Evidence Portfolio – Sedentary Subcommittee, Question 4

What is the relationship between sedentary behavior and (1) type 2 diabetes, (2) weight status, (3) cardiovascular disease, and (4) cancer?

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. Is the relationship independent of levels of light, moderate, or vigorous physical activity?
d. Is there any evidence that bouts or breaks in sedentary behavior are important factors?

Sources of Evidence: Existing Systematic Reviews, Meta-Analyses, and Original Research

Conclusion Statements and Grades

TYPE 2 DIABETES

Strong evidence demonstrates a significant relationship between greater time spent in sedentary behavior and higher risk of type 2 diabetes. **PAGAC Grade: Strong.**

Limited evidence suggests the existence of a direct, graded dose-response relationship between sedentary behavior and risk of type 2 diabetes. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether the relationship between sedentary behavior and type 2 diabetes varies by age, sex/ethnicity, socioeconomic status, or weight status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the relationship between sedentary behavior and type 2 diabetes varies by amount of moderate-to-vigorous physical activity. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether bouts or breaks in sedentary behavior are important factors in the relationship between sedentary behavior and incidence of type 2 diabetes. **PAGAC Grade: Not assignable.**

WEIGHT STATUS

Limited evidence suggests a positive relationship between greater time spent in sedentary behavior and higher levels of adiposity and indicators of weight status. **PAGAC Grade: Limited.**

Limited evidence suggests the existence of a direct, graded dose-response relationship between greater sedentary behavior and higher levels of adiposity and indicators of weight status. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether the relationship between sedentary behavior and weight status varies by age, sex/ethnicity, socioeconomic status, or baseline weight status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the relationship between sedentary behavior and weight status varies by amount of moderate-to-vigorous physical activity. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether bouts or breaks in sedentary behavior are important factors in the relationship between sedentary behavior and weight status. **PAGAC Grade: Not assignable.**

CARDIOVASCULAR DISEASE

Strong evidence demonstrates a significant relationship between greater time spent in sedentary behavior and higher risk of incident cardiovascular disease. **PAGAC Grade: Strong.**

Strong evidence demonstrates the existence of a direct, graded dose-response relationship between sedentary behavior and risk of incident cardiovascular disease. **PAGAC Grade: Strong.**

Insufficient evidence is available to determine whether the relationship between sedentary behavior and incident cardiovascular disease varies by age, sex/ethnicity, socioeconomic status, or weight status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the relationship between sedentary behavior and incident cardiovascular disease varies by amount of moderate-to-vigorous physical activity. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether bouts or breaks in sedentary behavior are important factors in the relationship between sedentary behavior and incidence of cardiovascular disease. **PAGAC Grade: Not assignable.**

CANCER

Moderate evidence indicates a significant relationship between greater time spent in sedentary behavior and higher risk of incident endometrial, colon, and lung cancers. **PAGAC Grade: Moderate.**

Limited evidence suggests the existence of a direct dose-response relationship between sedentary behavior and incident endometrial, colon, and lung cancers. **PAGAC Grade: Limited.**

Insufficient evidence is available to determine whether the relationship between sedentary behavior and incident cancer varies by age, sex/ethnicity, socioeconomic status, or weight status. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether the relationship between sedentary behavior and incident cancer varies by amount of moderate-to-vigorous physical activity. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether bouts or breaks in sedentary behavior are important factors in the relationship between sedentary behavior and incident cancer. **PAGAC Grade: Not assignable.**

Description of the Evidence

An initial search for systematic reviews, meta-analyses, pooled analyses, and reports did not identify sufficient literature to fully answer the research question as determined by the Sedentary Subcommittee. A supplementary search for original research was conducted to capture the most recent literature.

TYPE 2 DIABETES

Existing Systematic Reviews and Meta-Analyses

Overview

A total of 5 existing reviews were included: 2 systematic reviews[1, 2] and 3 meta-analyses.[3-5] The reviews were published from 2011 to 2015.

One systematic review included 3 studies,[2] while the other included 2 studies that examined risk of type 2 diabetes. Reviews covered the following timeframes: from 1989 to February 2010[1] and 1996 to January 2011.[2]

The meta-analyses included a range of 4 to 10 studies that examined risk of type 2 diabetes. Meta-analyses covered the following timeframes: from inception to August 2014,[3] inception to January 2012,[5] and 1970 to March 2010.[4]

Exposures

All of the included reviews examined participants' self-reported sedentary behavior. Three reviews[2, 3, 5] examined sitting and TV viewing time. Grontved and Hu[4] only examined TV viewing time or screen time. Proper et al[1] included driving, objectively measured sedentary behavior, time spent sitting outside work, and sedentary work.

Outcomes

All of the included reviews examined risk of type 2 diabetes.

Original Research

Overview

Eight original research studies were included as sources of evidence.[6-13] All of the included studies were prospective cohort studies and were published between 2014 and 2017.

Three of the studies were conducted in the United States,[8-10] 1 in the United Kingdom,[13] 1 in India,[6] 1 in Denmark,[12] 1 in Australia,[11] and 1 in Norway.[7] The analytic sample size ranged from 1,718 to 88,829.

Exposures

The majority of the studies assessed participants' self-reported sedentary behavior. Of these studies, 1 specifically assessed participants' television or video viewing time.[13] Joseph et al[9] examined television viewing and total leisure sedentary time defined as the sum of reading and television time.

One study by Barone Gibbs et al[8] measured sedentary behavior objectively with an accelerometer.

Outcomes

The included studies examined the relationship between sedentary behavior and risk of type 2 diabetes.

WEIGHT STATUS

Existing Systematic Reviews and Meta-Analyses

Overview

A total of 2 systematic reviews were included.[1, 2] Each systematic review included 10 studies related to weight status. Reviews covered the following timeframes: from 1989 to February 2010[1] and 1996 to January 2011.[2]

Exposures

Both reviews examined participants' self-reported sedentary behavior. Both reviews included total sitting time, TV viewing time, and other screen-time behaviors. Proper et al[1] also included driving, objectively measured sedentary behavior, time spent sitting outside work, and sedentary work.

Outcomes

Both included reviews addressed body weight-related measures such as weight gain and obesity.

Original Research

Overview

Fourteen original research studies were included as sources of evidence.[14-27] All of the included studies were prospective cohort studies and were published between 2014 and 2017.

None of the studies were conducted in the United States. Three were in the United Kingdom,[15, 17, 23] 2 in Australia,[22, 27] 2 in Finland,[18, 19] 1 in Netherlands,[14] 1 in Brazil,[16] 1 in Denmark,[21] 1 in China,[24] and 1 in Sweden.[25] Two did not report the location.[20, 26] The analytic sample size ranged from 85 to 15,050.

Exposures

The majority of the studies assessed participants' self-reported sedentary behavior. Of these studies, 6 specifically assessed participants' television or video viewing time.[16, 18, 22, 23, 26, 27] One assessed overall screen time[19]; one assessed daily computer use[25]; and another assessed TV viewing, computer use, and reading time.[20]

Three studies used accelerometers to objectively measure sedentary behaviors.[16, 17, 26]

Outcomes

All of the studies addressed adiposity or weight status measured by BMI, change in BMI, body weight gain, and/or waist circumference as an outcome. Two studies also measured percentage of body fat using bio electrical impedance.[17, 20]

CARDIOVASCULAR DISEASE

Existing Systematic Reviews and Meta-Analyses

Overview

A total of 5 existing reviews were included: 1 systematic review[2] and 4 meta-analyses.[3-5, 28] The reviews were published from 2011 to 2016.

The systematic review by Thorp et al[2] included 1 study that examined risk of cardiovascular disease and covered 1996 to January 2011.

The meta-analyses included a range of 3 to 9 studies that examined risk of cardiovascular disease. Meta-analyses covered the following timeframes: from inception to July 2015,[28] from inception to August 2014,[3] inception to January 2012,[5] and 1970 to March 2010.[4]

Exposures

All of the included reviews examined sedentary behavior. Three reviews[2, 3, 5] examined sitting and TV viewing time. Grontved and Hu[4] only examined TV viewing or screen time and Pandey et al[28] only examined sitting time.

Outcomes

All of the included reviews examined risk of cardiovascular disease.

Original Research

Overview

Six original research studies were included as sources of evidence.[29-34] All of the included studies were prospective cohort studies and were published between 2014 and 2016.

Three of the studies were conducted in the United States,[30, 31, 34] 2 in Denmark,[32, 33] and 1 in Finland.[29] The analytic sample size ranged from 4,516 to 88,940.

Exposures

All of the studies assessed participants' self-reported sedentary behavior. Two of the studies specifically assessed participants' television or video viewing time,[30, 31] 1 study assessed participants' occupational sitting,[32] and 1 study assessed time spent traveling in a motor vehicle. Petersen et al[33] examined total sitting time including time spent traveling in a motor vehicle.

Outcomes

The included studies examined the relationship between sedentary behavior and cardiovascular disease. Three studies examined incident coronary heart disease,[30, 32, 33] 1 examined incident stroke,[31] 1 examined incident myocardial infarction,[33] 1 examined incident heart failure,[34] and 1 examined incident fatal and nonfatal cardiovascular disease.[29]

CANCER

Existing Systematic Reviews and Meta-Analyses

Overview

A total of 8 existing reviews were included: 4 systematic reviews[1, 2, 35, 36] and 4 meta-analyses.[3, 37-39] The reviews were published from 2010 to 2015.

The systematic reviews included a range of 2 to 11 studies that examined risk of cancer. Reviews covered the following timeframes: inception to December 2009,[36] 1980 to June 2010,[35] 1989 to February 2010[1] and 1996 to January 2011.[2]

The meta-analyses included a range of 7 to 43 studies that examined risk of cancer. Meta-analyses covered the following timeframe: inception to February 2014,[37] inception to March 2014,[38] inception to August 2014,[3] and inception to September 2014.[39]

Exposures

All of the included reviews examined sedentary behavior including sitting time. The majority of reviews also included TV viewing. Some reviews addressed sedentary behavior in specific domains such as occupational,[1, 37] and occupational and leisure-time.[38, 39] Proper et al[1] also included transportation (driving).

Outcomes

All of the included reviews examined risk of cancer.

Original Research

Overview

Six original research studies were included as sources of evidence.[40-45] All of the included studies were prospective cohort studies and were published between 2014 and 2016.

Five of the studies were conducted in the United States.[40-43, 45] The other study was conducted in Canada.[44] The analytic sample size ranged from 3,299 to 170,481.

Exposures

All of the studies assessed participants' self-reported sedentary time, including sitting and TV viewing time. Of these studies, 2 specifically assessed participants' daily leisure time sitting.[40, 43] Nomura et al[42] also assessed sitting time at work.

Outcomes

The included studies examined the relationship between sedentary behavior and total cancer and site-specific cancers,[43] breast cancer,[42, 44] ovarian cancer,[40] prostate cancer,[41] and lung cancer.[45]

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
Altenburg, 2014			Adults 30–50			Semi-rural
Anjana, 2015	Male, Female	Asian Indian	Adults ≥20			
Asvold, 2017			Adults ≥20	Obese (BMI: ≥30)		
Barone Gibbs, 2015			Adults 38–50			
Bell, 2014			Adults mean age 56			
Biswas, 2015			Adults			
Borodulin, 2015			Adults 25–74			
Catsburg, 2014	Female			Underweight (BMI: Below 18.5), Normal/Healthy Weight (BMI: 18.5–24.9), Overweight and Obese		Pre and post-menopausal
Chomistek, 2015	Female		Adults 27–44			
Florencio, 2015	Female		Adults 18–45			Low income
Golubic, 2015			Adults mean age 41.3			
Grontved, 2011			Adults			
Helajarvi, 2014			Adults 33–50			
Hildebrand, 2015	Female		Adults 50–74			Post-menopausal
Joseph, 2016		White, Black or African American, Chinese-American, Hispanic or Latino	Adults 45–84			Family history of diabetes
Kaikkonen, 2015	Male, Female		Adults 24–27; 30–39			
Lynch, 2010			Adults			
Lynch, 2014	Male		Adults 50–71	Normal/Healthy Weight (BMI:		

	Sex	Race/ Ethnicity	Age	Weight Status	Chronic Conditions	Other
				18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30)		
Manini, 2014	Female		Adults 50–79	Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30)		Post-menopausal
McDonnell, 2016			Adults ≥45			
Menai, 2016			Adults 45–65			
Moller, 2016	Male, Female		Adults 18-59			
Moore, 2010	Female		Adults			
Nguyen, 2017			Adults ≥45	Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30)		
Nomura, 2016	Female	Black or African American	Adults 21–69	Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30)		Menopausal status; hormone receptor status
Pandey, 2016			Adults ≥18			
Patel, 2015	Male, Female		Adults 50-74			
Petersen, 2014	Male, Female		Adults 18–99			
Petersen, 2016	Male, Female		Adults ≥18	Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9), Obese (BMI: ≥30)		
Proper, 2011			Adults			
Saidj, 2016			Adults 18–69			
Schmid, 2014	Male, Female		Adults			
Shen, 2014			Adults			
Shibata, 2016			Adults 25–74			

	Sex	Race/ Ethnicity	Age	Weight Status	Chronic Conditions	Other
Smith, 2014			Adults mean age 65			
Smith, 2015			Adults mean age 65			
Su, 2017	Male, Female		Adults 18–60			
Thomee, 2015	Male, Female		Adults 20–24	Underweight (BMI: Below 18.5), Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: 30 and above)		
Thorp, 2011			Adults			
Wang, 2016	Female		Adults 50–79			Post-menopausal
Wijndaele, 2014			Adults 30–50			
Wilmot, 2012			Adults ≥18			
Wiseman, 2014	Female		Adults ≥55			Post-menopausal
Young, 2014	Male	White, Black or African American, Asian, Hispanic or Latino	Adults 45–69	Normal/Healthy Weight (BMI: 18.5-24.9), Overweight and Obese	Heart Disease, Hypertension	
Zhou, 2015	Female		Not reported			Menopause state

Supporting Evidence

Existing Systematic Reviews and Meta-Analyses

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

<table>
<tr><th colspan="2">Cancer, Cardiovascular Disease</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Biswas A, Oh PI, Faulkner GE, et al. Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults: A systematic review and meta-analysis. Ann Intern Med. 2015;162(2):123-132. doi:10.7326/M14-1651.</td></tr>
<tr><td>Purpose: To quantify the association between sedentary time and hospitalizations, all-cause mortality, cardiovascular disease (CVD), diabetes, and cancer in adults independent of PA.</td><td rowspan="5">Abstract: BACKGROUND: The magnitude, consistency, and manner of association between sedentary time and outcomes independent of physical activity remain unclear. PURPOSE: To quantify the association between sedentary time and hospitalizations, all-cause mortality, cardiovascular disease, diabetes, and cancer in adults independent of physical activity. DATA SOURCES: English-language studies in MEDLINE, PubMed, EMBASE, CINAHL, Cochrane Library, Web of Knowledge, and Google Scholar databases were searched through August 2014 with hand-searching of in-text citations and no publication date limitations. STUDY SELECTION: Studies assessing sedentary behavior in adults, adjusted for physical activity and correlated to at least 1 outcome. DATA EXTRACTION: Two independent reviewers performed data abstraction and quality assessment, and a third reviewer resolved inconsistencies. DATA SYNTHESIS: Forty-seven articles met our eligibility criteria. Meta-analyses were performed on outcomes for cardiovascular disease and diabetes (14 studies), cancer (14 studies), and all-cause mortality (13 studies). Prospective cohort designs were used in all but 3 studies; sedentary times were quantified using self-report in all but 1 study. Significant hazard ratio (HR) associations were found with all-cause mortality (HR, 1.240 [95% CI, 1.090 to 1.410]), cardiovascular disease mortality (HR, 1.179 [CI, 1.106 to 1.257]), cardiovascular disease incidence (HR, 1.143 [CI, 1.002 to 1.729]), cancer mortality (HR, 1.173 [CI, 1.108 to 1.242]), cancer incidence (HR, 1.130 [CI, 1.053 to 1.213]), and type 2 diabetes incidence (HR, 1.910 [CI, 1.642 to 2.222]). Hazard ratios associated with sedentary time and outcomes were generally more pronounced at lower levels of physical activity than at higher levels. LIMITATION: There was marked heterogeneity in research designs and the assessment of sedentary time and physical activity. CONCLUSION: Prolonged sedentary time was independently associated with deleterious health outcomes regardless of physical activity.</td></tr>
<tr><td>Timeframe: Inception–2014</td></tr>
<tr><td>Total # of Studies: 41</td></tr>
<tr><td>Author's Definition of Sedentary: A distinct class of waking behaviors characterized by little physical movement and low energy expenditure (≤1.5 metabolic equivalents), including sitting, television watching, and reclined posture.</td></tr>
<tr><td>Outcomes Addressed: All-cause mortality, CVD mortality, CVD, cancer mortality, type 2 diabetes.</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: No funding source used</td></tr>
</table>

<table>
<tr><th colspan="2">Cardiovascular Disease, Type 2 Diabetes</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Grontved A, Hu FB. Television viewing and risk of type 2 diabetes, cardiovascular disease, and all-cause mortality: A meta-analysis. JAMA. 2011;305(23):2448-2455. doi:10.1001/jama.2011.812.</td></tr>
<tr><td>Purpose: To determine the association between TV viewing and type 2 diabetes, nonfatal or fatal cardiovascular disease (CVD), and all-cause mortality, and to quantify the dose-response relationship of TV viewing with the risk of these health outcomes.</td><td rowspan="5">Abstract: CONTEXT: Prolonged television (TV) viewing is the most prevalent and pervasive sedentary behavior in industrialized countries and has been associated with morbidity and mortality. However, a systematic and quantitative assessment of published studies is not available. OBJECTIVE: To perform a meta-analysis of all prospective cohort studies to determine the association between TV viewing and risk of type 2 diabetes, fatal or nonfatal cardiovascular disease, and all-cause mortality. DATA SOURCES AND STUDY SELECTION: Relevant studies were identified by searches of the MEDLINE database from 1970 to March 2011 and the EMBASE database from 1974 to March 2011 without restrictions and by reviewing reference lists from retrieved articles. Cohort studies that reported relative risk estimates with 95% confidence intervals (CIs) for the associations of interest were included. DATA EXTRACTION: Data were extracted independently by each author and summary estimates of association were obtained using a random-effects model. DATA SYNTHESIS: Of the 8 studies included, 4 reported results on type 2 diabetes (175,938 individuals; 6,428 incident cases during 1.1 million person-years of follow-up), 4 reported on fatal or nonfatal cardiovascular disease (34,253 individuals; 1,052 incident cases), and 3 reported on all-cause mortality (26,509 individuals; 1879 deaths during 202,353 person-years of follow-up). The pooled relative risks per 2 hours of TV viewing per day were 1.20 (95% CI, 1.14-1.27) for type 2 diabetes, 1.15 (95% CI, 1.06-1.23) for fatal or nonfatal cardiovascular disease, and 1.13 (95% CI, 1.07-1.18) for all-cause mortality. While the associations between time spent viewing TV and risk of type 2 diabetes and cardiovascular disease were linear, the risk of all-cause mortality appeared to increase with TV viewing duration of greater than 3 hours per day. The estimated absolute risk differences per every 2 hours of TV viewing per day were 176 cases of type 2 diabetes per 100,000 individuals per year, 38 cases of fatal cardiovascular disease per 100,000 individuals per year, and 104 deaths for all-cause mortality per 100,000 individuals per year. CONCLUSION: Prolonged TV viewing was associated with increased risk of type 2 diabetes, cardiovascular disease, and all-cause mortality.</td></tr>
<tr><td>Timeframe: 1970–March 2011</td></tr>
<tr><td>Total # of Studies: 8</td></tr>
<tr><td>Author's Definition of Sedentary: TV viewing or screen time.</td></tr>
<tr><td>Outcomes Addressed: All-cause mortality, CVD mortality, CVD, type 2 diabetes.</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Danish Heart Foundation, Sygekassernes Helsefond (the Danish Health Fund), Oticon Foundation, Augustinus Foundation, National Institutes of Health</td></tr>
</table>

<table>
<tr><th colspan="2">Cancer</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Lynch BM. Sedentary behavior and cancer: a systematic review of the literature and proposed biological mechanisms. Cancer Epidemiol Biomarkers Prev. 2010;19:2691-2709. doi:10.1158/1055-9965.EPI-13-0808.</td></tr>
<tr><td>Purpose: To evaluate the research on sedentary behavior and cancer, to summarize possible biological pathways that may underlie these associations, and to propose an agenda for future research.</td><td rowspan="5">Abstract: BACKGROUND: Sedentary behavior (prolonged sitting or reclining characterized by low energy expenditure) is associated with adverse cardiometabolic profiles and premature cardiovascular mortality. Less is known for cancer risk. The purpose of this review is to evaluate the research on sedentary behavior and cancer, to summarize possible biological pathways that may underlie these associations, and to propose an agenda for future research. METHODS: Articles pertaining to sedentary behavior and (a) cancer outcomes and (b) mechanisms that may underlie the associations between sedentary behavior and cancer were retrieved using Ovid and Web of Science databases. RESULTS: The literature review identified 18 articles pertaining to sedentary behavior and cancer risk, or to sedentary behavior and health outcomes in cancer survivors. Ten of these studies found statistically significant, positive associations between sedentary behavior and cancer outcomes. Sedentary behavior was associated with increased colorectal, endometrial, ovarian, and prostate cancer risk; cancer mortality in women; and weight gain in colorectal cancer survivors. The review of the literature on sedentary behavior and biological pathways supported the hypothesized role of adiposity and metabolic dysfunction as mechanisms operant in the association between sedentary behavior and cancer. CONCLUSIONS: Sedentary behavior is ubiquitous in contemporary society; its role in relation to cancer risk should be a research priority. Improving conceptualization and measurement of sedentary behavior is necessary to enhance validity of future work. IMPACT: Reducing sedentary behavior may be a viable new cancer control strategy.</td></tr>
<tr><td>Timeframe: 1980–June 2010</td></tr>
<tr><td>Total # of Studies: 18</td></tr>
<tr><td>Author's Definition of Sedentary: Prolonged sitting or reclining characterized by low energy expenditure.</td></tr>
<tr><td>Outcomes Addressed: Cancer mortality.</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: National Health and Medical Research Council Public Health Training Fellowship, an Alberta Innovates-Health Solutions Fellowship</td></tr>
</table>

<table>
<tr><th colspan="2">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 further investigate the role of sedentary behaviors in endometrial cancer aetiology among women.</td><td rowspan="5">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 (physical activity), 1 (sedentary)</td></tr>
<tr><td>Author's Definition of Sedentary: Time spent sitting per day.</td></tr>
<tr><td>Outcomes Addressed: Endometrial cancer risk (RR).</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>

<table>
<tr><th colspan="2">Cardiovascular Disease</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Pandey A, Salahuddin U, Garg S, et al. Continuous dose-response association between sedentary time and risk for cardiovascular disease: a meta-analysis. JAMA Cardiol. 2016;1(5):575-583. doi:10.1001/jamacardio.2016.1567.</td></tr>
<tr><td>Purpose: To determine the categorical and quantitative dose-response association between sedentary time and cardiovascular disease risk among adults, independent of physical activity (PA).</td><td rowspan="5">Abstract: IMPORTANCE: Prior studies suggest that higher sedentary time is associated with a greater risk for cardiovascular disease (CVD). However, the quantitative, dose-response association between sedentary time and CVD risk is not known. OBJECTIVE: To determine the categorical and quantitative dose-response association between sedentary time and CVD risk. DATA SOURCES: Two independent investigators searched the MEDLINE and EMBASE databases for all studies published before July 6, 2015, that evaluated the association between sedentary time and incident CVD. STUDY SELECTION: Prospective cohort studies with participants 18 years or older that reported the association between sedentary time and incident CVD were included. DATA EXTRACTION AND SYNTHESIS: Two independent investigators performed the data extraction and collection using a standardized form. The study quality was assessed using the Newcastle-Ottawa Scale. The categorical dose-response association was evaluated by comparing the pooled hazard ratio (HR) for incident CVD associated with different levels of sedentary time (vs lowest sedentary time) across studies. The continuous dose-response association was assessed using random-effects generalized least squares spline models. Data were collected from April 5 to July 6, 2015. MAIN OUTCOMES AND MEASURES: Incident CVD (coronary heart disease, including nonfatal myocardial infarction, stroke, and cardiovascular mortality). RESULTS: Nine prospective cohort studies with 720425 unique participants (57.1% women; 42.9% men; mean age, 54.5 years) and 25769 unique cardiovascular events and a median follow-up of 11 years were included. In categorical analyses, compared with the lowest sedentary time category (median, 2.5 h/d), participants in the highest sedentary time category (median, 12.5 h/d) had an increased risk for CVD (HR, 1.14; 95% CI, 1.09-1.19). However, no apparent risk associated with intermediate levels of sedentary time (HR for 7.5 h/d, 1.02; 95% CI, 0.96-1.08) was found. In continuous analyses, a nonlinear association between sedentary time and incident CVD was found (P for nonlinearity < .001), with an increased risk observed for more than 10 hours of sedentary time per day (pooled HR, 1.08; 95% CI, 1.00-1.14). CONCLUSIONS AND RELEVANCE: The association between sedentary time and the risk for CVD is nonlinear with an increased risk only at very high levels. These findings could have implications for guideline recommendations regarding the risks related to sedentary behavior.</td></tr>
<tr><td>Timeframe: Inception–2015</td></tr>
<tr><td>Total # of Studies: 9</td></tr>
<tr><td>Author's Definition of Sedentary: Sitting time.</td></tr>
<tr><td>Outcomes Addressed: Risk of cardiovascular disease.</td></tr>
<tr><td>Populations Analyzed: Adults ≥18</td><td>Author-Stated Funding Source: Dedman Family Scholar in Clinical Care Endowment at University of Texas Southwestern Medical Center, American Heart Association Prevention Network</td></tr>
</table>

<table>
<tr><th colspan="2">Cancer, Type 2 Diabetes, Weight Status</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Proper KI, Singh AS, van Mechelen W, Chinapaw MJ. Sedentary behaviors and health outcomes among adults: a systematic review of prospective studies. Am J Prev Med. 2011;40(2):174-182. doi:10.1016/j.amepre.2010.10.015.</td></tr>
<tr><td>Purpose: To systematically review the literature with respect to the relationship between diverse sedentary behaviors and health outcomes among adults.</td><td rowspan="5">Abstract: CONTEXT: Nowadays, people spend a substantial amount of time per day on sedentary behaviors and it is likely that the time spent sedentary will continue to rise. To date, there is no review of prospective studies that systematically examined the relationship between diverse sedentary behaviors and various health outcomes among adults. PURPOSE: This review aimed to systematically review the literature as to the relationship between sedentary behaviors and health outcomes considering the methodologic quality of the studies. EVIDENCE ACQUISITION: In February 2010, a search for prospective studies was performed in diverse electronic databases. After inclusion, in 2010, the methodologic quality of each study was assessed. A best-evidence synthesis was applied to draw conclusions. EVIDENCE SYNTHESIS: 19 studies were included, of which 14 were of high methodologic quality. Based on inconsistency in findings among the studies and lack of high-quality prospective studies, insufficient evidence was concluded for body weight-related measures, CVD risk, and endometrial cancer. Further, moderate evidence for a positive relationship between the time spent sitting and the risk for type 2 diabetes was concluded. Based on three high-quality studies, there was no evidence for a relationship between sedentary behavior and mortality from cancer, but strong evidence for all-cause and CVD mortality. CONCLUSIONS: Given the trend toward increased time in sedentary behaviors, additional prospective studies of high methodologic quality are recommended to clarify the causal relationships between sedentary behavior and health outcomes. Meanwhile, evidence to date suggests that interventions aimed at reducing sedentary behavior are needed.</td></tr>
<tr><td>Timeframe: 1989–February 2010</td></tr>
<tr><td>Total # of Studies: 19</td></tr>
<tr><td>Author's Definition of Sedentary: Sedentary behaviors: TV viewing, PC use, driving, weekly time spent TV/VCR viewing, objectively measured sedentary behavior, time spent sitting outside work, sedentary work, and sitting time.</td></tr>
<tr><td>Outcomes Addressed: Risk of cardiovascular disease, endometrial cancer, obesity, and type 2 diabetes.</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Schmid D, Leitzmann MF. Television viewing and time spent sedentary in relation to cancer risk: a meta-analysis. J Natl Cancer Inst. 2014;106(7). doi:10.1093/jnci/dju098. Print 2014 Jul.</td></tr>
<tr><td>Purpose: To quantitatively summarize the evidence relating television viewing and other sedentary behaviors to cancer risk among adults.</td><td rowspan="5">Abstract: BACKGROUND: Sedentary behavior is emerging as an independent risk factor for chronic disease and mortality. However, the evidence relating television (TV) viewing and other sedentary behaviors to cancer risk has not been quantitatively summarized. METHODS: We performed a comprehensive electronic literature search in Cochrane, EMBASE, Medline, and SciSearch databases through February 2014 for published articles investigating sedentary behavior in relation to cancer incidence. Because randomized controlled trials are difficult to perform on this topic, we focused on observational studies that met uniform inclusion criteria. Data were extracted independently by both authors and summarized using random-effects meta-analysis and meta-regression. All statistical tests were two-sided. RESULTS: Data from 43 observational studies including a total of 68936 cancer cases were analyzed. Comparing the highest vs lowest levels of sedentary time, the relative risks (RRs) for colon cancer were 1.54 (95% confidence interval [CI] = 1.19 to 1.98) for TV viewing time, 1.24 (95% CI = 1.09 to 1.41) for occupational sitting time, and 1.24 (95% CI = 1.03 to 1.50) for total sitting time. For endometrial cancer, the relative risks were 1.66 (95% CI = 1.21 to 2.28) for TV viewing time and 1.32 (95% CI = 1.08 to 1.61) for total sitting time. A positive association with overall sedentary behavior was also noted for lung cancer (RR = 1.21; 95% CI = 1.03 to 1.43). Sedentary behavior was unrelated to cancers of the breast, rectum, ovaries, prostate, stomach, esophagus, testes, renal cell, and non-Hodgkin lymphoma. CONCLUSIONS: Prolonged TV viewing and time spent in other sedentary pursuits is associated with increased risks of certain types of cancer.</td></tr>
<tr><td>Timeframe: Inception– February 2014</td></tr>
<tr><td>Total # of Studies: 43</td></tr>
<tr><td>Author's Definition of Sedentary: Sedentary behaviors: total sitting time, TV viewing time, and occupational sitting time.</td></tr>
<tr><td>Outcomes Addressed: Cancer risk (RR) (breast cancer, colon cancer, rectal cancer, colorectal cancer, endometrial cancer, ovarian, lung, prostate, gastric, esophageal, testicular, renal cell, and non-Hodgkin lymphoma.</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">Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Shen D, Mao W, Liu T, et al. Sedentary behavior and incident cancer: a meta-analysis of prospective studies. PLoS One. 2014;9(8):e105709. doi:10.1371/journal.pone.0105709.</td></tr>
<tr><td>Purpose: To clarify the association between sedentary behavior and incident cancer among adults.</td><td rowspan="4">Abstract: BACKGROUND: Sedentary behavior is ubiquitous in modern adults' daily lives and it has been suggested to be associated with incident cancer. However, the results have been inconsistent. In this study, we performed a systematic review and meta-analysis of prospective cohort studies to clarify the association between sedentary behavior and incident cancer. METHOD: PubMed and Embase databases were searched up to March 2014. All prospective cohort studies on the association between sedentary behavior and incident cancer were included. The summary relative risks (RRs) with 95% confidence intervals (CIs) were estimated using random effect model. RESULTS: A total of 17 prospective studies from 14 articles, including a total of 857,581 participants and 18,553 cases, were included in the analysis for sedentary behavior and risk of incident cancer. The overall meta-analysis suggested that sedentary behavior increased risk of cancer (RR = 1.20, 95%CI = 1.12-1.28), with no evidence of heterogeneity between studies (I(2) = 7.3%, P = 0.368). Subgroup analyses demonstrated that there were statistical associations between sedentary behavior and some cancer types (endometrial cancer: RR = 1.28, 95% CI = 1.08-1.53; colorectal cancer: RR = 1.30, 95%CI = 1.12-1.49; breast cancer: RR = 1.17, 95%CI = 1.03-1.33; lung cancer: RR = 1.27, 95%CI = 1.06-1.52). However, there was no association of sedentary behavior with ovarian cancer (RR = 1.26, 95%CI = 0.87-1.82), renal cell carcinoma (RR = 1.11, 95%CI = 0.87-1.41) or non-Hodgkin lymphoid neoplasms (RR = 1.09, 95%CI = 0.82-1.43). CONCLUSION: The present meta-analysis suggested that prolonged sedentary behavior was independently associated with an increased risk of incident endometrial, colorectal, breast, and lung cancers, but not with ovarian cancer, renal cell carcinoma or non-Hodgkin lymphoid neoplasms.</td></tr>
<tr><td>Timeframe: Inception– March 2014</td></tr>
<tr><td>Total # of Studies: 14</td></tr>
<tr><td>Author's Definition of Sedentary: Sedentary behaviors: total sitting time, occupational sitting time, leisure sitting time, or TV viewing.</td></tr>
<tr><td>Outcomes Addressed: Cancer risk (RR). Subgroup analyses performed to investigate the association between sedentary behavior and risk of types of cancer (breast cancer, colorectal cancer, lung cancer, endometrial cancer, ovarian cancer, renal cell carcinoma, non-Hodgkin lymphoid neoplasms).</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: The Medical Research Council, the British Heart Foundation</td></tr>
</table>

<table>
<tr><th colspan="2">Cancer, Cardiovascular Disease, Type 2 Diabetes, Weight Status</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Thorp AA, Owen N, Neuhaus M, Dunstan DW. Sedentary behaviors and subsequent health outcomes in adults a systematic review of longitudinal studies, 1996-2011. Am J Prev Med. 2011;41(2):207-215. doi:10.1016/j.amepre.2011.05.004.</td></tr>
<tr><td>Purpose: To systematically review and provide an informative synthesis of findings on relationships between self-reported sedentary behavior and device-based measures of sedentary time with health-related outcomes in adults.</td><td rowspan="5">Abstract: CONTEXT: To systematically review and provide an informative synthesis of findings from longitudinal studies published since 1996 reporting on relationships between self-reported sedentary behavior and device-based measures of sedentary time with health-related outcomes in adults. EVIDENCE ACQUISITION: Studies published between 1996 and January 2011 were identified by examining existing literature reviews and by systematic searches in Web of Science, MEDLINE, PubMed, and PsycINFO. English-written articles were selected according to study design, targeted behavior, and health outcome. EVIDENCE SYNTHESIS: Forty-eight articles met the inclusion criteria; of these, 46 incorporated self-reported measures including total sitting time; TV viewing time only; TV viewing time and other screen-time behaviors; and TV viewing time plus other sedentary behaviors. Findings indicate a consistent relationship of self-reported sedentary behavior with mortality and with weight gain from childhood to the adult years. However, findings were mixed for associations with disease incidence, weight gain during adulthood, and cardiometabolic risk. Of the three studies that used device-based measures of sedentary time, one showed that markers of obesity predicted sedentary time, whereas inconclusive findings have been observed for markers of insulin resistance. CONCLUSIONS: There is a growing body of evidence that sedentary behavior may be a distinct risk factor, independent of physical activity, for multiple adverse health outcomes in adults. Prospective studies using device-based measures are required to provide a clearer understanding of the impact of sedentary time on health outcomes.</td></tr>
<tr><td>Timeframe: 1996–January 2011</td></tr>
<tr><td>Total # of Studies: 48</td></tr>
<tr><td>Author's Definition of Sedentary: Total sitting time, TV viewing time, and other screen-time behaviors.</td></tr>
<tr><td>Outcomes Addressed: Risk of cardiovascular disease, cancer (all cancers, endometrial, colon, and ovarian), diabetes, and obesity.</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: NHMRC Program Grant funding, Healthy Lifestyle Research Centre, Queensland Health Core Research Infrastructure grant , Victorian Health Promotion Foundation</td></tr>
</table>

<table>
<tr><th colspan="2">Cardiovascular Disease, Type 2 Diabetes</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Wilmot EG, Edwardson CL, Achana FA, et al. Sedentary time in adults and the association with diabetes, cardiovascular disease and death: systematic review and meta-analysis. Diabetologia. 2012;55(11):2895-2905. doi:10.1007/s00125-012-2677-z.</td></tr>
<tr><td>Purpose: To quantitatively synthesize existing observational evidence relating sedentary (sitting) time to four key clinical outcomes: diabetes, cardiovascular disease, cardiovascular mortality, and all-cause mortality among adults.</td><td rowspan="5">Abstract: AIMS/HYPOTHESIS: Sedentary (sitting) behaviours are ubiquitous in modern society. We conducted a systematic review and meta-analysis to examine the association of sedentary time with diabetes, cardiovascular disease and cardiovascular and all-cause mortality. METHODS: Medline, Embase and the Cochrane Library databases were searched for terms related to sedentary time and health outcomes. Cross-sectional and prospective studies were included. RR/HR and 95% CIs were extracted by two independent reviewers. Data were adjusted for baseline event rate and pooled using a random-effects model. Bayesian predictive effects and intervals were calculated to indicate the variance in outcomes that would be expected if new studies were conducted in the future. RESULTS: Eighteen studies (16 prospective, two cross-sectional) were included, with 794,577 participants. Fifteen of these studies were moderate to high quality. The greatest sedentary time compared with the lowest was associated with a 112% increase in the RR of diabetes (RR 2.12; 95% credible interval [CrI] 1.61, 2.78), a 147% increase in the RR of cardiovascular events (RR 2.47; 95% CI 1.44, 4.24), a 90% increase in the risk of cardiovascular mortality (HR 1.90; 95% CrI 1.36, 2.66) and a 49% increase in the risk of all-cause mortality (HR 1.49; 95% CrI 1.14, 2.03). The predictive effects and intervals were only significant for diabetes. CONCLUSIONS/INTERPRETATION: Sedentary time is associated with an increased risk of diabetes, cardiovascular disease and cardiovascular and all-cause mortality; the strength of the association is most consistent for diabetes.</td></tr>
<tr><td>Timeframe: Inception–2012</td></tr>
<tr><td>Total # of Studies: 18</td></tr>
<tr><td>Author's Definition of Sedentary: All studies reported either TV/screen-based entertainment or self-reported sitting time, or both.</td></tr>
<tr><td>Outcomes Addressed: Risk of diabetes and risk of cardiovascular disease.</td></tr>
<tr><td>Populations Analyzed: Adults ≥18</td><td>Author-Stated Funding Source: Department of Cardiovascular Sciences, Univeristy of Leicester</td></tr>
</table>

<table>
<tr><th colspan="2">Cancer</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Zhou Y, Zhao H, Peng C. Association of sedentary behavior with the risk of breast cancer in women: update meta-analysis of observational studies. Ann Epidemiol. 2015;25(9):687-697. doi:10.1016/j.annepidem.2015.05.007.</td></tr>
<tr><td>Purpose: To evaluate the association between sedentary behaviors and the risk of breast cancer among women.</td><td rowspan="4">Abstract: PURPOSE: Increasing studies focus on the health consequences of sedentary behavior, and whether sedentary behavior is associated with the risk of breast cancer remains uncertain. We applied quantitative techniques to synthesize relevant original observational studies to investigate this issue. METHODS: PubMed and Embase were searched through September 2014 to identify cohort and case-control studies that evaluated the association between sedentary behavior and breast cancer risk in women. Information on the characteristics of the included studies, risk estimates, and control for possible confounding factors, was extracted independently by two authors. A random effects model of meta-analysis was used to calculate the pooled risk estimate. RESULTS: Twenty one studies with 34 reports were included in our quantitative analysis. Sedentary behavior was found to slightly increase the risk of breast cancer in women and the pooled odds ratio (OR) and its 95% confidence interval (CI) were 1.08 and 1.04 to 1.13, without substantial heterogeneity (P = .579, I(2) = 0.0%). Subgroup analysis showed that the risks of breast cancer for different domains of sedentary behavior were similar, although only occupational behavior showed statistical significance (OR, 1.10; 95% CI, 1.02-1.18) and the combined ORs of breast cancer are of borderline significance for sedentary behavior of daily life (OR, 1.10; 95% CI, 1.00-1.20) and sedentary behavior of leisure time (OR, 1.08; 95% CI, 0.98-1.19). Exclusion of any single study did not materially alter the combined risk estimate. Visual inspection of funnel plot, Begg's and Egger's tests did not indicate evidence of publication bias. CONCLUSIONS: Integrated evidence from observational studies suggests a statistically significant slightly positive association of sedentary behavior with breast cancer risk.</td></tr>
<tr><td>Timeframe: Inception–2014</td></tr>
<tr><td>Total # of Studies: 21</td></tr>
<tr><td>Author's Definition of Sedentary: Sedentary behavior was defined by calculating time spent in "sitting" or "TV", describing a job as "mostly sitting", evaluating the job title based specific criterion. Sub-analyses by definition and measurement (sitting time, TV time, job titled), and domain (daily life, leisure time, occupational).</td></tr>
<tr><td>Outcomes Addressed: Risk of breast cancer. Sub-analysis by type of breast cancer (in situ, invasive, not mentioned type).</td></tr>
<tr><td>Populations Analyzed: Female</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

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

AMSTARExBP: SR/MA							
	Biswas, 2015	Grontved, 2011	Lynch, 2010	Moore, 2010	Pandey, 2016	Proper, 2011	Schmid, 2014
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	No	Yes	Yes	No	Yes
Comprehensive literature search performed.	Yes	Yes	Yes	Partially Yes	N/A	Yes	Yes
Duplicate study selection and data extraction performed.	Yes	No	No	No	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	Yes	No	No	N/A	No	No
Characteristics of included studies provided.	Yes	Yes	Yes	No	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	Yes	N/A	N/A	No	N/A	N/A	N/A
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	No	No	Yes	Yes	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	Yes	N/A	N/A	Yes	Yes	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	Yes	N/A	N/A	Yes	Yes	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	Yes	N/A	Yes	Yes	N/A	Yes
Effect size index chosen justified, statistically.	Yes	Yes	N/A	Yes	Yes	N/A	Yes
Individual-level meta-analysis used.	No	Partially Yes	N/A	Partially Yes	Yes	N/A	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	Yes	Yes	No	No	N/A	No	Yes
Conflict of interest disclosed.	Yes	Yes	Yes	No	Yes	No	No

AMSTARExBP: SR/MA	Shen, 2014	Thorp, 2011	Wilmot, 2012	Zhou, 2015
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	No	No	No	Yes
Comprehensive literature search performed.	Partially Yes	Yes	Yes	Yes
Duplicate study selection and data extraction performed.	No	No	Yes	Yes
Search strategy clearly described.	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	No	No	No	No
List of studies (included and excluded) provided.	No	No	No	No
Characteristics of included studies provided.	Yes	No	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	N/A	N/A	N/A	N/A
Scientific quality (risk of bias) of included studies assessed and documented.	No	No	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	N/A	N/A	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	N/A	N/A	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	N/A	Yes	Yes
Effect size index chosen justified, statistically.	Partially Yes	N/A	Yes	Yes
Individual-level meta-analysis used.	No	N/A	No	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	Yes	No	Yes	Yes
Conflict of interest disclosed.	Yes	Yes	Yes	No

Original Research

Table 4. Original Research Individual Evidence Summary Tables

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Altenburg TM, Lakerveld J, Bot SD, Nijpels G, Chinapaw MJ. The prospective relationship between sedentary time and cardiometabolic health in adults at increased cardiometabolic risk - the Hoorn Prevention Study. Int J Behav Nutr Phys Act. 2014;11:90. doi:10.1186/s12966-014-0090-3.</td></tr>
<tr><td colspan="2">Purpose: To examine the prospective relationship between time spent on sedentary behaviours in different domains with individual and clustered cardiometabolic risk in adults.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: BACKGROUND: Sedentary time has been identified as an important and independent risk factor for the development of type 2 diabetes mellitus (T2DM) and cardiovascular diseases (CVD) in adults. However, to date most studies have focused on TV time, few also included other sedentary behaviours such as computer use and reading, and most studies had a cross-sectional design. We aimed to examine the prospective relationship between time spent on sedentary behaviours in different domains with individual and clustered cardiometabolic risk in adults. METHODS: Longitudinal data of 622 adults aged 30-50 years (42% males) at increased cardiometabolic risk were used. Leisure time TV viewing, computer use, reading and other sedentary activities (e.g. passive transport) were assessed using a subscale of the Activity Questionnaire for Adolescents and Adults (AQuAA), and summed into overall sedentary behaviour (min/day). Weight and blood pressure were measured, waist-to-hip ratio and BMI calculated, and fasting plasma levels of glucose, HbA1c, total cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides determined. T2DM risk score was estimated according to the ARIC formula and CVD mortality risk according to the SCORE formula. RESULTS: Generalized Estimating Equation analysis demonstrated that over a two-year period higher levels of overall sedentary time and TV time were weakly but negatively associated with one out of 13 studied cardiometabolic risk factors (i.e. HDL cholesterol). CONCLUSION: Overall sedentary time, as well as sedentary time in different domains, was virtually not related with cardiometabolic risk factors.</td></tr>
<tr><td>Location: Netherlands</td></tr>
<tr><td>Sample: 479
Attrition Rate: 22.99%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Sedentary time during leisure in minutes per day assessed with the Subscale of the Activity Questionnaire for Adolescents & Adults (AQuAA). Total sedentary time was calculated by summing the minutes per day spent in the different domains of sedentary behavior (SB) including TV time, computer time, reading time and time spent on other SB (such as passive transport and talking with friends). Analysis were also stratified by SB domain.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Weight, blood pressure, BMI, waist circumference, 9-year risk of developing type II diabetes mellitus; 10-year risk of fatal cardiovascular disease. Risk was assessed at baseline, after 6 months, 12 months, and 24 months.</td></tr>
<tr><td>Populations Analyzed: Adults 30–50, Semi-rural</td><td>Author-Stated Funding Source: Netherlands Organization for Health Research and Development</td></tr>
</table>

<table>
<tr><th colspan="2">Type 2 Diabetes</th></tr>
<tr><td colspan="2">Original Research
Citation: Anjana RM, Sudha V, Nair DH, et al. Diabetes in Asian Indians-How much is preventable? Ten-year follow-up of the Chennai Urban Rural Epidemiology Study (CURES-142). Diabetes Res Clin Pract. 2015;109(2):253-261. doi:10.1016/j.diabres.2015.05.039.</td></tr>
<tr><td colspan="2">Purpose: To evaluate the contribution of various modifiable risk factors to the partial population attributable risk (PARp) for diabetes in an Asian Indian population.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: We sought to evaluate the contribution of various modifiable risk factors to the partial population attributable risk (PARp) for diabetes in an Asian Indian population. Of a cohort of 3,589 individuals, representative of Chennai, India, followed up after a period of ten years, we analyzed data from 1376 individuals who were free of diabetes at baseline. A diet risk score was computed incorporating intake of refined cereals, fruits and vegetables, dairy products, and monounsaturated fatty acid. Abdominal obesity was found to contribute the most to incident diabetes [Relative Risk (RR) 1.63(95%CI 1.21–2.20)]; (PARp 41.1% (95%CI 28.1–52.6)]. The risk for diabetes increased with increasing quartiles of the diet risk score [highest quartile RR 2.14(95% CI 1.26–3.63)] and time spent viewing television [(RR 1.84(95%CI 1.36–2.49] and sitting [(RR 2.09(95%CI 1.42–3.05)]. The combination of five risk factors (obesity, physical inactivity, unfavorable diet risk score, hypertriglyceridemia and low HDL cholesterol) could explain 80.7% of all incident diabetes (95%CI 53.8–92.7). Modifying these easily identifiable risk factors could therefore prevent the majority of cases of incident diabetes in the Asian Indian population. Translation of these findings into public health practice will go a long way in arresting the progress of the diabetes epidemic in this region.</td></tr>
<tr><td>Location: India</td></tr>
<tr><td>Sample: 1,376
Attrition Rate: 61.66%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Interviewer-administered questionnaire measured sitting time and TV viewing. Total time spent in sitting and TV viewing was represented in quartiles of hours/day.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Incidence of type II diabetes: venous plasma glucose 2 h after oral glucose load of ≥ 200 mg/dl and/or fasting plasma glucose levels ≥ 126 mg/dl; Partial population attributable risk for type 2 diabetes; Obesity: body mass index, waist circumference.</td></tr>
<tr><td>Populations Analyzed: Male, Female, Asian Indian Adults ≥20</td><td>Author-Stated Funding Source: No funding source used</td></tr>
</table>

<table>
<tr><th colspan="2">Type 2 Diabetes</th></tr>
<tr><td colspan="2">Original Research
Citation: Asvold BO, Midthjell K, Krokstad S, Rangul V, Bauman A. Prolonged sitting may increase diabetes risk in physically inactive individuals: an 11 year follow-up of the HUNT Study, Norway. Diabetologia. 2017;60(5):830-835. doi:10.1007/s00125-016-4193-z.</td></tr>
<tr><td colspan="2">Purpose: To investigate the association between total sitting time and the risk of any diabetes, and to examine whether this association was modified by leisure-time physical inactivity or obesity.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: AIMS/HYPOTHESIS: We examined the association between sitting time and diabetes incidence, overall and by strata of leisure-time physical activity and BMI. METHODS: We followed 28,051 adult participants of the Nord-Trondelag Health Study (the HUNT Study), a population-based study, for diabetes incidence from 1995-1997 to 2006-2008 and estimated HRs of any diabetes by categories of self-reported total daily sitting time at baseline. RESULTS: Of 28,051 participants, 1253 (4.5%) developed diabetes during 11 years of follow-up. Overall, sitting >/=8 h/day was associated with a 17% (95% CI 2, 34) higher risk of developing diabetes compared with sitting </=4 h/day, adjusted for age, sex and education. However, the association was attenuated to a non-significant 9% (95% CI -5, 26) increase in risk after adjustment for leisure-time physical activity and BMI. The association between sitting time and diabetes risk differed by leisure-time physical activity (p Interaction = 0.01). Among participants with low leisure-time physical activity (</=2 h light activity per week and no vigorous activity), sitting 5-7 h/day and >/=8 h/day were associated with a 26% (95% CI 2, 57) and 30% (95% CI 5, 61) higher risk of diabetes, respectively, compared with sitting </=4 h/day. There was no corresponding association among participants with high leisure-time physical activity (>/=3 h light activity or >0 h vigorous activity per week). There was no statistical evidence that the association between sitting time and diabetes risk differed by obesity (p Interaction = 0.65). CONCLUSIONS/INTERPRETATION: Our findings suggest that total sitting time has little association with diabetes risk in the population as a whole, but prolonged sitting may contribute to an increased diabetes risk among physically inactive people.</td></tr>
<tr><td>Location: Norway</td></tr>
<tr><td>Sample: 28,051
Attrition Rate: 49.34%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Daily sitting time: ≤4, 5–7 or ≥8 hrs/day
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Diabetes incidence: measured by self-reported diagnosis, random serum glucose ≥11.1 mmol/l or in participants who attended additional examination with fasting serum glucose ≥7.0 mmol/l, 120 min serum glucose ≥11.1 mmol/l in the oral glucose tolerance test (OGTT) or HbA1c ≥6.5% (48 mmol/mol).</td></tr>
<tr><td>Populations Analyzed: Adults ≥20, Obese (BMI: ≥30)</td><td>Author-Stated Funding Source: Norwegian University of Science and Technology, Research Council of Norway</td></tr>
</table>

<table>
<tr><th colspan="2">Type 2 Diabetes</th></tr>
<tr><td colspan="2">Original Research
Citation: Barone Gibbs B, Pettee Gabriel K, Reis JP, Jakicic JM, Carnethon MR, Sternfeld B. Cross-sectional and longitudinal associations between objectively measured sedentary time and metabolic disease: the Coronary Artery Risk Development in Young Adults (CARDIA) study. Diabetes Care. 2015;38(10):1835-1843. doi:10.2337/dc15-0226.</td></tr>
<tr><td colspan="2">Purpose: To investigate associations of accelerometry-derived sedentary time (ST) with continuous metabolic variables (fasting glucose, fasting insulin, 2-h postchallenge glucose, HOMA of insulin resistance [HOMA-IR], and HbA1c) and metabolic outcomes (impaired fasting glucose [IFG], impaired glucose tolerance [IGT], prediabetes by HbA1c, and diabetes) both cross-sectionally and after 5 years of follow-up in a well-characterized, population-based cohort of middle-aged adults.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: United States
Sample: 2,027
Attrition Rate: 1.07%
Sample Power: Not Reported
Exposure Measurement
Device-Measured: Accelerometer, sedentary time categorized as 6.0, 6.0 to <8.0, 8 to <10.0, or ≥10 hrs/day.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: OBJECTIVE: Prolonged sedentary time (ST) might be contributing to the diabetes epidemic, but most studies have been cross-sectional and few have objectively measured ST. The purpose of this study was to evaluate cross-sectional and 5-year longitudinal relationships between ST and metabolic parameters and outcomes. RESEARCH DESIGN AND METHODS: This was an analysis of 2,027 Coronary Artery Risk Development in Young Adults (CARDIA) study participants (aged 38-50 years, 57% female, and mean BMI of 29.0 +/- 7.0 kg/m(2)) with accelerometry data (>/=4 days with >/=10 h/day) measured at the year 20 follow-up exam (2005-2006). Metabolic variables (fasting glucose, fasting insulin, 2-h postchallenge glucose, HOMA of insulin resistance [HOMA-IR], and HbA1c) and outcomes (impaired fasting glucose [IFG], impaired glucose tolerance [IGT], prediabetes by HbA1c, and diabetes) were assessed concurrently and 5 years later. RESULTS: Average ST was 8.1 +/- 1.7 h/day or 55 +/- 10% of wear time. Each additional hour per day of ST was cross-sectionally associated with a 3% higher fasting insulin and HOMA-IR (both P < 0.01) but not 5-year changes in metabolic parameters. Having >/=10 h/day vs. <6 h/day of ST was associated with an odds ratio (OR) = 2.74 (95% CI 1.13, 6.62) for IGT and an OR = 3.80 (95% CI 1.39, 10.35) for diabetes. ST was not associated with prevalent IFG, prevalent prediabetes by HbA1c, or 5-year incidence of any metabolic outcomes (all P > 0.05). CONCLUSIONS: ST was independently related to insulin, HOMA-IR, and prevalent diabetes and IGT but did not predict 5-year changes in metabolic parameters or incidence of metabolic outcomes. These results suggest that higher ST may not be a risk factor for future metabolic outcomes, but more research with repeated ST measurement and longer follow-up is needed.</td></tr>
<tr><td>Refers to Other Materials: No
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Diabetes was defined as either self-reported use of diabetes medications, ≥HbA1c 6.5% (≥47.5 mmol/mol), fasting glucose ≥126 mg/dL, or 2-h glucose ≥200 mg/dL.</td></tr>
<tr><td>Populations Analyzed: Adults 38–50</td><td>Author-Stated Funding Source: National Heart, Lung, and Blood Institute (NHLBI), Intramural Research Program of the National Institute on Aging (NIA), intra-agency agreement between NIA and NHLBI</td></tr>
</table>

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Bell JA, Hamer M, Batty GD, Singh-Manoux A, Sabia S, Kivimaki M. Combined effect of physical activity and leisure time sitting on long-term risk of incident obesity and metabolic risk factor clustering. Diabetologia. 2014;57(10):2048-2056. doi:10.1007/s00125-014-3323-8.</td></tr>
<tr><td colspan="2">Purpose: To prospectively investigate the long-term risk of incident obesity and incident metabolic risk factor clustering among adults with different levels and combinations of physical activity and leisure time sitting.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: United Kingdom
Sample: 3,670
Attrition Rate: 64.39%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: Total leisure time sitting (assessed by Minnesota Leisure Time Physical Activity Questionnaire) into tertiles (low, 0–11.5 hrs/week; intermediate, 15–23 hrs/week; high, 25–90 hrs/week).
Measures Steps: No
Measures Bouts: No</td><td>Abstract: AIMS/HYPOTHESIS: Our study aimed to investigate the combined effects of moderate-to-vigorous physical activity and leisure time sitting on the long-term risk of obesity and clustering of metabolic risk factors. METHODS: The duration of moderate and vigorous physical activity and of leisure time sitting was assessed by questionnaire between 1997 and 1999 among 3,670 participants from the Whitehall II cohort study (73% male; mean age 56 years). Multivariable-adjusted logistic regression models examined associations of physical activity and leisure time sitting tertiles with odds of incident obesity (BMI >/= 30 kg/m(2)) and incident metabolic risk factor clustering (two or more of the following: low HDL-cholesterol, high triacylglycerol, hypertension, hyperglycaemia, insulin resistance) at 5 and 10 year follow-ups. RESULTS: Physical activity, but not leisure time sitting, was associated with incident obesity. The lowest odds of incident obesity after 5 years were observed for individuals reporting both high physical activity and low leisure time sitting (OR = 0.26; 95% CI 0.11, 0.64), with weaker effects after 10 years. Compared with individuals in the low physical activity/high leisure time sitting group, those with intermediate levels of both physical activity and leisure time sitting had lower odds of incident metabolic risk factor clustering after 5 years (OR 0.53; 95% CI 0.36, 0.78), with similar odds after 10 years.
CONCLUSIONS/INTERPRETATION: Both high levels of physical activity and low levels of leisure time sitting may be required to substantially reduce the risk of obesity. Associations with developing metabolic risk factor clustering were less clear.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Incident obesity: body mass index (BMI) calculated using the standard formula: weight in kilograms divided by the square of height in meters. Obesity was defined as BMI≥30 kg/m2 (with ‘non-obese’ defined as BMI ≥30 kg/m2 (with ‘non-obese’ defined as BMI <30 kg/m2).</td></tr>
<tr><td>Populations Analyzed: Adults mean age 56</td><td>Author-Stated Funding Source: Economic and Social Research Council, British Heart Foundation, U.S. National Institutes of Health, National Institute on Aging, Medical Research Council, National Heart, Lung, and Blood Institute, National Institute of Aging, the Academy of Finland</td></tr>
</table>

<table>
<tr><th colspan="2">Cardiovascular Disease</th></tr>
<tr><td colspan="2">Original Research
Citation: Borodulin K, Karki A, Laatikainen T, Peltonen M, Luoto R. Daily sedentary time and risk of cardiovascular disease: The National FINRISK 2002 Study. J Phys Act Health. 2015;12(7):904-908. doi:10.1123/jpah.2013-0364.</td></tr>
<tr><td colspan="2">Purpose: To examine the association of total sitting time with the incidence of fatal and nonfatal cardiovascular disease (CVD) in a population-based cohort of 4,516 Finns.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: BACKGROUND: Daily sitting time may be a risk factor for incident cardiovascular disease (CVD); however, this has not yet been extensively studied. Our aim was to study the association of total sitting time with the risk of CVD. METHODS: Participants (n = 4516, free of CVD at baseline) from the National FINRISK 2002 Study were followed for fatal and nonfatal CVD using national registers. Participants underwent a health examination and completed questionnaires, including total daily sitting time. RESULTS: During a mean follow-up of 8.6 years, 183 incident CVD cases occurred. Sitting on a typical weekday, at baseline, was statistically significantly associated with fatal and nonfatal incident CVD. The hazard ratios (with 95% confidence intervals, CI) for the total amount of sitting were 1.05 (95% CI, 1.00-1.10) in the age and gender adjusted model and 1.06 (95% CI, 1.01-1.11) in the fully adjusted model, including age, gender, employment status, education, BMI, smoking status, leisure time physical activity, use of vegetables and fruit, alcohol use, blood pressure or its medication, and cholesterol or its medication. CONCLUSIONS: Our findings suggest that total amount of daily sitting is a risk factor for incident CVD. More research is needed to understand the etiology of sedentary behavior and CVD.</td></tr>
<tr><td>Location: Finland</td></tr>
<tr><td>Sample: 4,516
Attrition Rate: 23.07%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Assessed as minutes and hours per day used as a continuous variable (hours/day), total time spent sitting.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Fatal and nonfatal incident cardiovascular disease (CVD); international classification of diseases was used to identify fatal cases of ischemic heart disease (IHD) (ICD-10 codes I20–I25, I46, R96, R98), nonfatal cases of IHD (ICD-10 codes I20–I25) including invasive procedures (CABG and angioplasty) and fatal and nonfatal strokes (ICD-10 codes I61, I63 (not I636), I64).</td></tr>
<tr><td>Populations Analyzed: Adults 25–74</td><td>Author-Stated Funding Source: Juho Vainio Foundation, Ministry of Culture and Education, Finland</td></tr>
</table>

<table>
<tr><th colspan="2">Cancer</th></tr>
<tr><td colspan="2">Original Research
Citation: Catsburg C, Kirsh VA, Soskolne CL, et al. Associations between anthropometric characteristics, physical activity, and breast cancer risk in a Canadian cohort. Breast Cancer Res Treat. 2014;145(2):545-552. doi:10.1007/s10549-014-2973-z.</td></tr>
<tr><td colspan="2">Purpose: To investigate the associations of physical activity and estimates of sedentary lifestyles with risk of pre- and post-menopausal breast cancer in prospective cohort of Canadian women.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: Obesity, physical inactivity, and sedentary behavior, concomitants of the modern environment, are potentially modifiable breast cancer risk factors. This study investigated the association of anthropometric measurements, physical activity and sedentary behavior, with the risk of incident, invasive breast cancer using a prospective cohort of women enrolled in the Canadian Study of Diet, Lifestyle and Health. Using a case-cohort design, an age-stratified subcohort of 3,320 women was created from 39,532 female participants who returned completed self-administered lifestyle and dietary questionnaires at baseline. A total of 1,097 incident breast cancer cases were identified from the entire cohort via linkage to the Canadian Cancer Registry. Cox regression models, modified to account for the case-cohort design, were used to estimate hazard ratios (HR) and 95 % confidence intervals (CI) for the association between anthropometric characteristics, physical activity, and the risk of breast cancer. Weight gain as an adult was positively associated with risk of post-menopausal breast cancer, with a 6 % increase in risk for every 5 kg gained since age 20 (HR 1.06; 95 % CI 1.01-1.11). Women who exercised more than 30.9 metabolic equivalent task (MET) hours per week had a 21 % decreased risk of breast cancer compared to women who exercised less than 3 MET hours per week (HR 0.79; 95 % CI 0.62-1.00), most evident in pre-menopausal women (HR 0.62; 95 % CI 0.43-0.90). As obesity reaches epidemic proportions and sedentary lifestyles have become more prevalent in modern populations, programs targeting adult weight gain and promoting physical activity may be beneficial with respect to reducing breast cancer morbidity.</td></tr>
<tr><td>Location: Canada</td></tr>
<tr><td>Sample: 3,299
Attrition Rate: 0.63%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Time spent sitting and time spent in front of the television, sedentary activity.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Risk of breast cancer.</td></tr>
<tr><td>Populations Analyzed: Female, Underweight (BMI: Below 18.5), Normal/Healthy Weight (BMI: 18.5-24.9), Overweight and Obese, Pre and post-menopausal</td><td>Author-Stated Funding Source: Breast Cancer Research Foundation, Canadian Tobacco Control Research Initiative.</td></tr>
</table>

<table>
<tr><th colspan="2">Cardiovascular Disease</th></tr>
<tr><td colspan="2">Original Research
Citation: Chomistek AK, Chiuve SE, Eliassen AH, Mukamal KJ, Willett WC, Rimm EB. Healthy lifestyle in the primordial prevention of cardiovascular disease among young women. J Am Coll Cardiol. 2015;65(1):43-51. doi:10.1016/j.jacc.2014.10.024.</td></tr>
<tr><td colspan="2">Purpose: To estimate the proportion of cases of coronary heart disease (CHD) and clinical cardiovascular disease (CVD) risk factors—diabetes, hypertension, and high cholesterol— among younger women attributable to poor adherence to a healthy lifestyle.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: United States
Sample: 88,940
Attrition Rate: 0.00%
Sample Power: Not Reported
Exposure Measurement
Self-Reported:
Questionnaire, television viewing hours/day.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: BACKGROUND: Overall mortality rates from coronary heart disease (CHD) in the United States have declined in recent decades, but the rate has plateaued among younger women. The potential for further reductions in mortality rates among young women through changes in lifestyle is unknown. OBJECTIVES: The aim of this study was to estimate the proportion of CHD cases and clinical cardiovascular disease (CVD) risk factors among young women that might be attributable to poor adherence to a healthy lifestyle. METHODS: A prospective analysis was conducted among 88,940 women ages 27 to 44 years at baseline in the Nurses' Health Study II who were followed from 1991 to 2011. Lifestyle factors were updated repeatedly by questionnaire. A healthy lifestyle was defined as not smoking, a normal body mass index, physical activity >/= 2.5 h/week, television viewing </= 7 h/week, diet in the top 40% of the Alternative Healthy Eating Index-2010, and 0.1 to 14.9 g/day of alcohol. To estimate the proportion of CHD and clinical CVD risk factors (diabetes, hypertension, and hypercholesterolemia) that could be attributed to poor adherence to a healthy lifestyle, we calculated the population-attributable risk percent. RESULTS: During 20 years of follow-up, we documented 456 incident CHD cases. In multivariable-adjusted models, nonsmoking, a healthy body mass index, exercise, and a healthy diet were independently and significantly associated with lower CHD risk. Compared with women with no healthy lifestyle factors, the hazard ratio for CHD for women with 6 lifestyle factors was 0.08 (95% confidence interval: 0.03 to 0.22). Approximately 73% (95% confidence interval: 39% to 89%) of CHD cases were attributable to poor adherence to a healthy lifestyle. Similarly, 46% (95% confidence interval: 43% to 49%) of clinical CVD risk factor cases were attributable to a poor lifestyle. CONCLUSIONS: Primordial prevention through maintenance of a healthy lifestyle among young women may substantially lower the burden of CVD.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Incident coronary heart disease (CHD): diagnosed nonfatal myocardial infarction and fatal CHD. Physician diagnosed clinical cardiovascular disease (CVD) risk factors: type 2 diabetes, hypertension, and hypercholesterolemia.</td></tr>
<tr><td>Populations Analyzed: Female 27–44 at baseline</td><td>Author-Stated Funding Source: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases</td></tr>
</table>

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Florencio MT, Bueno NB, Clemente A, et al. Weight gain and reduced energy expenditure in low-income Brazilian women living in slums: a 4-year follow-up study. Br J Nutr. 2015;114(3):462-471. doi:10.1017/S0007114515001816.</td></tr>
<tr><td colspan="2">Purpose: To assess the changes in dietary intake, biochemical profile, energy expenditure, and physical activity level(PAL) in women living in a poor socio-economic environment, and to explore the influence of their dietary intake and physical activity patterns on these changes.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: Brazil
Sample: 85
Attrition Rate: 3.40%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: Time spent watching television
Device-Measured: Accelerometer, sedentary time defined as a coefficient of physical activity level of ≥1·0 <1·4, which registered the intensity and duration of behavior.
Measures Steps: No
Measures Bouts: No</td><td rowspan="2">Abstract: The present study aimed to investigate the possible changes in anthropometric and biochemical parameters in low-income women living in the outskirts of Maceio (northeast Brazil), and to explore the possible role of dietary intake and physical activity in these changes. A prospective longitudinal study was conducted in a cohort of mothers of malnourished children who attended the Center for Nutritional Recovery and Education, an outreach programme of the Federal University of Alagoas. Socio-economic, anthropometric, biochemical and dietary intake data were assessed at baseline and after a follow-up period of 4 years. Energy expenditure (using doubly labelled water) and physical activity (using triaxial accelerometers) were assessed only in a subgroup of women after 4 years. A total of eighty-five women were assessed. Participants showed an altered biochemical profile, increased systolic blood pressure, decreased thyroid hormone levels, and body-weight gain. However, dietary intakes of the participants did not include large quantities of highly processed and high-glycaemic index foods. The energy intake of the participants did not differ from their total energy expenditure (7990.3 (7173.7-8806.8) v. 8798.1 (8169.0-9432.4) kJ, respectively; P= 0.084). Multivariate analyses showed a significant effect of time spent watching television (beta = 0.639 (0.003 to 1.275); P= 0.048) and dietary diversity score (beta = -1.039 (-2.010 to -0.067); P = 0.036) on weight gain. The present study indicates that poor women, who are mothers of malnourished children and have a reasonably balanced dietary intake, exhibit weight gain and are at risk of developing chronic diseases.</td></tr>
<tr><td>Refers to Other Materials: No
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Adults 18–45, Low-income</td><td>Outcomes Examined: Body weight gain (kg).

Author-Stated Funding Source: Conselho Nacional de Desenvolvimento Científico e Tecnológico</td></tr>
</table>

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Golubic R, Wijndaele K, Sharp SJ, et al. Physical activity, sedentary time and gain in overall and central body fat: 7-year follow-up of the ProActive trial cohort. Int J Obes (2005). 2015;39(1):142-148. doi:10.1038/ijo.2014.66.</td></tr>
<tr><td colspan="2">Purpose: To examine the association between objectively measured moderate-to-vigorous physical activity, sedentary time, and total and abdominal body fat at three time points (baseline, one year, and seven years later).</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: United Kingdom
Sample: 231
Attrition Rate: 0.43%
Sample Power: Not Reported
Exposure Measurement
Device-Measured:
Accelerometer worn for at least three days, average daily time (hours/day) spent sedentary; sedentary time defined as <100 accelerometer counts per minute.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: OBJECTIVE: The objective of this study is to examine the independent associations of time spent in moderate-to-vigorous physical activity (MVPA) and sedentary (SED-time), with total and abdominal body fat (BF), and the bidirectionality of these associations in adults at high risk of type 2 diabetes. DESIGN AND SUBJECTS: We measured MVPA (min per day) and SED-time (h per day) by accelerometry, and indices of total (body weight, fat mass (FM), BF% and FM index) and abdominal BF (waist circumference (WC)) using standard procedures in 231 adults (41.3 ± 6.4 years) with parental history of type 2 diabetes (ProActive UK) at baseline, 1-year and 7-year follow-up. Mixed effects models were used to quantify the independent associations (expressed as standardised ?-coefficients (95% confidence interval (CI))) of MVPA and SED-time with fat indices, using data from all three time points. All models were adjusted for age, sex, intervention arm, monitor wear time, follow-up time, smoking status, socioeconomic status and MVPA/SED-time. RESULTS: MVPA was inversely and independently associated with all indices of total BF (for example, 1 s.d. higher MVPA was associated with a reduction in FM, ? = -0.09 (95% CI: -0.14, -0.04) s.d.) and abdominal BF (for example, WC: ? = -0.07 (-0.12, -0.02)). Similarly, higher fat indices were independently associated with a reduction in MVPA (for example, WC: ? = -0.25 (-0.36, -0.15); FM: ? = -0.27 (-0.36, -0.18)). SED-time was positively and independently associated with most fat indices (for example, WC: ? = 0.03 (-0.04, 0.09); FM: ? = 0.10 (0.03, 0.17)). Higher values of all fat indices independently predicted longer SED-time (for example, WC: ? = 0.10 (0.02, 0.18), FM: ? = 0.15 (0.07, 0.22)). CONCLUSIONS: The associations of MVPA and SED-time with total and abdominal BF are bidirectional and independent among individuals at high risk for type 2 diabetes. The association between BF and MVPA is stronger than the reciprocal association, highlighting the importance of considering BF as a determinant of decreasing activity and a potential consequence. Promoting more MVPA and less SED-time may reduce total and abdominal BF.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Body mass index (kg/m2): objectively measured; waist circumference (cm): objectively measured. Fat free mass and body fat: Bio-electrical impedance. Fat Mass index (FMI): fat mass divided by square of height in meters.</td></tr>
<tr><td>Populations Analyzed: Adults mean age 41.3</td><td>Author-Stated Funding Source: Medical Research Council, NHS, Scientific Foundation and Diabetes UK</td></tr>
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<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Helajarvi H, Rosenstrom T, Pahkala K, et al. Exploring causality between TV viewing and weight change in young and middle-aged adults. The Cardiovascular Risk in Young Finns study. PLoS One. 2014;9(7):e101860. doi:10.1371/journal.pone.0101860.</td></tr>
<tr><td colspan="2">Purpose: To explore the relative importance of TV time to obesity and obesity and physical restrictions to TV time.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: BACKGROUND: Television viewing time (TV time) is associated with increased weight and obesity, but it is unclear whether this relation is causal. METHODS AND RESULTS: We evaluated changes in TV time, waist circumference (waist) and body mass index (BMI) in participants of the population-based Cardiovascular Risk in Young Finns study (761 women, 626 men aged 33-50 years in 2011). Waist and BMI were measured, and TV time was self-reported in 2001, 2007, and 2011. Changes in waist and BMI between 2001 and 2011 were studied a) for the whole group, b) in groups with constantly low (</= 1 h/d), moderate (1-3 h/d), or high (>/= 3 h/d) TV time, and c) in groups with >/= 1 hour in-/decrease in daily TV time between 2001 and 2011. BMIs in 1986 were also evaluated. We explored the causal relationship of TV time with waist and BMI by classical temporality criterion and recently introduced causal-discovery algorithms (pairwise causality measures). Both methods supported the hypothesis that TV time is causative to weight gain, and no evidence was found for reverse or bidirectional causality. Constantly low TV time was associated with less pronounced increase in waist and BMI, and waist and BMI increase was lower with decreased TV time (P<0.05). The increase in waist and BMI was at least 2-fold in the high TV time group compared to the low TV time group (P<0.05). Adjustment for age, sex, BMI/waist in 2001, physical activity, energy intake, or smoking did not change the results. CONCLUSIONS: In young and middle-aged adults, constantly high TV time is temporally antecedent to BMI and waist increase.</td></tr>
<tr><td>Location: Finland</td></tr>
<tr><td>Sample: 1,387
Attrition Rate: 32.66%
Sample Power: Yes</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Groups divided by hours watched per day: low (≤ 1 hr), moderate (1–3 hrs), and high (≥ 3 hrs), TV viewing time: how much time on average they spent watching TV daily (in 1 hr increments); Also evaluated groups of decrease TV time and increase TV time (at least 1 hr increase or decrease) from 2001 to 2011.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Body mass index (kg/m2) and waist circumference (cm): objectively measured.</td></tr>
<tr><td>Populations Analyzed: Adults 33–50</td><td>Author-Stated Funding Source: Academy of Finland, Social Insurance Institution of Finland, Turku Hospital Medical Funds, Juho Vainio Foundation, Paavo Nurmi Foundation, Finnish, Foundation of Cardiovascular Research and Finnish Cultural Foundation, Sigrid Juselius Foundation, Tampere Tuberculosis Foundation, Emil Aaltonen Foundation</td></tr>
</table>

<table>
<tr><th colspan="2">Cancer</th></tr>
<tr><td colspan="2">Original Research
Citation: Hildebrand JS, Gapstur SM, Gaudet MM, Campbell PT, Patel AV. Moderate-to-vigorous physical activity and leisure-time sitting in relation to ovarian cancer risk in a large prospective US cohort. Cancer Causes Control. 2015;26(11):1691-1697. doi:10.1007/s10552-015-0656-7.</td></tr>
<tr><td colspan="2">Purpose: To examine moderate-vigorous recreational PA, recreational walking, and leisure-time sitting in relation to risk of total, serous, and nonserous epithelial ovarian cancer.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: PURPOSE: Physical activity is hypothesized to lower the risk of ovarian cancer, but current evidence for an association is limited and inconclusive. The purpose of this study was to examine moderate-to-vigorous physical activity, walking, and leisure-time sitting in relation to incident ovarian cancer, overall and by histologic subtype. METHODS: Moderate-vigorous recreational physical activity (MET-hours/week), recreational walking, and leisure-time sitting were examined in relation to epithelial ovarian cancer in the American Cancer Society Cancer Prevention Study II Nutrition Cohort, a US cohort followed for cancer incidence from 1992 to 2011. Exposure information was collected via self-administered questionnaires. Cox proportional hazards regression was used to estimate multivariable-adjusted relative risks (RRs) and 95% confidence intervals (CIs) of total, serous, and nonserous ovarian cancer according to MET-hours/week, hours/week of walking, and hours/day of sitting. RESULTS: Among 63,972 postmenopausal women, 651 cases of ovarian cancer were identified during follow-up. Neither MET-hours/week nor walking was associated with risk. However, >/=6 h/day of sitting, compared to <3, was associated with higher risk of ovarian cancer (RR 1.44, 95% CI 1.12-1.85), particularly for serous cancer (RR 1.52, 95% CI 1.06-2.16), although statistical heterogeneity by histology was not detected (p = 0.36). CONCLUSIONS: Results from this study do not support an association between physical activity and ovarian cancer, whereas prolonged sitting may be associated with higher risk. Additional large studies are needed to further assess possible etiologic differences by histologic subtype.</td></tr>
<tr><td>Location: United States</td></tr>
<tr><td>Sample: 63,972
Attrition Rate: 0.00%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Evaluated hours per day in three groups: <3 hrs, 3–5 hrs, and ≥ 6 hrs per day of sitting, leisure time sitting (non-occupational).
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Ovarian Cancer: self report verified through medical record or linkage with state cancer registries, or through death certificate. Subgroups: serous and non serous ovarian cancer.</td></tr>
<tr><td>Populations Analyzed: Female, Adults 50–74, Post-menopausal</td><td>Author-Stated Funding Source: The American Cancer Society</td></tr>
</table>

<table>
<tr><th colspan="2">Type 2 Diabetes</th></tr>
<tr><td colspan="2">Original Research
Citation: Joseph JJ, Echouffo-Tcheugui JB, Golden SH, et al. Physical activity, sedentary behaviors and the incidence of type 2 diabetes mellitus: the Multi-Ethnic Study of Atherosclerosis (MESA). BMJ Open Diabetes Res Care. 2016;4(1):e000185. doi:10.1136/bmjdrc-2015-000185.</td></tr>
<tr><td colspan="2">Purpose: To explore the association of different measures of physical activity (PA) and sedentary behaviors with incident type 2 diabetes in a large, contemporary multi-ethnic population.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: BACKGROUND: The association between physical activity (PA), sedentary behavior, and incident diabetes has been assessed in whites but is less well investigated in multiethnic populations. OBJECTIVE: To assess the association between PA, sedentary behavior, and incident diabetes in the Multi-Ethnic Study of Atherosclerosis. RESEARCH DESIGN AND METHODS: Incident diabetes was assessed among adults without prevalent baseline diabetes (2000–2002) at 5 in-person examinations between 2002 and 2012. Baseline PA (moderate, vigorous, and exercise-specific; metabolic equivalents of task-hours/week) and sedentary behaviors (television watching, reading; hours/day) were assessed by questionnaire. HRs were estimated using Cox proportional hazard models. RESULTS: Among 5829 adults (mean age 61.8 years, 54% female, 42% white, 12% Chinese-American, 26% African-American, 21% Hispanic-American), there were 655 incident diabetes cases (median follow-up 11.1 years). After adjustment, diabetes risk was lower in those with brisk or striding compared with none or casual walking pace (HR 0.67; 95% CI 0.54 to 0.84), higher levels of exercise PA (HR for highest vs lowest quartile 0.79; 95% CI 0.63 to 0.98), and any compared with no vigorous PA (HR 0.79; 95% CI 0.66 to 0.95). Race/ethnicity influenced the association of walking pace, exercise PA, and any vigorous PA on diabetes risk, which was only significant among whites. Total leisure sedentary behaviors (HR for highest vs lowest quartile 1.65; 95% CI 1.26 to 2.14) and television watching (HR for highest vs lowest quartile 2.68; 95% CI 1.38 to 5.21) were significantly associated with diabetes risk in multiethnic analyses and were influenced by race/ethnicity. CONCLUSIONS: These results confirm the importance of PA and sedentary behavior on diabetes risk in a multiethnic population and demonstrate potential variations across race/ethnic groups.</td></tr>
<tr><td>Location: United States</td></tr>
<tr><td>Sample: 5,829
Attrition Rate: 0.00%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Assessed with MESA Typical Week Physical Activity Survey, time and frequency spent in various physical activities during a typical week in the past month, total leisure sedentary behavior (sum of reading and television time) and television watching alone; created quartiles of hours per day in leisure sedentary behavior and TV watching (0–2 hrs, 2.01–4 hrs, 4.01–6 hrs, and >6 hrs daily). The effect of sedentary behavior was assessed across quartiles of PA (highest to lowest).
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Body mass index (kg/m2): obtained weight and height from calibrated devices. Diabetes: hypoglycemic drugs or fasting blood glucose >= 7.0 mmol/L (126 mg/dL).</td></tr>
<tr><td>Populations Analyzed: White, Black or African American, Hispanic or Latino, Chinese-American, Adults 45–84, Family history of diabetes</td><td>Author-Stated Funding Source: National Institutes of Health</td></tr>
</table>

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Kaikkonen JE, Mikkila V, Juonala M, et al. Factors associated with six-year weight change in young and middle-aged adults in the Young Finns Study. Scand J Clin Lab Invest. 2015:75(2):133-144. doi:10.3109/00365513.2014.992945.</td></tr>
<tr><td colspan="2">Purpose: To examine factors associated with weight change and obesity risk in young and middle-aged adults.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: OBJECTIVE: To examine factors associated with weight change and obesity risk in young and middle-aged adults. SUBJECTS/METHODS: The Young Finns Study with its 923 women and 792 men aged 24-39 years at baseline were followed for six years. Variables associated with the weight change were investigated with regression models. RESULTS: The average weight change was 0.45 kg/year in women and 0.58 kg/year in men. In women, weight change was steady across all ages. In men, weight changes were more pronounced in younger age groups. In women (weight gain > 2 kg, n = 490), medication for anxiety, low occupational status, high baseline BMI (body mass index), high intake of sweet beverages, high childhood BMI, high salt (NaCl and/or KCl) use, low number of children, low childhood family income, high stature and low level of dependence (a temperament subscale) were associated with increased weight gain (in the order of importance). In men (weight gain > 2 kg, n = 455), high stature, high intake of french fries, low intake of sweet cookies, young age, recent divorce, low intake of cereals, high intake of milk, depressive symptoms, rural childhood origin, high baseline BMI and unemployment were associated with more pronounced weight gain. Sedentarity (screen-time) was associated with weight gain only in young men. Physical activity and genetic risk for high BMI (score of 31 known variants) were not consistently associated with weight change. CONCLUSIONS: Socio-economic factors, temperamental and physical characteristics, and some dietary factors are related with weight change in young/middle-aged adults. The weight change occurring in adulthood is also determined by childhood factors, such as high BMI and low family income.</td></tr>
<tr><td>Location: Finland</td></tr>
<tr><td>Sample: 1,715
Attrition Rate: 0.00%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Screen-time: daily minutes per day used to watch television and play computer games.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Body mass index (kg/m2): objectively measured; assessed change in body mass.</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults 24–27, 30–39</td><td>Author-Stated Funding Source: Academy of Finland; the Social Insurane Institution of Finland; Kuopio, Tampere, and Turky University Hospital Medical Funds; the Yrjo Jahnsson Foundation; Juho Vainio Foundation; Paavo Nurmi Foundation; Finnish Foundation of Cardiovascular research; Finnish Cultural Foundation; Sigrid Juselius Foundation; Tampere Tuberculosis Foundation; Emil Aaltonen Foundation; Signe and Ane Gyllenberg Foundation; the Bothnia Welfare Coalition for Research and Knowledge through grants from the University of Vassa; the Vassa Hospital District</td></tr>
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<table>
<tr><th colspan="2">Cancer</th></tr>
<tr><td colspan="2">Original Research
Citation: Lynch BM, Friedenreich CM, Kopciuk KA, Hollenbeck AR, Moore SC, Matthews CE. Sedentary behavior and prostate cancer risk in the NIH-AARP Diet and Health Study. Cancer Epidemiol Biomarkers Prev. 2014;23(5):882-889. doi:10.1158/1055-9965.EPI-13-0808.</td></tr>
<tr><td colspan="2">Purpose: To examine whether self reported daily sitting or television/video viewing time were associated with prostate cancer, independent of moderate-to-vigorous intensity physical activity.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: Sedentary behavior (sitting time) has been proposed as an independent risk factor for some cancers; however, its role in the development of prostate cancer has not been determined. We examined the prospective associations of self-reported daily sitting time and daily television/video viewing time with the risk of developing or dying from prostate cancer among 170,481 men in the NIH-AARP Diet and Health Study. We estimated HRs and 95% confidence intervals (CI) using Cox proportional hazards regression. Between 1996 and 2006, there were 13,751 incident (including 1,365 advanced) prostate cancer cases identified; prostate cancer mortality (through 2008) was 669. No strong or significant association with prostate cancer risk was seen in fully adjusted models for either daily sitting or television/video time. There were some suggestions of effect modification by body mass index (BMI; interaction for television/video time and BMI, P = 0.02). For total prostate cancer risk, television/video time was associated with a slightly elevated, but nonsignificant, increase amongst obese men (HR = 1.28; 95% CI, 0.98-1.69); a null association was observed amongst overweight men (HR = 1.04; 0.89-1.22); and, for men with a normal BMI, television/video time was associated with a nonsignificant risk decrease (HR = 0.82; 95% CI, 0.66-1.01). Similar patterns were observed for total daily sitting and television/video time in advanced prostate cancer and prostate cancer mortality. Sedentary behavior seems to play a limited role in the development of prostate cancer; however, we cannot rule out potential effect modification by BMI or the impact of measurement error on results.</td></tr>
<tr><td>Location: United States</td></tr>
<tr><td>Sample: 170,481
Attrition Rate: 0.00%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Over a typical 24-hour period, total daily sitting time reported in hours per day (<3 hrs, 3–4 hrs, 5–6 hrs, 7 < hrs) and television/video viewing time reported in hours per day (<3 hrs, 3–4 hrs, 5 < hrs).
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Prostate cancer: histologically confirmed cases through linkage to state cancer registry databases. Subgroups: Total prostate cancer, advanced prostate cancer and prostate cancer mortality.</td></tr>
<tr><td>Populations Analyzed: Male, Adults 50–71, Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30)</td><td>Author-Stated Funding Source: American Association of Retired Persons, National Institute of Health, National Health and Medican Research Council, the Victorian Government</td></tr>
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<table>
<tr><th colspan="2">Type 2 Diabetes</th></tr>
<tr><td colspan="2">Original Research
Citation: Manini TM, Lamonte MJ, Seguin RA, et al. Modifying effect of obesity on the association between sitting and incident diabetes in post-menopausal women. Obesity (Silver Spring). 2014;22(4):1133-1141. doi:10.1002/oby.20620.</td></tr>
<tr><td colspan="2">Purpose: To evaluate the association between self-reported daily sitting time and the incidence of type 2 diabetes in a cohort of post menopausal women.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: OBJECTIVE: To evaluate the association between self-reported daily sitting time and the incidence of type 2 diabetes in a cohort of postmenopausal women. METHODS: Women (N=88,829) without diagnosed diabetes reported the number of hours spent sitting over a typical day. Incident cases of diabetes were identified annually by self-reported initiation of using oral medications or insulin for diabetes > 14.4 years follow-up. RESULTS: Each hour of sitting time was positively associated with increased risk of diabetes [risk ratio (RR): 1.05; 95% confidence interval (CI): 1.02–1.08]. However, sitting time was only positively associated with incident diabetes in obese women. Obese women reporting sitting 8–11 (RR: 1.08; 95% CI 1.0–1.1), 12-15 (OR: 1.13; 95% CI 1.0–1.2), and >/=16 hours (OR: 1.25; 95% CI 1.0–1.5) hours per day had an increased risk of diabetes compared to women sitting </=7 hours per day. These associations were adjusted for demographics, health conditions, behaviors (smoking, diet, and alcohol intake), and family history of diabetes. Time performing moderate to vigorous intensity physical activity did not modify these associations. CONCLUSIONS: Time spent sitting was independently associated with increased risk of diabetes diagnosis among obese women-a population already at high risk of the disease.</td></tr>
<tr><td>Location: United States</td></tr>
<tr><td>Sample: 88,250
Attrition Rate: 0.65%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Daily sitting time in hours per day, including sitting at work, table eating, driving, riding in a car or bus, and sitting watching TV or talking; categories: <4, 4–5, 6–7, 8–9,10–11, 12–13, 14–15, and <16 hrs per day; also assessed categorized into ≤ 7 hrs, 8–11 hrs, 12–15 hrs, and ≥16 hrs.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Type 2 Diabetes status: self report of physician diagnosis.</td></tr>
<tr><td>Populations Analyzed: Female, Adults 50–79, Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30), Post-menopausal</td><td>Author-Stated Funding Source: National Institutes of Health, U.S. Department of Health and Human Services</td></tr>
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<table>
<tr><th colspan="2">Cardiovascular Disease</th></tr>
<tr><td colspan="2">Original Research
Citation: McDonnell MN, Hillier SL, Judd SE, Yuan Y, Hooker SP, Howard VJ. Association between television viewing time and risk of incident stroke in a general population: Results from the REGARDS study. Prev Med. 2016;87:1-5. doi:10.1016/j.ypmed.2016.02.013.</td></tr>
<tr><td colspan="2">Purpose: To explore the relationship between TV/video viewing, as a measure of sedentary behavior, and risk of incident stroke in a large prospective cohort of men and women.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: OBJECTIVES: The purpose of this study was to explore the relationship between TV/video viewing, as a measure of sedentary behavior, and risk of incident stroke in a large prospective cohort of men and women. METHODS: This analysis involved 22,257 participants from the REasons for Geographic And Racial Differences in Stroke (REGARDS) study who reported at baseline the amount of time spent watching TV/video daily. Suspected stroke events were identified at six-monthly telephone calls and were physician-adjudicated. Cox proportional hazards models were used to examine risk of stroke at follow-up. RESULTS: During 7.1 years of follow-up, 727 incident strokes occurred. After adjusting for demographic factors, watching TV/video >/=4h/day (30% of the sample) was associated with a hazard ratio of 1.37 increased risk of all stroke (95% confidence interval (CI), 1.10–1.71) and incident ischemic stroke (hazard ratio 1.35, CI 1.06–1.72). This association was attenuated by socioeconomic factors such as employment status, education and income. CONCLUSIONS: These results suggest that while TV/video viewing is associated with increased stroke risk, the effect of TV/video viewing on stroke risk may be explained through other risk factors.</td></tr>
<tr><td>Location: United States</td></tr>
<tr><td>Sample: 22,257
Attrition Rate: 0.00%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: TV or viewing video time per day (<2, 2–4 and <4 hrs/day) on average; categorical responses available by hours per day (none, 1–6 hrs/week, 1 hr/day, 2 hrs/day,
3 hrs/day, and 4 or more hrs/day). Evaluated in groups of <2 hrs/day, 2–4 hrs/day, and 4+ hrs/day.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Stroke: self report confirmed by medical charts. Subgroups: Ischemic and all incident stroke.</td></tr>
<tr><td>Populations Analyzed: Adults ≥45</td><td>Author-Stated Funding Source: National Institute of Health, Department of Human and Health Services</td></tr>
</table>

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Menai M, Charreire H, Kesse-Guyot E, et al. Determining the association between types of sedentary behaviours and cardiometabolic risk factors: A 6-year longitudinal study of French adults. Diabetes Metab. 2016;42(2):112-121. doi:10.1016/j.diabet.2015.08.004.</td></tr>
<tr><td colspan="2">Purpose: To identify longitudinal associations between leisure time sedentary behaviors (television viewing, computer use, and reading) and cardiometabolic risk factors.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: Not Reported
Sample: 2,517
Attrition Rate: 0.00%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: Modifiable Activity Questionnaire (MAQ), assessing time (hours/day or minutes/day) in leisure-time sedentary occupations such as TV viewing, computer use, and reading over the past 12 months.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: AIM: This study identified the longitudinal associations between leisure-time sedentary behaviours [television (TV) viewing, computer use and reading (h/week)] and cardiometabolic risk factors, including the metabolic syndrome. METHODS: A total of 2,517 participants (mean+/-SD age: 55.5+/-4.9 years) were assessed in 2001 and in 2007 for physical activity and leisure-time sedentary behaviours, anthropometry, body composition, blood pressure, fasting blood glucose and lipids, using standardized methods. Multivariate generalized linear (beta, 95% CI and P values) and logistic (OR and 95% CI) regression models were used to assess cross-sectional associations between sedentary behaviours and cardiometabolic risk factors, while a 6-year longitudinal study explored these associations as well as the odds of developing the metabolic syndrome, as defined by the NCEP ATPIII. RESULTS: Increased TV viewing time over the follow-up period was positively associated with increases in body mass index (BMI; P<0.01) and percent body fat (P<0.001), and marginally with waist circumference (P=0.06). Reverse associations were also found, with changes in BMI, percent fat mass and waist circumference positively associated with TV viewing and computer use. Associations between reading and cardiometabolic risk factors were less consistent. Each 1-h/week increase in baseline TV viewing and in reading was associated with an increase in the chances of developing the metabolic syndrome (OR=1.031, 95% CI: 0.998–1.060, P=0.07; and OR=1.032, 95% CI: 1.002–1.065, P=0.02; respectively). CONCLUSION: The present study data emphasizes the notion of differential associations of specific sedentary behaviours with cardiometabolic risk factors. They are also evidence that different longitudinal associations should be taken into account when designing public health objectives of interventions aimed at improving cardiometabolic health.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Body Mass Index (kg/m2), percent fat mass (%), and waist circumference. Percent fat mass: Bio electrical impedance analysis assessed fat mass, divided by total mass.</td></tr>
<tr><td>Populations Analyzed: Adults 45–65</td><td>Author-Stated Funding Source: French National Research Agency, French National Cancer Institute, French Ministry of Health, Mederic, Sodexho, Ipsen, MGEN, Pierre Fabre</td></tr>
</table>

<table>
<tr><th colspan="2">Cardiovascular Disease</th></tr>
<tr><td colspan="2">Original Research
Citation: Moller SV, Hannerz H, Hansen AM, Burr H, Holtermann A. Multi-wave cohort study of sedentary work and risk of ischemic heart disease. Scand J Work Environ Health. 2016;42(1):43-51. doi:10.5271/sjweh.3540.</td></tr>
<tr><td colspan="2">Purpose: To test the hypotheses that employees engaged in sedentary work have a higher risk of ischemic heart disease (IHD) compared to employees not engaged in sedentary work, and a positive dose-response relationship exists between occupational sitting time and the risk of IHD.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: OBJECTIVES: This study aimed to investigate whether sedentary work is a distinct risk factor for ischemic heart disease (IHD) when the effect of occupational sitting is disentangled from that of occupational physical activity. METHODS: Data on occupational sitting time and several covariates were derived from the Danish Work Environment Cohort Study (DWECS) conducted every five years from 1990–2005 among the active Danish population. This study was designed as a multi-wave longitudinal study including participants employed at entry. Respondents were followed in national registers, first for death or hospital treatment due to IHD and second for purchase of medication that may prevent IHD from (re)occurring serving as a proxy for IHD. RESULTS: During 145 850 person-years of follow-up, 510 cases of fatal and non-fatal IHD occurred. After adjustment for age, sex, body mass index (BMI), and socioeconomic status, no difference in risk of IHD was observed between sedentary and non-sedentary employees [hazard ratio (HR) 0.95, 95% confidence interval (95% CI) 0.78–1.16]. During 44 949 and 42 456 person-years of follow-up among men and and women, respectively, 1,263 men and 1,364 women purchased IHD-related medication. No differences in risk were observed between sedentary and non-sedentary participants, either for men or women. A dose-response relationship between occupational sitting time and the risk of IHD was also not detected. CONCLUSIONS: This study could not confirm the hypothesis that sedentary work is a distinct risk factor for IHD. Future studies may further investigate the association with objective measures of occupational sitting time.</td></tr>
<tr><td>Location: Denmark</td></tr>
<tr><td>Sample: 11,996
Attrition Rate: 0.00%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Hours/week of occupational sitting calculated using categories of self-reported sitting in combination with time (hours per week) spent at work; occupational sitting was further categorized into five groups ranging from 0 to ≥30 hrs/week. Participants were also classified as sedentary at work if they spend ≥25 hours sitting at work per week and were compared to those non-sedentary at work
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Ischemic Heart Disease: purchase of medication for ischemic heart disease, death, or hospitalization of ischemic heart disease.</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults 18-59</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Type 2 Diabetes</th></tr>
<tr><td colspan="2">Original Research
Citation: Nguyen B, Bauman A, Ding D. Incident type 2 diabetes in a large Australian cohort study: does physical activity or sitting time alter the risk associated with body mass index? J Phys Act Health. 2017;14(1):13-19. doi:10.1123/jpah.2016-0184.</td></tr>
<tr><td colspan="2">Purpose: To examine the combined effects of body mass index and physical activity level, and sitting time on incident type 2 diabetes among Australian adults.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: PURPOSE: To examine the combined effects of body mass index (BMI), physical activity (PA) and sitting on incident type 2 diabetes mellitus (T2DM) among Australian adults. METHODS: A sample of 29,572 adults aged >/=45 years from New South Wales, Australia, completed baseline (2006-2008) and follow-up (2010) questionnaires. Incident T2DM was defined as self-reported, physician-diagnosed diabetes at follow-up. BMI was categorized as normal/overweight/obese. PA was tertiled into low/medium/ high. Sitting was dichotomized as higher/lower sitting (>/=8 hours/day or <8 hours/day). Odds ratios (OR) were estimated for developing T2DM using logistics regression for individual and combined risk factors, and data stratified by BMI categories. RESULTS: During a mean 2.7 (SD: 0.9) years of follow-up, 611 (2.1%) participants developed T2DM. In fully adjusted models, BMI was the only independent risk factor for incident T2DM. In stratified analyses, the association between BMI and T2DM did not differ significantly across sitting or PA categories. Overweight/obese individuals with high PA and lower sitting had higher odds of incident T2DM than normal counterparts with low PA and higher sitting. CONCLUSIONS: High PA/low sitting did not attenuate the risk of T2DM associated with overweight/obesity. Maintaining a healthy weight, by adopting healthy lifestyle behaviors, is critical for T2DM prevention.</td></tr>
<tr><td>Location: Australia</td></tr>
<tr><td>Sample: 29,572
Attrition Rate: 0.00%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Active Australia Survey, average daily sitting time in two categories: higher sitting time (≥8 hrs/day) and lower sitting (<8 hrs/day)
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Incident Type 2 Diabetes mellitus: self reported of physician-diagnosis; body mass index (kg/m2): self report height and weight.</td></tr>
<tr><td>Populations Analyzed: Adults ≥45, Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30)</td><td>Author-Stated Funding Source: NHMRC Strategic Award for Preventive Healthcare and Strengthening Australia's Social Economic Factor, Cardiovascular Research Network of NSW</td></tr>
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<table>
<tr><th colspan="2">Cancer</th></tr>
<tr><td colspan="2">Original Research
Citation: Nomura SJ, Dash C, Rosenberg L, Palmer J, Adams-Campbell LL. Sedentary time and breast cancer incidence in African American women. Cancer Causes Control. 2016;27(10):1239-1252. doi:10.1007/s10552-016-0803-9.</td></tr>
<tr><td colspan="2">Purpose: To investigate the association between sedentary time and breast cancer incidence overall and by hormone receptor subtypes in the Black Women's Health Study.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: United States
Sample: 46,734
Attrition Rate: 0.00%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: Questionnaires of time spent sitting, measured in hours/day and divided into categories; expressed as total sitting time (in 4 categories: <5 hrs/day, 5–<7 hrs/day, 7–<10 hrs/day, and ≥10 hrs/day), sitting at work or watching TV (<1 hour per day, 1–2 hrs/day, 3–4 hrs/day, ≥ 5 hrs/day).
Measures Steps: No
Measures Bouts: No</td><td>Abstract: PURPOSE: The objective of this study was to evaluate whether time spent sitting at work or watching television was associated with breast cancer risk among African American women. METHODS: The Black Women's Health Study (analytic cohort = 46,734) is an ongoing prospective cohort study of African American women ages 21–69 at baseline (1995). Questionnaire data were used to estimate sedentary time. Total time spent sitting at work and watching television (individually and combined) at baseline and updated through follow-up (1995–2001) and breast cancer incidence (n = 2,041 incident cases, 1995–2013) was evaluated using proportional hazards regression. RESULTS: Higher total time spent sitting at baseline (>/=10 vs. <5 h/day, HR 1.27, 95 % CI 1.06, 1.53) and updated through follow-up (>/=10 vs. <5 h/day, HR 1.38, 95 % CI 1.14, 1.66) was associated with an increased breast cancer risk. Associations were stronger for hormone receptor-negative tumors (>/=10 vs. <5 h/day, HR 1.70, 95 % CI 1.12, 2.55) compared to hormone receptor-positive tumors (>/=10 vs. <5 h/day, HR 1.16, 95 % CI 0.88, 1.52), but tests for heterogeneity were not statistically significant (p heterogeneity = 0.31). Positive associations between total time spent sitting and breast cancer incidence did not differ by physical activity level or body composition measurements. CONCLUSIONS: Our findings suggest that high sedentary time may increase risk for breast cancer among African American women.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Breast Cancer: self report and linkage with cancer registries, and histologically confirmed in most cases; evaluated subgroups of breast cancer type.</td></tr>
<tr><td>Populations Analyzed: Female, Black or African American, Adults 21–69, Normal/Healthy Weight (BMI: 18.5-24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30), Menopausal status; Hormone receptor status</td><td>Author-Stated Funding Source: National Cancer Institute</td></tr>
</table>

<table>
<tr><th colspan="2">Cancer</th></tr>
<tr><td colspan="2">Original Research
Citation: Patel AV, Hildebrand JS, Campbell PT, et al. Leisure-time spent sitting and site-specific cancer incidence in a large U.S. cohort. Cancer Epidemiol Biomarkers Prev. 2015;24(9):1350-1359. doi:10.1158/1055-9965.EPI-15-0237.</td></tr>
<tr><td colspan="2">Purpose: To examine the relationship between sitting time and cancer risk with and without adjustment for body mass index.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: United States
Sample: 146,722
Attrition Rate: 0.00%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: Leisure-time sitting (e.g., TV watching and reading); time spent sitting (hours/day) categorized in 3 groups: <3, 3–5, and ≥6 hrs/day.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: BACKGROUND: Time spent sitting is distinctly different from accumulating too little physical activity and may have independent deleterious effects. Few studies have examined the association between sitting time and site-specific cancer incidence. METHODS: Among 69,260 men and 77,462 women who were cancer-free and enrolled in the American Cancer Society Cancer Prevention Study II Nutrition Cohort, 18,555 men and 12,236 women were diagnosed with cancer between 1992 and 2009. Extended Cox proportional hazards regression was used to estimate multivariable-adjusted relative risks (RR) and 95% confidence intervals (CI) of leisure-time spent sitting with total and site-specific cancer incidence. RESULTS: Longer leisure-time spent sitting, after adjustment for physical activity, BMI, and other factors, was associated with risk of total cancer in women (RR = 1.10; 95% CI, 1.04–1.17 for >/=6 hours vs. <3 hours per day), but not men (RR = 1.00; 95% CI, 0.96-1.05). In women, sitting time was associated with risk of multiple myeloma (RR = 1.65; 95% CI, 1.07–2.54), invasive breast cancer (RR = 1.10; 95% CI, 1.00–1.21), and ovarian cancer (RR = 1.43; 95% CI, 1.10–1.87). There were no associations between sitting time and site-specific cancers in men. CONCLUSION: Longer leisure-time spent sitting was associated with a higher risk of total cancer risk in women, and specifically with multiple myeloma, breast, and ovarian cancers, but sitting time was not associated with cancer risk in men. Further research is warranted to better understand the differences in associations between men and women. IMPACT: For women, these findings support American Cancer Society guidelines for cancer prevention to reduce sitting time when possible.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Cancer: self report, verified by medical record or linkage with state cancer registries, cancer death through linkage with national death index; subgroup analysis by cancer site: head and neck, esophagus, stomach, cancer and rectum, liver, gall bladder, pancreas, lung, melanoma, kidney, bladder, non-hodgkin lymphoma, multiple myeloma, endometrium, ovary, all others, and breast.</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults 50-74</td><td>Author-Stated Funding Source: American Cancer Society</td></tr>
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<table>
<tr><th colspan="2">Cardiovascular Disease</th></tr>
<tr><td colspan="2">Original Research
Citation: Petersen CB, Bauman A, Gronbaek M, Helge JW, Thygesen LC, Tolstrup JS. Total sitting time and risk of myocardial infarction, coronary heart disease and all-cause mortality in a prospective cohort of Danish adults. Int J Behav Nutr Phys Act. 2014;11:13. doi:10.1186/1479-5868-11-13.</td></tr>
<tr><td colspan="2">Purpose: To investigate total sitting time and risk of myocardial infarction (MI), coronary heart disease (CHD) and all-cause mortality in a large prospective cohort of both men and women.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: Denmark
Sample: 71,363
Attrition Rate: 6.69%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: A Danish version of the long International Physical Activity Questionnaire (IPAQ), daily total sitting time; average total sitting time (minutes per day) calculated as the sum of weekday sitting minutes*5 and weekend day sitting minutes*2, and divided by 7; time spent travelling in a motor vehicle was also added (minutes per day); lastly the sum was converted to hours per day.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: BACKGROUND: Evidence suggests that sitting time is adversely associated with health risks. However, previous epidemiological studies have mainly addressed mortality whereas little is known of the risk of coronary heart disease. This study aimed to investigate total sitting time and risk of myocardial infarction, coronary heart disease incidence and all-cause mortality. METHODS: In the Danish Health Examination Survey (DANHES) conducted in 2007–2008 we tested the hypothesis that a higher amount of daily total sitting time is associated with greater risk of myocardial infarction, coronary heart disease and all-cause mortality. The study population consisted of 71,363 men and women aged 18–99 years without coronary heart disease. Participants were followed for myocardial infarction, coronary heart disease and mortality in national registers to August 10, 2012. Cox regression analyses were performed with adjustment for potential confounders and multiple imputation for missing values. RESULTS: During a mean follow-up period of 5.4 years 358 incident cases of myocardial infarction, 1,446 of coronary heart disease, and 1,074 deaths from all causes were registered. The hazard ratios associated with 10 or more hours of daily sitting compared to less than 6 hours were 1.38 (95% CI: 1.01, 1.88) for myocardial infarction, 1.07 (95% CI: 0.91, 1.27) for coronary heart disease and 1.31 (95% CI: 1.09, 1.57). Compared to sitting less than 6 hours per day and being physically active in leisure time, the hazard ratios of sitting more than 10 hours per day and also being physically inactive in leisure time were 1.80 (95% CI: 1.15, 2.82) for myocardial infarction, 1.42 (95% CI: 1.11, 1.81) for coronary heart disease, and 2.29 (95% CI: 1.82, 2.89) for all-cause mortality. CONCLUSIONS: The results suggest that a higher amount of daily total sitting time is associated with all-cause mortality, particularly among inactive adults. In relation to coronary heart, disease results were less clear. This paper adds new evidence to the limited data on the evidence of sitting time and cardiovascular disease and mortality.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Incidence of myocardial infarction (MI): defined according to the International Classification of Diseases (ICD); incidence of coronary heart disease (CHD); incident MI and CHD included both fatal and non-fatal cases; obesity: waist circumference (cm) and BMI (kg/m2).</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults 18-99</td><td>Author-Stated Funding Source: University of Southern Denmark, the Tryg Foundation</td></tr>
</table>

<table>
<tr><th colspan="2">Type 2 Diabetes</th></tr>
<tr><td colspan="2">Original Research
Citation: Petersen CB, Bauman A, Tolstrup JS. Total sitting time and the risk of incident diabetes in Danish adults (the DANHES cohort) over 5 years: a prospective study. Br J Sports Med. 2016;50(22):1382-1387. doi:10.1136/bjsports-2015-095648.</td></tr>
<tr><td colspan="2">Purpose: To examine whether total sitting time is associated with subsequent risk of diabetes in a large prospective cohort of Danish adults.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: Denmark
Sample: 72,608
Attrition Rate: 0.00%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: International Physical Activity Questionnaire (IPAQ), average daily total sitting time, including weekday, weekend, different domains (transportation, work, and, leisure), and time spent traveling in a motor vehicle, reported in hours/day; categories: 0 to <6, 6 to <10, and 10 + hrs/day of sitting.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: AIMS: To test the hypothesis that total sitting time is associated with incident diabetes, after adjustment for physical activity and obesity. METHODS: 72,608 Danish adults from the DANHES cohort reported their total sitting time in 2007–2008 and were followed-up for 5 years, in relation to register-based incident diabetes mellitus. Cox regression analyses were used, and the effect-modifying influence of obesity and physical activity assessed. RESULTS: The age-sex adjusted HR for developing diabetes among those who sat 10+ h/day as compared to <6 h/day was 1.35 (95% CI 1.17 to 1.57). The relative risks were similar by gender, but were largely attenuated by adjustment for potential confounding factors including physical activity, and statistically non-significant for all categories of body mass index except the obese. CONCLUSIONS: The association between total sitting time and incident diabetes is substantially moderated by physical activity and obesity. Total sitting time remains a risk factor for diabetes only in inactive and obese populations.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Incidence of diabetes: self reported and linkage with Danish National Diabetes Register; waist circumference (cm): objectively measured.</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults ≥18, Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30)</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Saidj M, Jorgensen T, Jacobsen RK, Linneberg A, Oppert JM, Aadahl M. Work and leisure time sitting and inactivity: Effects on cardiorespiratory and metabolic health. Eur J Prev Cardiol. 2016;23(12):1321-1329. doi:10.1177/2047487315619559.</td></tr>
<tr><td colspan="2">Purpose: To examine the separate and combined relationships of work and leisure time sitting and moderate-to-vigorous physical activity (MVPA) with cardiorespiratory fitness and cardiometabolic risk factors.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: BACKGROUND: Prospective relationships between sedentary behaviour and cardiorespiratory and metabolic markers need to be better delineated in adults with different physical activity levels. We examined the separate and combined relationships of work and leisure time sitting and moderate to vigorous physical activity (MVPA) with cardiorespiratory fitness and cardiometabolic risk factors. METHODS: A total of 2,308 adults from the Health2006 cohort were followed for five years. Work sitting, leisure time sitting and MVPA were self-reported and cardiorespiratory fitness (Vo2max) was estimated by a submaximal step test. Cardiometabolic risk factors included body mass index, waist circumference, systolic and diastolic blood pressure, triglycerides, high-density lipoprotein cholesterol and insulin levels. Prospective associations with each sitting domain alone and in combination with MVPA level were investigated by multiple linear regression analyses, as were the reverse associations with weight status (body mass index and waist circumference). RESULTS: Baseline leisure time sitting predicted increased insulin ($p < 0.05$) and decreased estimated Vo2max ($p < 0.05$), whereas work sitting predicted decreased waist circumference ($p < 0.05$) and increased estimated Vo2max ($p < 0.01$) over the five-year study. Low baseline leisure time sitting, but not work sitting, predicted increased estimated Vo2max regardless of the MVPA level. Weight status predicted increased leisure time sitting ($p < 0.01$), but leisure time sitting did not predict weight. CONCLUSIONS: These findings emphasize sedentary behaviour during leisure time, rather than at work, as a risk behaviour in relation to cardiorespiratory and metabolic health. For cardiorespiratory fitness, it may be important not only to promote MVPA, but also to discourage sedentary behaviour during leisure time.</td></tr>
<tr><td>Location: Denmark</td></tr>
<tr><td>Sample: 1,403
Attrition Rate: 39.21%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Physical Activity Scale (PAS2), time spent in daily sedentary activities during leisure time (hrs/day) or work (hrs/day); dichotomized into ≤3 hrs/day vs. >3 hrs/day.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Waist circumference (cm) and body mass index (kg/m2) were objectively assessed.</td></tr>
<tr><td>Populations Analyzed: Adults 18–69</td><td>Author-Stated Funding Source: Health Insurance Foundation</td></tr>
</table>

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Shibata AI, Oka K, Sugiyama T, Salmon JO, Dunstan DW, Owen N. Physical activity, television viewing time, and 12-year changes in waist circumference. Med Sci Sports Exerc. 2016;48(4):633-640. doi:10.1249/MSS.0000000000000803.</td></tr>
<tr><td colspan="2">Purpose: To examine whether changes in moderate-to-vigorous physical activity (MVPA) and television (TV) viewing time are associated with subsequent changes in waist circumference, using data from three separate observation points in a large population based prospective study of Australian adults.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: PURPOSE: Both moderate-to-vigorous physical activity (MVPA) and sedentary behavior can be associated with adult adiposity. Much of the relevant evidence is from cross-sectional studies or from prospective studies with relevant exposure measures at a single time point before weight gain or incident obesity. This study examined whether changes in MVPA and television (TV) viewing time are associated with subsequent changes in waist circumference, using data from three separate observation points in a large population-based prospective study of Australian adults. METHODS: Data were obtained from the Australian Diabetes, Obesity, and Lifestyle study collected in 1999-2000 (baseline), 2004-2005 (wave 2), and 2011-2012 (wave 3). The study sample consisted of adults age 25 to 74 yr at baseline who also attended site measurement at three time points (n = 3261). Multilevel linear regression analysis examined associations of initial 5-yr changes in MVPA and TV viewing time (from baseline to wave 2) with 12-yr change in waist circumference (from baseline to wave 3), adjusting for well-known confounders. RESULTS: As categorical predictors, increases in MVPA significantly attenuated increases in waist circumference (P for trend < 0.001). TV viewing time change was not significantly associated with changes in waist circumference (P for trend = 0.06). Combined categories of MVPA and TV viewing time changes were predictive of waist circumference increases; compared with those who increased MVPA and reduced TV viewing time, those who reduced MVPA and increased TV viewing time had a 2-cm greater increase in waist circumference (P = 0.001). CONCLUSION: Decreasing MVPA emerged as a significant predictor of increases in waist circumference. Increasing TV viewing time was also influential, but its impact was much weaker than MVPA.</td></tr>
<tr><td>Location: Australia</td></tr>
<tr><td>Sample: 3,261
Attrition Rate: 0.00%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Compared baseline to 5 year follow up to create three categories: decrease (decreased >3.5 hrs/week), no change (0–3.5 change), and increased (increased >3.5 hrs/week), time spent watching TV or video/DVD on weekdays and the weekend (hrs/week).
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Waist circumference (cm) and body mass index (kg/m2): measured objectively.</td></tr>
<tr><td>Populations Analyzed: Adults 25–74</td><td>Author-Stated Funding Source: National Health and Medical Research Council, Australian Government Department of Health and Ageing, Abbott Australasia Pty Ltd, Alphapharm Pty Ltd, Amgen Australia, AstraZeneca, Bristol-Myers Squibb, City Health Centre-Diabetes Service-Canberra, Department of Health and Community Services – Northern</td></tr>
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	Territory, Department of Health and Human Services, Tasmania; Department of Health, New South Wales; Department of Health, Western Australia; Department of Health, South Australia; Department of Human Services, Victoria; Diabetes Australia, Diabetes Australia Northern Territory, Eli Lilly Australia, Estate of the Late Edward Wilson, GlaxoSmithKline, Jack Brockhoff Foundation, Janssen-Cilag, Kidney Health Australia, Marian & FH Flack Trust, Menzies Research Institute, Merck Sharp & Dohme, Novartis Pharmaceuticals, Novo Nordisk Pharmaceuticals, Pfizer Pty Ltd, Pratt Foundation, Queensland Health, Roche Diagnostics Australia, Royal Prince Alfred Hospital, Sydney, Sanofi Aventis, sanofi-synthelabo the Victorian Government's OIS Program, 2015–2019 MEXTSupported Program for the Strategic Research Foundation at Private Universities

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Smith L, Fisher A, Hamer M. Television viewing time and risk of incident obesity and central obesity: the English longitudinal study of ageing. BMC Obes. 2015;2:12. doi:10.1186/s40608-015-0042-8.</td></tr>
<tr><td colspan="2">Purpose: To investigate longitudinal associations between television viewing time and central and total adiposity in a sample of older English adults.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: BACKGROUND: Research suggests television viewing time may be associated with incident obesity and central obesity in young adults. No study has investigated these associations in older English adults. The aim of this study was to investigate longitudinal associations between television viewing time and incident obesity and central obesity in a sample of older English adults. Analyses of data from the English Longitudinal Study of Ageing. At baseline (2008), participants reported their television viewing time. Research nurses recorded obesity and central obesity by body mass index and waist circumference, respectively, at four year follow-up. Associations between television viewing time and incident obesity (BMI > 30 kg/m(2)) and central obesity (waist >102 cm men; > 88 cm women) at four year follow-up were examined using adjusted logistic regression. Participants gave full written informed consent to participate in the study and ethical approval was obtained from the London Multicentre Research Ethics Committee. RESULTS: A total of 3777 initially non-obese participants (aged 64.8 +/- 8.6 yrs, 46.4% male) were included in the analyses using BMI as an outcome and 2947 for the analyses using waist circumference. No significant associations were found between television viewing time and incident obesity. A significant association was found between watching >/=6 hrs/d of television (compared to <2 hrs/d) and central obesity (Odds Ratio 1.48; 95% confidence interval 1.07 to 2.03) after adjustment for covariables including physical activity. CONCLUSIONS: In this sample of older community dwelling English adults greater television viewing time was associated with incident central obesity, but not total obesity when measured by BMI. Interventions to reduce the incidence of central obesity in this age group that focus on reducing TV time, as well as targeting other health behaviours (eg, increasing physical activity levels, improving dietary intake) might prove useful.</td></tr>
<tr><td>Location: United Kingdom</td></tr>
<tr><td>Sample: 3,777
Attrition Rate: 47.18%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Two questions were asked to ascertain tv viewing time, television viewing time; average daily time spent watching television was calculated as [(weekday television time x 5) + (Weekend television time)]/7; and average daily television was categorized into four categories (<4 hrs/day, ≥4 <6 hrs/day, ≥6 hrs/day).
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: No
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Incidence of obesity: Body mass index (kg/m2), Waist circumference (cm).</td></tr>
<tr><td>Populations Analyzed: Adults mean age 65</td><td>Author-Stated Funding Source: National Institute for Health Research’s School for Public Health Research, the British Heart Foundation, a Cancer Research UK programme</td></tr>
</table>

<table>
<tr><th colspan="2">Type 2 Diabetes</th></tr>
<tr><td colspan="2">Original Research
Citation: Smith L, Hamer M. Television viewing time and risk of incident diabetes mellitus: the English Longitudinal Study of Ageing. Diabet Med. 2014;31(12):1572-1576. doi:10.1111/dme.12544.</td></tr>
<tr><td colspan="2">Purpose: To investigate the longitudinal association between television viewing time, physical activity level, and risk of incident diabetes mellitus, using data from the English Longitudinal Study of Ageing (ELSA).</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: AIM: To investigate the longitudinal association between television viewing time and risk of incident diabetes mellitus in an elderly sample of adults in England. METHODS: Analyses of data from the English Longitudinal Study of Ageing. At baseline (2008), participants reported their television viewing time and physical activity level. Diabetes mellitus was recorded from self-reported physician diagnosis at 2-year follow-up. Associations between television viewing time and combined television viewing time and physical activity level with risk of incident diabetes mellitus at follow-up were examined using adjusted logistic regression models. RESULTS: A total of 5964 participants (mean +/- sd age 65 +/- 9 years at baseline, 44% male) were included in the analyses. There was an association between baseline television viewing time and risk of incident diabetes mellitus at 2-year follow-up (>/= 6 h/day compared with <2 h/day; odds ratio 4.27, 95% CI 1.69, 10.77), although the association was attenuated to the null in final adjusted models that included BMI. Participants who were inactive/had high television viewing time at baseline were almost twice as likely to have diabetes mellitus at 2-year follow-up than those who were active/had low television viewing time (fully adjusted odds ratio 1.94, 95% CI 1.02, 3.68), although active participants reporting high television viewing were not at risk. CONCLUSION: Interventions to reduce the incidence of diabetes in the elderly that focus on both increasing physical activity and reducing television viewing time might prove useful.</td></tr>
<tr><td>Location: United Kingdom</td></tr>
<tr><td>Sample: 5,964
Attrition Rate: 10.35%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Two questions were asked to ascertain tv viewing time, television viewing time; average daily time spent watching television was calculated as [(weekday television time x 5) + (Weekend television time)]/7; and average daily television was categorized into four categories (<4 hrs/day, ≥4 <6 hrs/day, ≥6 hrs/day).
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Incidence of diabetes mellitus.</td></tr>
<tr><td>Populations Analyzed: Adults mean age 65</td><td>Author-Stated Funding Source: The National Institute on Aging in the United States; consortium of UK government departments, coordinated by the Office for National Statistics; the National Institute for Health Research's School for Public Health Research; the British Heart Foundation</td></tr>
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<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Su C, Jia XF, Wang ZH, Wang HJ, Ouyang YF, Zhang B. Longitudinal association of leisure time physical activity and sedentary behaviors with body weight among Chinese adults from China Health and Nutrition Survey 2004-2011. Eur J Clin Nutr. 2017;71(3):383-388. doi:10.1038/ejcn.2016.262.</td></tr>
<tr><td colspan="2">Purpose: To examine the associations of leisure time physical activity (LTPA) combined with sedentary behaviors with weight changes as well as risk of overweight and obesity among Chinese adult men and women using the longitudinal data from four recent China Health and Nutrition Surveys (CHNS).</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: China
Sample: 15,050
Attrition Rate: 2.18%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: Value of each non-occupational recreational activity was summed to obtain total time expenditure on sedentary behaviors, average time per day (hrs/day) spent in various non-occupational recreational activities, such as reading, drawing, watching TV, DVDs, VCDs and videos, watching movies/videos and playing games online or via smartphone, surfing and chatting by internet and others; categories for sedentary behaviors were: 0–3, 3–6 and ≥6 hrs/day.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: BACKGROUND/OBJECTIVES: Present study aims to longitudinally explore independent association of physical activity and sedentary behaviors with body weight. SUBJECTS/METHODS: This study included 15050 adults who have complete demographic and dietary data, leisure time physical activity (LTPA) and sedentary behavior evaluations, anthropometric measurements from longitudinal data of China Health and Nutrition Survey 2004-2011. Three-level mixed-effects linear and logistic regression models were performed for association analysis. RESULTS: Overweight and obesity prevalence in men and women progressively increased from 2004 to 2011. MET-h/week from LTPA declined, whereas time (h/day) spent in sedentary behaviors increased in men and women over 7 years. After adjustment for confounders, LTPA (MET-h/week) was linked with weight gain for moderate (beta=0.43, 95% confidence interval (CI): 0.16-0.60, P<0.01) and low (beta=0.52, 95% CI: 0.23-0.81, P<0.01) versus high LTPA in men; weight was increased by 0.7 kg (95% CI: 0.44-0.93, P<0.001) and 0.4 kg (95% CI: 0.12-0.68, P<0.01) among men and women without LTPA, respectively, compared with those with high LTPA. Sedentary behavior was associated with weight gain in men (beta=0.45, 95% CI: 0.14-0.76, P<0.01) and in women (beta=0.29, 95% CI: 0.11-0.49, P<0.05) for high versus low level. Moreover, overweight and obesity risk in men with low LTPA or without LTPA was 1.88 (95% CI: 1.15-2.51, P<0.05) and 2.01 (95% CI: 1.41-3.03, P<0.001) times higher than those with high LTPA, respectively. Odds of overweight and obesity were increased to 1.63 (95% CI: 1.29-2.21, P<0.01) times in women with low LTPA and 1.69 (95% CI: 1.37-2.27, P<0.001) times in women without LTPA compared with those with high LTPA. High level sedentary behavior was associated with 19% (OR=1.19, 95% CI: 1.04-1.35, P<0.05) greater odds of overweight and obesity against low level in men. CONCLUSIONS: LTPA and sedentary behaviors are independently and longitudinally associated with overweight and obesity, especially in men.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Weight change (Kg); overweight and obesity prevalence: body mass index (kg/m2).</td></tr>
</table>

Populations Analyzed: Male, Female, Adults 18–60	**Author-Stated Funding Source:** National Institute for Nutrition and Health, Chinese Center for Disease Control and Prevention, Carolina Population Center, University of North Carolina at Chapel Hill, the Fogarty International Center, NIH, the National Natural Science Foundation of China

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Thomee S, Lissner L, Hagberg M, Grimby-Ekman A. Leisure time computer use and overweight development in young adults--a prospective study. BMC Public Health. 2015;15:839. doi:10.1186/s12889-015-2131-5.</td></tr>
<tr><td colspan="2">Purpose: To examine the relation between leisure time computer use for gaming and for emailing/chatting with overweight development in young adults.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: BACKGROUND: The prevalence of overweight among Swedish young adults has nearly doubled since the 1980s. The weight increase has been paralleled by the increased use of computers at work, at school, and at leisure time. The aim was to examine leisure time computer use for gaming, and for emailing/chatting, in relation to overweight development in young adults. METHODS: A prospective cohort study with Swedish young adults (20-24 years at baseline) who responded to a questionnaire at baseline (n = 6735), and after 1 year (n = 3928) and 5 years (n = 2593). Exposure variables were average daily time spent on leisure time computer gaming and emailing/chatting. Logistic regression was performed for cross-sectional analyses with overweight (BMI >/= 25) and obesity (BMI >/= 30) as the outcomes, and for prospective analyses with new cases of overweight at the 1- and 5-year follow-ups. Change in BMI from baseline to 5 year-follow-up was analyzed with linear regression. RESULTS: There were cross-sectional and prospective associations between computer gaming and overweight (BMI >/= 25) in women, after adjusting for age, occupation, physical activity, sleep, social support, and total computer use. For the men, only cross-sectional associations could be seen. Spending more than 2 h daily for emailing and chatting was related cross-sectionally to overweight in the women. No clear prospective associations were found for emailing/chatting and overweight development in either sex. CONCLUSIONS: We have identified a new risk group for overweight development: young adult female computer gamers. Leisure time computer gaming was a prospective risk factor for overweight in women even after adjusting for demographic and lifestyle factors, but not in men. There were no clear prospective associations between computer use for emailing/chatting and overweight in either sex.</td></tr>
<tr><td>Location: Sweden</td></tr>
<tr><td>Sample: 2,593
Attrition Rate: 61.49%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Four response categories: 1 = None at all, 2 = 2 hrs/day, total daily computer use (gaming and emailing chatting) over the past 30 days.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: No
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Body mass index (kg/m2); change in BMI from baseline to 5 year-follow-up.</td></tr>
<tr><td>Populations Analyzed: Male, Female, Adults 20–24, Underweight (BMI: Below 18.5), Normal/Healthy Weight (BMI: 18.5–24.9), Overweight (BMI: 25–29.9) and Obese (BMI: ≥30)</td><td>Author-Stated Funding Source: FORTE: Swedish Research Council for Health, Working Life and Welfare</td></tr>
</table>

<table>
<tr><th colspan="2">Cancer</th></tr>
<tr><td colspan="2">Original Research
Citation: Wang A, Qin F, Hedlin H, et al. Physical activity and sedentary behavior in relation to lung cancer incidence and mortality in older women: The Women's Health Initiative. Int J Cancer. 2016;139(10):2178-2192. doi:10.1002/ijc.30281.</td></tr>
<tr><td colspan="2">Purpose: To investigate physical activity and sedentary behavior in relation to lung cancer incidence and mortality in older women.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: United States
Sample: 129,401
Attrition Rate: 20.02%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: Sitting time in hrs/day: 5, 5.1 to 9.9, 10.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: Physical activity has been associated with lower lung cancer incidence and mortality in several populations. We investigated these relationships in the Women's Health Initiative Observational Study (WHI-OS) and Clinical Trial (WHI-CT) prospective cohort of postmenopausal women. The WHI study enrolled 161,808 women aged 50-79 years between 1993 and 1998 at 40 U.S. clinical centers; 129,401 were eligible for these analyses. Cox proportional hazards models were used to assess the association of baseline physical activity levels [metabolic equivalent (MET)-min/week: none <100 (reference), low 100 to <500, medium 500 to <1,200, high 1,200+] and sedentary behavior with total lung cancer incidence and mortality. Over 11.8 mean follow-up years, 2,148 incident lung cancer cases and 1,365 lung cancer deaths were identified. Compared with no activity, higher physical activity levels at study entry were associated with lower lung cancer incidence [p = 0.009; hazard ratios (95% confidence intervals) for each physical activity category: low, HR: 0.86 (0.76-0.96); medium, HR: 0.82 (0.73-0.93); and high, HR: 0.90 (0.79-1.03)], and mortality [p < 0.0001; low, HR: 0.80 (0.69-0.92); medium, HR: 0.68 (0.59-0.80); and high, HR: 0.78 (0.66-0.93)]. Body mass index (BMI) modified the association with lung cancer incidence (p = 0.01), with a stronger association in women with BMI <30 kg/m(2) . Significant associations with sedentary behavior were not observed. In analyses by lung cancer subtype, higher total physical activity levels were associated with lower lung cancer mortality for both overall NSCLC and adenocarcinoma. In conclusion, physical activity may be protective for lung cancer incidence and mortality in postmenopausal women, particularly in non-obese women.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Lung cancer incidence and mortality: body mass index (BMI).</td></tr>
<tr><td>Populations Analyzed: Female, Adults 50–79, Post-menopausal</td><td>Author-Stated Funding Source: National Institutes of Health, Stanford University School of Medicine</td></tr>
</table>

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Wijndaele K, Orrow G, Ekelund U, et al. Increasing objectively measured sedentary time increases clustered cardiometabolic risk: a 6 year analysis of the ProActive study. Diabetologia. 2014;57(2):305-312. doi:10.1007/s00125-013-3102-y.</td></tr>
<tr><td colspan="2">Purpose: To estimate the independent associations between changes in objectively measured time spent sedentary, in moderate-to-vigorous physical activity (MVPA) and in self-reported television viewing over 6 years and changes in clustered and individual cardiometabolic risk factors in adults with a parental history of type 2 diabetes.</td></tr>
<tr><td>Study Design: Prospective cohort study
Location: Not Reported
Sample: 171
Attrition Rate: 15.34%
Sample Power: Not Reported
Exposure Measurement
Self-Reported: EPAQ2 questionnaire, television viewing time (all hrs/day).
Device-Measured: Accelerometer, sedentary time was defined using a cut-off of <100 counts/min.
Measures Steps: No
Measures Bouts: No</td><td>Abstract: AIMS/HYPOTHESIS: We aimed to quantify the associations between change in objectively measured sedentary and moderate-to-vigorous physical activity (MVPA) times and self-reported television viewing over 6 years and change in a clustered cardiometabolic risk score (CCMR), including and excluding waist circumference (CCMR without adiposity component, CCMR no adip), and its individual components, among the adult children of people with type 2 diabetes. METHODS: In 171 adults (mean +/- SD age 42.52 +/- 6.30 years; 46% men) with a parental history of diabetes (ProActive UK), physical activity accelerometer measures and self-reported television viewing were assessed at baseline and a mean +/- SD of 6.27 +/- 0.46 years later. Associations between change in sedentary time, MVPA time and television viewing and cardiometabolic risk and mediation by adiposity change were examined by multiple linear regression and the product of coefficients method, respectively. RESULTS: Greater increases in sedentary time (h/day) were associated with larger increases in clustered cardiometabolic risk (CCMR: 0.08 [95% CI 0.01, 0.15]; CCMR no adip : 0.08 [0.01, 0.16]) and triacylglycerol (0.15 [0.01, 0.29]), independent of baseline sedentary and MVPA times, change in MVPA time and other confounders. No evidence was found for mediation by change in waist circumference and BMI for the associations with CCMR no adip and triacylglycerol. Greater increases in MVPA time (h/day) were associated with larger decreases in waist circumference (-3.86 [-7.58, -0.14]), independently of baseline MVPA and sedentary times, change in sedentary time and other confounders. Television viewing was not independently associated with any of the cardiometabolic outcomes. CONCLUSIONS/INTERPRETATION: Increasing sedentary time is independently related to increasing clustered cardiometabolic risk and triacylglycerol in adults at high risk of developing diabetes. Strategies to prevent diabetes might target reducing sedentary time. Trial registration ISRCTN61323766.</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Clustered cardiometabolic risk score (CCMR) computed incorporating indicators of central obesity (waist circumference), dyslipidaemia (triacylglycerol and HDL-cholesterol), hypertension (systolic and diastolic blood pressure), and hyperglycaemia (fasting plasma glucose and serum insulin).</td></tr>
<tr><td>Populations Analyzed: Adults 30–50</td><td>Author-Stated Funding Source: UK Medical Research Council, UK National Health Service Research and Development, the UK Royal College of General Practitioners Scientific Foundation, Diabetes UK, the British Heart Foundation, the National Institute for Health Research School for Primary Care Research</td></tr>
</table>

<table>
<tr><th colspan="2">Weight Status</th></tr>
<tr><td colspan="2">Original Research
Citation: Wiseman AJ, Lynch BM, Cameron AJ, Dunstan DW. Associations of change in television viewing time with biomarkers of post-menopausal breast cancer risk: the Australian Diabetes, Obesity and Lifestyle Study. Cancer Causes Control. 2014;25(10):1309-1319. doi:10.1007/s10552-014-0433-z.</td></tr>
<tr><td colspan="2">Purpose: To investigate in a representative sample of Australian post-menopausal women the associations between change in TV viewing time (h/day) over 5 years and biomarkers of post-menopausal breast cancer risk at follow-up, including adiposity (BMI, waist circumference), metabolic dysfunction (fasting plasma glucose, 2-h plasma glucose, fasting insulin, HOMA-IR), and inflammation (high-sensitivity C-reactive protein [hs-CRP]).</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: PURPOSE: Sedentary behavior has been previously shown, in a cross-sectional study, to have deleterious associations with biomarkers of postmenopausal breast cancer risk. We examined the associations of change in sedentary behavior [daily television (TV) viewing time, h/day] over a 5-year period with putative markers of postmenopausal breast cancer risk. METHODS: The analytic cohort consisted of 1,001 postmenopausal women from the Australian Diabetes, Obesity and Lifestyle (AusDiab) study (1999-2005). Multivariate linear regression models were used to examine associations of change in TV viewing time with biomarkers of the following risk mechanisms: adiposity (body mass index [BMI], waist circumference); metabolic dysfunction (fasting plasma glucose, 2-h plasma glucose, fasting insulin, insulin resistance [homeostasis model assessment of insulin resistance (HOMA-IR)]); and inflammation (high-sensitivity C-reactive protein (hs-CRP)). All analyses were adjusted for age, baseline TV viewing, and potential confounders. RESULTS: Hourly increments of change in TV viewing time were positively associated with BMI (beta = 0.50, 95% CI 0.20, 0.81; p = 0.001), waist circumference (beta = 1.18, 95% CI 0.49, 1.87; p = 0.001), fasting insulin (beta = 38.13%, 95% CI 37.08, 39.20; p = 0.01) and HOMA-IR (beta = 37.93%, 95% CI 36.92, 38.98; p = 0.03) in fully adjusted models. Significant associations with BMI, waist circumference, fasting insulin and HOMA-IR were also present in analyses using categories of change in TV viewing time (reduced, same, increased). CONCLUSIONS: The findings suggest that increasing habitual sedentary behavior over time could increase breast cancer risk among postmenopausal women. Further investigation into the role of sedentary behavior in breast cancer etiology is warranted.</td></tr>
<tr><td>Location: Australia</td></tr>
<tr><td>Sample: 1,001
Attrition Rate: 55.51%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement Self-Reported: Interviewer-administered questionnaire, television viewing time; assessed using both continuous (hrs/day) and categorical (decrease; no change (±half hour/day); increase) measures.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Biomarkers of post-menopausal breast cancer risk: adiposity was assessed using BMI and waist circumference; metabolic dysfunction: fasting plasma glucose, 2-h plasma glucose, fasting insulin and HOMA-Insulin Resistance, and high sensitivity c-reactive protein levels measured by chemiluminescent enzyme immunoassays.</td></tr>
<tr><td>Populations Analyzed: Female, Adults ≥55, Post-menopausal</td><td>Author-Stated Funding Source: Early Career Fellowships from the National Health and Medical Research Council, a Future Fellowship from the Australian Research Council, the Victorian Government's Operational Infrastructure Support Program</td></tr>
</table>

<table>
<tr><th colspan="2">Cardiovascular Disease</th></tr>
<tr><td colspan="2">Original Research
Citation: Young DR, Reynolds K, Sidell M, et al. Effects of physical activity and sedentary time on the risk of heart failure. Circ Heart Fail. 2014;7(1):21-27. doi:10.1161/CIRCHEARTFAILURE.113.000529.</td></tr>
<tr><td colspan="2">Purpose: To assess the association between physical activity and heart failure incidence and sedentary behavior and heart failure incidence.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="4">Abstract: BACKGROUND: Although the benefits of physical activity for risk of coronary heart disease are well established, less is known about its effects on heart failure (HF). The risk of prolonged sedentary behavior on HF is unknown. METHODS AND RESULTS: The study cohort included 82,695 men aged>/=45 years from the California Men's Health Study without prevalent HF who were followed up for 10 years. Physical activity, sedentary time, and behavioral covariates were obtained from questionnaires, and clinical covariates were determined from electronic medical records. Incident HF was identified through International Classification of Diseases, Ninth Revision codes recorded in electronic records. During a mean follow-up of 7.8 years (646,989 person-years), 3,473 men were diagnosed with HF. Controlling for sedentary time, sociodemographics, hypertension, diabetes mellitus, unfavorable lipid levels, body mass index, smoking, and diet, the hazard ratio (95% confidence interval [CI]) of HF in the lowest physical activity category compared with those in the highest category was 1.52 (95% CI, 1.39-1.68). Those in the medium physical activity category were also at increased risk (hazard ratio, 1.17 [95% CI, 1.06-1.29]). Controlling for the same covariates and physical activity, the hazard ratio (95% CI) of HF in the highest sedentary category compared with the lowest was 1.34 (95% CI, 1.21-1.48). Medium sedentary time also conveyed risk (hazard ratio, 1.13 [95% CI, 1.04-1.24]). Results showed similar trends across white and Hispanic subgroups, body mass index categories, baseline hypertension status, and prevalent coronary heart disease. CONCLUSIONS: Both physical activity and sedentary time may be appropriate intervention targets for preventing HF.</td></tr>
<tr><td>Location: United States</td></tr>
<tr><td>Sample: 82,695
Attrition Rate: 1.75%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Self-Reported: Categories were created for low (≤2 hours), medium (3–4 hours), and high (≥5 hours) daily sedentary time, sedentary time spent watching television, sitting at a computer, or reading.
Measures Steps: No
Measures Bouts: Yes</td></tr>
<tr><td>Refers to Other Materials: No
Examine Cardiorespiratory Fitness as Outcome: No</td><td>Outcomes Examined: Risk of heart failure: measured by number of heart failure cases, person-years, cases per 1,000 person-years, and hazard ratios.</td></tr>
<tr><td>Populations Analyzed: Male, White, Black or African American, Asian, Hispanic or Latino, Adults 45–69, Normal/Healthy Weight (BMI: 18.5–24.9), Overweight and Obese, Heart Disease, Hypertension</td><td>Author-Stated Funding Source: The California Cancer Research Program, the Kaiser Permanente Northern California Community Benefit Program, the Kaiser Permanente Southern California Community Benefit Program</td></tr>
</table>

Table 5. Original Research Bias Assessment Chart

Nutrition Evidence Library (NEL) Bias Assessment Tool (BAT): Original Research							
	Altenburg, 2014	Anjana, 2015	Asvold, 2017	Barone Gibbs, 2015	Bell, 2014	Boroduli n, 2015	Catsburg, 2014
(???) = Can't Determine							
Inclusion/exclusion criteria similar across study groups.	N/A	Yes	Yes	Yes	Yes	Yes	Yes
Strategy for recruiting or allocating participants similar across study groups.	N/A	Yes	Yes	Yes	Yes	Yes	Yes
Allocation sequence randomly generated.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Group allocation concealed (i.e., assignments could not be predicted).	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Distribution of critical confounding factors similar across study groups at baseline, or analysis controlled for differences between groups.	N/A	Yes	Yes	Yes	Yes	Yes	No
Accounted for variations in execution of study from proposed protocol or research plan.	N/A	N/A	N/A	N/A	N/A	N/A	Yes
Adherence to study protocols similar across study groups.	N/A	Yes	Yes	Yes	Yes	Yes	Yes
Investigators accounted for unintended concurrent exposures that were differentially experienced by study groups and might bias results.	Yes	No	No	Yes	No	No	Yes
Participants blinded to their intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Investigators blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Outcome assessors blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Valid and reliable measures used consistently across study groups to assess inclusion/exclusion criteria, exposures, outcomes, and confounders.	N/A	Yes	Yes	Yes	Yes	Yes	Yes
Length of follow-up similar across study groups.	N/A	Yes	Yes	Yes	Yes	Yes	No
In cases of high or differential loss to follow-up, impact assessed through sensitivity analysis or other adjustment.	???	Yes	Yes	Yes	N/A	No	N/A
Other sources of bias taken into account in design and/or analysis of study through matching or other statistical adjustment.	Yes	Yes	Yes	Yes	Yes	No	Yes
Adequate statistical methods used to assess primary outcomes.	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Nutrition Evidence Library (NEL) Bias Assessment Tool (BAT): Original Research							
	Chomistek, 2015	Florencio, 2015	Golubic, 2015	Helajarvi, 2014	Hildebrand, 2015	Joseph, 2016	Kaikkonen, 2015
(???) = Can't Determine							
Inclusion/exclusion criteria similar across study groups.	Yes	N/A	N/A	Yes	Yes	Yes	N/A
Strategy for recruiting or allocating participants similar across study groups.	Yes	N/A	N/A	Yes	Yes	Yes	N/A
Allocation sequence randomly generated.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Group allocation concealed (i.e., assignments could not be predicted).	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Distribution of critical confounding factors similar across study groups at baseline, or analysis controlled for differences between groups.	Yes	Yes	N/A	Yes	Yes	Yes	N/A
Accounted for variations in execution of study from proposed protocol or research plan.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Adherence to study protocols similar across study groups.	Yes	N/A	N/A	Yes	Yes	Yes	N/A
Investigators accounted for unintended concurrent exposures that were differentially experienced by study groups and might bias results.	Yes	N/A	Yes	Yes	Yes	Yes	N/A
Participants blinded to their intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Investigators blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Outcome assessors blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Valid and reliable measures used consistently across study groups to assess inclusion/exclusion criteria, exposures, outcomes, and confounders.	Yes	Yes	Yes	No	No	Yes	N/A
Length of follow-up similar across study groups.	Yes	Yes	N/A	Yes	Yes	Yes	N/A
In cases of high or differential loss to follow-up, impact assessed through sensitivity analysis or other adjustment.	N/A	N/A	N/A	No	N/A	N/A	N/A
Other sources of bias taken into account in design and/or analysis of study through matching or other statistical adjustment.	Yes	No	Yes	Yes	Yes	Yes	Yes
Adequate statistical methods used to assess primary outcomes.	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Nutrition Evidence Library (NEL) Bias Assessment Tool (BAT): Original Research							
	Lynch, 2014	Manini, 2014	McDonnell, 2016	Menai, 2016	Moller, 2016	Nguyen, 2017	Nomura, 2016
(???) = Can't Determine							
Inclusion/exclusion criteria similar across study groups.	Yes	Yes	Yes	N/A	Yes	Yes	Yes
Strategy for recruiting or allocating participants similar across study groups.	Yes	Yes	Yes	N/A	Yes	Yes	Yes
Allocation sequence randomly generated.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Group allocation concealed (i.e., assignments could not be predicted).	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Distribution of critical confounding factors similar across study groups at baseline, or analysis controlled for differences between groups.	Yes	Yes	Yes	N/A	Yes	???	Yes
Accounted for variations in execution of study from proposed protocol or research plan.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Adherence to study protocols similar across study groups.	Yes	Yes	Yes	N/A	Yes	Yes	Yes
Investigators accounted for unintended concurrent exposures that were differentially experienced by study groups and might bias results.	Yes	Yes	Yes	N/A	Yes	N/A	N/A
Participants blinded to their intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Investigators blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Outcome assessors blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Valid and reliable measures used consistently across study groups to assess inclusion/exclusion criteria, exposures, outcomes, and confounders.	No	Yes	Yes	N/A	No	No	No
Length of follow-up similar across study groups.	Yes	Yes	Yes	N/A	Yes	Yes	Yes
In cases of high or differential loss to follow-up, impact assessed through sensitivity analysis or other adjustment.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other sources of bias taken into account in design and/or analysis of study through matching or other statistical adjustment.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adequate statistical methods used to assess primary outcomes.	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Nutrition Evidence Library (NEL) Bias Assessment Tool (BAT): Original Research							
	Patel, 2015	Petersen, 2016	Petersen, 2014	Saidj, 2016	Shibata, 2016	Smith, 2015	Smith, 2014
(???) = Can't Determine							
Inclusion/exclusion criteria similar across study groups.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy for recruiting or allocating participants similar across study groups.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Allocation sequence randomly generated.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Group allocation concealed (i.e., assignments could not be predicted).	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Distribution of critical confounding factors similar across study groups at baseline, or analysis controlled for differences between groups.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Accounted for variations in execution of study from proposed protocol or research plan.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Adherence to study protocols similar across study groups.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investigators accounted for unintended concurrent exposures that were differentially experienced by study groups and might bias results.	Yes	Yes	No	Yes	No	Yes	Yes
Participants blinded to their intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Investigators blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Outcome assessors blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Valid and reliable measures used consistently across study groups to assess inclusion/exclusion criteria, exposures, outcomes, and confounders.	No	Yes	Yes	Yes	Yes	Yes	Yes
Length of follow-up similar across study groups.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In cases of high or differential loss to follow-up, impact assessed through sensitivity analysis or other adjustment.	N/A	N/A	N/A	No	N/A	No	N/A
Other sources of bias taken into account in design and/or analysis of study through matching or other statistical adjustment.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adequate statistical methods used to assess primary outcomes.	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Nutrition Evidence Library (NEL) Bias Assessment Tool (BAT): Original Research						
	Su, 2017	Thomee, 2015	Wang, 2016	Wijndaele, 2014	Wiseman, 2014	Young, 2014
(???) = Can't Determine						
Inclusion/exclusion criteria similar across study groups.	Yes	Yes	Yes	N/A	Yes	Yes
Strategy for recruiting or allocating participants similar across study groups.	Yes	Yes	Yes	N/A	Yes	Yes
Allocation sequence randomly generated.	N/A	N/A	N/A	N/A	N/A	N/A
Group allocation concealed (i.e., assignments could not be predicted).	N/A	N/A	N/A	N/A	N/A	N/A
Distribution of critical confounding factors similar across study groups at baseline, or analysis controlled for differences between groups.	Yes	Yes	Yes	N/A	Yes	Yes
Accounted for variations in execution of study from proposed protocol or research plan.	N/A	N/A	N/A	N/A	N/A	N/A
Adherence to study protocols similar across study groups.	Yes	Yes	Yes	N/A	Yes	N/A
Investigators accounted for unintended concurrent exposures that were differentially experienced by study groups and might bias results.	Yes	Yes	Yes	N/A	Yes	Yes
Participants blinded to their intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A
Investigators blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A
Outcome assessors blinded to participants' intervention or exposure status.	N/A	N/A	N/A	N/A	N/A	N/A
Valid and reliable measures used consistently across study groups to assess inclusion/exclusion criteria, exposures, outcomes, and confounders.	Yes	Yes	Yes	Yes	No	Yes
Length of follow-up similar across study groups.	Yes	Yes	Yes	N/A	Yes	Yes
In cases of high or differential loss to follow-up, impact assessed through sensitivity analysis or other adjustment.	N/A	No	Yes	N/A	Yes	N/A
Other sources of bias taken into account in design and/or analysis of study through matching or other statistical adjustment.	Yes	Yes	Yes	Yes	Yes	Yes
Adequate statistical methods used to assess primary outcomes.	Yes	Yes	Yes	Yes	Yes	Yes

Appendices

Appendix A: Analytical Framework

Topic Area
Sedentary

Systematic Review Question

What is the relationship between sedentary behavior and (1) diabetes, (2) weight status, (3) cardiovascular disease, and (4) cancer?

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. Is the relationship independent of levels of light, moderate, or vigorous physical activity?
d. Is there any evidence that bouts or breaks in sedentary behavior are important factors?

Population
Adults, 18 years and older

Exposure

Sedentary behavior:

- Total sitting time
- Screen time
- Leisure-time sitting
- Occupational sitting time
- Objective measures of sedentary time

Comparison

Adults who participate in varying levels and types of sedentary behavior

Endpoint Health Outcomes

- Diabetes
- Weight status
- Cardiovascular disease
- Cancer

Key Definition:

Sedentary Behavior: In general, it is any waking behavior characterized by an energy expenditure ≤1.5 METs while in a sitting or reclining posture (Sedentary Behaviour Research Network. Standardized use of the terms "sedentary" and "sedentary behaviours." *Appl Physiol Nutr Metab.* 2012;37:540–542).

Appendix B: Final Search Strategy

Search Strategy: PubMed Q4 (Systematic Reviews, Meta-Analyses, and Pooled Analyses)

Database: PubMed; Date of Search: 2/21/2017; 173 results

Set	Search Strategy
Limit: Language	(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]))
Limit: Publication Date (Systematic Reviews/Meta-Analyses)	AND ("2000/01/01"[PDAT] : "3000/12/31"[PDAT])
Limit: Publication Type Include Systematic Reviews/Meta-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 Systematic Reviews/Meta-Analyses	NOT (“comment”[Publication Type] OR “editorial”[Publication Type])
Sedentary	AND (("Sedentary lifestyle"[mh] OR "Computer time"[tiab] OR "Computer use"[tiab] OR "Screen time"[tiab] OR "Sitting"[tiab] OR "Television"[tiab] OR "TV viewing"[tiab] OR "TV watching"[tiab] OR "Video game"[tiab] OR "Video gaming"[tiab]) OR (("Sedentary"[tiab] OR "Inactivity"[tiab] OR "Physically inactive"[tiab] OR "Sedentarism"[tiab]) NOT medline[sb]))
Incidence/Risk	AND ("risk"[tiab] OR "risks"[tiab] OR "Incidence"[tiab] OR "incident"[tiab] OR "incidents"[tiab] OR "risk"[mh] OR "Incidence"[mh])
Diabetes OR Obesity OR Cardiovascular disease OR cancer	AND (("Arteriosclerosis"[mh] OR "Death, sudden, cardiac"[mh] OR "Heart failure"[mh] OR "Myocardial ischemia"[mh] OR "myocardial infarction"[mh] OR "Stroke"[mh] OR "Subarachnoid hemorrhage"[mh] OR "Aortic Aneurysm, Thoracic"[mh] OR "Intracranial hemorrhages"[mh] OR "neoplasms"[mh] OR "Adiposity"[mh] OR "Body composition"[mh] OR "Body Mass Index"[mh] OR "Overweight"[mh] OR "Insulin resistance"[mh] OR "Diabetes Mellitus, Type 2"[mh] OR "Blood glucose"[mh] OR "Hyperglycemia"[mh]) OR ((Arteriosclero*[tiab] OR Atherosclero*[tiab] OR "Cerebral infarction"[tiab] OR "Cerebrovascular diseases"[tiab] OR "Cerebrovascular disease"[tiab] OR "Coronary heart disease"[tiab] OR "Heart failure"[tiab] OR "Intracerebral Hemorrhage"[tiab] OR "Intracerebral Hemorrhages"[tiab] OR "Intracranial hemorrhage"[tiab] OR "Intracranial hemorrhages"[tiab] OR "ischemic"[tiab]

Set	Search Strategy
	OR "myocardial infarction"[tiab] OR "Stroke"[tiab] OR "Subarachnoid hemorrhages"[tiab] OR "Subarachnoid hemorrhage"[tiab] OR "Cancer"[tiab] OR "Neoplasm"[tiab] OR "Tumor"[tiab] OR "Carcinogenesis"[tiab] OR "Leukemia"[tiab] OR "Lymphoma"[tiab] OR "Malignancy"[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] OR "Fatness"[tiab] OR "Adiposity"[tiab] OR "Body composition"[tiab] OR "Body Mass Index"[tiab] OR "BMI"[tiab] OR "Obese"[tiab] OR "Obesity"[tiab] OR "Overweight"[tiab] OR "Insulin resistance"[tiab] OR "diabetes"[tiab] OR "Hyperglycemia"[tiab] OR "Glycemic Index"[tiab] OR "Blood glucose"[tiab])))

Search Strategy: CINAHL Q4 (Systematic Reviews, Meta-Analyses, and Pooled Analyses)

Database: CINAHL; Date of Search: 2/21/17; 1 result
Terms searched in title or abstract

Set	Search Strategy
Sedentary	("Sedentary" OR "Sedentary lifestyle" OR "Inactivity" OR "Physically inactive" OR "Sedentarism" OR "Computer time" OR "Computer use" OR "Screen time" OR "Sitting" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming")
Incidence/Risk	AND ("risk" OR "risks" OR "Incidence" OR "incident" OR "incidents")
Diabetes OR Obesity OR Cardiovascular disease OR cancer	AND ("Arteriosclerosis" OR "Death, sudden, cardiac" OR "Heart failure" OR "Myocardial ischemia" OR "myocardial infarction" OR "Stroke" OR "Subarachnoid hemorrhage" OR "Aortic Aneurysm, Thoracic" OR "Intracranial hemorrhages" OR Arteriosclero* OR Atherosclero* OR "Cerebral infarction" OR "Cerebrovascular diseases" OR "Cerebrovascular disease" OR "Coronary heart disease" OR "Intracerebral Hemorrhage" OR "Intracerebral Hemorrhages" OR "Intracranial hemorrhage" OR "ischemic" OR "Subarachnoid hemorrhages" OR "Adiposity" OR "Body composition" OR "Body Mass Index" OR "Overweight" OR "Fatness" OR "BMI" OR "Obese" OR "Obesity" OR "neoplasms" OR "Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignancy" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" 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" OR "Insulin resistance" OR "Diabetes Mellitus, Type 2" OR "Hyperglycemia" OR "diabetes" OR "Glycemic Index" OR "Blood glucose")
Systematic Reviews and Meta-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	2000-present English language Peer reviewed Exclude Medline records Human

Search Strategy: Cochrane Q4 (Systematic Reviews, Meta-Analyses, and Pooled Analyses)

Database: Cochrane; Date of Search: 2/21/17; 30 results
Terms searched in title, abstract, or keywords

Set	Search Strategy
Sedentary	("Sedentary" OR "Sedentary lifestyle" OR "Inactivity" OR "Physically inactive" OR "Sedentarism" OR "Computer time" OR "Computer use" OR "Screen time" OR "Sitting" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming")
Incidence/Risk	AND ("risk" OR "risks" OR "Incidence" OR "incident" OR "incidents")
Diabetes OR Obesity OR Cardiovascular disease OR cancer	AND ("Arteriosclerosis" OR "Death, sudden, cardiac" OR "Heart failure" OR "Myocardial ischemia" OR "myocardial infarction" OR "Stroke" OR "Subarachnoid hemorrhage" OR "Aortic Aneurysm, Thoracic" OR "Intracranial hemorrhages" OR Arteriosclero* OR Atherosclero* OR "Cerebral infarction" OR "Cerebrovascular diseases" OR "Cerebrovascular disease" OR "Coronary heart disease" OR "Intracerebral Hemorrhage" OR "Intracerebral Hemorrhages" OR "Intracranial hemorrhage" OR "ischemic" OR "Subarachnoid hemorrhages" OR "Adiposity" OR "Body composition" OR "Body Mass Index" OR "Overweight" OR "Fatness" OR "BMI" OR "Obese" OR "Obesity" OR "neoplasms" OR "Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignancy" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" 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" OR "Insulin resistance" OR "Diabetes Mellitus, Type 2" OR "Hyperglycemia" OR "diabetes" OR "Glycemic Index" OR "Blood glucose")
Limits	2000-present Cochrane Reviews and Other Reviews Word variations will not be searched

Search Strategy: PubMed Q4 (Original Research)

Database: PubMed; Date of Search: 4/25/17; 1,574 results

Set	Search Terms
Limit: Language	(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]))
Limit: Publication Date (Systematic Reviews/Meta-Analyses)	AND ("2014/01/01"[PDAT] : "3000/12/31"[PDAT])
Limit: Publication Type Exclude (Original)	NOT (“comment”[Publication Type] OR “editorial”[Publication Type] OR “review”[Publication Type] OR systematic[sb] OR "meta-analysis"[publication type] 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])
Sedentary	AND (("Sedentary lifestyle"[mh] OR "Computer time"[tiab] OR "Computer use"[tiab] OR "Screen time"[tiab] OR "Sitting"[tiab] OR "Television"[tiab] OR "TV viewing"[tiab] OR "TV watching"[tiab] OR "Video game"[tiab] OR "Video gaming"[tiab]) OR (("Sedentary"[tiab] OR "Inactivity"[tiab] OR "Physically inactive"[tiab] OR "Sedentarism"[tiab]) NOT medline[sb]))
Incidence/Risk	AND ("risk"[tiab] OR "risks"[tiab] OR "Incidence"[tiab] OR "incident"[tiab] OR "incidents"[tiab] OR "risk"[mh] OR "Incidence"[mh])
Diabetes OR Obesity OR Cardiovascular disease OR cancer	AND (("Arteriosclerosis"[mh] OR "Death, sudden, cardiac"[mh] OR "Heart failure"[mh] OR "Myocardial ischemia"[mh] OR "myocardial infarction"[mh] OR "Stroke"[mh] OR "Subarachnoid hemorrhage"[mh] OR "Aortic Aneurysm, Thoracic"[mh] OR "Intracranial hemorrhages"[mh] OR "neoplasms"[mh] OR "Adiposity"[mh] OR "Body composition"[mh] OR "Body Mass Index"[mh] OR "Overweight"[mh] OR "Insulin resistance"[mh] OR "Diabetes Mellitus, Type 2"[mh] OR "Blood glucose"[mh] OR "Hyperglycemia"[mh]) OR ((Arteriosclero*[tiab] OR Atherosclero*[tiab] OR "Cerebral infarction"[tiab] OR "Cerebrovascular diseases"[tiab] OR "Cerebrovascular disease"[tiab] OR "Coronary heart disease"[tiab] OR "Heart failure"[tiab] OR "Intracerebral Hemorrhage"[tiab] OR "Intracerebral Hemorrhages"[tiab] OR "Intracranial hemorrhage"[tiab] OR "Intracranial hemorrhages"[tiab] OR "ischemic"[tiab] OR "myocardial infarction"[tiab] OR "Stroke"[tiab] OR "Subarachnoid hemorrhages"[tiab] OR "Subarachnoid hemorrhage"[tiab] OR "Cancer"[tiab] OR "Neoplasm"[tiab] OR "Tumor"[tiab] OR "Carcinogenesis"[tiab] OR "Leukemia"[tiab] OR "Lymphoma"[tiab] OR "Malignancy"[tiab] OR "Blastoma"[tiab] OR "Tumour"[tiab] OR "Melanoma"[tiab] OR "Myeloma"[tiab] OR "Carcinoma"[tiab] OR "Neoplasia"[tiab] OR

Set	Search Terms
	"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] OR "Fatness"[tiab] OR "Adiposity"[tiab] OR "Body composition"[tiab] OR "Body Mass Index"[tiab] OR "BMI"[tiab] OR "Obese"[tiab] OR "Obesity"[tiab] OR "Overweight"[tiab] OR "Insulin resistance"[tiab] OR "diabetes"[tiab] OR "Hyperglycemia"[tiab] OR "Glycemic Index"[tiab] OR "Blood glucose"[tiab])))

Search Strategy: CINAHL Q4 (Original Research)

Database: CINAHL; Date of Search: 4/25/17; 44 results
Terms searched in title or abstract

Set	Search Terms
Sedentary	("Sedentary" OR "Sedentary lifestyle" OR "Inactivity" OR "Physically inactive" OR "Sedentarism" OR "Computer time" OR "Computer use" OR "Screen time" OR "Sitting" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming")
Incidence/Risk	AND ("risk" OR "risks" OR "Incidence" OR "incident" OR "incidents")
Diabetes OR Obesity OR Cardiovascular disease OR cancer	AND ("Arteriosclerosis" OR "Death, sudden, cardiac" OR "Heart failure" OR "Myocardial ischemia" OR "myocardial infarction" OR "Stroke" OR "Subarachnoid hemorrhage" OR "Aortic Aneurysm, Thoracic" OR "Intracranial hemorrhages" OR Arteriosclero* OR Atherosclero* OR "Cerebral infarction" OR "Cerebrovascular diseases" OR "Cerebrovascular disease" OR "Coronary heart disease" OR "Intracerebral Hemorrhage" OR "Intracerebral Hemorrhages" OR "Intracranial hemorrhage" OR "ischemic" OR "Subarachnoid hemorrhages" OR "Adiposity" OR "Body composition" OR "Body Mass Index" OR "Overweight" OR "Fatness" OR "BMI" OR "Obese" OR "Obesity" OR "neoplasms" OR "Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignancy" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" 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" OR "Insulin resistance" OR "Diabetes Mellitus, Type 2" OR "Hyperglycemia" OR "diabetes" OR "Glycemic Index" OR "Blood glucose")
Original Research	NOT (“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	2014-present English language Peer reviewed Exclude Medline records Human

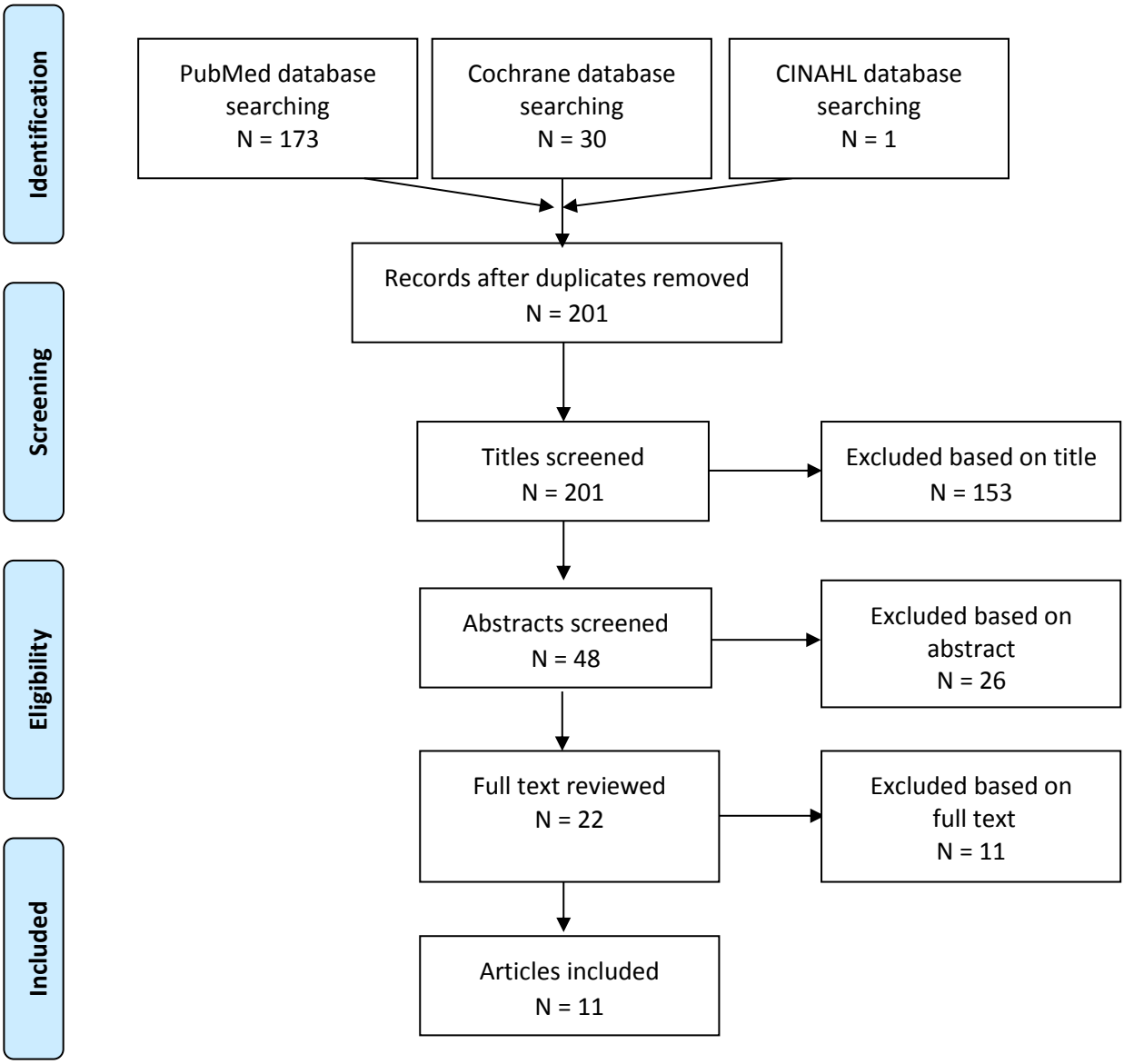
Search Strategy: Cochrane Q4 (Original Research)

Database: Cochrane; Date of Search: 4/25/17; 474 results
Terms searched in title, abstract, or keywords

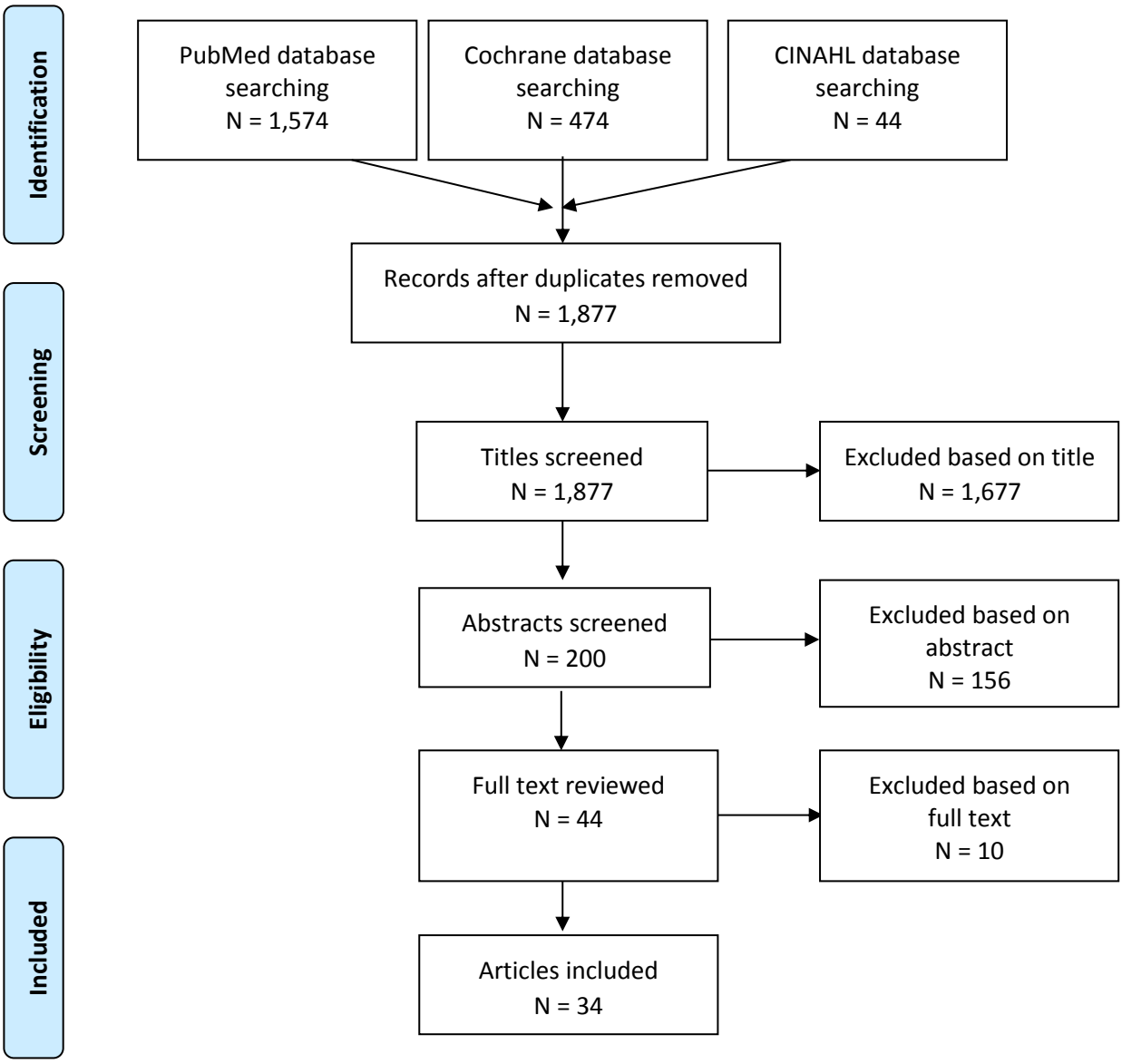
Set	Search Terms
Sedentary	("Sedentary" OR "Sedentary lifestyle" OR "Inactivity" OR "Physically inactive" OR "Sedentarism" OR "Computer time" OR "Computer use" OR "Screen time" OR "Sitting" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming")
Incidence/Risk	AND ("risk" OR "risks" OR "Incidence" OR "incident" OR "incidents")
Diabetes OR Obesity OR Cardiovascular disease OR cancer	AND ("Arteriosclerosis" OR "Death, sudden, cardiac" OR "Heart failure" OR "Myocardial ischemia" OR "myocardial infarction" OR "Stroke" OR "Subarachnoid hemorrhage" OR "Aortic Aneurysm, Thoracic" OR "Intracranial hemorrhages" OR Arteriosclero* OR Atherosclero* OR "Cerebral infarction" OR "Cerebrovascular diseases" OR "Cerebrovascular disease" OR "Coronary heart disease" OR "Intracerebral Hemorrhage" OR "Intracerebral Hemorrhages" OR "Intracranial hemorrhage" OR "ischemic" OR "Subarachnoid hemorrhages" OR "Adiposity" OR "Body composition" OR "Body Mass Index" OR "Overweight" OR "Fatness" OR "BMI" OR "Obese" OR "Obesity" OR "neoplasms" OR "Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignancy" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" 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" OR "Insulin resistance" OR "Diabetes Mellitus, Type 2" OR "Hyperglycemia" OR "diabetes" OR "Glycemic Index" OR "Blood glucose")
Limits	2014-present Trials Word variations will not be searched

Appendix C: Literature Tree

Existing Systematic Reviews and Meta-Analyses Literature Tree



Original Research Literature Tree



Appendix D: Inclusion/Exclusion Criteria

Sedentary Subcommittee

What is the relationship between sedentary behavior and incidence of (1) diabetes, (2) weight status, (3) cardiovascular disease, and (4) cancer?

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. Is the relationship independent of levels of light, moderate, or vigorous physical activity?
d. Is there any evidence that bouts or breaks in sedentary behavior are important factors?

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 **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	Sedentary behavior in youth will be address by youth SC
Health Status of Study Subjects	**Exclude:** • Nonambulatory adults • Hospitalized patients	
Date of Publication	**Include:** • Original research, systematic reviews, and meta-analyses published from 2000–2016	
Study Design	**Include:** • Prospective cohort studies • Systematic reviews • Meta-analyses • Reports determined to have appropriate suitability and quality by PAGAC	

	Exclude: • Randomized controlled trials • Non-randomized controlled trials • Retrospective cohort studies • Case-control studies • Narrative reviews • Commentaries • Editorials • Cross-sectional studies • Before-and-after studies	
Exposure	**Include studies in which the exposure is:** • All types of sedentary behavior **Exclude:** • Studies that use sedentary behavior solely as a confounding variable	
Outcome	**Include studies in which the outcome is the incidence of:** • Diabetes • Weight status • Cardiovascular disease • Cancer	

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
Al Tunaiji H, Davis JC, Mackey DC, Khan KM. Population attributable fraction of type 2 diabetes due to physical inactivity in adults: a systematic review. *BMC Public Health*. May 2014;14:469. doi:org/10.1186/1471-2458-14-469.			X	
Audrey S, Procter S, Cooper A, et al. Employer schemes to encourage walking to work: feasibility study incorporating an exploratory randomised controlled trial. In: *Public Health Res*. Southampton, UK: NIHR Journals Library; 2015;(3):4. doi:10.3310/phr03040.		X		
Barnes AS. Obesity and sedentary lifestyles: risk for cardiovascular disease in women. *Tex Heart Inst J*. 2012;39(2):224-227.		X		
Boyle T, Fritschi L, Kobayashi LC, et al. Sedentary work and the risk of breast cancer in premenopausal and postmenopausal women: a pooled analysis of two case-control studies. *Occup Environ Med*. 2016;73(11):735-741. doi:10.1136/oemed-2015-103537.		X		
Brenner DR. Cancer incidence due to excess body weight and leisure-time physical inactivity in Canada: implications for prevention. *Prev Med*. Sept 2014;66:131-139. doi:10.1016/j.ypmed.2014.06.018.			X	
Brocklebank LA, Falconer CL, Page AS, Perry R, Cooper AR. Accelerometer-measured sedentary time and cardiometabolic biomarkers: a systematic review. *Prev Med*. July 2015; 76:92-102. doi:10.1016/j.ypmed.2015.04.013.	X			
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.		X		
Charansonney OL, Despres JP. Disease prevention--should we target obesity or sedentary lifestyle? *Nat Rev Cardiol*. 2010;7(8):468-472. doi:10.1038/nrcardio.2010.68.		X		
Chastin SF, Egerton T, Leask C, Stamatakis E. Meta-analysis of the relationship between breaks in sedentary behavior and cardiometabolic health. *Obesity (Silver Spring).* 2015;23(9):1800-1810. doi:10.1002/oby.21180.				X
Cong YJ, Gan Y, Sun HL, et al. Association of sedentary behaviour with colon and rectal cancer: a meta-analysis of observational studies. *Br J Cancer*. 2014;110(3):817-826. doi:10.1038/bjc.2013.709.				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		
de Rezende LF, Rey-Lopez JP, Matsudo VK, do Carmo Luiz O. Sedentary behavior and health outcomes among older adults: a				X

Citation	Outcome	Study design	Exposure	Not ideal fit for replacement of de novo search
systematic review. *BMC Public Health.* April 2014;14:333. doi:10.1186/1471-2458-14-333.				
de Rezende LF, Rodrigues Lopes M, Rey-Lopez JP, Matsudo VK, Luiz Odo C. Sedentary behavior and health outcomes: an overview of systematic reviews. *PLoS One*. 2014;9(8):e105620. doi:10.1371/journal.pone.0105620.				X
Dempsey PC, Owen N, Biddle SJ, Dunstan DW. Managing sedentary behavior to reduce the risk of diabetes and cardiovascular disease. *Curr Diab Rep*. 2014;14(9):522. doi:10.1007/s11892-014-0522-0.		X		
Ekelund U, Brage S, Griffin SJ, Wareham NJ. Objectively measured moderate- and vigorous-intensity physical activity but not sedentary time predicts insulin resistance in high-risk individuals. *Diabetes Care*. 2009;32(6):1081-1086. doi:10.2337/dc08-1895.		X		
Gierisch JM, Beadles C, Shapiro A, et al. Health Disparities in Quality Indicators of Healthcare Among Adults with Mental Illness. In: *VA Evidence-based synthesis program reports.* Washington, D.C.: Department of Veterans Affairs; Oct 2014.			X	
Hamilton MT, Hamilton DG, Zderic TW. Sedentary behavior as a mediator of type 2 diabetes. *Med Sport Sci*. 2014;(60):11-26. doi:10.1159/000357332.		X		
Haney EM, Huffman LH, Bougatsos C, et al. Screening for Lipid Disorders in Children and Adolescents In: *U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews*. Rockville, MD: Agency for Healthcare Research and Quality; July 2007, Report No.: 07-0598-EF-1.	X			
Henson J, Dunstan DW, Davies MJ, Yates T. Sedentary behaviour as a new behavioural target in the prevention and treatment of type 2 diabetes. *Diabetes Metab Res Rev*. 2016;32(suppl 1):213-220. doi:10.1002/dmrr.2759.		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		
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.	X			
Kivimaki M, Nyberg ST, Fransson EI, et al. Associations of job strain and lifestyle risk factors with risk of coronary artery disease: a meta-analysis of individual participant data. *CMAJ*. 2013;185(9):763-769. doi:10.1503/cmaj.121735.			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. In: *U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews*. Rockville, MD: Agency for Healthcare Research and Quality; Feb 2011, Report No.: 11-05152-EF-1.	X			
Mehboob B, Safdar NF, Zaheer S. Socio-economic, environmental and demographic determinants of rise in obesity			X	

Citation	Outcome	Study design	Exposure	Not ideal fit for replacement of de novo search
among Pakistani women: a Systematic Review. *J Pak Med Assoc*. 2016;66(9):1165-1172.				
Milton K, Macniven R, Bauman A. Review of the epidemiological evidence for physical activity and health from low- and middle-income countries. *Glob Public Health*. 2014;9(4):369-381. doi:10.1080/17441692.2014.894548.			X	
Musaiger AO. Overweight and obesity in eastern mediterranean region: prevalence and possible causes. *J Obes*. Sept 2011:407237. doi:10.1155/2011/407237.			X	
Neilson HK, Farris MS, Stone CR, Vaska MM, Brenner DR, Friedenreich CM. Moderate-vigorous recreational physical activity and breast cancer risk, stratified by menopause status: a systematic review and meta-analysis. *Menopause*. 2016;24(3):322-344. doi:10.1097/GME.0000000000000745.			X	
Oczkowski W. Complexity of the relation between physical activity and stroke: a meta-analysis. *Clin J Sport Med*. 2005;15(5):399.			X	
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.			X	
Rhodes RE, Mark RS, Temmel CP. Adult sedentary behavior: a systematic review. *Am J Prev Med*. 2012;42(3):e3-e28. doi:10.1016/j.amepre.2011.10.020.				X
Schulze MB, Hu FB. Primary prevention of diabetes: what can be done and how much can be prevented? *Annu Rev Public Health*. 2005;(26):445-467. doi:10.1146/annurev.publhealth.26.021304.144532.		X		
Shephard RJ. Physical activity in the prevention and management of bladder cancer. *J Sports Med Phys Fitness*. Jan 2017. doi:10.23736/S0022-4707.17.06830-X.	X			
Solomon TP, Thyfault JP. Type 2 diabetes sits in a chair. *Diabetes Obes Metab*. 2013;15(11):987-992. doi:10.1111/dom.12105.		X		
Tarraga Lopez PJ, Albero JS, Rodriguez-Montes JA. Primary and secondary prevention of colorectal cancer. *Clin Med Insights Gastroenterol*. 2014;(7):33-46. doi:10.4137/CGast.S14039.			X	
van Uffelen JG, Wong J, Chau JY, et al. Occupational sitting and health risks: a systematic review. *Am J Prev Med*. 2010;39(4):379-388. doi:10.1016/j.amepre.2010.05.024.				X
Wahid A, Manek N, Nichols M, et al. Quantifying the association between physical activity and cardiovascular disease and diabetes: a systematic review and meta-analysis. *J Am Heart Assoc*. 2016;5(9):pii: e002495. doi:10.1161/JAHA.115.002495.			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*. 2013;76(4):370-376. doi:10.1016/j.maturitas.2013.09.002.	X			

Rationale for Exclusion at Abstract or Full-Text Triage for Original Research

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

Citation	Population	Outcome	Study Design	Exposure
Adams ML, Grandpre J. Dose-response gradients between a composite measure of six risk factors and cognitive decline and cardiovascular disease. *Prev Med.* 2016;91:329-334. doi:10.1016/j.ypmed.2016.09.004.				X
Allesoe K, Holtermann A, Aadahl M, Thomsen JF, Hundrup YA, Søgaard K. High occupational physical activity and risk of ischaemic heart disease in women: the interplay with physical activity during leisure time. *Eur J Prev Cardiol*. 2015;22(12):1601-1608. doi:10.1177/2047487314554866.				X
Alley S, Wellens P, Schoeppe S, et al. Impact of increasing social media use on sitting time and body mass index. *Health Promot J Austr.* Oct 2016. doi:10.1071/HE16026.			X	
Alneami YM, Coleman CL. Risk factors for and barriers to control type-2 diabetes among Saudi population. *Glob J Health Sci*. 2016;8(9):54089. doi:10.5539/gjhs.v8n9p10.			X	
Alquaiz AM, Kazi A, Qureshi R, Siddiqui AR, Jamal A, Shaik SA. Correlates of cardiovascular disease risk scores in women in Riyadh, Kingdom of Saudi Arabia. *Women Health*. 2015;55(1):103-117. doi:10.1080/03630242.2014.972020.			X	
Alsenany S, Al Saif A. Incidence of diabetes mellitus type 2 complications among Saudi adult patients at primary health care center. *J Phys Ther Sci*. 2015;27(6):1727-1730. doi:10.1589/jpts.27.1727.			X	
Aravindalochanan V, Kumpatla S, Rengarajan M, Rajan R, Viswanathan V. Risk of diabetes in subjects with sedentary profession and the synergistic effect of positive family history of diabetes. *Diabetes Technol Ther*. 2014;16(1):26-32. doi:10.1089/dia.2013.0140.			X	
Ardisson Korat AV, Willett WC, Hu FB. Diet, lifestyle, and genetic risk factors for type 2 diabetes: a review from the Nurses' Health Study, Nurses' Health Study 2, and Health Professionals' Follow-up Study. *Curr Nutr Rep*. 2014;3(4):345-354. doi:10.1007/s13668-014-0103-5.			X	
Azagba S, Sharaf MF. Physical inactivity among older Canadian adults. *J Phys Act Health*. 2014;11(1):99-108. doi:10.1123/jpah.2011-0305.			X	
Bakrania K, Edwardson CL, Khunti K, et al. Associations of objectively measured moderate-to-vigorous-intensity physical activity and sedentary time with all-cause mortality in a population of adults at high risk of type 2 diabetes mellitus. *Prev Med Rep*. Jan 2017; 5:285-288. doi:10.1016/j.pmedr.2017.01.013.	X			
Bao W, Tobias DK, Bowers K, et al. Physical activity and sedentary behaviors associated with risk of progression from gestational diabetes mellitus to type 2 diabetes mellitus: a prospective cohort study. *JAMA Intern Med*. 2014;174(7):1047-1055. doi:10.1001/jamainternmed.2014.1795.		X		
Barlow CE, Shuval K, Balasubramanian BA, et al. Association between sitting time and cardiometabolic risk factors after adjustment for cardiorespiratory fitness, Cooper Center			X	

Citation	Population	Outcome	Study Design	Exposure
Longitudinal Study, 2010-2013. *Prev Chronic Dis*. Dec 2016;13:E181. doi:10.5888/pcd13.160263.				
Behrend SW. Television viewing and time spent sedentary in relation to cancer risk. *Oncol Nurs Forum*. 2014;41(6):695-696. doi:10.1188/14.ONF.695-696.			X	
Bellocco R, Marrone G, Ye W, et al. A prospective cohort study of the combined effects of physical activity and anthropometric measures on the risk of post-menopausal breast cancer. *Eur J Epidemiol*. 2016;31(4):395-404. doi:10.1007/s10654-015-0064-z.				X
Bernabe-Ortiz A, Carrillo-Larco RM, Gilman RH, et al. Contribution of modifiable risk factors for hypertension and type-2 diabetes in Peruvian resource-limited settings. *J Epidemiol Community Health*. 2016;70(1):49-55. doi:10.1136/jech-2015-205988.			X	
Blomstrand A, Blomstrand C, Ariai N, Bengtsson C, Björkelund C. Stroke incidence and association with risk factors in women: a 32-year follow-up of the Prospective Population Study of Women in Gothenburg. *BMJ Open*. 2014;4(10):e005173. doi:10.1136/bmjopen-2014-005173.				X
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Judice PB, Silva AM, Sardinha LB. Sedentary bout durations are associated with abdominal obesity in older adults*. J Nutr Health Aging.* 2015;19(8):798-804. doi:10.1007/s12603-015-0501-4.				X
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Lope V, Martin M, Castello A, et al. Physical activity and breast cancer risk by pathological subtype. *Gynecol Oncol.* 2017;144(3):577-585. doi:10.1016/j.ygyno.2016.12.014.				X
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Nag T, Ghosh A. Cardiometabolic risk factors and TV watching in a rural community in West Bengal, India. *Diabetes Metab Syndr*. 2015;9(3):147-152. doi:10.1016/j.dsx.2015.04.013.			X	
Nang EE, van Dam RM, Tan CS, et al. Association of television viewing time with body composition and calcified subclinical atherosclerosis in Singapore Chinese. *PLoS One*. 2015;10(7):e0132161. doi:10.1371/journal.pone.0132161.			X	
Nayak M, Peinhaupt M, Heinemann A, et al. Sedentary behavior in obese pregnant women is associated with		X		

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Oldenburg B, Sathish T, Thankappan KR, et al. Identifying people at high risk for type 2 diabetes: preliminary results from the Kerala Diabetes Prevention Programme. *Diabetologia*. 2015;58(suppl 1):S166.			X	
Olsen CM, Wilson LF, Nagle CM, et al. Cancers in Australia in 2010 attributable to insufficient physical activity. *Aust N Z J Public Health.* 2015;39(5):458-463. doi:10.1111/1753-6405.12469.			X	
Omran S, Barakat H, Muliira JK, McMillan S. Dietary and lifestyle risk factors for colorectal cancer in apparently healthy adults in Jordanian hospitals. *J Cancer Educ*. 2015;32(3):447-453. doi:10.1007/s13187-015-0970-5.			X	
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Citation	Population	Outcome	Study Design	Exposure
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Citation	Population	Outcome	Study Design	Exposure
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