0.83) and distal colon (RR 0.77, 95% CI 0.71-0.83). Such a relationship could not be established for the rectum (RR 0.98, 95% CI 0.88-1.08). In conclusion, the results suggest minor differences in the associations of BMI and the risk of cancer between the colorectal subsites. For physical activity, the association does not seem to differ between the colonic subsites, but a difference was observed between the colon and the rectum, perhaps indicating that different mechanisms are operating in the development of colon and rectal cancer.</td></tr>
<tr><td>Timeframe: Inception–2010</td></tr>
<tr><td>Total # of Studies: 30</td></tr>
<tr><td>Exposure Definition: Physical activity as lifetime, recreational, and occupational; levels classified as vigorous/high, moderate, or sedentary/inactive. Exposure categories included hours/week, times/week, and metabolic equivalents.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk estimates for colorectal cancer. Subgroups: proximal colon, distal colon, and rectum.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Colon Cancers</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Wolin KY, Yan Y, Colditz GA, Lee IM. Physical activity and colon cancer prevention: a meta-analysis. Br J Cancer. 2009;100(4):611-616. doi:10.1038/sj.bjc.6604917.</td></tr>
<tr><td>Purpose: To estimate the summary relative risk of colon cancer associated with physical activity (PA), based on available studies to date.</td><td rowspan="4">Abstract: Although an inverse association between physical activity and risk of colon cancer is well established, a formal estimate of the magnitude of this risk reduction that includes recent studies is not available. This analysis examines the association by sex and study design, restricting analyses to studies where data for colon cancer alone were available. The authors reviewed published studies through June 2008 examining the association between physical activity and risk of colon cancer. Heterogeneity and publication bias were evaluated and random effects models used to estimate relative risks (RR). Differences by sex and study design were evaluated. A total of 52 studies were included. An inverse association between physical activity and colon cancer was found with an overall relative risk (RR) of 0.76 (95% confidence interval (CI): 0.72, 0.81). For men, the RR was 0.76 (95% CI: 0.71, 0.82); for women, this was little different, (RR=0.79, 95% CI: 0.71, 0.88). The findings from case-control studies were stronger (RR=0.69, 95% CI: 0.65, 0.74) than for cohort studies (RR=0.83, 95% CI: 0.78, 0.88). This study confirms previous studies reporting an inverse association between physical activity and colon cancer in both men and women, and provides quantitative estimates of the inverse association.</td></tr>
<tr><td>Timeframe: Inception–2008</td></tr>
<tr><td>Total # of Studies: 52</td></tr>
<tr><td>Exposure Definition: Self-reported total PA, recreational or leisure-time PA, PA in commuting, and occupational PA.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Odds ratio or relative risk of colon cancer.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Males, Females, Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Endometrial Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Keum N, Ju W, Lee DH, et al. Leisure-time physical activity and endometrial cancer risk: dose-response meta-analysis of epidemiological studies. Int J Cancer. 2014;135(3):682-694. doi:10.1002/ijc.28687.</td></tr>
<tr><td>Purpose: To identify the shape of the dose–response relationship and to reconcile the results based on metabolic equivalent (MET) hours/week and hours/week with a specific focus on leisure-time physical activity (PA).</td><td rowspan="5">Abstract: Although considerable evidence suggests that leisure-time physical activity is associated with a reduced risk of endometrial cancer (EC), the shape of dose-response relationship has not been investigated and previous meta-analyses have not accounted for differences in measures of physical activity. To address such issues, we conducted linear and nonlinear dose-response meta-analyses by metabolic equivalent of task (MET)-hour/week and hour/week, respectively, based on observational studies published up to September 2013 identified from PubMed and Embase databases. Summary relative risks (RRs) and 95% confidence intervals (CIs) were calculated using a random-effects model. In the linear dose-response analysis, an increase in leisure-time physical activity by 3 MET-hour/week was associated with an approximately 2% reduced risk of EC (summary RR = 0.98, p = 0.02, 95% CI = 0.95-1.00, I(2) = 53%, p(heterogeneity) = 0.06, three case-control studies and three cohort studies, 3,460 cases, range of activity = 0-50 MET-hour/week) and an increase by an hour/week was associated with an approximately 5% reduced risk of EC (summary RR = 0.95, p < 0.001, 95% CI = 0.93-0.98, I(2) = 31%, p(heterogeneity) = 0.20, four case-control studies and two cohort studies, 3,314 cases, range of activity = 0-12 hour/week). Nonlinear dose-response meta-analysis suggested that the curve may plateau at 10 MET-hour/week (p(change) in slope = 0.04) but this statistical significance was sensitive to one study. No evidence of a nonlinear association was indicated by hour/week (p(change) in slope > 0.69). In conclusion, an increase in leisure-time physical activity may continue to decrease EC risk, within the range of 0-50 MET-hour/week or 0-15 hour/week. Future studies should evaluate possible independent role of intensity of physical activity and effect modification by obesity.</td></tr>
<tr><td>Timeframe: Inception–2013</td></tr>
<tr><td>Total # of Studies: 20</td></tr>
<tr><td>Exposure Definition: Leisure time PA. The highest vs. lowest analyses pooled relative risks for the highest vs. lowest categories of PA assessed in any measure. The dose–response analyses were performed for two measures of PA, MET hours/week and hours/week. Sub-group analyses provided by MET hours/week vs. hours/week; unit (MET hours/week, frequency, duration, or subjective); period between PA and diagnosis (<5 years or >5 years); and validated vs. not validated PA questionnaire.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Endometrial cancer risks.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Smoking status, Hormone replacement therapy (HRT), Female, Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Endometrial Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Moore SC, Gierach GL, Schatzkin A, Matthews CE. Physical activity, sedentary behaviours, and the prevention of endometrial cancer. Br J Cancer. 2010;103(7):933-938. doi:10.1038/sj.bjc.6605902.</td></tr>
<tr><td>Purpose: To evaluate the biological and epidemiological evidence between low levels of physical activity (PA), sedentary behavior, and endometrial cancer.</td><td rowspan="4">Abstract: Physical activity has been hypothesised to reduce endometrial cancer risk, but this relationship has been difficult to confirm because of a limited number of prospective studies. However, recent publications from five cohort studies, which together comprise 2663 out of 3463 cases in the published literature for analyses of recreational physical activity, may help resolve this question. To synthesise these new data, we conducted a meta-analysis of prospective studies published through to December 2009. We found that physical activity was clearly associated with reduced risk of endometrial cancer, with active women having an approximately 30% lower risk than inactive women. Owing to recent interest in sedentary behaviour, we further investigated sitting time in relation to endometrial cancer risk using data from the NIH-AARP Diet and Health Study. We found that, independent of the level of moderate-vigorous physical activity, greater sitting time was associated with increased endometrial cancer risk. Thus, limiting time in sedentary behaviours may complement increasing level of moderate-vigorous physical activity as a means of reducing endometrial cancer risk. Taken together with the established biological plausibility of this relation, the totality of evidence now convincingly indicates that physical activity prevents or reduces risk of endometrial cancer.</td></tr>
<tr><td>Timeframe: Inception–2009</td></tr>
<tr><td>Total # of Studies: 14</td></tr>
<tr><td>Exposure Definition: Recreational PA: time spent in varying leisure activities such as walking, cycle and/or sports. Intense exercise: running, or causing a sweat. Occupational PA: PA based on job codes or classification of job intensity by self-report. Reference category: no or little PA, or a very sedentary job (such as desk job). Subgroups: time spent sitting during the day, active time, and joint active and sitting time. Highest vs. lowest level of recreational PA compared in relationship to the outcome.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Incidence of endometrial cancer, presented as relative risk.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Adults</td><td>Author-Stated Funding Source: Intramural Research Program of the National Institutes of Health, National Cancer Institute</td></tr>
</table>

Endometrial Cancer	
Meta-Analysis **Citation:** Schmid D, Behrens G, Keimling M, Jochem C, Ricci C, Leitzmann M. A systematic review and meta-analysis of physical activity and endometrial cancer risk. *Eur J Epidemiol*. 2015;30(5):397-412. doi:10.1007/s10654-015-0017-6.	
Purpose: To evaluate physical activity (PA) across various domains and intensities, age levels, and body mass index groups.	**Abstract:** Physical activity is related to decreased endometrial cancer risk. However, a comprehensive investigation of activity domains, intensities, time periods in life, and potential interaction with body mass index is unavailable. We performed a meta-analysis of physical activity and endometrial cancer studies published through October 2014. We identified 33 eligible studies comprising 19,558 endometrial cancer cases. High versus low physical activity was related to reduced endometrial cancer risk [relative risk (RR) = 0.80; 95% confidence interval (CI) 0.75-0.85]. The corresponding RRs for recreational activity, occupational activity, household activity, and walking were 0.84 (95% CI 0.78-0.91), 0.81 (95% CI 0.75-0.87), 0.70 (95% CI 0.47-1.02), and 0.82 (95% CI 0.69-0.97), respectively (Pdifference). Walking/biking for transportation, walking for recreation, and walking without specification revealed summary RRs of 0.70 (95% CI 0.58-0.85), 0.94 (95% CI 0.76-1.17), and 0.88 (95% CI 0.52-1.50), respectively (Pdifference). Inverse associations were noted for light (RR 0.65; 95% CI 0.49-0.86), moderate to vigorous (RR 0.83; 95 % CI 0.71-0.96), and vigorous activity (RR 0.80; 95% CI 0.72-0.90; (Pdifference). A statistically significant inverse relation was found for postmenopausal (RR 0.81; 95% CI 0.67-0.97), but not premenopausal women (RR 0.74; 95% CI 0.49-1.13; (Pdifference). Physical activity performed during childhood/adolescence, young adulthood/midlife, and older age yielded RRs of 0.94 (95% CI 0.82-1.08), 0.77 (95% CI 0.58-1.01), and 0.69 (95% CI 0.37-1.28), respectively (Pdifference). An inverse relation was evident in overweight/obese (RR 0.69; 95% CI 0.52-0.91), but not normal weight women (RR 0.97; 95% CI 0.84-1.13; (Pdifference). In conclusion, recreational physical activity, occupational physical activity, and walking/biking for transportation are related to decreased endometrial cancer risk. Inverse associations are evident for physical activity of light, moderate to vigorous, and vigorous intensities. The inverse relation with physical activity is limited to women who are overweight or obese.
Timeframe: Inception–2014	
Total # of Studies: 33	
Exposure Definition: Recent PA: highest vs. lowest category. Stratified analysis of different domains, including recreational activity, occupational activity, household activity, and walking (walking/biking for transportation, walking for recreation, and walking without specification); different intensities of PA, including light, moderate to vigorous, and vigorous; across different time periods in life (childhood/adolescence, young adulthood/midlife, older age). Performed additional analyses restricted to studies that used metabolic equivalent (MET) hours per week as PA measure, and finally, a nonlinear dose-response meta-analysis of recreational PA expressed in MET-hours per week based on the combination of all activities and inactivities, including time spent sitting and sleeping. **Measures Steps:** No **Measures Bouts:** No **Examines HIIT:** No	
Outcomes Addressed: Endometrial cancer risk (relative risk). **Examine Cardiorespiratory Fitness as Outcome:** No	

Populations Analyzed: Normal/Healthy weight (BMI: 18.5–24.9), Overweight and obese, Menopausal status (premenopausal/postmenopausal), Female, Childhood (birth to 19 years), Adulthood (19 to 49 years), Older age (50 years or older)	**Author-Stated Funding Source:** Not Reported

<table>
<tr><th colspan="2">Esophageal and Gastric Cancers</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Behrens G, Jochem C, Keimling M, Ricci C, Schmid D, Leitzmann MF. The association between physical activity and gastroesophageal cancer: systematic review and meta-analysis. Eur J Epidemiol. 2014;29(3):151-170. doi:10.1007/s10654-014-9895-2.</td></tr>
<tr><td>Purpose: 1) To conduct a systematic review and meta-analysis of physical activity in relation to gastroesophageal cancers, examining potential variation by anatomic site and tumor histology. 2) To perform an exploratory dose–response meta-analysis in a first attempt to produce a physical activity recommendation for the primary prevention of gastroesophageal cancers.</td><td rowspan="4">Abstract: Physical activity may decrease gastroesophageal cancer risk through a reduction of oxidative stress and decreased chronic inflammation, yet few epidemiologic studies have been able to report a clear inverse association between physical activity and gastroesophageal cancer. Because no meta-analysis has investigated the relation of physical activity to gastroesophageal cancer, we conducted a comprehensive systematic review and meta-analysis according to the PRISMA guidelines based on 24 studies with a total of 15,745 cases. When we compared high versus low physical activity levels and summarized associations according to anatomic site and tumor histology, risk reductions were evident for esophageal adenocarcinoma [relative risk (RR) = 0.79, 95% confidence interval (CI) = 0.66-0.94], gastric cardia adenocarcinoma (RR = 0.83, 95% CI = 0.69-0.99) and gastric non-cardia adenocarcinoma (RR = 0.72, 95% CI = 0.62-0.84). The risk reduction for esophageal squamous cell carcinoma (RR = 0.94, 95% CI = 0.41-2.16) became statistically significant (RR = 0.66, 95% CI = 0.46-0.96) after excluding an influential study. The test for heterogeneity by gastroesophageal cancer subtype was statistically non-significant (p-difference = 0.71). The RR of total gastroesophageal cancer for high versus low physical activity was 0.82 (95% CI = 0.74-0.90). A dose-response analysis of frequency of physical activity and total gastroesophageal cancer risk revealed that the greatest risk reduction was achieved among those engaging in moderate to vigorous physical activity five times per week (RR = 0.67, 95% CI = 0.58-0.79). Our results provide support for an inverse relation of physical activity, in particular exercise frequency, to gastroesophageal cancer risk.</td></tr>
<tr><td>Timeframe: Inception–2013</td></tr>
<tr><td>Total # of Studies: 24</td></tr>
<tr><td>Exposure Definition: Physical activity; domains (recreational or occupational); low physical activity; high physical activity.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of gastroesophageal cancer.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Esophageal and Gastric Cancers</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Chen Y, Yu C, Li Y. Physical activity and risks of esophageal and gastric cancers: a meta-analysis. PLoS One. 2014;9(2):e88082. doi:10.1371/journal.pone.0088082.</td></tr>
<tr><td>Purpose: To provide evidence of the relationship between physical activity and gastric and esophageal cancer.</td><td rowspan="4">Abstract: BACKGROUND: The incidence of esophageal and gastric cancer has been increasing rapidly worldwide in recent years, although the reason for this increase is unclear. Here, a statistical synthesis of studies that evaluated the association between physical activity, a well-known protecting factor against death and other chronic diseases, and the risk of esophageal and gastric cancer was performed. METHODS: Potentially suitable studies were identified using Medline and Embase. The reference lists of all included articles and those of several recent reviews were searched manually. Studies were included if they (1) were published as case-control or cohort studies evaluating the association between physical activity and risk of esophageal or gastric cancer; and (2) reported point estimates (i.e., risk ratios, odds ratios) and measures of variability (i.e., 95% confidence intervals [CIs]) for physical activity and risk of esophageal or gastric cancer. RESULTS: Fifteen studies were identified (7 cohorts, 8 case-controls; 984 esophageal and 7,087 gastric cancers). Collectively, they indicated that the risk of gastric cancer was 13% lower among the most physically active people than among the least active people (RR = 0.87, 95% confidence interval [CI] = 0.78 to 0.97) and that of esophageal cancer was 27% lower (RR = 0.73, 95% CI = 0.56 to 0.97). CONCLUSIONS: Pooled results from observational studies support a protective effect of physical activity against both esophageal and gastric cancer.</td></tr>
<tr><td>Timeframe: Inception–2013</td></tr>
<tr><td>Total # of Studies: 15</td></tr>
<tr><td>Exposure Definition: Occupational or recreational physical activity as measured through questionnaires and interviews.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Relative risk of esophageal and gastric cancer.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults</td><td>Author-Stated Funding Source: National Key Basic Research Development Program, National Science and Technology Support Plan Project, National Natural Science Foundation of China, Zhejiang Provincial Natural Science Foundation of China, Science Foundation of Health Bureau of Zhejiang</td></tr>
</table>

<table>
<tr><th colspan="2">Esophageal, Gastric Cancers</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Singh S, Devanna S, Edakkanambeth Varayil J, Murad MH, Iyer PG. Physical activity is associated with reduced risk of esophageal cancer, particularly esophageal adenocarcinoma: a systematic review and meta-analysis. BMC Gastroenterol. 2014;14:101. doi:10.1186/1471-230X-14-101.</td></tr>
<tr><td>Purpose: To better understand the relationship between physical activity (PA) and esophageal cancer risk, in particular, the risk of esophageal adenocarcinoma among adults.</td><td rowspan="5">Abstract: BACKGROUND: Physical activity has been inversely associated with risk of several cancers. We performed a systematic review and meta-analysis to evaluate the association between physical activity and risk of esophageal cancer (esophageal adenocarcinoma [EAC] and/or esophageal squamous cell carcinoma [ESCC]). METHODS: We conducted a comprehensive search of bibliographic databases and conference proceedings from inception through February 2013 for observational studies that examined associations between recreational and/or occupational physical activity and esophageal cancer risk. Summary adjusted odds ratio (OR) estimates with 95% confidence intervals (CI) were estimated using the random-effects model. RESULTS: The analysis included 9 studies (4 cohort, 5 case-control) reporting 1,871 cases of esophageal cancer among 1,381,844 patients. Meta-analysis demonstrated that the risk of esophageal cancer was 29% lower among the most physically active compared to the least physically active subjects (OR, 0.71; 95% CI, 0.57-0.89), with moderate heterogeneity (I2 = 47%). On histology-specific analysis, physical activity was associated with a 32% decreased risk of EAC (4 studies, 503 cases of EAC; OR, 0.68; 95% CI, 0.55-0.85) with minimal heterogeneity (I2 = 0%). There were only 3 studies reporting the association between physical activity and risk of ESCC with conflicting results, and the meta-analysis demonstrated a null association (OR, 1.10; 95% CI, 0.21-5.64). The results were consistent across study design, geographic location and study quality, with a non-significant trend towards a dose-response relationship. CONCLUSIONS: Meta-analysis of published observational studies indicates that physical activity may be associated with reduced risk of esophageal adenocarcinoma. Lifestyle interventions focusing on increasing physical activity may decrease the global burden of EAC.</td></tr>
<tr><td>Timeframe: 1966–2013</td></tr>
<tr><td>Total # of Studies: 9</td></tr>
<tr><td>Exposure Definition: PA: various domains across studies, including recreational and occupational. Measurement included self-administered questionnaires, interviewer-administered questionnaires, and job title. The dose–response relationship was assessed using the least active group as reference. We measured the association between the middle tertile/quartile and reference as well as the association between the highest tertile/quartile and reference.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of overall esophageal cancer and by histological subtypes: esophageal squamous cell cancer and esophageal adenocarcinoma.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Gastric Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Abioye AI, Odesanya MO, Abioye AI, Ibrahim NA. Physical activity and risk of gastric cancer: a meta-analysis of observational studies. Br J Sports Med. 2015;49(4):224-229. doi:10.1136/bjsports-2013-092778.</td></tr>
<tr><td>Purpose: To quantitatively evaluate the association of physical activity (PA) with gastric malignancies and to assess factors contributing to inconsistency across the studies.</td><td rowspan="4">Abstract: BACKGROUND: Studies evaluating the relationship of physical activity and stomach cancer risk have yielded inconsistent and largely inconclusive results. We therefore conducted a systematic review and meta-analysis of observational studies that assessed the relationship between physical activity and risk of gastric cancer. METHODS: Following a standard protocol, we searched medical literature databases (PubMed, EMBASE, CINAHL, PsycINFO and Google Scholar) from inception to July 2012, and conducted a random effects meta-analysis. RESULTS: Seven prospective cohorts and four case-control studies of physical activity and gastric cancer risk, with 1,535,006 people and 7944 cases of gastric cancer were included. We found a modest protective association between sufficient physical activity and gastric cancer risk (relative risk: 0.81 (95% CI 0.69 to 0.96); I(2)=68.5%) in the prospective studies and (relative risk: 0.78 (95% CI 0.66 to 0.91); I(2)=0%) in case-control studies. The association appeared weaker in smokers than in non-smokers (p heterogeneity=0.035). The association may also be weaker for gastric cardia cancer relative to the distal non-cardia subtypes. Physical activity type (recreational or occupational), intake of alcohol, total energy intake, consumption of fruits and vegetables and infection with Helicobacter pylori had no influence on the association. The effect measure from cohort studies (relative risk: 0.82 (95% CI 0.70 to 0.97); I(2)=61.7%) and case-control studies (relative risk: 0.83 (95% CI 0.66 to 1.04); I(2)=49.8%) did not differ materially at higher physical activity levels. CONCLUSIONS: We conclude that a regular physical activity may be protective against stomach cancer risk.</td></tr>
<tr><td>Timeframe: Inception–2012</td></tr>
<tr><td>Total # of Studies: 11</td></tr>
<tr><td>Exposure Definition: The authors employed guidelines from the World Health Organization’s contemporary recommendations for PA in adults, a measure of duration and intensity of PA. A person is “sufficiently active” if they engage in 150 minutes of moderate intensity aerobic PA throughout the week or 75 minutes of vigorous intensity PA, or an equivalent combination of both. Classified a person as “highly active” if they engage in 300 minutes of moderate intensity exercise or 150 minutes of vigorous intensity exercise per week. The “inactive” or “insufficiently active” category included persons whose reported PA was less than that required to meet the sufficiently active category.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of gastric cancer
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults, Smoking status</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Gastric Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Psaltopoulou T, Ntanasis-Stathopoulos I, Tzanninis IG, Kantzanou M, Georgiadou D, Sergentanis TN. Physical activity and gastric cancer risk: a systematic review and meta-analysis. Clin J Sport Med. 2016;26(6):445-464.</td></tr>
<tr><td>Purpose: To examine the association between physical activity (PA) and gastric cancer risk.</td><td rowspan="4">Abstract: OBJECTIVE: Physical activity represents a well-established way to prolong the life span; yet, it remains an unfulfilled goal for a great part of the population. In parallel, the burden of gastric cancer is considerable throughout the globe. In that context, the present meta-analysis aims to shed light on the association between physical activity and gastric cancer risk. DATA SOURCES: Eligible observational studies were sought in PubMed up to June 01, 2015. In addition, a snowball procedure was conducted and contact with authors was implemented. Separate analyses were performed by type of physical activity (total; occupational; recreational), study design, published/provided data, anatomical site, and study location, along with stratification by gender. MAIN RESULTS: Ten cohort studies (7551 incident cases in a total cohort size of 1 541 208 subjects) and 12 case-control studies (5803 cases and 73 629 controls) were eligible. "Any" type of physical activity was associated with lower risk of gastric cancer [pooled relative risk (RR) = 0.81; 95% CI: 0.73 to 0.89], which was reproducible in men (pooled RR = 0.87; 95% CI: 0.77-0.99). The protective effect was significant in the subgroup analyses of published data, noncardia cancer (pooled RR = 0.62; 95% CI: 0.52-0.75), and studies stemming from Asia (pooled RR = 0.82; 95% CI: 0.74-0.90). CONCLUSIONS: This meta-analysis suggests a protective effect of physical activity regarding gastric cancer risk, especially in Asian populations.</td></tr>
<tr><td>Timeframe: Inception–2015</td></tr>
<tr><td>Total # of Studies: 22</td></tr>
<tr><td>Exposure Definition: PA: included total, leisure/recreational, and occupational. Compared highest level of PA reported to lowest level of PA reported. Stratified analysis by recreational and occupational PA.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Pooled relative risk or odds ratio of gastric cancer. Subgroups: location of gastric cancer (cardia or noncardia), geographic location.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

Gastric Cancer

Meta-Analysis

Citation: Singh S, Edakkanambeth Varayil J, Devanna S, Murad MH, Iyer PG. Physical activity is associated with reduced risk of gastric cancer: a systematic review and meta-analysis. *Cancer Prev Res (Phila).* 2014;7(1):12-22. doi:10.1158/1940-6207.CAPR-13-0282.

Purpose: To better understand the relationship between physical activity (PA) and gastric cancer risk among adults.

Timeframe: 1966–February 2013

Total # of Studies: 15

Exposure Definition: PA: Most physically active people as compared with the least physically active people. Subgroup analysis measured the impact of recreational and occupational activity domains separately. Dose-response analysis measured the association between the middle tertile/quartile and reference as well as the association between the highest tertile/quartile and reference, using the least active group as reference.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No

Outcomes Addressed: Risk of gastric cancer. Subgroup analysis assessed subsite-specific impact of PA on gastric cancer (cardia, noncardia).
Examine Cardiorespiratory Fitness as Outcome: No

Abstract: Physical activity may be associated with reduced risk of gastric cancer. We performed a systematic review and meta-analysis to evaluate the magnitude of the association and the quality of supporting evidence. After a comprehensive search of bibliographic databases and conference proceedings through February 2013 for observational studies that examined associations between recreational and/or occupational physical activity and gastric cancer risk, we identified 16 studies (seven cohort, nine case control) reporting 11,111 cases of gastric cancer among 1,606,760 patients. Summary adjusted-OR estimates with 95% confidence intervals (CI) were estimated using the random-effects model. Meta-analysis demonstrated that the risk of gastric cancer was 21% lower among the most physically active people as compared with the least physically active people (OR = 0.79; 95% CI, 0.71-0.87) with moderate heterogeneity among studies (I(2) = 55%). This protective effect was seen for gastric cancers in the cardia (four studies; OR = 0.80; 95% CI, 0.63-1.00) and distal stomach (five studies; OR = 0.63; 95% CI, 0.52-0.76). The effect size was significantly smaller in high-quality studies (six studies; OR = 0.86; 95% CI, 0.75-0.99), as compared with low-quality studies (10 studies; OR = 0.74; 95% CI, 0.69-0.81). The results were consistent across sex, study quality, study design, and geographic location. In conclusion, meta-analysis of published observational studies indicates that physical activity is associated with reduced risk of gastric cancer. Lifestyle interventions focusing on increasing physical activity may decrease the global burden of gastric cancer, in addition to a myriad of other health benefits.

Populations Analyzed: Study location (Asian, Western), Male, Female, Adults

Author-Stated Funding Source: Takeda Pharmaceuticals

<table>
<tr><th colspan="2">Head and Neck Cancers</th></tr>
<tr><td colspan="2">Pooled Analysis
Citation: Nicolotti N, Chuang SC, Cadoni G, et al. Recreational physical activity and risk of head and neck cancer: a pooled analysis within the international head and neck cancer epidemiology (INHANCE) Consortium. Eur J Epidemiol. 2011;26(8):619-628. doi:10.1007/s10654-011-9612-3.</td></tr>
<tr><td>Purpose: To examine the risk of head and neck cancer associated with recreational physical activity (PA) in a larger population with respect to the studies conducted thus far as part of the International Head and Neck Cancer Epidemiology (INHANCE) Consortium.</td><td rowspan="4">Abstract: Increasing evidence suggests that physical activity could prevent cancer, but scanty data is available on head and neck cancer (HNC). The aim of our study is to clarify the effect of recreational physical activity (rPA) on HNC. We analyzed data from four case-control studies, including 2,289 HNC cases and 5,580 controls. rPA was classified as: none/low (reference group), moderate and high. We calculated summary Odds Ratios (ORs) by pooling study-specific ORs. Overall, moderate rPA was associated with 22% lower risk of HNC compared to those with none or very low rPA levels [OR = 0.78, 95% Confidence Interval (95% CI): 0.66, 0.91]. Moderate rPA is associated with reduced risk of oral (OR = 0.74, 95% CI: 0.56, 0.97) and pharyngeal cancer (OR = 0.67, 95% CI: 0.53, 0.85), as well as high rPA levels (OR = 0.53, 95% CI: 0.32, 0.88 for oral cavity, OR = 0.58, 95% CI: 0.38, 0.89 for pharynx). High rPA levels, however, is associated with higher risk of laryngeal cancer (OR = 1.73, 95% CI: 1.04, 2.88). Stratified analyses showed that such inverse association between moderate rPA and HNC was more evident among males (OR = 0.75, 95% CI: 0.62, 0.90), subjects >/=45 years (OR = 0.78, 95% CI: 0.66, 0.93), and ever smokers and ever drinkers (OR = 0.72, 95% CI: 0.59, 0.88). High rPA significantly reduces HNC risk among subject >/=45 years (OR = 0.66, 95% CI: 0.48, 0.91). Promoting rPA might be inversely associated with HNC.</td></tr>
<tr><td>Total # of Studies: 4</td></tr>
<tr><td>Exposure Definition: Recreational PA: 1 to 2 years prior to cancer diagnosis/interview, and varied across studies. Categories were none/low, moderate, and high, defined differently by each study.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Cases of head and neck cancer: newly diagnosed invasive cancers of the oral cavity, pharynx, oral/pharynx not otherwise specified, or larynx. Estimated in odds ratios. Subgroups: ages (greater than 45 and less than 45 years old), oral cavity, and tobacco smokers.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults; <45 vs. >45</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Hematologic Cancers</th></tr>
<tr><td colspan="2">Pooled Analysis
Citation: Aschebrook-Kilfoy B, Cocco P, La Vecchia C, et al. Medical history, lifestyle, family history, and occupational risk factors for mycosis fungoides and Sézary syndrome: the InterLymph Non-Hodgkin Lymphoma Subtypes Project. J Natl Cancer Inst Monogr. 2014;2014(48):98-105. doi:10.1093/jncimonographs/lgu008.</td></tr>
<tr><td>Purpose: To investigate the associations with lifestyle, medical history, family history, and occupational risk factors for mycosis fungiodes and Sezary Syndrome.</td><td rowspan="5">Abstract: BACKGROUND: Mycosis fungoides and Sezary syndrome (MF/SS) are rare cutaneous T-cell lymphomas. Their etiology is poorly understood. METHODS: A pooled analysis of 324 MF/SS cases and 17217 controls from 14 case-control studies from Europe, North America, and Australia, as part of the International Lymphoma Epidemiology Consortium (InterLymph) Non-Hodgkin Lymphoma (NHL) Subtypes Project, was carried out to investigate associations with lifestyle, medical history, family history, and occupational risk factors. Multivariate logistic regression models were used to calculate odds ratios (OR) and 95% confidence intervals (CI). RESULTS: We found an increased risk of MF/SS associated with body mass index equal to or larger than 30 kg/m(2) (OR = 1.57, 95% CI = 1.03 to 2.40), cigarette smoking for 40 years or more (OR = 1.55, 95% CI = 1.04 to 2.31), eczema (OR = 2.38, 95% CI = 1.73 to 3.29), family history of multiple myeloma (OR = 8.49, 95% CI = 3.31 to 21.80), and occupation as crop and vegetable farmers (OR = 2.37, 95% CI = 1.14 to 4.92), painters (OR = 3.71, 95% CI = 1.94 to 7.07), woodworkers (OR = 2.20, 95% CI = 1.18 to 4.08), and general carpenters (OR = 4.07, 95% CI = 1.54 to 10.75). We also found a reduced risk of MF/SS associated with moderate leisure time physical activity (OR = 0.46, 95% CI = 0.22 to 0.97). CONCLUSIONS: Our study provided the first detailed analysis of risk factors for MF/SS and further investigation is needed to confirm these findings in prospective data and in other populations.</td></tr>
<tr><td>Total # of Studies: 14</td></tr>
<tr><td>Exposure Definition: Lifestyle, medical history, family history, and occupational risk factors.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed:
Histologically confirmed cases of Mycosis fungoides and Sezary syndrome.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed:
Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9), Obese (BMI: 30 and above), Smoking</td><td>Author-Stated Funding Source: The Intramural Research Program of the National Cancer Institute/National Institutes of Health</td></tr>
</table>

Hematologic Cancers	
Meta-Analysis **Citation:** Jochem C, Leitzmann MF, Keimling M, Schmid D, Behrens G. Physical activity in relation to risk of hematologic cancers: a systematic review and meta-analysis. *Cancer Epidemiol Biomarkers Prev*. 2014;23(5):833-846. doi:10.1158/1055-9965.EPI-13-0699.	
Purpose: To quantify the association between physical activity (PA) and hematologic cancer subtypes. **Timeframe:** Inception–2013 **Total # of Studies:** 23 **Exposure Definition:** Recreational PA; dose-response expressed as metabolic equivalent task (MET) hours or MET minutes per week in relation to hematologic cancer subtypes. The highest category was defined as 1.5 times the value of the lower bound of that category. The reference level (lowest category) was set to 0 MET hours. **Measures Steps:** No **Measures Bouts:** No **Examines HIIT:** No **Outcomes Addressed:** Risk of hematologic cancer subtypes. **Examine Cardiorespiratory Fitness as Outcome:** No	**Abstract:** BACKGROUND: Despite the existence of numerous biologic pathways potentially linking increased physical activity to decreased risk of hematologic cancers, the associations between physical activity and subtype-specific hematologic cancers have not been comprehensively quantified. METHODS: We conducted a systematic review and meta-analysis of physical activity in relation to subtype-specific hematologic cancers. We summarized the data from 23 eligible studies (15 cohort and eight case-control studies) and estimated summary relative risks (RR) and 95% confidence intervals (CI) using random-effects models. RESULTS: When comparing high versus low physical activity levels, the RR for non-Hodgkin lymphoma was 0.91 (95% CI, 0.82-1.00), for Hodgkin lymphoma it was 0.86 (95% CI, 0.58-1.26), for leukemia it was 0.97 (95% CI, 0.84-1.13), and for multiple myeloma it was 0.86 (95% CI, 0.68-1.09). When focusing on subtypes of non-Hodgkin lymphoma, the RR for diffuse large B-cell lymphoma was 0.95 (95% CI, 0.80-1.14) and for follicular lymphoma it was 1.01 (95% CI, 0.83-1.22). In an exploratory analysis combining all hematologic cancers, high versus low physical activity levels yielded a statistically significant RR of 0.93 (95% CI, 0.88-0.99). CONCLUSIONS: Physical activity showed statistically nonsignificant associations with risks of non-Hodgkin lymphoma, Hodgkin lymphoma, multiple myeloma, and leukemia. These findings may not represent a true lack of associations given the variation in high versus low physical activity definitions, the quality of physical activity assessments, and the variability in hematologic cancer classification schemes in individual studies. IMPACT: Physical activity is unrelated to risks of subtype-specific hematologic cancers.
Populations Analyzed: Male, Female, Adults	**Author-Stated Funding Source:** Not Reported

<table>
<tr><th colspan="2">Hematologic Cancers</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Vermaete NV, Wolter P, Verhoef GE, et al. Physical activity and risk of lymphoma: a meta-analysis. Cancer Epidemiol Biomarkers Prev. 2013;22(7):1173-1184. doi:10.1158/1055-9965.EPI-13-0182.</td></tr>
<tr><td>Purpose: To explore the literature on the relationship between physical activity (PA) and risk of lymphoma among adults.</td><td rowspan="5">Abstract: BACKGROUND: Physical activity has a protective effect on some types of cancer. The aim of the present meta-analysis was to explore the literature on the association between physical activity and risk of lymphoma. METHODS: A meta-analysis was conducted for cohort and case-control studies examining the association between self-reported physical activity and risk of lymphoma. Depending on statistical heterogeneity, a random or fixed effects model was used to estimate the summary OR and corresponding 95% confidence interval (CI). RESULTS: Seven case-control studies and 5 cohort studies were included. When data from both study designs were combined, no significant influence of physical activity on risk of lymphoma was found (pooled OR = 0.90; 95% CI: 0.79-1.02; P = 0.10). Subgroup analysis revealed a significant protective influence of physical activity on risk of lymphoma in case-control studies (pooled OR = 0.81; 95% CI: 0.68-0.96; P = 0.02). In contrast, cohort studies, which have a higher level of evidence than case-control studies, confirm the results of the primary meta-analysis (pooled OR = 1.02; 95% CI: 0.88-1.19; P = 0.76). A subsequent subgroup analysis found no significant differences between results for Hodgkin lymphoma and non-Hodgkin lymphoma (chi(2) = 0.16; P = 0.69), nor between results for recreational and occupational activities (chi(2) = 1.01; P = 0.31). CONCLUSIONS: Epidemiologic research indicates no significant influence of physical activity on risk of lymphoma. IMPACT: Future research should examine the association between sedentary behavior and risk of lymphoma and investigate the dose-response and timing effect of physical activity on risk of lymphoma.</td></tr>
<tr><td>Timeframe: Inception–2013</td></tr>
<tr><td>Total # of Studies: 12</td></tr>
<tr><td>Exposure Definition: PA: The highest vs. lowest categories of PA assessed using any measure. Subanalysis by PA domain (recreational, occupational).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of lymphoma. Subanalysis by type of lymphoma (Hodgkin lymphoma and non-Hodgkin lymphoma).
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Research Foundation Flanders</td></tr>
</table>

<table>
<tr><th colspan="2">Lung Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Brenner DR, Yannitsos DH, Farris MS, Johansson M, Friedenreich CM. Leisure-time physical activity and lung cancer risk: a systematic review and meta-analysis. Lung Cancer. 2016;95:17-27. doi:10.1016/j.lungcan.2016.01.021.</td></tr>
<tr><td>Purpose: To assess the association between recreational physical activity (PA) and lung cancer risk.</td><td rowspan="4">Abstract: OBJECTIVES: We conducted a systematic review and meta-analysis of the association between recreational physical activity and lung cancer risk to update previous analyses and to examine population subgroups of interest defined by smoking status and histology. MATERIALS AND METHODS: We searched the PubMed database for studies up to May 2015. Individual study characteristics were abstracted including study design, number of cases, assessment of recreational physical activity and type and level of adjustment for confounding factors. Combined effect estimates were calculated for the overall associations and across subgroups of interest. RESULTS: We identified 28 studies that were eligible for inclusion in the meta-analysis. The overall analysis indicated an inverse association between recreational physical activity and lung cancer risk (Relative Risk (RR), 0.76; 95% Confidence Interval (CI), 0.69-0.85, p-value: <0.001). Similar inverse associations with risk were also noted for all evaluated histological subtypes, including adenocarcinoma (RR, 0.80; 95% CI, 0.72-0.88), squamous (RR, 0.80; 95% CI, 0.71-0.90) and small cell (RR, 0.79; 95% CI, 0.66-0.94). When we examined effects by smoking status, inverse associations between recreational physical activity and lung cancer risk were observed among former (RR, 0.77; 95% CI, 0.69-0.85) and current smokers (RR, 0.77; 95% CI, 0.72-0.83), but not among never smokers (RR, 0.96; 95% CI, 0.79-1.18). CONCLUSION: Results from this meta-analysis suggest that regular recreational physical activity may be associated with reduced risk of lung cancer. Only four studies examining never smokers were identified, suggesting the need for additional research in this population.</td></tr>
<tr><td>Timeframe: Inception–2015</td></tr>
<tr><td>Total # of Studies: 28</td></tr>
<tr><td>Exposure Definition: Recreational PA was characterized/measured in four ways: ≥150 minutes of moderate PA per week or ≥75 minutes of vigorous PA per week (World Health Organization recommendation); subjective measures provided by study participants, where levels of PA were classified as high vs. low; frequency of recreational PA, estimated as the number of times per week participants engaged in recreational PA; and regular participation in sports.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Relative risk of lung cancer mortality.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults, Smoking status, Male, Female</td><td>Author-Stated Funding Source: Alberta InnovatesHealth Solutions Health Senior Scholar Award, Alberta Cancer Foundation, Canadian Cancer Society Research Institute Capacity Development in Prevention Award</td></tr>
</table>

<table>
<tr><th colspan="2">Lung Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Buffart LM, Singh AS, van Loon EC, Vermeulen HI, Brug J, Chinapaw MJ. Physical activity and the risk of developing lung cancer among smokers: a meta-analysis. J Sci Med Sport. 2014;17(1):67-71. doi:10.1016/j.jsams.2013.02.015.</td></tr>
<tr><td>Purpose: To investigate the relationship between physical activity (PA) and lung cancer in smokers.</td><td rowspan="4">Abstract: OBJECTIVE: To investigate the relationship between physical activity and lung cancer among smokers and whether this relationship differed according to physical activity intensity, smoking status, and gender. DESIGN: Meta-analysis. METHODS: A computerized bibliographical search was conducted in five databases. Study inclusion criteria were: (i) the study population was not diagnosed with lung cancer at baseline; (ii) the study provided information concerning the effect size of physical activity on the risk of developing lung cancer in smokers; and (iii) the study distinguished different physical activity intensity levels. Two authors independently extracted data and assessed the methodological quality. Pooled rate ratios (RR) were calculated for all data, and for subgroups of physical activity intensity, smoking status, and gender. RESULTS: Pooled RRs of 7 cohort studies showed that physical activity was associated with a reduced risk of lung cancer in smokers (RR=0.82, 95% CI=0.77; 0.87). We did not find clear dose-response relationship regarding exercise or smoking intensity, i.e. high levels of physical activity did not show a higher risk reduction than moderate physical activity levels, and the association between physical activity and risk reduction did not differ between heavy and light smokers. The reduced risk associated with physical activity was greater in women than in men (p=0.03), but this finding was based on only one study that reported data on women. CONCLUSIONS: Results of this meta-analysis indicate that leisure time physical activity is associated with reduced risk of developing lung cancer among smokers. Future studies should provide insight into a potential dose-response relationship, and should use reliable and valid physical activity measurements.</td></tr>
<tr><td>Timeframe: Inception–2011</td></tr>
<tr><td>Total # of Studies: 8</td></tr>
<tr><td>Exposure Definition: PA was measured using self-reported questionnaires. PA levels were defined as moderate, moderate to high, and high, compared to the lowest PA, i.e., reference category.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Rate ratio (risk) of developing lung cancer.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults, Smoking status, Male, Female</td><td>Author-Stated Funding Source: EMGO Institute for Health and Care Research; Dutch Cancer Society</td></tr>
</table>

Lung Cancer	
Meta-Analysis **Citation:** Schmid D, Ricci C, Behrens G, Leitzmann MF. Does smoking influence the physical activity and lung cancer relation? A systematic review and meta-analysis. *Eur J Epidemiol*. 2016;31(12):1173-1190. doi:10.1007/s10654-016-0186-y.	
Purpose: To evaluate the association between physical activity (PA) and lung cancer according to smoking status and the degree of smoking adjustment.	**Abstract:** Research suggests an inverse association between physical activity and lung cancer. However, whether the relation is modified by degree of smoking adjustment has not been summarized. We conducted a meta-analysis of physical activity and lung cancer focusing on evaluating whether smoking status and the degree of smoking adjustment influenced the association. Comparing high versus low physical activity levels from 25 observational studies yielded a lung cancer summary relative risk (RR) of 0.79 [95 % confidence interval (CI) = 0.72-0.87], with RRs of 0.87 (95 % CI = 0.80-0.94) for cohort studies and 0.57 (95 % CI = 0.46-0.71) for case-control studies. In further analyses restricted to cohort studies, physical activity was inversely related to lung cancer among former smokers (RR = 0.68, 95 % CI = 0.51-0.90) and current smokers (RR = 0.80, 95 % CI = 0.70-0.90), whereas the association was null among never smokers (RR = 1.05, 95 % CI = 0.78-1.40, p interaction = 0.26). The degree of smoking adjustment did not modify the association (p interaction = 0.73). Physical activity was unrelated to lung cancer among never smokers but it was inversely associated with lung cancer among former and current smokers. Although the physical activity and lung cancer relation was not modified by smoking status or degree of smoking adjustment, residual confounding by smoking remains a possible explanation for the relations observed.
Timeframe: Inception–2015	
Total # of Studies: 25	
Exposure Definition: PA: overall, nonoccupational, or recreational. Subgroups: moderate, vigorous, overall, recreational, occupational, and household. **Measures Steps:** No **Measures Bouts:** No **Examines HIIT:** No	
Outcomes Addressed: Risk estimates of lung cancer (including odds ratios, hazard ratios, and relative risk). Subgroups: never, former, and current smoker; smoking intensity; status; age; duration and time since cessation; histological type of lung cancer; adiposity; and alcohol. **Examine Cardiorespiratory Fitness as Outcome:** No	
Populations Analyzed: Adults, Smoking status, Male, Female	**Author-Stated Funding Source:** Not Reported

Lung Cancer	
Meta-Analysis **Citation:** Sun JY, Shi L, Gao XD, Xu SF. Physical activity and risk of lung cancer: a meta-analysis of prospective cohort studies. *Asian Pac J Cancer Prev*. 2012;13(7):3143-3147.	
Purpose: To update available evidence on any association of physical activity (PA) with risk of lung cancer. **Timeframe:** Inception–2012 **Total # of Studies:** 14 **Exposure Definition:** PA: Three levels of PA: high, medium, and low. The lowest category was defined as low-level PA (reference group), the highest as high level of PA. Categories in between were pooled to represent a medium level of PA. **Measures Steps:** No **Measures Bouts:** No **Examines HIIT:** No **Outcomes Addressed:** Lung cancer risk (relative risk). **Examine Cardiorespiratory Fitness as Outcome:** No	**Abstract:** BACKGROUND: Previous studies investigating the association of physical activity with risk of lung cancer reported conflicting results. In order to update and improve available evidence on any link, a meta-analysis was performed. METHOD: We searched the PubMed database for prospective cohort studies investigating the relation of physical activity with risk of lung cancer. The pooled relative risk (RR) with its 95% confidence intervals (95%CI) was used to assess the association. RESULTS: We included 14 prospective studies with a total of 1,644,305 participants, with 14,074 incident lung cancer cases documented during follow-up. Meta-analysis of all 14 studies suggested both high and medium levels of physical activity to be associated with decreased risk of lung cancer compared to the reference group with low level of physical activity (for high level, RR = 0.77, 95%CI 0.73-0.81, P < 0.001; for medium level, RR = 0.87, 95%CI 0.83-0.90, P < 0.001). Subgroup analyses by gender found obvious associations in both men and women. No publication bias was observed. CONCLUSION: Our findings suggest that high and medium levels of physical activity have a beneficial effect on lung cancer by reducing the overall risk of tumour development among both men and women.
Populations Analyzed: Male, Female, Adults	**Author-Stated Funding Source:** Not Reported

<table>
<tr><th colspan="2">Lung Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Zhong S, Ma T, Chen L, et al. Physical activity and risk of lung cancer: a meta-analysis. Clin J Sport Med. 2016;26(3):173-181. doi:10.1097/JSM.0000000000000219.</td></tr>
<tr><td>Purpose: To derive a more precise estimation of this association between physical activity (PA) and risk of lung cancer.</td><td rowspan="4">Abstract: OBJECTIVE: Previous studies concerning the association between physical activity (PA) and risk of lung cancer yielded mixed results. We investigated the association by performing a meta-analysis. DATA SOURCES: Relevant studies were identified by searching PubMed and EMBASE to January 2014. Twelve cohort studies and 6 case-control studies involving 2 468 470 participants and 26 453 cases of lung cancer were selected for meta-analysis. MAIN RESULTS: We calculated the summary relative risk (RR) and 95% confidence intervals (CIs) using random-effects models. The analyses showed that individuals who participated in any amount of PA had an RR of 0.79 (95% CI, 0.73-0.86) for risk of lung cancer. Those who participated in high PA (vs low PA) had an RR of 0.75 (95% CI, 0.68-0.84). Stratifying by study design (case-control and cohort studies), smoking status (current, former, and never smokers), and gender, similar inverse associations were found for all the subgroups except for never smokers subgroup. CONCLUSIONS: Pooled results from observational studies support a protective effect of PA against lung cancer.</td></tr>
<tr><td>Timeframe: Inception–2014</td></tr>
<tr><td>Total # of Studies: 18</td></tr>
<tr><td>Exposure Definition: For each study, low-level PA represented the reference category, high-level PA represented the highest category, moderate-level PA represented in-between, and moderate-high level of PA represented both low- and moderate-level PA. Compared high level of PA with low PA, moderate level of PA to low PA, and moderate-high level of PA to low PA.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Lung cancer risk (relative risk).
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults, Smoking status, Male, Female</td><td>Author-Stated Funding Source: National Natural Science Foundation of China</td></tr>
</table>

<table>
<tr><th colspan="2">Ovarian Cancer</th></tr>
<tr><td colspan="2">Pooled Analysis
Citation: Cannioto R, LaMonte MJ, Risch HA, et al. Chronic recreational physical inactivity and epithelial ovarian cancer risk: evidence from the Ovarian Cancer Association Consortium. Cancer Epidemiol Biomarkers Prev. 2016;25(7):1114-1124. doi:10.1158/1055-9965.EPI-15-1330.</td></tr>
<tr><td>Purpose: To evaluate the association between physical inactivity exposure and epithelial ovarian cancer risk overall.</td><td rowspan="4">Abstract: BACKGROUND: Despite a large body of literature evaluating the association between recreational physical activity and epithelial ovarian cancer (EOC) risk, the extant evidence is inconclusive, and little is known about the independent association between recreational physical inactivity and EOC risk. We conducted a pooled analysis of nine studies from the Ovarian Cancer Association Consortium to investigate the association between chronic recreational physical inactivity and EOC risk. METHODS: In accordance with the 2008 Physical Activity Guidelines for Americans, women reporting no regular, weekly recreational physical activity were classified as inactive. Multivariable logistic regression was utilized to estimate the ORs and 95% confidence intervals (CI) for the association between inactivity and EOC risk overall and by subgroups based upon histotype, menopausal status, race, and body mass index. RESULTS: The current analysis included data from 8,309 EOC patients and 12,612 controls. We observed a significant positive association between inactivity and EOC risk (OR = 1.34; 95% CI, 1.14-1.57), and similar associations were observed for each histotype. CONCLUSIONS: In this large pooled analysis examining the association between recreational physical inactivity and EOC risk, we observed consistent evidence of an association between chronic inactivity and all EOC histotypes. IMPACT: These data add to the growing body of evidence suggesting that inactivity is an independent risk factor for cancer. If the apparent association between inactivity and EOC risk is substantiated, additional work via targeted interventions should be pursued to characterize the dose of activity required to mitigate the risk of this highly fatal disease. Cancer Epidemiol Biomarkers Prev; 25(7); 1114-24. (c)2016 AACR.</td></tr>
<tr><td>Total # of Studies: 9</td></tr>
<tr><td>Exposure Definition:
Recreational physical inactivity defined as engaging in no regular, weekly moderate-to-vigorous intensity recreational activity, as assessed by questionnaires.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Odds ratio of epithelial ovarian cancer risk.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed:
Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5–24.9), Overweight and obese, Female, Adults</td><td>Author-Stated Funding Source: U.S. Army Medical Research and Materiel Command; National Health & Medical Research Council of Australia; Cancer Councils of New South Wales, Victoria, Queensland, South Australia, and Tasmania;Cancer Foundation of Western Australia, National Health and Medical Research Council of Australia</td></tr>
</table>

<table>
<tr><th colspan="2">Ovarian Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Zhong S, Chen L, Lv M, Ma T, Zhang X, Zhao J. Nonoccupational physical activity and risk of ovarian cancer: a meta-analysis. Tumour Biol. 2014;35(11):11065-11073. doi:10.1007/s13277-014-2385-z.</td></tr>
<tr><td>Purpose: To derive a more precise estimation of the association between nonoccupational physical activity (PA) and risk of ovarian cancer.</td><td rowspan="4">Abstract: Previous studies concerning the association between nonoccupational physical activity (PA) and risk of ovarian cancer yielded mixed results. We investigated the association by performing a meta-analysis. Relevant studies were identified by searching PubMed and EMBASE to June 2014. We calculated the summary relative risks (RRs) and 95% confidence intervals (CIs) using random-effects models. The dose-response relationship was assessed by restricted cubic spline model and multivariate random-effect meta-regression. Nine cohort studies and ten case-control studies involving 730,703 participants and 9,459 cases of ovarian cancer were selected for meta-analysis. The analyses showed that individuals who participated in any amount of nonoccupational PA had a RR of 0.92 (95% CI = 0.84-1.00) for risk of ovarian cancer. Those who participated in high or moderate nonoccupational PA had a RR of ovarian cancer risk of 0.89 (95% CI = 0.79-1.01) and 0.91 (95% CI = 0.85-0.99), respectively. Stratifying by study design and cancer subtype (borderline and invasive tumors), inverse association was only found in case-control studies. A linear but not significant dose-response relationship was found between nonoccupational PA and ovarian cancer risk. In conclusion, a weak inverse association exists between nonoccupational PA and the risk of ovarian cancer. Regarding the significant heterogeneity among included studies, confirmation in further prospective cohort studies with more accurate assessment of PA level is essential.</td></tr>
<tr><td>Timeframe: 1984–June 2014</td></tr>
<tr><td>Total # of Studies: 19</td></tr>
<tr><td>Exposure Definition: For each study, low-level PA represented the reference category, high-level PA represented the highest category, moderate-level PA represented categories between the reference category and the highest category, and moderate-high level of PA represented all categories except the reference category. Compared high level of PA with low level PA, moderate level PA to low PA, and moderate-high level of PA to low PA (nonoccupational). Dose-response meta-analysis was performed at the 25th, 50th, and 75th percentiles of levels of PA (metabolic equivalent hours/week and hours/week).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of ovarian cancer (relative risk). Subanalysis by cancer subtype (borderline or invasive).
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female</td><td>Author-Stated Funding Source: National Natural Science Foundation of China</td></tr>
</table>

Pancreatic Cancer	
Systematic Review **Citation:** Bao Y, Michaud DS. Physical activity and pancreatic cancer risk: a systematic review. *Cancer Epidemiol Biomarkers Prev.* 2008;17(10):2671-2682. doi:10.1158/1055-9965.EPI-08-0488.	
Purpose: To evaluate the association between physical activity (PA) and pancreatic cancer risk.	**Abstract:** BACKGROUND: Physical activity has been associated with a lower risk for pancreatic cancer in several studies, but the overall epidemiologic evidence is not consistent. We therefore did a systematic review to evaluate the association between physical activity and pancreatic cancer risk. METHODS: We searched MEDLINE and EMBASE through April 2008 and examined the reference lists of the retrieved articles. We excluded studies that relied on job titles as surrogate measures for physical activity. We used a random-effects model to pool study-specific risk estimates comparing the highest versus the lowest category of physical activity. RESULTS: Total physical activity (occupational and leisure time) was not significantly associated with risk for pancreatic cancer [4 prospective studies; summary relative risk, 0.76, 95% confidence interval (95% CI), 0.53-1.09]. A decreased risk for pancreatic cancer was observed for occupational physical activity (3 prospective studies; relative risk, 0.75; 95% CI, 0.58-0.96) but not for leisure-time physical activity (14 prospective studies; relative risk, 0.94; 95% CI, 0.83-1.05). No association was found with light physical activity (2 prospective studies; relative risk, 1.01; 95% CI, 0.77-1.34), moderate physical activity (6 prospective studies; relative risk, 0.83; 95% CI, 0.58-1.18), or vigorous physical activity (7 prospective studies; relative risk, 0.94; 95% CI, 0.80-1.12). CONCLUSIONS: This systematic review does not provide strong evidence for an association between physical activity and risk for pancreatic cancer.
Timeframe: 1966–April 2008	
Total # of Studies: 18	
Exposure Definition: PA: Total PA, occupational PA, leisure-time PA (metabolic equivalents), transport PA, light PA, moderate PA, and vigorous PA. **Measures Steps:** No **Measures Bouts:** No **Examines HIIT:** No	
Outcomes Addressed: Risk of pancreatic cancer. **Examine Cardiorespiratory Fitness as Outcome:** No	
Populations Analyzed: Adults	**Author-Stated Funding Source:** Not Reported

<table>
<tr><th colspan="2">Pancreatic Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Behrens G, Jochem C, Schmid D, Keimling M, Ricci C, Leitzmann MF. Physical activity and risk of pancreatic cancer: a systematic review and meta-analysis. Eur J Epidemiol. 2015;30(4):279-298. doi:10.1007/s10654-015-0014-9.</td></tr>
<tr><td>Purpose: To examine the association between any type of physical activity (PA) and pancreatic cancer, with a focus on exploring whether the relation is dependent on smoking status or body mass index group.</td><td rowspan="5">Abstract: Physical activity may prevent pancreatic cancer by regulating body weight and decreasing insulin resistance, DNA damage, and chronic inflammation. Previous meta-analyses found inconsistent evidence for a protective effect of physical activity on pancreatic cancer but those studies did not investigate whether the association between physical activity and pancreatic cancer varies by smoking status, body mass index (BMI), or level of consistency of physical activity over time. To address these issues, we conducted an updated meta-analysis following the PRISMA guidelines among 30 distinct studies with a total of 10,501 pancreatic cancer cases. Random effects meta-analysis of cohort studies revealed a weak, statistically significant reduction in pancreatic cancer risk for high versus low levels of physical activity (relative risk (RR) 0.93, 95 % confidence interval (CI) 0.88-0.98). By comparison, case-control studies yielded a stronger, statistically significant risk reduction (RR 0.78, 95 % CI 0.66-0.94; p-difference by study design = 0.07). When focusing on cohort studies, physical activity summary risk estimates appeared to be more pronounced for consistent physical activity over time (RR 0.86, 95 % CI 0.76-0.97) than for recent past physical activity (RR 0.95, 95 % CI 0.90-1.01) or distant past physical activity (RR 0.95, 95 % CI 0.79-1.15, p-difference by timing in life of physical activity = 0.36). Physical activity summary risk estimates did not differ by smoking status or BMI. In conclusion, physical activity is not strongly associated with pancreatic cancer risk, and the relation is not modified by smoking status or BMI level. While overall findings were weak, we did find some suggestion of potential pancreatic cancer risk reduction with consistent physical activity over time.</td></tr>
<tr><td>Timeframe: Inception–2014</td></tr>
<tr><td>Total # of Studies: 30</td></tr>
<tr><td>Exposure Definition: PA; consistent PA over time
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Pancreatic cancer incidence.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Males, Females, Normal/Healthy weight (BMI: 18.5–24.9), Overweight and obese, Smoking exposure (high/low), Study location (North America, Europe, Asia)</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Pancreatic Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Farris MS, Mosli MH, McFadden AA, Friedenreich CM, Brenner DR. The association between leisure time physical activity and pancreatic cancer risk in adults: a systematic review and meta-analysis. Cancer Epidemiol Biomarkers Prev. 2015;24(10):1462-1473. doi:10.1158/1055-9965.EPI-15-0301.</td></tr>
<tr><td>Purpose: To investigate the association between leisure time physical activity (LTPA) and risk of pancreatic cancer. An update from previous analyses to examine subgroups of interest and potential sources of heterogeneity.</td><td rowspan="5">Abstract: We conducted a meta-analysis of the association between leisure time physical activity (LTPA) and risk of pancreatic cancer to update previous analyses in light of newly published studies, to examine subgroups of interest and potential sources of heterogeneity. We searched the PubMed and MEDLINE databases for studies until February 2015. Study information was collected using a standardized form to abstract relevant data on study design, number of cases, participant and study characteristics, assessment of LTPA, risk estimates, and adjustments for confounding by two independent abstractors. We used random-effects models to pool estimates from included studies of lowest versus highest comparison of LTPA. The search identified 26 studies eligible for inclusion into the meta-analysis. The combined summary risk estimate was [relative risk (RR), 0.89; 95% confidence interval (CI), 0.82-0.96]. There was evidence of heterogeneity across studies (I(2) = 22.1%, Pheterogeneity = 0.130). Some of the heterogeneity could be explained by study design, with stronger protective effects observed among case-control studies (RR, 0.69; 95% CI, 0.59-0.81) compared with cohort studies (RR, 0.96; 95% CI, 0.91-1.02). Across study designs, age of population was a source of heterogeneity, with stronger effects observed among younger (<50 years) populations. The present meta-analysis supports a protective association between LTPA and pancreatic cancer with an 11% risk reduction observed. LTPA appears to have the strongest effect among young populations. Additional investigations are needed to provide insights regarding the impact of LTPA in healthy adult populations, to reduce the risk of pancreatic cancer and encourage increases in LTPA.</td></tr>
<tr><td>Timeframe: Inception–2015</td></tr>
<tr><td>Total # of Studies: 26</td></tr>
<tr><td>Exposure Definition: Assessment of LTPA into 3 subgroups: lifetime LTPA (LTPA over the participant’s lifetime or several decades [>30 years] prior to study recruitment), past year LTPA, and 2–10 past years LTPA, as well as the type/intensity of activity. The type/intensity was separated into 5 subgroups based on the measures used in the different included studies: meeting World Health Organization Recommendations for PA and Health (>150 minutes moderate PA per week or >75 minutes of vigorous PA per week), quartiles/quintiles representing multiple levels of LTPA, low vs. high, frequency (times), and sports participation.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: The incidence of pancreatic cancer was assessed on the basis of the method used to confirm pancreatic cancer diagnosis. In studies, pancreatic cancer diagnosis was collected through either pathology reports, International Classification of Disease (ICD) codes, cancer registry, a combination of methods or subjective measures such as death certificates.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults (<50, 50–60, and >60)</td><td>Author-Stated Funding Source: Alberta Innovates Health Solutions Health Senior Scholar Award and Alberta Cancer Foundation Weekend to End Women's Cancers Breast Cancer Chair</td></tr>
</table>

<table>
<tr><th colspan="2">Pancreatic Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: O'Rorke MA, Cantwell MM, Cardwell CR, Mulholland HG, Murray LJ. Can physical activity modulate pancreatic cancer risk? A systematic review and meta-analysis. Int J Cancer. 2010;126(12):2957-2968. doi:10.1002/ijc.24997.</td></tr>
<tr><td>Purpose: To examine associations between physical activity (PA) and pancreatic cancer.</td><td rowspan="4">Abstract: Numerous epidemiological studies have examined the association between physical activity and pancreatic cancer; however, findings from individual cohorts have largely not corroborated a protective effect. Among other plausible mechanisms, physical activity may reduce abdominal fat depots inducing metabolic improvements in glucose tolerance and insulin sensitivity, thereby potentially attenuating pancreatic cancer risk. We performed a systematic review to examine associations between physical activity and pancreatic cancer. Six electronic databases were searched from their inception through July 2009, including MEDLINE and EMBASE, seeking observational studies examining any physical activity measure with pancreatic cancer incidence/mortality as an outcome. A random effects model was used to pool individual effect estimates evaluating highest vs. lowest categories of activity. Twenty-eight studies were included. Pooled estimates indicated a reduction in pancreatic cancer risk with higher levels of total (five prospective studies, RR: 0.72, 95% CI: 0.52-0.99) and occupational activity (four prospective studies, RR: 0.75, 95% CI: 0.59-0.96). Nonsignificant inverse associations were seen between risks and recreational and transport physical activity. When examining exercise intensity, moderate activity appeared more protective (RR: 0.79, 95% CI: 0.52-1.20) than vigorous activity (RR: 0.97, 95% CI: 0.85-1.11), but results were not statistically significant and the former activity variable incorporated marked heterogeneity. Despite indications of an inverse relationship with higher levels of work and total activity, there was little evidence of such associations with recreational and other activity exposures.</td></tr>
<tr><td>Timeframe: Inception–2009</td></tr>
<tr><td>Total # of Studies: 28</td></tr>
<tr><td>Exposure Definition: PA assessed by total, recreational, and occupational activity and its intensity, including walking/cycling; in studies with two levels, they compared the highest to the lowest level of PA; subgroups by total, occupational, recreational, transport, light, moderate, and vigorous activity.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of pancreatic cancer, assessed by relative risk. Subgroups: body mass index and smoking status adjustment in studies.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Department of Employment and Learning (DEL) PhD-funded scholarship</td></tr>
</table>

<table>
<tr><th colspan="2">Prostate Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Liu Y, Hu F, Li D, et al. Does physical activity reduce the risk of prostate cancer? A systematic review and meta-analysis. Eur Urol. 2011;60(5):1029-1044. doi:10.1016/j.eururo.2011.07.007.</td></tr>
<tr><td>Purpose: To determine the association between physical activity (PA) and risk of prostate cancer.</td><td rowspan="4">Abstract: CONTEXT: Numerous observational epidemiologic studies have evaluated the association between physical activity and prostate cancer (PCa); however, the existing results are inconsistent. OBJECTIVE: To determine the association between physical activity and risk of PCa. EVIDENCE ACQUISITION: A systematic search was performed using the Medline, Embase, and Web of Science databases through 15 May 2011 to identify all English-language articles that examined the effect of physical activity on the risk of PCa. This meta-analysis was conducted according to the guidelines for the meta-analysis of observational studies in epidemiology. EVIDENCE SYNTHESIS: This meta-analysis consisted of 88,294 cases from 19 eligible cohort studies and 24 eligible case-control studies. When data from both types of studies were combined, total physical activity (TPA) was significantly associated with a decreased risk of PCa (pooled relative risk [RR]: 0.90; 95% confidence interval [CI], 0.84-0.95). The pooled RR for occupational physical activity (OPA) and recreational physical activity (RPA) were 0.81 (95% CI, 0.73-0.91) and 0.95 (95% CI, 0.89-1.00), respectively. Notably, for TPA, we observed a significant PCa risk reduction for individuals between 20 and 45 yr of age (RR: 0.93; 95% CI, 0.89-0.97) and between 45 and 65 yr of age (RR: 0.91; 95% CI, 0.86-0.97) who performed activities but not for individuals <20 yr of age or >65 yr of age. CONCLUSIONS: There appears to be an inverse association between physical activity and PCa risk, albeit a small one. Given that increasing physical activity has numerous other health benefits, men should be encouraged to increase their physical activity in both occupational and recreational time to improve their overall health and potentially decrease their risk of PCa.</td></tr>
<tr><td>Timeframe: Inception–2011</td></tr>
<tr><td>Total # of Studies: 43</td></tr>
<tr><td>Exposure Definition: PA: occupational PA, recreational PA, and total PA. PA measures used given variability from studies: metabolic equivalent value, frequency of sporting activities, and energy expenditure of occupational activities.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Cancer risk
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and obese (BMI: 30 and above), European; North American; American; Whites; Blacks; Canadian; Asia-Pacific; Adults, <20; 20–45; 45–65; ≥65</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Renal Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Behrens G, Leitzmann MF. The association between physical activity and renal cancer: systematic review and meta-analysis. Br J Cancer. 2013;108(4):798-811. doi:10.1038/bjc.2013.37.</td></tr>
<tr><td>Purpose: To quantify the association between physical activity (PA) and renal cancer.</td><td rowspan="4">Abstract: BACKGROUND: Physical activity may decrease renal cancer risk by reducing obesity, blood pressure, insulin resistance, and lipid peroxidation. Despite plausible biologic mechanisms linking increased physical activity to decreased risk for renal cancer, few epidemiologic studies have been able to report a clear inverse association between physical activity and renal cancer, and no meta-analysis is available on the topic. METHODS: We searched the literature using PubMed and Web of Knowledge to identify published non-ecologic epidemiologic studies quantifying the relationship between physical activity and renal cancer risk in individuals without a cancer history. Following the PRISMA guidelines, we conducted a systematic review and meta-analysis, including information from 19 studies based on a total of 2 327 322 subjects and 10 756 cases. The methodologic quality of the studies was examined using a comprehensive scoring system. RESULTS: Comparing high vs low levels of physical activity, we observed an inverse association between physical activity and renal cancer risk (summary relative risk (RR) from random-effects meta-analysis=0.88; 95% confidence interval (CI)=0.79-0.97). Summarising risk estimates from high-quality studies strengthened the inverse association between physical activity and renal cancer risk (RR=0.78; 95% CI=0.66-0.92). Effect modification by adiposity, hypertension, type 2 diabetes, smoking, gender, or geographic region was not observed. CONCLUSION: Our comprehensive meta-analysis provides strong support for an inverse relation of physical activity to renal cancer risk. Future high-quality studies are required to discern which specific types, intensities, frequencies, and durations of physical activity are needed for renal cancer risk reduction.</td></tr>
<tr><td>Timeframe: Inception–2012</td></tr>
<tr><td>Total # of Studies: 19</td></tr>
<tr><td>Exposure Definition: PA; domain (recreational, occupational, or total physical activity); type of PA assessment (energy expenditure, physical fitness, moderate-to-vigorous PA duration, moderate-to-vigorous PA frequency, and qualitative assessments using categories, such as “sedentary,” “light,” “moderate,” or “high” physical activity); timing in life of PA (recent PA, past PA, or consistent PA over time).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Renal cancer
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Thyroid Cancer</th></tr>
<tr><td colspan="2">Pooled Analysis
Citation: Kitahara CM, Platz EA, Beane Freeman LE, et al. Physical activity, diabetes, and thyroid cancer risk: a pooled analysis of five prospective studies. Cancer Causes Control. 2012;23(3):463-471. doi:10.1007/s10552-012-9896-y.</td></tr>
<tr><td>Purpose: To examine the associations of self-reported physical activity (PA) and diabetes history with thyroid cancer risk.</td><td rowspan="4">Abstract: PURPOSE: Although many studies have linked obesity with increased risk of thyroid cancer, few have investigated the role of obesity-related lifestyle characteristics and medical conditions in the etiology of this disease. We examined the associations of self-reported physical activity and diabetes history with thyroid cancer risk in a large pooled analysis of prospective cohort studies. METHODS: Data from five prospective studies in the U.S. (n = 362,342 men, 312,149 women) were coded using standardized exposure, covariate, and outcome definitions. Hazard ratios (HR) and 95% confidence intervals (CI) for thyroid cancer were estimated using age as the time metric and adjusting for sex, education, race, marital status, cigarette smoking, body mass index, alcohol intake, and cohort. Effect modification by other risk factors (e.g., age, sex, and body mass index) and differences by cancer subtype (e.g., papillary, follicular) were also examined. RESULTS: Over follow-up (median = 10.5 years), 308 men and 510 women were diagnosed with a first primary thyroid cancer. Overall, subjects reporting the greatest amount of physical activity had an increased risk of the disease (HR = 1.18, 95% CI:1.00-1.39); however, this association was restricted to participants who were overweight/obese (>/=25 kg/m(2); HR = 1.34, 95% CI:1.09-1.64) as opposed to normal-weight (<25 kg/m(2); HR = 0.92, 95% CI:0.69-1.22; P-interaction = 0.03). We found no overall association between self-reported history of diabetes and thyroid cancer risk (HR = 1.08, 95% CI:0.83-1.40). CONCLUSION: Neither physical inactivity nor diabetes history was associated with increased risk of thyroid cancer. While it may have been a chance finding, the possible increased risk associated with greater physical activity warrants further investigation.</td></tr>
<tr><td>Total # of Studies: 5</td></tr>
<tr><td>Exposure Definition: PA was defined as the average time spent engaging in vigorous or strenuous leisure time or occupational activity. Data as collected from self-administered questionnaires. Different PA assessment by study. Study subjects were assigned to one of three categories of PA: low, medium, or high based on cohort-specific tertiles.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Thyroid cancer; participants who were diagnosed with a malignant first primary thyroid neoplasm during follow-up. Cancer information was obtained through various sources: self-report, cancer registry linkage, death certificates, and the National Death Index.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Underweight (BMI: below 18.5), Normal/Healthy weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and obese (BMI: 30 and above), Diabetes, Smoking; Alcohol intake, Male, Female, Adults, Education: high school or less, post-high school.</td><td>Author-Stated Funding Source: Intramural Research Program of the National Cancer Institute, National Institutes of Health</td></tr>
</table>

<table>
<tr><th colspan="2">Thyroid Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Schmid D, Behrens G, Jochem C, Keimling M, Leitzmann M. Physical activity, diabetes, and risk of thyroid cancer: a systematic review and meta-analysis. Eur J Epidemiol. 2013;28(12):945-958. doi:10.1007/s10654-013-9865-0.</td></tr>
<tr><td>Purpose: To summarize thyroid cancer risk estimates comparing high vs. low levels of physical activity (PA), and separately, comparing individuals with diabetes with those without diabetes.</td><td rowspan="5">Abstract: Thyroid cancer incidence has been increasing more rapidly over time than the occurrence of cancers of other sites, and interest in potential adverse relations of diabetes and lack of physical activity to thyroid cancer risk is accumulating. We conducted a systematic review and meta-analysis of published epidemiologic studies on the relations of physical activity and diabetes to thyroid cancer according to the Meta-analysis of Observational Studies in Epidemiology guidelines. Published studies were identified through a search in MEDLINE and EMBASE. Random-effects models were used to summarize thyroid cancer risk estimates comparing high versus low levels of physical activity, and separately, comparing individuals with diabetes versus those without diabetes. Meta-regression analyses were performed to evaluate potential effect modification by study design and thyroid cancer risk factors. Information was extracted from seven studies of physical activity and thyroid cancer and from six studies of diabetes and thyroid cancer. The number of individuals from studies on physical activity was 939,305 (yielding 2,250 incident thyroid cancer cases) and from studies on diabetes it was 960,840 (yielding 1,230 cases). The summary relative risk (RR) estimate from cohort and case-control studies combined indicated no association between physical activity and thyroid cancer (summary RR 1.06, 95 % confidence interval (CI) 0.79-1.42). Subgroup-analyses revealed a significant positive association between physical activity and thyroid cancer in cohort studies (summary RR 1.28; 95 % CI 1.01-1.63), whereas the relation was suggestively inverse in case-control studies (summary RR 0.70; 95 % CI 0.48-1.03; p for heterogeneity = 0.005). Individuals with diabetes showed a borderline statistically significant increased risk of thyroid cancer compared with those without diabetes (summary RR 1.17; 95 % CI 0.99-1.39). The relations of physical activity and diabetes to thyroid cancer were not modified by sex, number of adjustment factors, and adjustments for adiposity, smoking, and study quality. In this comprehensive systematic review and meta-analysis, no significant association between physical activity and thyroid cancer was found. Diabetes showed a suggestive positive relation with risk of thyroid cancer.</td></tr>
<tr><td>Timeframe: Inception–2013</td></tr>
<tr><td>Total # of Studies: 13 (PA=7)</td></tr>
<tr><td>Exposure Definition: PA: Total PA was prioritized in this meta-analysis. [Unspecified] highest vs. lowest categories of PA. PA was assessed by interviewer-administered questionnaires in 2 studies and by self-administered questionnaires in 5 studies.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Thyroid cancer risk (relative risk): endpoint definition included both total thyroid cancer cases and papillary thyroid cancer cases.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Male, Female</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

Table 3. Existing Systematic Reviews, Meta-Analyses, and Pooled Analyses Quality Assessment Chart

AMSTARExBP: SR/MA							
	Abioye, 2015	Aschebrook-Kilfoy, 2014	Bao, 2008	Behrens, 2015	Behrens, 2014	Behrens, 2013	Boyle, 2012
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	Yes	No	Yes	Yes	Yes	Yes	Yes
Comprehensive literature search performed.	Yes	N/A	Yes	Yes	Yes	Yes	Yes
Duplicate study selection and data extraction performed.	No	N/A	No	No	No	No	No
Search strategy clearly described.	Yes	N/A	Yes	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	No	N/A	No	No	No	No	No
List of studies (included and excluded) provided.	No	N/A	Yes	No	No	No	Yes
Characteristics of included studies provided.	No	Yes	Yes	Yes	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	No	No	N/A	Yes	No	No	No
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	No	Partially Yes	Yes	Yes	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	No	N/A	Yes	Yes	Yes	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	Yes	N/A	Yes	Yes	Yes	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Effect size index chosen justified, statistically.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level meta-analysis used.	No	No	N/A	No	No	No	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	Yes	N/A	Yes	Yes	Yes	Yes	Yes
Conflict of interest disclosed.	Yes	No	Yes	No	No	No	No

AMSTARExBP: SR/MA							
	Brenner, 2016	Buffart, 2014	Cannioto, 2016	Chen, 2014	Farris, 2015	Gong, 2016	Harriss, 2009
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Comprehensive literature search performed.	Partially Yes	Yes	N/A	Yes	Yes	N/A	Yes
Duplicate study selection and data extraction performed.	Yes	Yes	N/A	Yes	No	N/A	Yes
Search strategy clearly described.	Yes	Yes	N/A	Yes	Yes	N/A	Yes
Relevant grey literature included in review.	No	No	N/A	No	No	N/A	No
List of studies (included and excluded) provided.	No	No	N/A	No	No	N/A	Yes
Characteristics of included studies provided.	Yes	No	Yes	Yes	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	No	No	No	No	Yes	Yes	Yes
Scientific quality (risk of bias) of included studies assessed and documented.	Partially Yes	Yes	Yes	Partially Yes	Yes	Yes	No
Results depended on study quality, either overall, or in interaction with moderators.	Yes	No	Yes	Yes	Yes	Yes	N/A
Scientific quality used appropriately in formulating conclusions.	Yes	Yes	Yes	Yes	Yes	Yes	N/A
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Effect size index chosen justified, statistically.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level meta-analysis used.	No	No	Yes	No	No	No	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	Yes	No	N/A	Yes	Yes	N/A	Yes
Conflict of interest disclosed.	No	Yes	Yes	Yes	Yes	Yes	Yes

AMSTARExBP: SR/MA	Jochem, 2014	Johnson, 2013	Keimling, 2014	Keum, 2014	Kitahara, 2012	Kyu, 2016	Liu, 2016
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Comprehensive literature search performed.	Partially Yes	No	Yes	Yes	N/A	Yes	Yes
Duplicate study selection and data extraction performed.	No	No	No	Yes	N/A	Yes	No
Search strategy clearly described.	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Relevant grey literature included in review.	No	No	No	No	N/A	No	No
List of studies (included and excluded) provided.	No	No	No	No	N/A	No	No
Characteristics of included studies provided.	Yes	No	Yes	Yes	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	Yes	No	Yes	Yes	Yes	Yes	Yes
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	No	Yes	Yes	No	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	Yes	N/A	Yes	Yes	N/A	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	Yes	N/A	Yes	Yes	N/A	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Effect size index chosen justified, statistically.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level meta-analysis used.	No	No	No	No	Yes	No	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Conflict of interest disclosed.	Yes	No	No	No	No	Yes	Yes

AMSTARExBP: SR/MA							
	Liu, 2011	Moore, 2016	Moore, 2010	Neilson, 2016	Nicolotti, 2011	Niederma ier, 2015	O'Rorke, 2010
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	No	Yes	Yes
Population variables defined and considered in methods.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Comprehensive literature search performed.	Yes	N/A	Partially Yes	Yes	N/A	Yes	Yes
Duplicate study selection and data extraction performed.	No	N/A	No	Yes	N/A	Yes	Yes
Search strategy clearly described.	Yes	N/A	Yes	Yes	N/A	Yes	Yes
Relevant grey literature included in review.	No	N/A	No	Yes	N/A	No	No
List of studies (included and excluded) provided.	No	N/A	No	No	N/A	Yes	Yes
Characteristics of included studies provided.	Yes	Yes	No	Yes	Yes	No	Yes
FITT defined and examined in relation to outcome effect sizes.	Yes	No	N/A	Yes	Yes	No	Yes
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	Yes	Yes	Yes	No	Partially Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	Yes	Yes	Yes	Yes	Partially Yes	Yes
Effect size index chosen justified, statistically.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level meta-analysis used.	No	No	No	No	No	No	No
Practical recommendations clearly addressed.	Yes	Yes	No	Yes	No	Yes	No
Likelihood of publication bias assessed.	Yes	N/A	Yes	Yes	N/A	Yes	Yes
Conflict of interest disclosed.	Yes	Yes	No	Yes	No	Yes	No

AMSTARExBP: SR/MA							
	Pham, 2012	Pizot, 2016	Psaltopoulou, 2016	Robsahm, 2013	Schmid, 2016	Schmid, 2015	Schmid, 2013
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	No	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	No	Yes	Yes	Yes	Yes	Yes	Yes
Comprehensive literature search performed.	Yes	Yes	Partially Yes	Partially Yes	Yes	Yes	Yes
Duplicate study selection and data extraction performed.	No	No	Yes	No	No	No	No
Search strategy clearly described.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	No	No	No	No	No	No	No
List of studies (included and excluded) provided.	No	Yes	Yes	No	Yes	Yes	Yes
Characteristics of included studies provided.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	No	Yes	No	No	No	Yes	No
Scientific quality (risk of bias) of included studies assessed and documented.	No	No	Yes	Partially Yes	Yes	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	N/A	N/A	Yes	Yes	Yes	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	N/A	N/A	Yes	Yes	No	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	N/A	Yes	Yes	Yes	Yes	Yes	Yes
Effect size index chosen justified, statistically.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level meta-analysis used.	N/A	No	No	No	No	No	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	No	Yes	Yes	Yes
Likelihood of publication bias assessed.	No	Yes	Yes	Yes	Yes	Yes	Yes
Conflict of interest disclosed.	Yes	Yes	No	No	No	Yes	Yes

AMSTARExBP: SR/MA								
	Singh, 2014	Singh, 2014	Sun, 2012	Vermaete , 2013	Wolin, 2009	Wu, 2013	Zhong, 2016	Zhong, 2014
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Comprehensive literature search performed.	Yes	Yes	Partially Yes	Yes	Partially Yes	Yes	Yes	Yes
Duplicate study selection and data extraction performed.	Yes	Yes	No	No	No	Yes	Yes	Yes
Search strategy clearly described.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	Yes	Yes	No	No	No	No	No	No
List of studies (included and excluded) provided.	Yes	No	No	No	No	Yes	Yes	No
Characteristics of included studies provided.	Yes	Yes	No	Yes	No	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	Yes	Yes	No	No	No	Yes	Yes	Yes
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Effect size index chosen justified, statistically.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level meta-analysis used.	No	No	No	No	No	No	No	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Likelihood of publication bias assessed.	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Conflict of interest disclosed.	Yes	Yes	No	Yes	No	Yes	Yes	Yes

High-Quality Existing Reports

Table 4. High-Quality Existing Reports Individual Evidence Summary Tables

<table>
<tr><th colspan="2">Bladder Cancer</th></tr>
<tr><td colspan="2">Report: Summary/State of the Science
Citation: World Cancer Research Fund International, American Institute for Cancer Research. Continuous Update Project Report: Diet, Nutrition, Physical Activity and Bladder Cancer; 2015a. http://www.wcrf.org/bladder-cancer-2015. Accessed October 11, 2017.</td></tr>
<tr><td>Source/Sponsor: World Cancer Research Fund</td><td rowspan="5">Relevant Conclusions: Evidence for the physical activity exposure previously judged as ‘limited – no conclusion’ in the Second Expert Report remains unchanged after updating the analyses with new data identified in the Continious Update Project Bladder systematic literature review 2014.</td></tr>
<tr><td>Purpose: To analyze global research on how certain lifestyle factors affect the risk of developing bladder cancer.</td></tr>
<tr><td>Timeframe: January 2006- July 2013</td></tr>
<tr><td>Exposure Definition: Recreational physical activity (8 sstudies), total physical activity (1 study).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of bladder cancer
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Not reported</td><td>Author-Stated Funding Source: Not reported</td></tr>
</table>

<table>
<tr><th colspan="2">Colon, Rectal Cancers</th></tr>
<tr><td colspan="2">Report: Summary/State of the Science
Citation: World Cancer Research Fund/American Institute for Cancer Research. Continuous Update Project Report: Food, Nutrition, Physical Activity, and the Prevention of Colorectal Cancer. http://www.wcrf.org/sites/default/files/Colorectal-Cancer-2011-Report.pdf. Published 2011. Accessed October 11, 2017.</td></tr>
<tr><td>Source/Sponsor: World Cancer Research Fund</td><td rowspan="4">Relevant Conclusions: The evidence that physical activity protects against colon cancer is convincing.</td></tr>
<tr><td>Purpose: To provide an updated version of section 7.9, Colon and Rectum, from the Second Expert Report: Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective.</td></tr>
<tr><td>Timeframe: Not reported.</td></tr>
<tr><td>Exposure Definition: Total physical activity (metabolic equivalent [MET] hours/day), recreational physical activity (MET hours/week), leisure time physical activity (highest versus lowest).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of colorectal cancer, colon cancer, and rectal cancer.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Not reported.</td><td>Author-Stated Funding Source: Not reported</td></tr>
</table>

<table>
<tr><th colspan="2">Renal Cancer</th></tr>
<tr><td colspan="2">Report: Summary/State of the Science
Citation: World Cancer Research Fund International, American Institute for Cancer Research. Continuous Update Project Report: Diet, Nutrition, Physical Activity and Kidney Cancer; 2015b. http://www.wcrf.org/kidney-cancer-2015. Accessed October 11, 2017.</td></tr>
<tr><td>Source/Sponsor: World Cancer Research Fund</td><td rowspan="5">Relevant Conclusions: Evidence for the physical activity exposure, previously judged as ‘Limited – no conclusion’ in the Second Expert Report, remains unchanged after updating the analyses with new data identified in the Continious Update Project Kidney systematic literature review 2015.</td></tr>
<tr><td>Purpose: To analyze worldwide research on how certain lifestyle factors affect the risk of developing kidney cancer.</td></tr>
<tr><td>Timeframe: Inception-March 2014</td></tr>
<tr><td>Exposure Definition: Physical activity level
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Risk of kidney cancer
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Not reported</td><td>Author-Stated Funding Source: Not reported</td></tr>
</table>

<table>
<tr><th colspan="2">Colon, Rectal Cancers</th></tr>
<tr><td colspan="2">Report: Summary/State of the Science
Citation: World Cancer Research Fund International/American Institute for Cancer Research. Continuous Update Project Report: Diet, Nutrition, Physical Activity and Colorectal Cancer. http://www.aicr.org/continuous-update-project/reports/colorectal-cancer-2017-report.pdf. Published 2017. Accessed October 11, 2017.</td></tr>
<tr><td>Source/Sponsor: American Institute for Cancer Research</td><td rowspan="4">Relevant Conclusions: The evidence is strong and consistently shows significant inverse associations when comparing the highest and lowest levels of total and recreational physical activity (PA) and colon cancer incidence. A significant inverse association was observed for total PA and colorectal cancer; no significant associations were observed for rectal cancer and either total or recreational PA when comparing the highest and the lowest levels of activity. For recreational PA and colon cancer risk, three published meta-analyses reported inverse associations. There is robust evidence for mechanisms operating in humans. However, dose-response relationships could not be determined.</td></tr>
<tr><td>Purpose: To examine the relationship between lifestyle factors and colon cancer.</td></tr>
<tr><td>Timeframe: Not reported</td></tr>
<tr><td>Exposure Definition: Total and recreational physical activity.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Incidence, risk, and mortality of colorectal cancer.
Examine Cardiorespiratory Fitness as Outcome: No</td><td></td></tr>
<tr><td>Populations Analyzed: Not reported</td><td>Author-Stated Funding Source: World Cancer Research Fund International</td></tr>
</table>

Table 5. High-Quality Existing Reports Quality Assessment Chart

Report Quality Assessment				
	WCRF, 2017	WCRF, 2015a	WCRF, 2015b	WCRF, 2011
Research question(s) or purpose and inclusion/exclusion criteria or scope delineated prior to search.	No	Yes	Yes	Yes
Inclusion criteria permitted grey literature.	No	No	No	No
Comprehensive search performed.	Partially Yes	Partially Yes	Partially Yes	Partially Yes
Scientific quality of sources documented.	Yes	Yes	Yes	Yes
Limitations reported and discussed.	No	No	No	No
Conclusions substantiated by and logically connected to evidence and findings.	Yes	Yes	Yes	Yes
Recommendations for future research provided.	Yes	No	No	No
Recommendations were relevant to the report and supported by evidence, findings, and conclusions.	Yes	Yes	Yes	No
Potential conflicts of interest explained.	No	No	No	No
Reference list provided.	Yes	Yes	Yes	Yes

Appendices

Appendix A: Analytical Framework

Topic Area
Cancer

Systematic Review Questions

What is the relationship between physical activity and specific cancer incidence?

a. Is there a dose-response relationship? If yes, what is the shape of the relationship?
b. Does the relationship vary by age, sex, race/ethnicity, socio-economic status, or weight status?
c. Does the relationship vary by specific cancer subtypes?
d. Is the relationship present in persons at high risk, such as those with familial predisposition to cancer?

Population
Adults, 18 years and older

Exposure
All types and intensities of physical activity, including lifestyle activities/leisure activities

Comparison
Adults who participate in varying levels of physical activity

Endpoint Health Outcomes
Incidence of cancer

Appendix B: Final Search Strategy

Search Strategy: PubMed (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports)

Database: PubMed; Date of Search: 1/03/2017; 375 results

Set	Search Strategy for Systematic Reviews, Meta-Analyses, and Pooled Analyses
Physical Activity	(("Exercise"[mh] OR "Exercise"[tiab] OR "Physical activity"[tiab] OR "Sedentary lifestyle"[mh]) OR (("Aerobic activities"[tiab] OR "Aerobic activity"[tiab] OR "Cardiovascular activities"[tiab] OR "Cardiovascular activity"[tiab] OR "Endurance activities"[tiab] OR "Endurance activity"[tiab] OR "Energy expenditure"[tiab] OR "Resistance training"[tiab] OR "strength training"[tiab] OR "Sedentary"[tiab] OR "physical conditioning"[tiab] OR "walking"[tiab]) NOT medline[sb]))
Cancer	AND (("neoplasms"[mh]) OR (("Cancer"[tiab] OR "Neoplasm"[tiab] OR "Tumor"[tiab] OR "Carcinogenesis"[tiab] OR "Leukemia"[tiab] OR "Lymphoma"[tiab] OR "Malignan*"[tiab] OR "Blastoma"[tiab] OR "Tumour"[tiab] OR "Melanoma"[tiab] OR "Myeloma"[tiab] OR "Carcinoma"[tiab] OR "Neoplasia"[tiab] OR "Sarcoma"[tiab] OR "Tumors"[tiab] OR "Tumours"[tiab] OR "Neoplasms"[tiab] OR "Adenosarcoma"[tiab] OR "Angiosarcoma"[tiab] OR "Astrocytoma"[tiab] OR "Cholangiocarcinoma"[tiab] OR "Chondrosarcoma"[tiab] OR "Craniopharyngioma"[tiab] OR "Ependymoma"[tiab] OR "Fibrosarcoma"[tiab] OR "Glioma"[tiab] OR "Langerhans Cell Histiocytosis"[tiab] OR "Hodgkin's Disease"[tiab] OR "Leiomyosarcoma"[tiab] OR "Medulloblastoma"[tiab] OR "Mesothelioma"[tiab] OR "Neuroblastoma"[tiab] OR "Rhabdomyosarcoma"[tiab] OR "Osteosarcoma"[tiab]) NOT medline[sb]))
Risk	AND ("risk"[tiab] OR "risks"[tiab] OR "Incidence"[tiab] OR "incident"[tiab] OR "incidents"[tiab] OR “risk”[mh] OR “incidence”[mh])
Limit: Publication Type Include Systematic Reviews, Meta-Analyses, and Pooled Analyses	AND (systematic[sb] OR meta-analysis[pt] OR “systematic review”[tiab] OR “systematic literature review”[tiab] OR metaanalysis[tiab] OR "meta analysis"[tiab] OR metanalyses[tiab] OR "meta analyses"[tiab] OR "pooled analysis"[tiab] OR “pooled analyses”[tiab] OR "pooled data"[tiab])
Limit: Publication Type Exclude	NOT (“comment”[Publication Type] OR “editorial”[Publication Type])
Limit: Language	AND (English[lang])
Limit: Exclude animal only	NOT ("Animals"[Mesh] NOT ("Animals"[Mesh] AND "Humans"[Mesh]))
Limit: Exclude child only	NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) AND "adult"[Mesh]))

Search Strategy: CINAHL (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports)

Database: CINAHL; Date of Search: 1/3/2017; 5 results
All terms searched in title or abstract

Set	Search Strategy for Systematic Reviews, Meta-Analyses, and Pooled Analyses
Physical Activity	(“Aerobic activities" OR "Aerobic activity" OR "Cardiovascular activities" OR "Cardiovascular activity" OR "Endurance activities" OR "Endurance activity" OR "Energy expenditure" OR "Exercise" OR "Physical activity" OR "Resistance training" OR "Sedentary lifestyle" OR "strength training" OR "Sedentary" OR "physical conditioning" OR "walking")
Cancer	AND ("Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignan*" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" OR "Neoplasms" OR "Adenosarcoma" OR "Angiosarcoma" OR "Astrocytoma" OR "Cholangiocarcinoma" OR "Chondrosarcoma" OR "Craniopharyngioma" OR "Ependymoma" OR "Fibrosarcoma" OR "Glioma" OR "Langerhans Cell Histiocytosis" OR "Hodgkin's Disease" OR "Leiomyosarcoma" OR "Medulloblastoma" OR "Mesothelioma" OR "Neuroblastoma" OR "Rhabdomyosarcoma" OR "Osteosarcoma")
Risk	AND ("risk" OR "risks" OR "incidence" OR "incident" OR "incidents")
Publication Type: Systematic Reviews, Meta-Analyses, and Pooled Analyses	AND (“systematic review” OR “systematic literature review” OR metaanalysis OR "meta analysis" OR metanalyses OR "meta analyses"" OR "pooled analysis" OR “pooled analyses” OR "pooled data")
Limits	2006-present English language Peer reviewed Exclude Medline records Human

Search Strategy: Cochrane (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports)

Database: Cochrane; Date of Search: 12/5/16; 37 results
All terms searched in title, abstract, or keywords

Set	Search Strategy for Systematic Reviews, Meta-Analyses, and Pooled Analyses
Physical Activity	(“Aerobic activities" OR "Aerobic activity" OR "Cardiovascular activities" OR "Cardiovascular activity" OR "Endurance activities" OR "Endurance activity" OR "Energy expenditure" OR "Exercise" OR "Physical activity" OR "Resistance

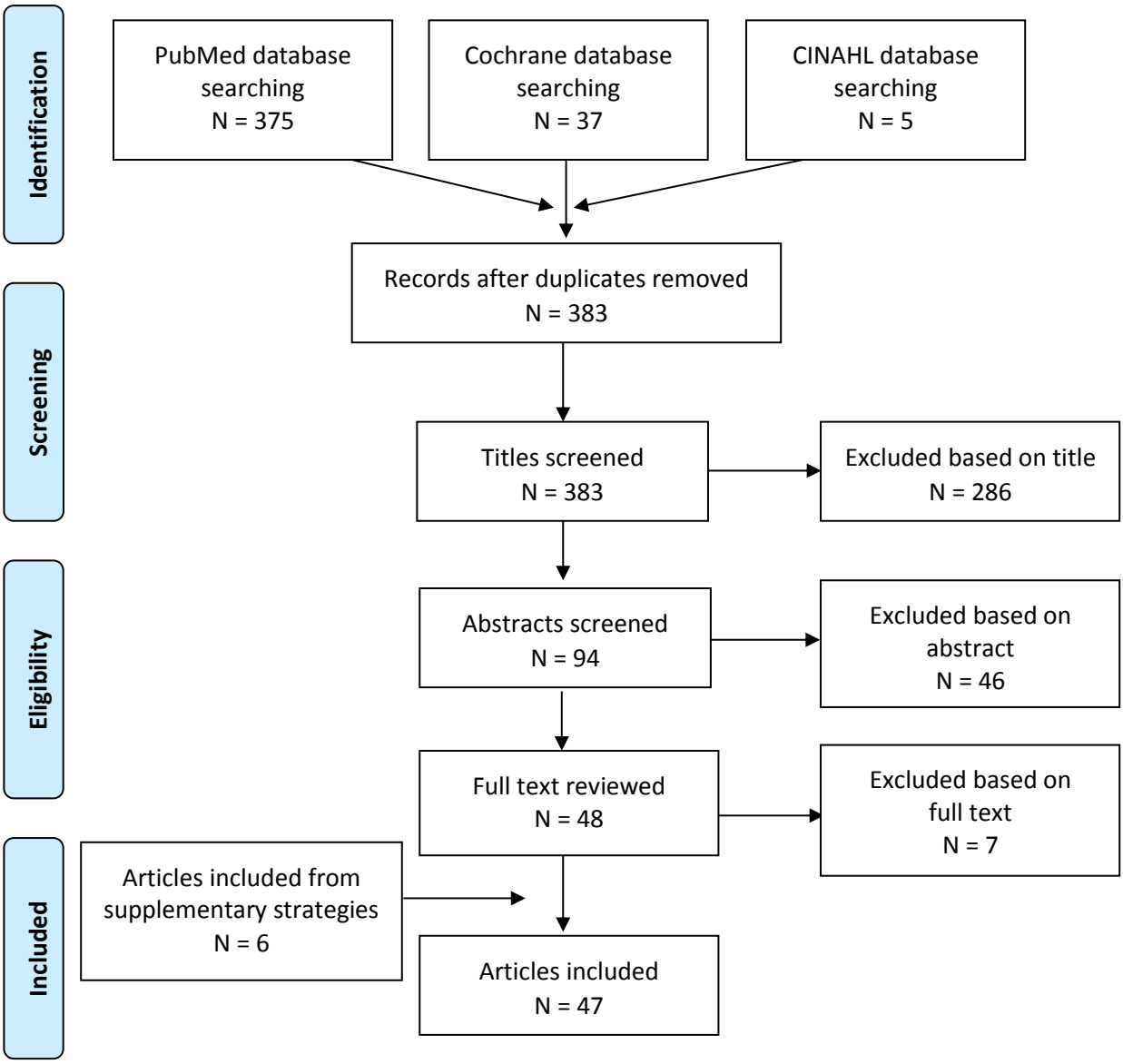
Set	Search Strategy for Systematic Reviews, Meta-Analyses, and Pooled Analyses
	training" OR "Sedentary lifestyle" OR "strength training" OR "Sedentary" OR "physical conditioning" OR "walking")
Cancer	AND ("Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignan*" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" OR "Neoplasms" OR "Adenosarcoma" OR "Angiosarcoma" OR "Astrocytoma" OR "Cholangiocarcinoma" OR "Chondrosarcoma" OR "Craniopharyngioma" OR "Ependymoma" OR "Fibrosarcoma" OR "Glioma" OR "Langerhans Cell Histiocytosis" OR "Hodgkin's Disease" OR "Leiomyosarcoma" OR "Medulloblastoma" OR "Mesothelioma" OR "Neuroblastoma" OR "Rhabdomyosarcoma" OR "Osteosarcoma")
Risk	AND ("risk" OR "risks" OR "incidence" OR "incident" OR "incidents")
Limits	2006–present Word variations not searched Cochrane Reviews and Other Reviews

Supplementary Strategies:

At full text review, members of the Cancer Subcommittee suggested relevant reviews that were not captured by the search strategies, as part of expert consultation. One relevant systematic review by Kyu et al[14], one meta-analysis by Wolin et al[16], and four reports by the World Cancer Research Fund[3, 17, 18, 45] were suggested by the Cancer Subcommittee lead and were included as sources of evidence.

Appendix C: Literature Tree

Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and Reports Literature Tree



Appendix D: Inclusion/Exclusion Criteria

Cancer Subcommittee

What is the relationship between physical activity and specific cancer incidence?

a. Is there a dose-response relationship? If yes, what is the shape of the relationship?
b. Does the relationship vary by age, sex, race/ethnicity, or socio-economic status?
c. Does the relationship vary by specific cancer subtypes?
d. Is the relationship present in persons at high risk, such as those with familial predisposition to cancer?

Category	Inclusion/Exclusion Criteria	Notes/Rationale
Publication Language	**Include:** • Studies published with full text in English	
Publication Status	**Include:** • Studies published in peer-reviewed journals • Reports determined to have appropriate suitability and quality by PAGAC (e.g., World Cancer Research Fund, Institute of Medicine) **Exclude:** • Grey literature, including unpublished data, manuscripts, abstracts, conference proceedings	
Research Type	**Include:** • Original research • Meta-analyses • Systematic reviews • Reports determined to have appropriate suitability and quality by PAGAC	
Study Subjects	**Include:** • Human subjects	
Age of Study Subjects	**Include:** • 18 years of age and above **Exclude:** • Studies with subjects exclusively under 18 years of age	
Date of Publication	**Include:** • Original research, systematic reviews, and meta-analyses published from 2006 to 2016	
Study Design/Type of Research	**Include:** • Prospective cohort studies • Systematic reviews • Meta-analyses • Reports determined to have appropriate suitability and quality by PAGAC (e.g., World Cancer Research Fund, Institute of Medicine)	

	• Randomized controlled trials • Case-control studies **Exclude:** • Non-randomized controlled trials • Retrospective cohort studies • Narrative reviews • Commentaries • Editorials • Cross-sectional studies • Before-and-after studies	
Exposure	**Include studies in which the exposure is:** • All types and intensities of physical activity **Exclude:** • Studies measuring fitness as the only exposure variable • Studies that only measure activities of daily living • Studies of multimodal interventions that do not present data on physical activity alone • Studies with physical activity variable only present as confounding variable • Studies missing physical activity (mental games such as Sudoku instead of physical activities) • Studies of a single, acute bout of exercise • Studies of a specific therapeutic exercise delivered by a medical professional (e.g., physical therapist)	
Outcome	**Include studies in which the outcome is:** • Cancer incidence **Exclude:** • Studies with cancer biomarkers/intermediate endpoints as the outcome • Studies with cancer survival, quality of life, physical function, comorbid conditions, recurrence, or progression as the outcome	

Appendix E: Rationale for Exclusion at Abstract or Full-Text Triage for Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and Reports

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search
Alipour S, Saberi A, Alikhassi A, Bayani L, Hosseini L. Association of mammographic breast density with dairy product consumption, sun exposure, and daily activity. *ISRN Oncol*. 2014;2014:159049. doi:10.1155/2014/159049.		X		
Arem H, Brinton LA, Moore SC, et al. Physical activity and risk of male breast cancer. *Cancer Epidemiol Biomarkers Prev*. 2015;24(12):1898-1901. doi:10.1158/1055-9965.EPI-15-0588.				X
Azevedo e Silva G, de Moura L, Curado MP, et al. The fraction of cancer attributable to ways of life, infections, occupation, and environmental agents in Brazil in 2020. *PLoS One.* 2016;11(2):e0148761. doi:10.1371/journal.pone.0148761.		X		
Babu GR, Lakshmi SB, Thiyagarajan JA. Epidemiological correlates of breast cancer in South India. *Asian Pac J Cancer Prev.* 2013;14(9):5077-5083.			X	
Brenner DR. Cancer incidence due to excess body weight and leisure-time physical inactivity in Canada: implications for prevention. *Prev Med*. 2014;66:131-139. doi:10.1016/j.ypmed.2014.06.018.			X	
Brody JG, Rudel RA, Michels KB, et al. Environmental pollutants, diet, physical activity, body size, and breast cancer: where do we stand in research to identify opportunities for prevention? *Cancer*. 2007;109(suppl 12):2627-2634.		X		
Brown JC, Winters-Stone K, Lee A, Schmitz KH. Cancer, physical activity, and exercise. *Compr Physiol*. 2012;2(4):2775-2809. doi:10.1002/cphy.c120005.		X		
Chlebowski RT. Nutrition and physical activity influence on breast cancer incidence and outcome. *Breast*. 2013;22(suppl 2):S30-S37. doi:10.1016/j.breast.2013.07.006.		X		
Cust AE. Physical activity and gynecologic cancer prevention. *Recent Results Cancer Res*. 2011;186:159-185. doi:10.1007/978-3-642-04231-7_7.		X		
Cuzick J, Thorat MA, Andriole G, et al. Prevention and early detection of prostate cancer. *Lancet Oncol*. 2014;15(11):e484-e492. doi:10.1016/S1470-2045(14)70211-6.			X	
de Vries E, Soerjomataram I, Lemmens VE, et al. Lifestyle changes and reduction of colon cancer incidence in Europe: a scenario study of physical activity promotion and weight reduction. *Eur J Cancer*. 2010;46(14):2605-2616. doi:10.1016/j.ejca.2010.07.040.		X		
Dolor RJ, Patel MR, Melloni C, et al. Noninvasive technologies for the diagnosis of coronary artery disease in women. *AHRQ Comparative Effectiveness Reviews.*Rockville, MD: Agency for Healthcare Research and Quality; 2012. Report No.: 12-EHC034-EF.	X			

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search
Eccles SA, Aboagye EO, Ali S, et al. Critical research gaps and translational priorities for the successful prevention and treatment of breast cancer. *Breast Cancer Res*. 2013;15(5):R92. doi:10.1186/bcr3493.		X		
Fahey PP, Mallitt KA, Astell-Burt T, Stone G, Whiteman DC. Impact of pre-diagnosis behavior on risk of death from esophageal cancer: a systematic review and meta-analysis. *Cancer Causes Control.* 2015;26(10):1365-1373. doi:10.1007/s10552-015-0635-z.	X			
Forman D, Burley VJ. Gastric cancer: global pattern of the disease and an overview of environmental risk factors. *Best Pract Res Clin Gastroenterol.* 2006;20(4):633-649.		X		
Gao Y, Huang YB, Liu XO, et al. Tea consumption, alcohol drinking and physical activity associations with breast cancer risk among Chinese females: a systematic review and meta-analysis. *Asian Pac J Cancer Prev*. 2013;14(12):7543-7550.				X
Gonçalves AK, Dantas Florencio GL, Maisonnette de Atayde Silva MJ, Cobucci RN, Giraldo PC, Cote NM. Effects of physical activity on breast cancer prevention: a systematic review. *J Phys Act Health*. 2014;11(2):445-454. doi:10.1123/jpah.2011-0316.				X
Green AC, Hayman LL, Cooley ME. Multiple health behavior change in adults with or at risk for cancer: a systematic review. *Am J Health Behav*. 2015;39(3):380-394. doi:10.5993/AJHB.39.3.11.	X			
Halle M, Schoenberg MH. Physical activity in the prevention and treatment of colorectal carcinoma. *Dtsch Arztebl Int*. 2009;106(44):722-727. doi:10.3238/arztebl.2009.0722.		X		
Hashibe M, Hunt J, Wei M, Buys S, Gren L, Lee YC. Tobacco, alcohol, body mass index, physical activity, and the risk of head and neck cancer in the prostate, lung, colorectal, and ovarian (PLCO) cohort. *Head Neck*. 2013;35(7):914-922. doi:10.1002/hed.23052.		X		
Hayes J, Richardson A, Frampton C. Population attributable risks for modifiable lifestyle factors and breast cancer in New Zealand women. *Intern Med J.* 2013;43(11):1198-1204. doi:10.1111/imj.12256.		X		
Je Y, Jeon JY, Giovannucci EL, Meyehardt JA. Association between physical activity and mortality in colorectal cancer: a meta-analysis of prospective cohort studies. *Int J Cancer*. 2013;133(8):1905-1913. doi:10.1002/ijc.28208.	X			
Jiao L, Berrington de Gonzalez A, Hartge P, et al. Body mass index, effect modifiers, and risk of pancreatic cancer: a pooled study of seven prospective cohorts. *Cancer Causes Control.* 2010;21(8):1305-1314. doi:10.1007/s10552-010-9558-x.			X	
Keum N, Cao Y, Oh H, et al. Sedentary behaviors and light-intensity activities in relation to colorectal cancer risk. *Int J Cancer*. 2016;138(9):2109-2117. doi:10.1002/ijc.29953.		X		
Koutsokera A, Kiagia M, Saif MW, Souliotis K, Syrigos KN. Nutrition habits, physical activity, and lung cancer: an		X		

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search
authoritative review. *Clin Lung Cancer*. 2013;14(4):342-350. doi:10.1016/j.cllc.2012.12.002.				
Kruk J, Aboul-Enein HY. Physical activity in the prevention of cancer. *Asian Pac J Cancer Prev.* 2006;7(1):11-21.		X		
Latino-Martel P, Cottet V, Druesne-Pecollo N, et al. Alcoholic beverages, obesity, physical activity and other nutritional factors, and cancer risk: a review of the evidence. *Crit Rev Oncol Hematol*. 2016;99:308-323. doi:10.1016/j.critrevonc.2016.01.002.		X		
Li T, Wei S, Shi Y, et al. The dose-response effect of physical activity on cancer mortality: findings from 71 prospective cohort studies. *Br J Sports Med*. 2016;50(6):339-345. doi:10.1136/bjsports-2015-094927.	X			
Li Y, Gu M, Jing F, et al. Association between physical activity and all cancer mortality: dose-response meta-analysis of cohort studies. *Int J Cancer*. 2016;138(4):818-832. doi:10.1002/ijc.29828.	X			
Lin JS, Eder M, Weinmann S, et al. Behavioral counseling to prevent skin cancer: systematic evidence review to update the 2003 U.S. Preventive Services Task Force Recommendation. *U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews*. Rockville, MD: Agency for Healthcare Research and Quality; 2011.			X	
Maisonneuve P, Lowenfels AB. Risk factors for pancreatic cancer: a summary review of meta-analytical studies. *Int J Epidemiol*. 2015;44(1):186-198. doi:10.1093/ije/dyu240.			X	
Markozannes G, Tzoulaki I, Karli D, et al. Diet, body size, physical activity and risk of prostate cancer: an umbrella review of the evidence. *Eur J Cancer*. 2016;69:61-69. doi:10.1016/j.ejca.2016.09.026.		X		
Martin D. Physical activity benefits and risks on the gastrointestinal system. *South Med J.* 2011;104(12):831-837. doi:10.1097/SMJ.0b013e318236c263.		X		
Meads C, Ahmed I, Riley RD. A systematic review of breast cancer incidence risk prediction models with meta-analysis of their performance. *Breast Cancer Res Treat*. 2012;132(2):365-377. doi:10.1007/s10549-011-1818-2.		X		
Mordukhovich I, Reiter PL, Backes DM, et al. A review of African American-white differences in risk factors for cancer: prostate cancer. *Cancer Causes Control*. 2011;22(3):341-357. doi:10.1007/s10552-010-9712-5.		X		
Morrison DS, Batty GD, Kivimaki M, Davey Smith G, Marmot M, Shipley M. Risk factors for colonic and rectal cancer mortality: evidence from 40 years' follow-up in the Whitehall I study. *J Epidemiol Community Health.* 2011;65(11):1053-1058. doi:10.1136/jech.2010.127555.	X			
Namiranian N, Moradi-Lakeh M, Razavi-Ratki SK, Doayie M, Nojomi M. Risk factors of breast cancer in the Eastern Mediterranean Region: a systematic review and meta-analysis. *Asian Pac J Cancer Prev.* 2014;15(21):9535-9541.				X

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search
Olsen CM, Bain CJ, Jordan SJ, et al; Australian Ovarian Cancer Study Group. Recreational physical activity and epithelial ovarian cancer: a case-control study, systematic review, and meta-analysis. *Cancer Epidemiol Biomarkers Prev.* 2007;16(11):2321-2330.				X
Otto SJ, Korfage IJ, Polinder S, et al. Association of change in physical activity and body weight with quality of life and mortality in colorectal cancer: a systematic review and meta-analysis. *Support Care Cancer*. 2015;23(5):1237-1250. doi:10.1007/s00520-014-2480-0.	X			
Park S, Kim Y, Shin HR, et al. Population-attributable causes of cancer in Korea: obesity and physical inactivity. *PLoS One.* 2014;9(4):e90871. doi:10.1371/journal.pone.0090871.			X	
Phung OJ, Coleman CI, Baker EL, et al. Effectiveness of recombinant human growth hormone (rhGH) in the treatment of patients with cystic fibrosis. *AHRQ Comparative Effectiveness Review No. 23.* Rockville, MD: Agency for Healthcare Research and Quality; 2010. AHRQ Publication No. 11-EHC003.	X			
Rajarajeswaran P, Vishnupriya R. Exercise in cancer. *Indian J Med Paediatr Oncol.* 2009;30(2):61-70. doi:10.4103/0971-5851.60050.		X		
Reimers CD, Knapp G, Reimers AK. Does physical activity increase life expectancy? A review of the literature. *J Aging Res.* 2012;2012:243958. doi:10.1155/2012/243958.		X		
Schoenberg MH. Physical activity and nutrition in primary and tertiary prevention of colorectal cancer. *Visc Med*. 2016;32(3):199-204. doi:10.1159/000446492.		X		
Shi Y, Li T, Wang Y, et al. Household physical activity and cancer risk: a systematic review and dose-response meta-analysis of epidemiological studies. *Sci Rep*. 2015;5:14901. doi:10.1038/srep14901.				
Tay L, Tan K, Diener E, Gonzalez E. Social relations, health behaviors, and health outcomes: a survey and synthesis. *Appl Psychol Health Well Being*. 2013;5(1):28-78. doi:10.1111/aphw.12000.		X		
Volaklis KA, Halle M, Tokmakidis SP. Exercise in the prevention and rehabilitation of breast cancer. *Wien Klin Wochenschr.* 2013;125(11-12):297-301. doi:10.1007/s00508-013-0365-8.		X		
Wang D, Zheng W, Wang SM, et al. Estimation of cancer incidence and mortality attributable to overweight, obesity, and physical inactivity in China. *Nutr Cancer*. 2012;64(1):48-56. doi:10.1080/01635581.2012.630166.		X		
Wigle DT, Turner MC, Gomes J, Parent ME. Role of hormonal and other factors in human prostate cancer. *J Toxicol Environ Health B Crit Rev*. 2008;11(3-4):242-259. doi:10.1080/10937400701873548.		X		
Wilson LF, Page AN, Dunn NA, Pandeya N, Protani MM, Taylor RJ. Population attributable risk of modifiable risk factors associated with invasive breast cancer in women aged 45-69 years in Queensland, Australia. *Maturitas*.			X	

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search
2013;76(4):370-376. doi:10.1016/j.maturitas.2013.09.002.				
Winzer BM, Whiteman DC, Reeves MM, Paratz JD. Physical activity and cancer prevention: a systematic review of clinical trials. *Cancer Causes Control*. 2011;22(6):811-826. doi:10.1007/s10552-011-9761-4.	X			
Wiseman M. The second World Cancer Research Fund/American Institute for Cancer Research expert report. Food, nutrition, physical activity, and the prevention of cancer: a global perspective. *Proc Nutr Soc*. 2008;67(3):253-256. doi:10.1017/S002966510800712X.		X		
Zhou LM. Recreational physical activity and risk of ovarian cancer: a meta-analysis. *Asian Pac J Cancer Prev.* 2014;15(13):5161-5166.				X

References

1. Keimling M, Behrens G, Schmid D, Jochem C, Leitzmann MF. The association between physical activity and bladder cancer: systematic review and meta-analysis. *Br J Cancer*. 2014;110(7):1862-1870. doi:10.1038/bjc.2014.77.

2. Moore SC, Lee IM, Weiderpass E, et al. Association of leisure-time physical activity with risk of 26 types of cancer in 1.44 million adults. *JAMA Intern Med*. 2016;176(6):816-825. doi:10.1001/jamainternmed.2016.1548.

3. World Cancer Research Fund International, American Institute for Cancer Research. *Continuous Update Project Report: Diet, Nutrition, Physical Activity and Bladder Cancer*; 2015a. http://www.wcrf.org/bladder-cancer-2015. Accessed January 16, 2018.

4. Niedermaier T, Behrens G, Schmid D, Schlecht I, Fischer B, Leitzmann MF. Body mass index, physical activity, and risk of adult meningioma and glioma: a meta-analysis. *Neurology*. 2015;85(15):1342-1350. doi:10.1212/WNL.0000000000002020.

5. Liu L, Shi Y, Li T, et al. Leisure time physical activity and cancer risk: evaluation of the WHO's recommendation based on 126 high-quality epidemiological studies. *Br J Sports Med*. 2016;50(6):372-378. doi:10.1136/bjsports-2015-094728.

6. Neilson HK, Farris MS, Stone CR, et al. Moderate-vigorous recreational physical activity and breast cancer risk, stratified by menopause status: a systematic review and meta-analysis. *Menopause*. 2017;24(3):322-344. doi: 10.1097/GME.0000000000000745.

7. Pizot C, Boniol M, Mullie P, et al. Physical activity, hormone replacement therapy and breast cancer risk: a meta-analysis of prospective studies. *Eur J Cancer*. 2016;52:138-154. doi:10.1016/j.ejca.2015.10.063.

8. Wu Y, Zhang D, Kang S. Physical activity and risk of breast cancer: a meta-analysis of prospective studies. *Breast Cancer Res Treat*. 2013;137(3):869-882. doi:10.1007/s10549-012-2396-7.

9. Gong Z, Hong CC, Bandera EV, et al. Vigorous physical activity and risk of breast cancer in the African American breast cancer epidemiology and risk consortium. *Breast Cancer Res Treat*. 2016;159(2):347-356. doi:10.1007/s10549-016-3936-3.

10. Pham NM, Mizoue T, Tanaka K, et al; Research Group for the Development and Evaluation of Cancer Prevention Strategies in Japan. Physical activity and colorectal cancer risk: an evaluation based on a systematic review of epidemiologic evidence among the Japanese population. *Jpn J Clin Oncol*. 2012;42(1):2-13. doi:10.1093/jjco/hyr160.

11. Boyle T, Keegel T, Bull F, Heyworth J, Fritschi L. Physical activity and risks of proximal and distal colon cancers: a systematic review and meta-analysis. *J Natl Cancer Inst*. 2012;104(20):1548-1561. doi:10.1093/jnci/djs354.

12. Harriss DJ, Atkinson G, Batterham A, et al; Colorectal Cancer, Lifestyle, Exercise And Research Group. Lifestyle factors and colorectal cancer risk (2): a systematic review and meta-analysis of associations with leisure-time physical activity. *Colorectal Dis*. 2009;11(7):689-701. doi:10.1111/j.1463-1318.2009.01767.x.

13. Johnson CM, Wei C, Ensor JE, et al. Meta-analyses of colorectal cancer risk factors. *Cancer Causes Control*. 2013;24(6):1207-1222. doi:10.1007/s10552-013-0201-5.

14. Kyu HH, Bachman VF, Alexander LT, et al. Physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events: systematic review and dose-response meta-analysis for the Global Burden of Disease Study 2013. *BMJ*. 2016;354:i3857. doi:10.1136/bmj.i3857.

15. Robsahm TE, Aagnes B, Hjartaker A, Langseth H, Bray FI, Larsen IK. Body mass index, physical activity, and colorectal cancer by anatomical subsites: a systematic review and meta-analysis of cohort studies. *Eur J Cancer Prev*. 2013;22(6):492-505. doi:10.1097/CEJ.0b013e328360f434.

16. Wolin KY, Yan Y, Colditz GA, Lee IM. Physical activity and colon cancer prevention: a meta-analysis. *Br J Cancer*. 2009;100(4):611-616. doi:10.1038/sj.bjc.6604917.

17. World Cancer Research Fund International, American Institute for Cancer Research. *Continuous Update Project Report: Food, Nutrition, Physical Activity, and the Prevention of Colorectal Cancer*. http://www.wcrf.org/sites/default/files/Colorectal-Cancer-2011-Report.pdf. Published 2011. Accessed October 11, 2017.

18. World Cancer Research Fund International, American Institute for Cancer Research. *Continuous Update Project Report: Diet, Nutrition, Physical Activity and Colorectal Cancer*. http://www.aicr.org/continuous-update-project/reports/colorectal-cancer-2017-report.pdf. Published 2017. Accessed October 11, 2017.

19. Keum N, Ju W, Lee DH, et al. Leisure-time physical activity and endometrial cancer risk: dose-response meta-analysis of epidemiological studies. *Int J Cancer*. 2014;135(3):682-694. doi:10.1002/ijc.28687.

20. Moore SC, Gierach GL, Schatzkin A, Matthews CE. Physical activity, sedentary behaviours, and the prevention of endometrial cancer. *Br J Cancer*. 2010;103(7):933-938. doi:10.1038/sj.bjc.6605902.

21. Schmid D, Behrens G, Keimling M, Jochem C, Ricci C, Leitzmann M. A systematic review and meta-analysis of physical activity and endometrial cancer risk. *Eur J Epidemiol*. 2015;30(5):397-412. doi:10.1007/s10654-015-0017-6.

22. Behrens G, Jochem C, Keimling M, Ricci C, Schmid D, Leitzmann MF. The association between physical activity and gastroesophageal cancer: systematic review and meta-analysis. *Eur J Epidemiol*. 2014;29(3):151-170. doi:10.1007/s10654-014-9895-2.

23. Chen Y, Yu C, Li Y. Physical activity and risks of esophageal and gastric cancers: a meta-analysis. *PLoS One*. 2014;9(2):e88082. doi:10.1371/journal.pone.0088082.

24. Singh S, Devanna S, Edakkanambeth Varayil J, Murad MH, Iyer PG. Physical activity is associated with reduced risk of esophageal cancer, particularly esophageal adenocarcinoma: a systematic review and meta-analysis. *BMC Gastroenterol*. 2014;14:101. doi:10.1186/1471-230X-14-101.

25. Abioye AI, Odesanya MO, Abioye AI, Ibrahim NA. Physical activity and risk of gastric cancer: a meta-analysis of observational studies. *Br J Sports Med*. 2015;49(4):224-229. doi:10.1136/bjsports-2013-092778.

26. Psaltopoulou T, Ntanasis-Stathopoulos I, Tzanninis IG, Kantzanou M, Georgiadou D, Sergentanis TN. Physical activity and gastric cancer risk: a systematic review and meta-analysis. *Clin J Sport Med*. 2016;26(6):445-464.

27. Singh S, Edakkanambeth Varayil J, Devanna S, Murad MH, Iyer PG. Physical activity is associated with reduced risk of gastric cancer: a systematic review and meta-analysis. *Cancer Prev Res (Phila)*. 2014;7(1):12-22. doi:10.1158/1940-6207.CAPR-13-0282.

28. Nicolotti N, Chuang SC, Cadoni G, et al. Recreational physical activity and risk of head and neck cancer: a pooled analysis within the international head and neck cancer epidemiology (INHANCE) Consortium. *Eur J Epidemiol*. 2011;26(8):619-628. doi:10.1007/s10654-011-9612-3.

29. Jochem C, Leitzmann MF, Keimling M, Schmid D, Behrens G. Physical activity in relation to risk of hematologic cancers: a systematic review and meta-analysis. *Cancer Epidemiol Biomarkers Prev*. 2014;23(5):833-846. doi:10.1158/1055-9965.EPI-13-0699.

30. Vermaete NV, Wolter P, Verhoef GE, et al. Physical activity and risk of lymphoma: a meta-analysis. *Cancer Epidemiol Biomarkers Prev*. 2013;22(7):1173-1184. doi:10.1158/1055-9965.EPI-13-0182.

31. Aschebrook-Kilfoy B, Cocco P, La Vecchia C, et al. Medical history, lifestyle, family history, and occupational risk factors for mycosis fungoides and Sézary syndrome: the InterLymph Non-Hodgkin Lymphoma Subtypes Project. *J Natl Cancer Inst Monogr*. 2014;2014(48):98-105. doi:10.1093/jncimonographs/lgu008.

32. Brenner DR, Yannitsos DH, Farris MS, Johansson M, Friedenreich CM. Leisure-time physical activity and lung cancer risk: a systematic review and meta-analysis. *Lung Cancer*. 2016;95:17-27. doi:10.1016/j.lungcan.2016.01.021.

33. Buffart LM, Singh AS, van Loon EC, Vermeulen HI, Brug J, Chinapaw MJ. Physical activity and the risk of developing lung cancer among smokers: a meta-analysis. *J Sci Med Sport*. 2014;17(1):67-71. doi:10.1016/j.jsams.2013.02.015.

34. Schmid D, Ricci C, Behrens G, Leitzmann MF. Does smoking influence the physical activity and lung cancer relation? A systematic review and meta-analysis. *Eur J Epidemiol*. 2016;31(12):1173-1190. doi:10.1007/s10654-016-0186-y.

35. Sun JY, Shi L, Gao XD, Xu SF. Physical activity and risk of lung cancer: a meta-analysis of prospective cohort studies. *Asian Pac J Cancer Prev*. 2012;13(7):3143-3147.

36. Zhong S, Ma T, Chen L, et al. Physical activity and risk of lung cancer: a meta-analysis. *Clin J Sport Med*. 2016;26(3):173-181. doi:10.1097/JSM.0000000000000219.

37. Zhong S, Chen L, Lv M, Ma T, Zhang X, Zhao J. Nonoccupational physical activity and risk of ovarian cancer: a meta-analysis. *Tumour Biol*. 2014;35(11):11065-11073. doi:10.1007/s13277-014-2385-z.

38. Cannioto R, LaMonte MJ, Risch HA, et al. Chronic recreational physical inactivity and epithelial ovarian cancer risk: evidence from the Ovarian Cancer Association Consortium. *Cancer Epidemiol Biomarkers Prev*. 2016;25(7):1114-1124. doi:10.1158/1055-9965.EPI-15-1330.

39. Bao Y, Michaud DS. Physical activity and pancreatic cancer risk: a systematic review. *Cancer Epidemiol Biomarkers Prev*. 2008;17(10):2671-2682. doi:10.1158/1055-9965.EPI-08-0488.

40. Behrens G, Jochem C, Schmid D, Keimling M, Ricci C, Leitzmann MF. Physical activity and risk of pancreatic cancer: a systematic review and meta-analysis. *Eur J Epidemiol*. 2015;30(4):279-298. doi:10.1007/s10654-015-0014-9.

41. Farris MS, Mosli MH, McFadden AA, Friedenreich CM, Brenner DR. The association between leisure time physical activity and pancreatic cancer risk in adults: a systematic review and meta-analysis. *Cancer Epidemiol Biomarkers Prev*. 2015;24(10):1462-1473. doi:10.1158/1055-9965.EPI-15-0301.

42. O'Rorke MA, Cantwell MM, Cardwell CR, Mulholland HG, Murray LJ. Can physical activity modulate pancreatic cancer risk? A systematic review and meta-analysis. *Int J Cancer*. 2010;126(12):2957-2968. doi:10.1002/ijc.24997.

43. Liu Y, Hu F, Li D, et al. Does physical activity reduce the risk of prostate cancer? A systematic review and meta-analysis. *Eur Urol*. 2011;60(5):1029-1044. doi:10.1016/j.eururo.2011.07.007.

44. Behrens G, Leitzmann MF. The association between physical activity and renal cancer: systematic review and meta-analysis. *Br J Cancer*. 2013;108(4):798-811. doi:10.1038/bjc.2013.37.

45. World Cancer Research Fund International, American Institute for Cancer Research. *Continuous Update Project Report: Diet, Nutrition, Physical Activity and Kidney Cancer*; 2015b. http://www.wcrf.org/kidney-cancer-2015. Accessed January 16, 2018.

46. Schmid D, Behrens G, Jochem C, Keimling M, Leitzmann M. Physical activity, diabetes, and risk of thyroid cancer: a systematic review and meta-analysis. *Eur J Epidemiol*. 2013;28(12):945-958. doi:10.1007/s10654-013-9865-0.

47. Kitahara CM, Platz EA, Beane Freeman LE, et al. Physical activity, diabetes, and thyroid cancer risk: a pooled analysis of five prospective studies. *Cancer Causes Control*. 2012;23(3):463-471. doi:10.1007/s10552-012-9896-y.