

Supplementary Material

Post-diagnosis recreational physical activity and breast cancer prognosis: Global Cancer Update Programme (CUP Global) systematic literature review and meta-analysis.

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List of Abbreviations

ABCPP, After Breast Cancer Pooling Project; **BMI**, Body mass index; **CPS-II Nutrition Cohort**, Cancer Prevention Study-II Nutrition Cohort; **CWLS**, Collaborative Women's Longevity Study; **DCH**, Diet, Cancer, and Health cohort; **ER+**, Estrogen receptor positive; **ER-**, Estrogen receptor negative; **HR**, Hazard Ratio; **HEAL**, The Health, Eating, Activity, and Lifestyle Study; **LACE**, Life After Cancer Epidemiology study; **LIBCSP**, Long Island Breast Cancer Study; **MET**, Metabolic equivalent of task; **NOWAC**, Norwegian Women and Cancer study; **NRWHS**, The National Runners' and Walkers' Health Studies; **NHIS**, National Health Interview Survey; **NHS**, Nurses' Health Study; **PICOS**, participants, interventions, comparisons, outcomes, and study design; **PA**, physical activity; **PR+**, Progesterone receptor positive; **PR-**, Progesterone receptor negative; **RCT**, Randomised controlled trial; **SBCSS**, Shanghai Breast cancer Survival Study; **SD**, Standard deviation; **TEAM-L side study**, Tamoxifen Exemestane Adjuvant Multicenter Lifestyle side study; **WHI**, Women's Health Initiative; **WHEL**, The Women's Healthy Eating and Living Study; **WISC**, Wisconsin In Situ Cohort study; **USA** United States of America

APPENDIX 1

Supplementary Tables

Supplementary Table 1 PRISMA Checklist 2009			
Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1-2
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	3-4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4-5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	4

Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	4-5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	4
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supplementary Material
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	4
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	4-5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	4
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	Narrative
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	5
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	5-6

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097 For more information, visit: www.prisma-statement.org.

Supplementary Table 1 PRISMA Checklist 2009

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	5 and supplementary material
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	5-6
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7 and Figure 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide	4-5

		the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Supplementary material/Narrative
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	7-11 and Figures 2-4 and supplementary Figures
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	7-11 Figures 2-4 and supplementary Figures
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Supplementary material
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	6-11 and Supplementary Figures
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	12-16
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	12-16
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	16
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	16

Supplementary Table 2A Search terms used for PubMed

Note: The physical activity-related terms are indicated in bold

a. Searching for mortality, survival, recurrence, second cancer

1. Recurrence [MeSH Terms] OR "Neoplasm Recurrence, Local" [MeSH Terms] OR "Disease Progression"[MeSH Terms] OR "Disease-Free Survival"[MeSH Terms] OR Mortality[MeSH Terms] OR Mortality [Subheading] OR "Survival Analysis" [MeSH Terms] OR recurrence [tiab] OR recurrences [tiab] OR relapse [tiab] OR relapses [tiab] OR survivor [tiab] OR survivors [tiab] OR progression [tiab] OR survival [tiab] OR mortality [tiab] OR death [tiab] OR second cancer [tiab]

b. Searching for studies on breast cancer

(Search terms are those tested in the SLR for the WCRF Second Expert Report and the CUP)

2. Breast Neoplasms [MeSH Terms]

3. Breast AND (cancer* OR neoplasm* OR tumor* OR tumor* OR carcinoma* OR adenocarcinoma*)

4. mammary AND (cancer* OR neoplasm* OR tumor* OR tumor* OR carcinoma* OR adenocarcinoma*)

5. #2 OR #3 OR #4

c. Search for all studies relating to diet, body fatness and physical activity

6. diet therapy[MeSH Terms] OR nutrition[MeSH Terms]

7. diet[tiab] OR diets[tiab] OR dietetic[tiab] OR dietary[tiab] OR eating[tiab] OR intake[tiab] OR nutrient*[tiab] OR nutrition[tiab] OR vegetarian*[tiab] OR vegan*[tiab] OR "seventh day adventist"[tiab] OR macrobiotic[tiab]

8. "food and beverages" [MeSH Terms]

9. food*[tiab] OR cereal*[tiab] OR grain*[tiab] OR granary[tiab] OR

wholegrain[tiab] OR wholewheat[tiab] OR roots[tiab] OR plantain*[tiab] OR tuber[tiab]

OR tubers[tiab] OR vegetable*[tiab] OR fruit*[tiab] OR pulses[tiab] OR beans[tiab] OR

lentils[tiab] OR chickpeas[tiab] OR legume*[tiab] OR soy[tiab] OR soya[tiab] OR

nut[tiab] OR nuts[tiab] OR peanut*[tiab] OR groundnut*[tiab] OR (seeds[tiab] AND (diet*[tiab] OR food*[tiab])) OR

meat[tiab] OR beef[tiab] OR pork[tiab] OR lamb[tiab] OR poultry[tiab] OR chicken[tiab] OR turkey[tiab] OR

duck[tiab] OR (fish[tiab] AND (diet*[tiab] OR food*[tiab])) OR ((fat[tiab] OR fats[tiab] OR fatty[tiab]) AND (diet*[tiab]

OR food*[tiab] OR adipose[tiab] OR blood[tiab] OR serum[tiab] OR plasma[tiab])) OR egg[tiab] OR eggs[tiab] OR

bread[tiab] OR (oils[tiab] AND (diet*[tiab] OR food*[tiab] OR adipose[tiab] OR blood[tiab] OR serum[tiab] OR

plasma[tiab])) OR shellfish[tiab] OR seafood[tiab] OR sugar[tiab] OR syrup[tiab] OR dairy[tiab] OR milk[tiab] OR

herbs[tiab] OR spices[tiab] OR chilli[tiab] OR chillis[tiab] OR pepper*[tiab] OR condiments[tiab] OR tomato*[tiab]

10. fluid intake[tiab] OR water[tiab] OR drinks[tiab] OR drinking[tiab] OR tea[tiab] OR coffee[tiab] OR caffeine[tiab]

OR juice[tiab] OR beer[tiab] OR spirits[tiab] OR

liquor[tiab] OR wine[tiab] OR alcohol[tiab] OR alcoholic[tiab] OR beverage*[tiab] OR

(ethanol[tiab] AND (drink*[tiab] OR intake[tiab] OR consumption[tiab])) OR yerba mate[tiab] OR ilex

paraguariensis[tiab]

11. pesticides[MeSH Terms] OR fertilizers[MeSH Terms] OR "veterinary

drugs"[MeSH Terms]

12. pesticide*[tiab] OR herbicide*[tiab] OR DDT[tiab] OR fertiliser*[tiab] OR

fertilizer*[tiab] OR organic[tiab] OR contaminants[tiab] OR contaminate*[tiab] OR

veterinary drug*[tiab] OR polychlorinated dibenzofuran*[tiab] OR PCDF*[tiab] OR

polychlorinated dibenzodioxin*[tiab] OR PCDD*[tiab] OR polychlorinated

biphenyl*[tiab] OR PCB*[tiab] OR cadmium[tiab] OR arsenic[tiab] OR chlorinated

hydrocarbon*[tiab] OR microbial contamination*[tiab]

13. food preservation[MeSH Terms]

14. (mycotoxin*[tiab] OR aflatoxin*[tiab] OR pickled[tiab] OR bottled[tiab] OR bottling[tiab] OR canned[tiab] OR

canning[tiab] OR vacuum pack*[tiab] OR refrigerate*[tiab] OR refrigeration[tiab] OR cured[tiab] OR smoked[tiab]

OR preserved[tiab] OR preservatives[tiab] OR nitrosamine[tiab] OR hydrogenation[tiab] OR fortified[tiab] OR

additive*[tiab] OR colouring*[tiab] OR coloring*[tiab] OR flavouring*[tiab] OR flavoring*[tiab] OR nitrates[tiab] OR

nitrites[tiab] OR solvent[tiab] OR solvents[tiab] OR ferment*[tiab] OR processed[tiab] OR antioxidant*[tiab] OR

genetic modif*[tiab] OR genetically modif*[tiab] OR vinyl chloride[tiab] OR packaging[tiab] OR labelling[tiab] OR

phthalates[tiab]) AND (diet*[tiab] OR food*[tiab] OR adipose[tiab] OR blood[tiab] OR serum[tiab] OR plasma[tiab])

15. cookery[MeSH Terms]

16. cooking[tiab] OR cooked[tiab] OR grill[tiab] OR grilled[tiab] OR fried[tiab] OR

fry[tiab] OR roast[tiab] OR bake[tiab] OR baked[tiab] OR stewing[tiab] OR stewed[tiab] OR casserol*[tiab] OR

broil[tiab] OR broiled[tiab] OR boiled[tiab] OR ((microwave[tiab] OR microwaved[tiab] OR re-heating[tiab] OR

reheating[tiab] OR heating[tiab] OR re-heated[tiab] OR heated[tiab]) AND (diet*[tiab] OR food*[tiab])) OR

poach[tiab] OR poached[tiab] OR steamed[tiab] OR barbecue*[tiab] OR chargrill*[tiab] OR heterocyclic amines[tiab]

OR polycyclic aromatic hydrocarbons[tiab]

17. ((carbohydrates[MeSH Terms] OR proteins[MeSH Terms]) AND (diet*[tiab] OR food*[tiab])) OR sweetening

agents[MeSH Terms]

18. (salt[tiab] OR salting[tiab] OR salted[tiab] OR fiber[tiab] OR fibre[tiab] OR polysaccharide*[tiab] OR starch[tiab]

OR starchy[tiab] OR carbohydrate*[tiab] OR lipid*[tiab] OR linoleic acid*[tiab] OR sterols[tiab] OR stanols[tiab] OR

sugar*[tiab] OR sweetener*[tiab] OR saccharin*[tiab] OR aspartame[tiab] OR acesulfame[tiab] OR cyclamates[tiab]

OR maltose[tiab] OR mannitol[tiab] OR sorbitol[tiab] OR sucrose[tiab] OR xylitol[tiab] OR cholesterol[tiab] OR

protein[tiab] OR proteins[tiab] OR hydrogenated dietary oils[tiab] OR hydrogenated lard[tiab] OR hydrogenated oils[tiab]) AND (diet*[tiab] OR food*[tiab] OR adipose[tiab] OR blood[tiab] OR serum[tiab] OR plasma[tiab])

19. vitamins[MeSH Terms]

20. supplements[tiab] OR supplement[tiab] OR vitamin*[tiab] OR retinol[tiab] OR carotenoid*[tiab] OR tocopherol[tiab] OR folate*[tiab] OR folic acid[tiab] OR methionine[tiab] OR riboflavin[tiab] OR thiamine[tiab] OR niacin[tiab] OR pyridoxine[tiab] OR cobalamin[tiab] OR mineral*[tiab] OR (sodium[tiab] AND (diet*[tiab] OR food*[tiab])) OR iron[tiab] OR ((calcium[tiab] AND (diet*[tiab] OR food*[tiab] OR supplement*[tiab])) OR selenium[tiab] OR (iodine[tiab] AND (diet*[tiab] OR food*[tiab] OR supplement*[tiab] OR deficiency)) OR magnesium[tiab] OR potassium[tiab] OR zinc[tiab] OR copper[tiab] OR phosphorus[tiab] OR manganese[tiab] OR chromium[tiab] OR phytochemical[tiab] OR allium[tiab] OR isothiocyanate*[tiab] OR glucosinolate*[tiab] OR indoles[tiab] OR polyphenol*[tiab] OR phytestrogen*[tiab] OR genistein[tiab] OR saponin*[tiab] OR coumarin*[tiab] OR lycopene[tiab])

21. **physical fitness[MeSH Terms] OR physical exertion[MeSH Terms] OR physical endurance[MeSH Terms] OR walking[MeSH Terms] OR exercise[MeSH Terms] OR muscle stretching exercises[MeSH Terms] OR tai ji[MeSH Terms] OR yoga[MeSH Terms] OR sedentary lifestyle[MeSH Terms]**

22. **recreational activit*[tiab] OR household activit*[tiab] OR occupational activit*[tiab] OR physical activit*[tiab] OR physical inactivit*[tiab] OR exercise[tiab] OR exercising[tiab] OR energy intake[tiab] OR energy expenditure[tiab] OR energy balance[tiab] OR energy density[tiab] OR sedentar*[tiab] OR standing[tiab] OR sitting[tiab] OR television[tiab] OR aerobic activities[tiab] OR aerobic activity[tiab] OR cardiovascular activities[tiab] OR cardiovascular activity[tiab] OR endurance activities[tiab] OR endurance activity[tiab] OR resistance training[tiab] OR strength training[tiab] OR physical conditioning[tiab] OR functional training[tiab] OR leisure-time physical activity[tiab] OR lifestyle activities[tiab] OR lifestyle activity[tiab] OR qi gong[tiab] OR tai chi[tiab] OR tai ji[tiab] OR yoga[tiab] OR free living activities[tiab] OR free living activity[tiab] OR walk[tiab] OR walking[tiab]**

23. body weight[MeSH Terms] OR anthropometry[MeSH Terms] OR body composition[MeSH Terms] OR body constitution[MeSH Terms] OR body size[MeSH Terms] OR body size[tiab]

24. weight loss[tiab] OR weight gain[tiab] OR anthropometry[tiab] OR birth weight[tiab] OR birthweight[tiab] OR birth-weight[tiab] OR child development[tiab] OR height[tiab] OR body composition[tiab] OR body mass index[tiab] OR BMI[tiab] OR obesity[tiab] OR obese[tiab] OR overweight[tiab] OR over-weight[tiab] OR over weight[tiab] OR skinfold measurement*[tiab] OR skinfold thickness[tiab] OR DEXA[tiab] OR bio-impedence[tiab] OR waist circumference[tiab] OR hip circumference[tiab] OR waist hip ratio*[tiab]

25. #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24

d. Limiting to human studies:

26. animal [MeSH Terms] NOT human [MeSH Terms]

27. #25 NOT #26

e. Combining the searches for each cancer

(a) AND (b) AND (c) AND (d)
i.e. #1 AND #5 AND #27

Supplementary Table 2B Search terms used for OVID Embase.

a. Searching for mortality, survival, recurrence, second cancer.

- 1 *Recurrent disease/
- 2 *Disease exacerbation/

- 3 Disease free survival/
- 4 mortality/ or all-cause mortality/ or cancer mortality/ or cardiovascular mortality/ or mortality rate/ or premature mortality/
- 5 Survival analysis/
- 6 Relapse/
- 7 Survivor/
- 8 Second cancer/
- 9 (recur\$ or local recurrence or progression or relap\$ or prognos\$ or surviv\$ or mortality or death or (second\$ adj5 primar\$)).ab,ti.
- 10 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9

b. Searching for studies on breast cancer

- 11 breast tumor/
- 12 (breast and (cancer\$ or neoplasm\$ or tumour\$ or tumor\$ or carcinoma\$ or adenocarcinoma\$)).tw,kw.
- 13 (mammary and (cancer\$ or neoplasm\$ or tumour\$ or tumor\$ or carcinoma\$ or adenocarcinoma\$)).tw,kw.
- 14 11 or 12 or 13

c. Search for all studies relating to diet, body fatness and physical activity

- 15 Diet therapy/
- 16 Nutrition/
- 17 (diet or diets or dietetic\$ or dietary or eating or intake or nutrient\$ or nutrition or vegetarian\$ or vegan\$ or (seventh adj1 day adj1 adventist) or macrobiotic).ab,ti.
- 18 15 or 16 or 17
- 19 Food/
- 20 (food\$ or cereal\$ or grain\$ or granary or wholegrain or wholewheat or roots or plantain\$ or tuber or tubers or vegetable\$ or fruit\$ or pulses or beans or lentils or chickpeas or legume\$ or soy or soya or nut or nuts or peanut\$ or groundnut\$ or (seeds and (diet\$ or food\$))).ab,ti.
- 21 (meat or beef or pork or lamb or poultry or chicken or turkey or duck or (fish and (diet\$ or food\$)) or ((fat or fats or fatty) and (diet\$ or food\$ or adipose or blood or serum or plasma)) or egg or eggs or bread or (oils and (diet\$ or food\$ or adipose or blood or serum or plasma)) or shellfish or seafood or sugar or syrup or dairy or milk or herbs or spices or chilli or chillis or pepper\$ or condiments or tomato\$).ab,ti.

- 22 19 or 20 or 21
- 23 Beverage/
- 24 (fluid intake or water or drinks or drinking or tea or coffee or caffeine or juice or beer or spirits or liquor or wine or alcohol or alcoholic or beverage\$ or (ethanol and (drink\$ or intake or consumption)) or yerba mate or ilex or paraguariensis).ab,ti.
- 25 23 or 24
- 26 *Pesticide/
- 27 *Fertilizer/
- 28 *Veterinary drug/
- 29 (pesticide\$ or herbicide\$ or DDT or fertiliser\$ or fertilizer\$ or organic or contaminants or contaminate\$ or veterinary drug\$ or polychlorinated dibenzofuran\$ or PCDF\$ or polychlorinated dibenzodioxin\$ or PCDD\$ or polychlorinated biphenyl\$ or PCB\$ or cadmium or arsenic or chlorinated hydrocarbon\$ or microbial contamination\$).ab,ti.
- 30 26 or 27 or 28 or 29
- 31 Food Preservation/
- 32 ((mycotoxin\$ or aflatoxin\$ or pickled or bottled or bottling or canned or canning or vacuum pack\$ or refrigerate\$ or refrigeration or cured or smoked or preserved or preservatives or nitrosamine or hydrogenation or fortified or additive\$ or colouring\$ or coloring\$ or flavouring\$ or flavoring\$ or nitrates or nitrites or solvent or solvents or ferment\$ or processed or antioxidant\$ or genetic modif\$ or genetically modif\$ or vinyl chloride or packaging or labelling or phthalates) and (diet\$ or food\$ or adipose or blood or serum or plasma)).ab,ti.
- 33 31 or 32
- 34 Cooking/
- 35 (cooking or cooked or grill or grilled or fried or fry or roast or bake or baked or stewing or stewed or casserol\$ or broil or broiled or boiled or (microwave or microwaved or re-heating or reheating or heating or re-heated or heated and (diet\$ or food\$)) or poach or poached or steamed or barbecue\$ or chargrill\$ or heterocyclic amines or polycyclic aromatic hydrocarbons).ab,ti.
- 36 34 or 35
- 37 Carbohydrate/ and ((diet\$ or food\$).ab,ti.)
- 38 Protein/ and ((diet\$ or food\$).ab,ti.)
- 39 Sweetening agent/

- 40 ((salt or salting or salted or fiber or fibre or polysaccharide\$ or starch or starchy or carbohydrate\$ or lipid\$ or linoleic acid\$ or sterols or stanols or sugar\$ or sweetener\$ or saccharin\$ or aspartame or acesulfame or cyclamates or maltose or mannitol or sorbitol or sucrose or xylitol or cholesterol or hydrogenated dietary oils or hydrogenated lard or hydrogenated oils or protein\$) and (diet\$ or food\$ or adipose or blood or serum or plasma)).ab,ti.
- 41 37 or 38 or 39 or 40
- 42 Vitamins/
- 43 Vitamin D/ or (supplements or supplement or vitamin\$ or retinol or carotenoid\$ or tocopherol or folate\$ or folic acid or methionine or riboflavin or thiamine or niacin or pyridoxine or cobalamin or mineral\$ or (sodium and (diet\$ or food\$)) or iron or (calcium and (diet\$ or food\$ or supplement\$)) or selenium or (iodine and (diet\$ or food\$ or supplement\$ or deficiency)) or magnesium or potassium or zinc or copper or phosphorus or manganese or chromium or phytochemical or allium or isothiocyanate\$ or glucosinolate\$ or indoles or polyphenol\$ or phytoestrogen\$ or genistein or saponin\$ or coumarin\$ or lycopene).ab,ti.
- 44 42 or 43
- 45 ***Fitness/**
- 46 **Exercise/**
- 47 ***Endurance/**
- 48 **Walking/**
- 49 **Stretching exercise/**
- 50 **Tai Chi/**
- 51 **Qigong/**
- 52 **Yoga/**
- 53 **Sedentary lifestyle/**
- 54 **(physical fitness or physical exertion or physical endurance or muscle stretching exercise\$ or recreational activit\$ or household activit\$ or occupational activit\$ or physical activit\$ or physical inactivit\$ or exercise\$ or exercising or energy intake or energy expenditure or energy balance or energy density or sedentar\$ or standing or sitting or television viewing or aerobic activit\$ or cardiovascular activit\$ or endurance activit\$ or resistance training or strength training or physical conditioning or functional training or leisure time physical activit\$ or lifestyle activit\$ or qigong or tai chi or tai ji or yoga or free living activit\$ or walk or walking).ab,ti.**
- 55 **45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54**
- 56 Body weight/
- 57 Anthropometry/

- 58 Body Composition/
- 59 Body Constitution/
- 60 Body size/
- 61 (weight or weight loss or weight gain or anthropometry or birth weight or birthweight or birth weight or child development or height or body composition or fat distribution or body mass or BMI or obesity or obese or overweight or over weight or skinfold measurement\$ or skinfold thickness or DEXA or bio-impedence or waist circumference or hip circumference or waist hip ratio\$ or body size).ab.ti.

- 62 56 or 57 or 58 or 59 or 60 or 61
- 63 18 or 22 or 25 or 30 or 33 or 36 or 41 or 44 or 55 or 62
- 64 exp animal/
- 65 exp human/
- 66 64 not 65
- 67 63 not 66

Combined

- 68 10 and 14 and 67

Supplementary Table 3 Grading Criteria for evidence on diet, nutrition, physical activity and survival in women with breast cancer					
Evidence grades		GRADING CRITERIA FOR EVIDENCE ON DIET, NUTRITION, PHYSICAL ACTIVITY AND SURVIVAL IN WOMEN WITH BREAST CANCER	Het	PB	Mec
Strong evidence	Convincing	Evidence of an effect from a meta-analysis of RCTs or at least two well-designed independent RCTs	No	No	Desirable
	Probable	Evidence of an effect from a meta-analysis of RCTs or two well-designed RCTs	Some	No	Desirable
		OR Evidence of an effect from one well-designed RCT and one well-designed cohort study	No	No	Required
		OR Evidence from at least one well-designed pooled analysis of follow-up studies	No	No	Required
		OR Evidence from at least two independent well-designed follow-up studies	No	No	Required
Limited evidence	Limited suggestive	Evidence from a meta-analysis of RCTs or at least two well-designed RCTs but the confidence interval may include the null	Some	No	Not required
		OR Evidence from one well-designed RCT but the confidence interval may include the null	No	No	Required
		OR Evidence of an effect from a pooled analysis of follow-up studies	Some	No	Not required
		OR Evidence from a pooled analysis of follow-up studies but the confidence interval may include the null	Some	No	Required
		OR Evidence of an effect from at least one follow-up study	No	No	Required
		OR Evidence of an effect from at least two follow-up studies	No	No	Not required
		OR Evidence from at least two follow-up studies but the confidence interval may include the null	Some	No	Required
	Limited – no conclusion	Any of the following reasons: - Too few studies available - Inconsistency of direction of effect - Poor quality of studies	-	-	-
Strong evidence	Substantial effect on risk unlikely	Evidence of the absence of an effect (a summary estimate close to 1.0) from any of the following: a) A meta-analysis of RCTs b) At least two well-designed independent RCTs c) A well-designed pooled analysis of follow-up studies d) At least two well-designed follow-up studies - Absence of a dose response relationship (in follow-up studies)	No	-	Absence

Het: Substantial unexplained heterogeneity or some unexplained heterogeneity
PB: Publication bias
Mec: Strong and plausible mechanistic evidence is required, desirable but not required, not required, or absent

Special upgrading factors:

- Presence of a plausible biological gradient ('dose response') in the association. Such a gradient need not be linear or even in the same direction across the different levels of exposure, so long as this can be explained plausibly.
- A particularly large summary effect size (a relative risk of 2.0 or more, or 0.5 or less, depending on the unit of exposure), after appropriate control for confounders.
- Evidence from appropriately controlled experiments demonstrating one or more plausible and specific mechanisms.
- All plausible known residual confounders or biases including reverse causation would reduce a demonstrated effect, or suggest a spurious effect when results show no effect. Special considerations important for evidence for breast cancer survivors including the following potential confounding variables – the type of tumour, type of treatment, amount of treatment received, and the dissemination of the disease.

Supplementary table 4 Physical activity definition in observational studies included in the review			
Study, country	Publications Author Year	Domains	Physical activity categorisation (total or recreational) in the SLR
ABCP (includes: WHEL, LACE, NHS, SBCSS) USA and China	Beasley 2012 Nechuta 2016 (Nechuta 2016 includes only the three USA cohorts not SBCSS)	Running, swimming, biking for exercise, stair master, aerobics, sit-ups, yoga, cross-country, skiing, downhill skiing, hiking, walking for exercise, volleyball, tennis, soccer, baseball, golf, horseback riding, fishing, dancing, and ballet (LACE) Walking or hiking outdoors, jogging, or running, bicycling, swimming, tennis, calisthenics, aerobics, squash or racquetball, lower intensity exercise (yoga, stretching, and toning) and other vigorous activities (i.e., lawn mowing) (NHS) Type and duration of any recreational physical activity (SBCSS) Walking and duration/frequency of strenuous, moderate, mild exercise (WHEL)	Recreational
CPS-II Nutrition Cohort, USA	Maliniak 2018	Moderate-to-vigorous recreational physical activity including walking, dancing, bicycling, aerobics, tennis or racquetball, jogging or running, and lap swimming	Recreational
CWLS, USA	Holick 2008	Hours per week of six recreational activities over the previous year: walking outdoors; running (≥ 10 min/mile); lap swimming; tennis, squash, or racquetball; calisthenics, aerobics, or rowing machine; and other aerobic recreation (e.g., lawn mowing). Usual walking pace (easy or < 2 mph, average or 2-2.9 mph, brisk or 3-3.9 mph, and very brisk or ≥ 4 mph) and number of flights of stairs climbed daily.	Recreational
DCH, Denmark	Ammitzbol I 2016	Exercise (sports, walking, cycling); household PA (housework, do-it-yourself, gardening). Total was defined as exercise and household PA.	Recreational Household
HEAL, USA	Irwin 2008	Recreational physical activity (e.g., brisk walking for exercise)	Recreational
LACE and Pathways, USA	Jones 2016	Exercise exposure was assessed using items from the Arizona Activity Frequency Questionnaire. Patients reported the frequency and duration of leisure-time recreational activities (e.g., walking, jogging, running, bicycling, swimming laps, racket sports) performed at least once a month in the past 6 (Pathways) or 12 months (LACE). Non-recreational activity (e.g., occupational activity, activities of daily living) was not included.	Recreational
LACE, USA	Sternfeld 2009	Based on Arizona Activity Frequency Questionnaire: job or work-related activities (including volunteer work), non-work routine activities (including household chores (6 items), caregiving (5 items), and home maintenance and repairs (7 items)), recreational activities (subdivided	Total

		into sports, exercise, and dance (22 items), sedentary recreational activities such as reading or socializing (6 items), and transportation (motorized or active transport (4 items)	(Occupational, household, recreational and transportation) Recreational
LIBCSP, USA	Bradshaw 2014	Recreational PA was assessed through structured interviews at baseline and follow-up using a modified questionnaire developed for a previous study of PA and breast cancer questionnaire was semi-open ended and assessed duration and average number of hours per week for each activity reported; MET was assigned to each activity	Recreational
NHS, USA	Holmes 2005	Leisure-time physical activity: walking or hiking outdoors (including walking while playing golf); jogging (>10 minutes per mile); running (\leq 10 minutes per mile); bicycling (including stationary bike); swimming laps; tennis; calisthenics, aerobics, aerobic dance, or rowing machine; or squash or racquetball, vigorous activities (e.g., lawn mowing) and lower-intensity exercise (e.g., yoga, stretching)	Recreational
NOWAC, Norway	Borch 2015	Physical activity both at work and outside work, at home, as well as training/exercise and other physical activity, such as walking, etc. Assessed by self-report on an ordinal scale of 1 to 10.	Total (Occupational, household, recreational and transportation)
SBCSS, China	Chen, 2011	Regular exercise frequency and duration for up to five types of the most common exercises (methods described in Chen 2011). Each activity was assigned a metabolic equivalent (MET) score. Walking was the most common type of regular exercise carried out in this study population (52%), followed by gymnastics (14%), body building (7%), and traditional Chinese exercises (5%, including Qigong and Tai Chi).	Recreational
TEAM-L side study, Various countries	de Glas 2014	Time per week in the summer and winter on the following recreational activities: walking, cycling, gardening, and sports	Recreational
WISC, USA	Veal 2017	Patterned on the Nurses' Health Study questionnaire. Regular physical activity (at least 30 min per week for at least 3 months of the year) including swimming, jogging/running, bicycling, calisthenics/aerobics/dance, racquet sports, walking/ hiking for exercise, and other individual and team activities as an open-ended response option. Participants reported the number of months per year and hours per week spent performing each activity.	Recreational
WHEL, USA	Bertram 2011	9-item physical activity questionnaire adapted from the Women's Health Initiative (WHI). The physical activity questionnaire assessed frequency, duration, and speed of walking outside the home and frequency and duration of participation in each of three intensity levels of exercise: mild, moderate, or strenuous (with example activities for each level). Moderate intensity: defined as 3-6 METs-h (this included walking, sports, exercise, and dance) and \geq 6 METs-h intensity for vigorous activity. Examples of moderate to vigorous activities were 150 min/week of moderate pace walking or the equivalent amount of other exercise durations/intensities	Recreational
WHI, USA	Irwin 2011	Frequency and duration of vigorous exercise (that increased heart rate and produced sweating) including aerobics, jogging, tennis, and swimming laps and of moderate intensity physical activities (including biking outdoors, exercise machine, calisthenics, easy swimming, and popular or folk dancing). Walking could be included in both categories depending on the pace	Recreational
NHIS, USA	Tarasenko 2018	Frequency and duration of moderate- and vigorous-intensity aerobic and muscle-strengthening activities. Meeting the American College of Sports Medicine (ACSM) and American Cancer Society (ACS) exercise recommendations.	Recreational

USA	Palesh 2018	Range of physical activities “moderate activities” (eg, yoga, mopping floors, sweeping, walking on a firm level surface 3-4 mph), “hard activities” (eg, aerobic dance, badminton, fast walking, scrubbing floors), or “very hard activities” (eg, circuit training, racquetball, rope jumping, cross-country running).	Recreational
NRWHS, USA	Williams 2014	Distance run or walked was obtained from the question “Average miles run per week for:” and then listed the current and preceding 5 years with spaces for the responses. To calculate MET-hours/day for walking, we converted walking distance into duration (i.e., distance/mph) and calculated the average hours walked per day and the MET value for the reported pace. Running MET values were calculated as 1.02 MET-hours per km	Recreational (Walking and running)
DELCaP, USA	Cannioto 2021	DELCaP questionnaire was adapted from the Lifetime Physical Activity Questionnaire, a self-administered survey with established reliability among adult women and assessed mode, frequency, and duration of recreational physical activity. Total MET minutes/hours were calculated for each person at each time based on corresponding codes and MET values published in the Physical Activity Compendium. Activities were included in the analysis if performed at least once a week throughout the exposure window assessed and if the compendium MET value was at least 3.0 or higher.	Recreational
MARIE study, Germany	Jung 2019	Physical activity assessment included self-reported participation in walking and cycling for the purposes of commuting/transportation as well as recreational activities, sports, and fitness. MET-h/week were calculated by multiplying the average hours per week spent on each activity with an individual intensity score. Leisure-time physical activity defined as additional activities related to recreational physical activities, sports, and fitness. We have evaluated leisure-time physical activity and not total physical activity in relation to prognosis in this analysis.	Recreational

Supplementary Table 5A Descriptive table of studies included in analyses of total physical activity after diagnosis and breast cancer prognosis									
Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristic s treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates	
Borch 2015, NOWAC, Norway	Population based cohort study of 1327 pre and postmenopausal (mainly) women Mean Age at diagnosis: 53.3 years	1991-2003 until 2012 Follow up= 10.6 years	Tumour stage, n (%) I 591 (44.5) II, 534 (40.2) III 25 (1.8) IV 20 (1.5) Unknown 158 (11.9)	Self-completed questionnaire, assessed on average 3 years after diagnosis	All-cause mortality (n=197)	Very high vs. moderate (assessed using ordinal score with range 1 to 10, 1 being very low and 10 being very high")	0.46 (0.17-1.28) P trend=NA	Age, tumour stage, pre-diagnosis physical activity, time from diagnosis to post-diagnostic PA assessment ≤365/>365 days *Sensitivity analyses carried out including other covariates, such as hormonal therapy (menopausal) use (ever/never), and comorbidities, such as diabetes and cardiovascular diseases, smoking status (ever/never), pack-years smoked, alcohol consumption (g/day), and duration of education (years). As these covariates had no statistically significant impact on the investigated associations, these analyses are not reported in the main result	
					BMI<25 kg/m ² (n=115)		0.33 (0.08-1.39) P trend<0.001		
					BMI>25 kg/m ² (n=79)		1.15 (0.27-4.93) P trend=0.007		
					Breast cancer-specific mortality (n=155)		0.5 (0.15-1.62) P trend=NA		
					BMI<25 kg/m ² (n=91)		0.44 (0.10-1.66) P trend<0.001		
					BMI>25 kg/m ² (n=61)		1.27 (0.17-9.77) P trend=0.006		
					All-cause mortality		Reduced physical activity level <5, vs. maintain active physical activity, levels 5-10		1.76 (1.21-2.56)
					Breast cancer-specific mortality				2.05 (1.35-3.10)
Sternfeld 2009, LACE, USA,	Prospective cohort study of 1970 breast cancer survivors diagnosed within 39 months of enrolment; had completed cancer treatment; and were free of any	Diagnosed in 1997-2000, mean follow up= 87 months SD=18 months	68.2% ER+/ PR+, 14.2% ER+/ PR-, 1.8% ER-/ PR+, 15.8% ER-/ PR- 47.6% stage I, 33.4% stage IIa, 16.0% stage IIb,	Questionnaire based on the Arizona Activity Frequency Questionnaire (validated against doubly labelled water) including job or work-related	All-cause mortality (n=187)	≥62 vs. <29 MET-h/week	0.76 (0.48-1.19) P trend=0.20	Age, number of positive nodes, stage, weight at 18 years, education level and smoking status	
					Breast cancer-specific mortality (n=102)		≥62 vs. <29 MET-h/week		0.87 (0.48-1.59) P trend=0.41

Supplementary Table 5A Descriptive table of studies included in analyses of total physical activity after diagnosis and breast cancer prognosis								
Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristic s treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
	documented recurrence. Pre and postmenopausal Age range at enrolment 18 to 79 years		2.9% stage IIIa Surgery: 50.4% conserving, 49.6% mastectomy; Chemotherapy: 56.3%; Radiation therapy: 62.9 %	activities, recreational activities and transportation. Questionnaire mailed to participants semi-annually until April 2006 and annually thereafter.	Recurrence (n=225) (local, regional, or distant recurrence or metastasis or death from breast cancer)	≥62 vs. <29 MET-h/week	0.91 (0.61-1.36) P trend=0.78	Age, number of positive nodes, stage and weight at 18 years
NOWAC Norwegian Women and Cancer study, LACE Life After Cancer Epidemiology study, USA United States of America, MET Metabolic equivalent of task, BMI Body mass index, ER+ Estrogen receptor positive, ER- Estrogen receptor negative, PR+ Progesterone receptor positive, PR- Progesterone receptor negative, SD Standard deviation, PA physical activity								

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
Cannioto 2021, DELCaP, USA	Prospective follow up of 1340 pre- and post-menopausal women from a randomised controlled trial SWOG clinical trial (S0221)	Mean follow-up: 89 months	High-risk stage I-III breast cancer	Mode, frequency, and duration of recreational physical activity self-reported from the Lifetime Physical Activity Questionnaire	All-cause mortality (n=182)	<p>Questionnaire two (Q2)</p> <p>Administered at treatment completion. Represents recreational activity during chemotherapy.</p> <p>Any regular recreational physical activity (1 session/week)</p> <p>Yes, vs No</p>	0.64 (0.47-0.86)	Age, study arm
						<p>Meeting minimum PAGAs</p> <p>Yes, vs No</p>	0.56 (0.39-0.80)	
						<p>Incremental activity categories (PAGAs)</p> <p>High activity vs no weekly recreational physical activity</p>	0.57 (0.36-0.88)	
						<p>Questionnaire three (Q3)</p> <p>Administered one year after study enrolment and assessed activity performed in previous 12 months.</p> <p>(Approximately six months after treatment completion)</p> <p>Any regular recreational physical activity (1 session/week)</p> <p>Yes, vs No</p>	0.56 (0.39-0.81)	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
						Meeting minimum PAGAs Yes, vs No	0.64 (0.43-0.96)	
						Incremental activity categories (PAGAs) High activity vs no weekly recreational physical activity	0.58 (0.36-0.95)	
						Questionnaire four (Q4) Administered two years after study enrolment and assessed recreational activity performed in previous 12 months. (Approximately one year after treatment completion) Any regular recreational physical activity (1 session/week) Yes, vs No	0.61 (0.37-1.02)	
						Meeting minimum PAGAs Yes, vs No	0.60 (0.31-1.12)	
						Incremental activity categories (PAGAs) High activity vs no weekly recreational physical activity	0.57 (0.26-1.26)	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
Jung 2019, MARIE study, Germany	Population-based cohort study of 3813 postmenopausal breast cancer patients Age range: 50-74 years old	Median follow-up: 6 years	Invasive breast cancer or in situ tumour	Leisure time physical activity assessment included self-reported participation in walking and cycling for the purposes of commuting/transportation as well as recreational activities, sports, and fitness.	All-cause mortality (n=148)	Postdiagnosis physical activity in insufficiently active women pre-diagnosis Sufficient activity vs no activity	0.43 (0.26-0.72)	Age at diagnosis, er/pr status, grade, menopausal hormone therapy use, mode of detection, nodal status, recurrence, study centre, time period, tumor size
					Breast cancer specific mortality (n=85)		0.48 (0.25-0.91)	
					Recurrence (n=226)		0.59 (0.40-0.86)	
					All-cause mortality (n=52)	Postdiagnosis physical activity in sufficiently active women pre-diagnosis Sufficient activity vs no activity	0.57 (0.30-1.08)	
					Breast cancer specific mortality (n=29)		0.59 (0.22-1.64)	
					Recurrence (n=29)		0.65 (0.39-1.09)	
					All-cause mortality (n=206)	Pre- to postdiagnosis leisure-time physical activity patterns	0.75 (0.48-1.15)	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
					Breast cancer specific mortality (n=114)		0.61 (0.33-1.13)	
					Recurrence (n=324)		0.80 (0.57-1.14)	
Maliniak 2018, CPS-II Nutrition Cohort, USA	Population-based cohort study of 5254 post-menopausal women diagnosed with invasive breast cancer Age range: 46-92 years old	Diagnosed between 1992-2013 Median (IQR) follow-up: 13.3 (5.8) for age group: 46-64 and median (IQR): 7.5 (6.8) for age group 65-92 years	Invasive breast cancer: Localised (74%) Regional (26%)	Moderate-to-vigorous recreational physical activity was self-reported on the 1992–1993 baseline questionnaire and updated on follow-up questionnaires in 1999 and biennially thereafter except for 2003 and 2013 Post-diagnosis exposures based on the first questionnaire completed more than two years after diagnosis to allow for completion of treatment at a median time of 3.4 years after diagnosis for physical activity.	All-cause mortality (n=185) Age range: 46-64 years	Moderate or vigorous recreational activity 17.5+ vs. 3.5-8.75 MET-h/week	0.56 (0.37-0.83) P trend <0.001	Age at diagnosis, race, calendar year, Surveillance, Epidemiology, and End Results (SEER) summary stage at diagnosis, post-diagnosis BMI, post-diagnosis number of comorbidities, post-diagnosis uses of hormone replacement therapy, post-diagnosis alcohol intake, post-diagnosis other cancer diagnosis, smoking status
					Per category median	0.97 (0.95-0.98)		
				All-cause mortality (n=946) Age range: 65-92 years	17.5+ vs. 3.5-8.75 MET-h/week	0.74 (0.61-0.90) P trend=0.01		
					Per category median	0.98 (0.97-0.99)		
				Breast cancer specific mortality (n=74) Age range: 46-64 years	17.5+ vs. 3.5-8.75MET-h/week	0.49 (0.26-0.95) P trend=0.01		
					Per category median	0.97 (0.94-0.99)		

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
					Breast cancer specific mortality (n=192) Age range: 65-92 years	17.5+ vs. 3.5-8.753MET-h/week Per category median	1 (0.66-1.5) P trend=0.25 0.99 (0.97-1.01)	
Palesh 2018, USA	Retrospective cohort study of 103 women with advanced breast cancer	Mean follow-up 60.4 months	Advanced breast cancer (stage IV) or locally recurrent (n=3)	Women completed the Seven-Day Physical Activity Recall (7DPAR) administered by an interviewer or via self-report Composite score that encompasses duration and intensity of a range of physical activities for the past week.	All-cause mortality (n=93)	Per 4 MET-h/day	0.91 (0.84 -0.99)	Age, marital status, ER status, treatment, metastases, salivary diurnal cortisol, depression score
Tarasenko 2018, NHIS, USA	Prospective cohort study of 2285 women with breast cancer	1999-2009 followed until 2011		Interviewed for on weekly frequency and duration of moderate- and vigorous-intensity aerobic and muscle-strengthening activities	All-cause mortality (n=721)	Sufficiently active (meeting recommendations on aerobic PA (≥150-min weekly session of moderate-intensity PA, or 75-min weekly session of vigorous-intensity PA, or an equivalent combination) vs Inactive (≤1 weekly session of aerobic 10-min activity)	0.61 (0.46-0.81)	Age (continuous), sex, race/ethnicity, education level, marital status, and insurance status, self-rated health, activity limitations, smoking status, BMI categories, number of comorbid conditions, and age at first cancer diagnosis
Veal 2017, WISC, USA	1925 women with incident primary DCIS diagnosis reported to the	Diagnosis 1997-2006 Mean follow-up 6.7 years	Ductal carcinoma in situ (DCIS)	Telephone interview or mailed questionnaire at least 2 years after diagnosis	All-cause mortality (n=87)	Per 1 hour/week >5 vs. 0 hours/week	0.97 (0.9-1.06) 0.85 (0.38-1.91)	Age at diagnosis, family history of breast cancer, education, surgery type, year of diagnosis, post-treatment endocrine therapy use, number of

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
	Wisconsin Cancer Reporting System aged between 20 and 74 years at diagnosis				Cardiovascular disease mortality	Per 1 hour/week	1.04 (0.91-1.18)	comorbidities, post-menopausal hormone uses BMI, smoking, alcohol, adjusted for pre-diagnosis exposure level as static covariates
					>5 vs. 0 hours/week	2.27 (0.40-12.76)		
					All-cause mortality	Per 1 hour/week	1.00 (0.89-1.11)	
					>5 vs. 0 hours/week	0.92 (0.30-2.86)		
Nechuta, 2016, ABCPP, USA cohorts (LACE, NHS, WHEL)	Pooled analysis of 6596 ER+ breast cancer survivors Age range: 20-83 Year of diagnosis, range in the three USA cohorts included: 1990–2004	Follow-up: 10 years	Women diagnosed with invasive breast cancer Chemotherapy, n (%)=3,046 (46.2); Radiotherapy, n (%)=4,063 (61.6); Mastectomy, n (%)=3,203 (48.6); Hormonal therapy, n (%)=5,689 (86.3)	LACE: (adapted from the Arizona Activity Frequency Questionnaire) NHS: validated questionnaire WHEL study: used the Women's Health Initiative (WHI) PA Questionnaire, which has been validated using accelerometer	Late recurrence, ≥5 years (n=604) ER positive	≥17.4 vs. <4.9 MET-h/week	0.89 (0.73-1.09) P trend=0.27	Age at diagnosis, TNM stage, PR status, chemotherapy, radiotherapy, Surgery, Hormonal therapy, race/ethnicity, menopausal status, comorbidity, time between exposure measurement and 5-year post-diagnosis date, stratified by study, pre-diagnosis BMI, alcohol intake, smoking
					Late all-cause mortality, ≥5 years (n=1209) ER positive		0.71 (0.61-0.82) P trend ≤ 0.0001	
					Early recurrence, <5 years n=383 ER positive		1.16 (0.9-1.49) P trend=0.26	
					Early all-cause mortality, <5 years =218 ER positive		0.61 (0.43-0.88) P Trend= 0.0007	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
Ammitzboll 2016, DCH, Denmark	Population-based cohort study of 959 women diagnosed with breast cancer Mean age at diagnosis: 63 years	Diagnosed 1993-2011 Median (IQR) years follow-up: 10 (7)	780 (81%) ER positive; 29 (3%) unknown 318 (33%) stage I; 352 (37%) stage II; 126 (13%) stage III; 163 (17%) unknown 644 (67%) ≤20mm 101 (11%) chemotherapy; 644 (67%) radiotherapy; 57 (6%) unknown; 470 (49%) anti hormone therapy	Validated questionnaire including recreational exercise (walking, cycling, sports) and household (housework do-it-yourself activities, gardening) assessed on average 3.5 years (IQR 3) after diagnosis	All-cause mortality (n=121)	Per 10 MET-h/week	0.94 (0.86-1.03)	Alcohol intake, smoking status, BMI, comorbidity, education, nodal status, operation type, chemotherapy, physical activity, household physical activity
					All-cause mortality (n=144)	39-273 vs. 0-8 MET-h/week	0.75 (0.42-1.33)	
					Low-high vs. low-low physical activity (n=43)		0.75 (0.37-1.52)	
					High-high vs. high-low physical activity (n=101)		0.83 (0.47-1.45)	
Jones 2016, LACE and Pathways Studies, USA	6211 women with early breast cancer from two population-based, prospective cohort studies Age mean: 59.1 (11.7) at diagnosis	LACE diagnosed between 1996-2000 PATHWAYS diagnosed from 2008 and followed through April, 2015	Breast cancer (stage I to III) 83.1% ER+; 65.5% PR +; 14.3% HER2+ AJCC stage: 52.8% I, 39.4% II, 7.8% III; 71.3% well or moderately differentiated, 28.7% poor/undifferentiated Surgery: 57.4%	Self-completed Arizona Activity Frequency Questionnaire (validated) assessed exercise in past 6 months (Pathway) and past 12 months (LACE), from 0 to 3.2 years after diagnosis	Breast cancer-specific mortality (n=405)	>25 vs. <2 MET-h/week	1.00 (0.74-1.34) P trend=0.39	Age at diagnosis, smoking status, BMI, menopausal status, tumour stage, chemotherapy, radiation therapy, trastuzumab, hormonal therapy, comorbidity
					ER negative (n=NA)	0 vs. >0 MET-h/week	0.89 (0.51-1.55)	
					ER positive (n=NA)		0.72 (0.53-0.97)	
					HER2 negative (n=NA)		0.78 (0.59-1.04)	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
			lumpectomy, 42.3% maastectomy, 0.3% no; Chemotherapy: 49.5% yes; Radiotherapy: 49.7% yes; Tamoxifen or AI: 70.9% yes		HER2+ (n=NA)		0.50 (0.24-1.01)	
					ER+, PR+ and HER2- (n=NA)		0.57 (0.37-0.86)	
					ER+ or PR+, PR- HER2+ (n=NA)		0.98 (0.62-1.56)	
					ER-, PR-, HER2- (n=NA)		1.01 (0.54-1.90)	
					ER-, PR-, HER2+ (n=NA)		0.29 (0.05-1.67)	
					HER2-enriched (n=NA)		0.65 (0.08-5.03)	
					Recurrence (n=678)	>25 vs. <2 MET-h/week	1.01 (0.8-1.27) P trend=0.60	
					ER negative (n=NA)	0 vs. >0 MET-h/week	0.96 (0.61-1.52)	
					ER positive (n=NA)		0.88 (0.69-1.13)	
					HER2 negative		0.89 (0.70-1.12)	
					HER2 positive (n=NA)		0.76 (0.43-1.33)	
					ER+, PR+ and HER2- (n=NA)		0.89 (0.71-1.10)	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
					ER+ or PR+, PR, HER2+ (n=NA)		0.63 (0.45-0.88)	
					ER-, PR-, HER2- (n=NA)		1.32 (0.90-1.96)	
					ER-, PR-, HER2+ (n=NA)		0.81 (0.25-2.64)	
Bradshaw 2014, LIBCSP, USA (New York)	Population-based cohort study of 1423 women diagnosed with in situ or invasive breast cancer Age range: 25 to 91 years old Pre and postmenopausal (mainly postmenopausal)	Diagnosed between 1996-1997 Median follow up: 12.7 years		Structured interviews (more than 2 years after diagnosis)	All-cause mortality (n=420)	≥9 vs. 0 MET-h/week	0.37 (0.25-0.55)	Age, pre-diagnosis BMI, chemotherapy, tumour size
					ER- or PR- (n=NA)		0.46 (0.29-0.70)	
					ER+ and PR+ (n=NA)		0.25 (0.14-0.42)	
					BMI<25 kg/m ² (n=NA)		0.24 (0.13-0.42)	
					BMI>25 kg/m ² (n=NA)		0.43 (0.26-0.69)	
					Breast cancer-specific mortality (n=195)	≥9 vs. 0 MET-h/week	0.30 (0.16-0.56)	
					BMI<25 kg/m ² (n=NA)		0.18 (0.08-0.42)	
					BMI>25 kg/m ² (n=NA)		0.33 (0.16-0.65)	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
					ER- or PR- (n=NA)		0.38 (0.19-0.72)	
					ER+ and PR+ (n=NA)		0.18 (0.08-0.36)	
de Glas 2014, TEAM-L side study of an open label randomized controlled trial, multi-country	Prospective cohort of 521 postmenopausal hormone receptor-positive breast cancer patients	Follow up: 8 years	ER+98.1%; ER-: 1.7%; PR+:67.0%; PR-:23.0% Grade: 1 16.6%; 2: 46.5%; 3/4:	Validated questionnaire, Two years after diagnosis. Note: The number of hours spent on physical activity one year after	All-cause mortality (n=58)	65.6-258 vs. 0-21.0 MET-h/week	0.57 (0.26-1.40) P trend=0.34	Age, number of comorbidities, tumour stage, nodal status, BMI, chemotherapy
					Breast cancer-specific mortality (n=39)	65.6-258 vs. 0-21.0 MET-h/week	0.77 (0.28-2.12) P trend=0.95	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
	Median age 63.6 years (range 44-88)		<p>34.5%; unknown 2.4%.</p> <p>Tumour stage: T1/in situ: 48.9%; T2: 44.5%; T3: 3.8%; T4:2.1%TherapyNo resection:0.2%; Wide local excision: 49.1%; Mastectomy: 50.3%; Unknown: 0.4%</p> <p>Most extensive axillary surgery: sentinel node: 22.5%; axillary lymph node dissection: 76.4%; Radiotherapy: 65.3%; Unknown: 1.3% Chemotherapy: 35.9%</p> <p>Endocrine therapy: tamoxifen followed by exemestane: 50.5%; exemestane alone: 49.5%.</p>	the diagnosis (T1) could be affected by breast cancer treatment during this period, the effect of postdiagnosis physical activity was assessed on the basis of physical activity 2 years after the diagnosis (T2).	<p>Recurrence-free (n=58)</p> <p>(Definition includes disease recurrence or breast cancer death)</p>	65.6-258 vs. 0-21.0 MET-h/week	<p>0.9</p> <p>(0.39-2.1)</p> <p>P trend=0.79</p>	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
Williams PT, 2014, NRWHS, USA	Population-based study (n= 986) Pre- and postmenopausal runners (n= 272) or walkers (n= 714) Caucasian 90.35%-100%	Recruited: 1998-2001 Follow up= 9.1 years 46 breast cancer deaths	Self-reported breast cancer, no other clinical and pathological information	Questionnaire for height and weight (Self-reported)	Breast cancer-specific mortality Runners: (n=13) Walkers: (n=33)	>3.6 vs <1.07 MET-hours/day (Equivalent to >=25.1 vs <7.5 MET-h/week)	Runners: 0.047 (0.002-0.29) Walkers: 1.125 (0.305-3.427)	Age, race, family history of breast cancer, menopause and duration of breastfeeding and oral contraceptive use, education
Beasley 2012, ABCPP (LACE, NHS, WHEL, SBCCS)	Pooled analysis of four prospective cohorts (three US and one Chinese) of 13302 breast cancer survivors Calendar year: Recruitment 1976-2006		Invasive TNM stage I-III	Questionnaire, a median of 23 months post-diagnosis (IQR 18-32 months) LACE: (adapted from the Arizona Activity Frequency Questionnaire) NHS: validated questionnaire SBCSS: validated PA questionnaire during in-person interviews WHEL study: used the Women's Health Initiative (WHI) PA Questionnaire, which has been validated using accelerometer	All-cause mortality (n=1468) Breast cancer-specific mortality (n=971) Breast cancer recurrence (n=1421)	29.7-48.0 vs. 0-0.2 MET-hours/week 29.7-48.0 vs. 0-0.2 MET-hours/week 29.7-48.0 vs. 0-0.2 MET-hours/week	0.60 (0.51 - 0.72) P trend≤ 0.0001 0.73 (0.59 - 0.91) P trend=0.0001 0.95 (0.8 - 1.14) P trend=0.60	Age at diagnosis, race, menopausal status, TNM stage, hormone receptor status, treatment, post-diagnosis BMI, smoking status
Bertram 2011, WHEL, USA	Follow up of a randomised controlled trial of dietary	Median (range) years follow up: 7.1 (1.0-10.8)	Invasive breast cancer: 40.5% stage I, 32.8% stage IIA, 12.4%	Validated questionnaire at the time of enrolment into the trial and at various	All-cause mortality (n=163)	Per 1 unit / MET-h/week	0.98 (0.96-0.99) P=0.003	Age at randomization, race, fruit and vegetable consumption, BMI at randomization, menopausal status, tumour type, tumour

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
	intervention of 2361 post-treatment pre and post-menopausal breast cancer survivors (Stage I-III) Study recruitment: 1995-2000 and follow up until June 2006		stage IIB, 11.3% stage IIIA, 3.0% stage IIIC 68.2% chemotherapy, 61.6% radiation	follow-up points using a 9-item physical activity measure adapted from the Women's Health Initiative (WHI)		24.7-107 vs. 0-2.5 MET-h/week	0.47 (0.26-0.84) P trend=0.08	grade, tumour stage, anti-oestrogen use, clinical site, time from diagnosis to randomization, hot flashes, and study group
					Additional breast cancer events (n=295)	Per 1 MET-h/week	0.99 (0.99-1.00) P trend= 0.21	
						24.7-107 vs. 0-2.5 MET-h/week	0.74 (0.50-1.10) P trend=0.58	
					Change in meeting physical activity guidelines	Not meeting guidelines vs. change to meet the guidelines of 10 MET-h/week	1.22 (0.81-1.83)	
					All-cause mortality (n=163)	22.9-107 vs. 0-1.3 MET-h/week	0.39 (0.21-0.72) P trend=0.02	
						Moderate to Vigorous intensity physical activity		
					Physical activity change from pre to post diagnosis		0.89 (0.49-1.64)	
					Change in meeting physical activity guidelines	Not meeting guidelines vs. change to meet the guidelines of 10 MET-h/week	1.04 (0.61-1.77)	
Chen 2011, SBCSS, China	Prospective cohort of 4826 pre and post-menopausal breast cancer survivors diagnosed with	Diagnosed 2002-2006 Median follow up: 4.3 years	51.2% ER+/PR+, 26.9% ER-/PR-, 20.2% ER/PR mixed, 1.8% ER/PR unknown TNM stages: 37.2% 0-I, 33.1%	Validated PA questionnaire during in-person interviews 36 months post diagnosis	All-cause mortality (n=436)	≥8.3 vs. 0 MET-h/week	0.65 (0.51-0.84) P trend<0.001	Date of birth, BMI, WHR, menopausal status, income, education, quality of life, cruciferous vegetables, soy protein, tea consumption, chemotherapy, radiotherapy,
					BMI<25 kg/m ² (n=267)		0.62 (0.45-0.85) P trend=0.002	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
	stage I to III breast cancer Mean age:53.5		IIA, 16.6% IIB, 8.7% III-IV, 4.4% unknown Surgery: 94.3% mastectomy, 2.7% conservation surgery, 2.7% unknown type, 0.3% no surgery; Chemotherapy: 91% yes, 9% no; Tamoxifen use: 66.3% yes, 33.7% no; Radiotherapy: 31.2% yes, 68.8% no; Immunotherapy: 14.9% yes, 84.8% no, 0.2% unknown	(60-month post diagnosis interviews still ongoing)	BMI>25 kg/m ² (n=169)		0.70 (0.46-1.05) P trend=0.027	tamoxifen use, TNM stage, ER status
					Postmenopausal only (n=250)		0.55 (0.40-0.77) P trend<0.001	
					Premenopausal only (n=186)		0.86 (0.58-1.26) P trend=0.317	
					ER+ PR+ (n=161)		1.32 (0.83-2.12) P trend=0.935	
					ER- PR- (n=171)		0.4 (0.29-0.59) P <0.001	
					ER+PR-/ER-PR+ (87)		0.67 (0.36-1.22) 0.051	
					Relapse/Disease specific mortality (n=450)		0.72 (0.57-0.93) P trend=0.324	
					ER+ PR+ (n=189)		0.79 (0.53-1.19) P trend=0.540	
					ER- PR- (n=155)		0.36 (0.24-0.56) P trend=0.002	
					ER+PR-/ER-PR+ (94)		0.51 (0.27-1.00) p-trend=0.166	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
Irwin 2011, WHI, USA	Population based prospective cohort of 4643 post-menopausal women with invasive breast cancer diagnosis Age range: 50-79 years	Diagnosed 1993-1998 Mean (SD) follow up from post-diagnosis physical activity assessment: 3.3 (1.8)	Invasive:4643 Stages I-III Chemotherapy: 25% yes among stage I, 78% yes among stage II/III patients	Questionnaire: Average time from breast cancer diagnosis to post diagnosis physical activity assessment was 1.8 years Validity of the physical activity questionnaire was examined by comparing the questionnaire with accelerometer data (r=0.73, and 100% sensitivity for meeting the physical activity guidelines	All-cause mortality (n=186)	>9 vs. 0 MET-h/week	0.54 (0.38-0.79) P trend=0.0014	Age, ethnicity, study group, HRT, BMI, diabetes, alcohol intake, smoking, energy, fruit and vegetable consumption
					BMI<25 kg/m ² (n=64)	>0 vs. 0 MET-h/week	0.49 (0.27-0.91)	
					BMI 25-29.9 kg/m ² (n=55)		0.43 (0.24-0.76)	
					BMI≥30 kg/m ² (n=63)		0.80 (0.45-1.41)	
					ER-negative (n=37)	>0 vs. 0 MET-h/week	0.78 (0.35-1.73)	
					ER-positive (n=121)		0.50 (0.34-0.74)	
					HER2-positive (n=16)		0.71 (0.16-3.11)	
					HER2-negative (n=40)		0.37 (0.19-0.75)	
					Increased/maintained physical activity (n=69)	>9 vs. 0 MET-h/week	0.67 (0.46-0.96)	
					Decreased/inactive physical activity (n=53)	<9 MET-h/week	1.06 (0.73-1.54)	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
					Breast cancer-specific mortality (n=86)	>9 vs. 0 MET-hours/week Moderate to Vigorous physical activity	0.61 (0.35 - 0.99) P trend=0.049	
					All-cause mortality (n=186)	>9 vs. 0 MET-hours/week Moderate-intensity physical activity	0.62 (0.41 - 0.93) P trend=0.020	Age, ethnicity, study group, HRT, BMI, diabetes, alcohol intake, smoking, energy, fruit and vegetable consumption, *also adjusted for vigorous physical activity
					Breast cancer-specific mortality (n=86)		0.66 (0.36-1.21) P trend=0.18	
					Increased/maintained physical activity (n=32)	>9 vs. 0 MET-h/week	0.91 (0.51-1.64)	
					Decreased/inactive physical activity (n=22)	<9 MET-h/week	1.06 (0.59-1.88)	
Sternfeld 2009, LACE, USA	Prospective cohort study of 1970 pre and postmenopausal breast cancer survivors. Age range: 18 to 79 years old	Diagnosed 1997-2000 Mean follow up=87 months	Among those with data: 68.2% ER+/PR+, 14.2% ER+/PR-, 1.8% ER-/PR+, 15.8% ER-/PR- Early-stage breast cancer; AJCC; among those with data: 47.6% stage I, 33.4% stage IIa, 16.0% stage IIb, 2.9% stage IIIa	Self-Report via a questionnaire mailed to participants semi-annually until April 2006 and annually thereafter. The questionnaire based on the Arizona Activity Frequency questionnaire, which has been validated	All-cause mortality (n=187)	Selected recreational activities ≥9 vs. <9 MET-h/week ≥27 vs. <5.3 MET-h/week Moderate to vigorous physical activity ≥6 vs. <1 h/week Moderate intensity physical activity	0.98 (0.71-1.35) 0.74 (0.49-1.13) P trend=0.06 0.66 (0.42-1.03) P trend=0.04	Age, number of positive nodes, stage, weight at 18 years old, education level and smoking status

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates		
			Among those with data: Surgery: 50.4% conserving, 49.6% mastectomy; Chemotherapy: 56.3%, Radiation therapy: 62.9 %	against doubly labelled water		≥1 vs. ≤ 0 h/week Vigorous intensity physical activity	1.02 (0.70-1.47)			
						>6 vs. <1 hours/week of moderate physical activity ER- PR-	0.75 (0.36-1.59) P trend=0.69			
						>6 vs. <1 hours/week of moderate physical activity ER+ PR+	0.59 (0.34-1.04) P trend=0.01			
						BMI<25 kg/m ² (n=NA)	0.38 (0.17-0.85)			
						BMI 25-29.9 kg/m ² (n=NA)	0.95 (0.47-1.94)			
						BMI≥30 kg/m ² (n=NA)	0.90 (0.38-2.16)			
						Breast cancer specific mortality (n=102)	Selected recreational activities ≥9 vs. <9 MET-h/week		1.19 (0.78-1.84)	Age, number of positive nodes, stage, weight at 18 years old, type of treatment (chemotherapy/radiation) and type of surgery (mastectomy or conserving)
							≥27 vs. <5.3 MET-h/week Moderate to vigorous intensity physical activity		0.90 (0.51-1.58) P trend=0.38	
							≥6 vs. <1 h/week Moderate intensity physical activity		0.73 (0.40-1.33) P trend=0.26	
							≥1 vs. ≤ 0 h/week Vigorous intensity physical activity		1.10 (0.68-1.80) P trend=0.82	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
					Recurrence (n=225) (Definition includes: Local, regional, or distant recurrence or metastasis or death from breast cancer)	Selected recreational activities ≥9 vs. <9 MET-h/week	1.16 (0.87-1.55)	Age, number of positive nodes, stage, and weight at 18 years old
					≥27 vs. <5.3 MET-h/week Moderate to vigorous intensity physical activity	1.00 (0.68-1.46)		
					≥6 vs. <1 h/week Moderate intensity physical activity	0.81 (0.54-1.22)		
					≥1 vs. ≤ 0 h/week Vigorous intensity physical activity	1.12 (0.81-1.56)		
Holick, 2008, CWLS USA	Prospective cohort of 4482 pre- and post-menopausal breast cancer survivors Mean age:58.5	Diagnosed 1988-2001 Follow up=5.5 years	Invasive breast cancer: 72.6% local, 27.4% regional	Questionnaire median of 5.6 years after diagnosis. Validity of the physical activity assessment has been reported	All-cause mortality (n=412)	≥21 vs. <2.8 MET-h/week	0.44 (0.32-0.61) P trend=0.001	Age at diagnosis, tumour stage, Residency at diagnosis, time from diagnosis to exposure assessment, BMI, menopausal status, hormonal therapy, energy intake, education, family history, treatment
					Breast cancer-specific mortality (n=109)	≥21 vs. <2.8 MET-h/week	0.49 (0.27-0.89) P trend=0.05	
					BMI<25 kg/m ² (n=26)	≥8 vs. <8 MET-h/week	0.91 (0.39-2.13)	
					BMI≥25 kg/m ² (n=75)		0.63 (0.39-1.02)	
					All-cause mortality (n=412) *excluding women who died 1y after assessing exposure	≥10.3 vs. <2 MET-h/week Moderate-intensity physical activity	0.47 (0.34-0.65) P trend=0.001	Age at diagnosis, tumour stage, residency at diagnosis, time from diagnosis to exposure assessment, BMI, menopausal status, hormonal therapy, energy intake, education, family

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
					Breast cancer-specific mortality (n=109) *excluding women who died 1y after assessing exposure		0.47 (0.26-0.86) P trend=0.03	history, treatment, vigorous physical activity
					All-cause mortality (n=412) *excluding women who died 1y after assessing exposure	≥15.1 vs. <0 MET-h/week Vigorous-intensity physical activity	0.85 (0.59-1.22) P trend=0.31	Moderate physical activity, age at diagnosis, tumour stage, residency at diagnosis, time from diagnosis to exposure assessment, BMI, menopausal status, hormonal therapy, energy intake, education, family history, treatment
Irwin 2008, HEAL, USA	Prospective cohort study of 688 pre- and post-menopausal breast cancer survivors diagnosed with local or regional breast cancer Pre and postmenopausal Mean age 55 years (SD 11 years)	Diagnosed in 1995-1998 Median (range) years follow up: 6 (5-8)	Primary local or regional breast cancer	2-year post diagnosis assessed through the interview-administered Modifiable Activity Questionnaire (validated using doubly labelled water)	All-cause mortality (n=53)	≥9 vs. 0 MET-h/week	0.33 (0.15-0.73) P trend=0.046	Age, race, disease stage, treatment, tamoxifen use, BMI, fruit and vegetable consumption
					BMI<25 kg/m ² (n=28)	>0 vs. 0 MET-h/week	0.47 (0.19-1.14)	
					BMI≥25 kg/m ² (n=25)		0.31 (0.13-0.74)	
					ER-negative (n=11)	≥0 vs. 0 MET-h/week	1.26 (0.15-11.00)	
					ER-positive (n=34)		0.20 (0.09-0.46)	
					Increase physical activity (n=7)	>3 vs. 0 MET-h/week	0.55 (0.22-1.38)	

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
					Maintain physical activity (11)	+/- 3 MET-h/week	1.55 (0.64-3.80)	
					Decrease physical activity (n=19)	< -3 vs. 0 MET-h/week	3.95 (1.45-10.50)	
					Breast cancer-specific mortality (n=30)	≥9 vs. 0 MET-h/week	0.65 (0.23-1.87) P trend=0.046	
					Increase physical activity (n=6)	>3 vs. 0 MET-h/week	0.82 (0.29-2.34)	
					Maintain physical activity (7)	+/- 3 MET-h/week	2.47 (0.78-7.78)	
					Decrease physical activity (n=7)	< -3 vs. 0 MET-h/week	3.69 (0.88-15.92)	
Holmes 2005, NHS, USA	Prospective cohort of 2987 pre- and post-menopausal breast cancer survivors Age range: 30 to 55 years old	Diagnosed 1982-1984 Median follow up in months: 96 (8 years)	Invasive breast cancer stage I, II and III 991 patients had undergone chemotherapy	Questionnaire more than 2 years after breast cancer diagnosis correlation for total MET-hours per week of activity was excellent (r=0.62; 95% confidence interval [CI], 0.44-0.75), suggesting that the questionnaire is a valid tool for categorical ranking of respondents	All-cause mortality (n=463)	≥24 vs. <3 MET-h/week	0.65 (0.48-0.88) P trend=0.003	Age, time from diagnosis to exposure assessment, smoking, BMI, menopausal status, hormonal therapy, age at first birth, parity, oral contraceptive, energy-adjusted protein intake, stage (I, II, III), radiation treatment (yes/no) tamoxifen use, chemotherapy
				Breast cancer-specific mortality (n=280)	0.6 (0.4-0.89) P trend=0.004			
				BMI<25 kg/m ² (n=159)	0.61 (0.37-0.99) P trend=0.10			
				BMI≥25 kg/m ² (n=121)	0.52 (0.26-1.06) P trend=0.01			

Supplementary Table 5B Descriptive table of studies included in analyses of recreational physical activity after diagnosis and breast cancer prognosis

Author, year, study name, country, WCRF Code	Study description	Time of diagnosis and follow-up	Disease characteristics treatment	Exposure assessment	Outcome (Events)	Contrast	HR (95% CI)	Covariates
					Postmenopausal only (n=206)	≥9 vs. <9 MET-h/week	0.73 (0.54-0.98)	
					Premenopausal only (n=58)		0.58 (0.32-1.04)	
					Breast cancer-specific mortality ER-PR-	≥9 vs. <9 MET-h/week	0.91 (0.43-1.96)	
					Breast cancer-specific mortality ER+PR+		0.5 (0.34-0.74)	
					Recurrence (n=370) Definition includes: Second cancer diagnosis, or death from breast cancer	≥24 vs. <3 MET-h/week	0.74 (0.53-1.04) P trend=0.05	

LACE Life After Cancer Epidemiology study, USA United States of America, MET Metabolic equivalent of task, BMI Body mass index, ER+ Estrogen receptor positive, ER- Estrogen receptor negative, PR+ Progesterone receptor positive, PR- Progesterone receptor negative, SD Standard deviation, PA physical activity, IQR Inter quartile range, SEER Surveillance, Epidemiology, and End Results, DCIS Ductal carcinoma in situ, CPS-II Nutrition Cohort Cancer Prevention Study-II Nutrition Cohort, WISC Wisconsin In Situ Cohort study, DCH Diet, Cancer, and Health cohort, ABCPP After Breast Cancer Pooling Project, SBCSS Shanghai Breast cancer Survival Study, LIBCSP Long Island Breast Cancer Study, TEAM-L side stud Tamoxifen Exemestane Adjuvant Multicenter Lifestyle side study, WHI Women's Health Initiative, WHEL The Women's Healthy Eating and Living Study, CWLS Collaborative Women's Longevity Study, HEAL The Health Eating Activity and Lifestyle Study, NHS Nurses' Health Study, HER2 Human epidermal growth factor receptor two

Supplementary Table 6 Descriptive table of follow-up observational analyses of patients enrolled in clinical trials of exercise after breast cancer diagnosis											
Author, Year, Study name, Country	Characteristics of study population	Randomisation, blinding	Intervention and timeframe	Follow-up time, Compliance	Outcome	Intervention vs control group	HR (95% CI)	Adjustments			
Hayes 2018, The Exercise for Health trials (EfH) – Urban study – Rural study, Australia	Urban- (n=194) and rural (n=143) regional-residing Stage 0-III breast cancer women (n=337) Usual care: Mean age 53.9±8.3 years.	Computer-generated, unblocked. sequence of random numbers	Face-face/phone-delivered aerobic-and resistance-based, moderate-intensity exercise intervention, commenced 6 weeks post-surgery, 8-month, >180 min/week	Median 8.3 years No loss to follow-up ≥75% compliance: exercise (n=152); usual care (n=130)	Primary endpoint	Moderate/high-intensity exercise (n=207) vs Usual care (n=130)	0.45 (0.20-0.97) P=0.04	Randomization factors: age, body mass index, comorbidities, stage, lymph node status, ER/PR status, HER2 status, surgery, chemotherapy, radiotherapy, hormone therapy, herceptin			
					Overall survival				Study, age, body mass index, presence of comorbidities and disease stage		
					(Exercise: 11 deaths; usual care: 15 deaths)						
					Overall survival					Randomization factors as above*	
					Age <55 years						0.44 (0.19-0.98), P=0.046
					Age ≥55 years						0.32 (0.11-0.87)
					BMI <25						0.74 (0.21-2.54)
					BMI 25 to 29.9						0.43 (0.10-1.93)
					BMI ≥30						0.32 (0.08-1.27)
					Disease stage I						0.62 (0.18-2.13)
					Disease stage II-III						0.36 (0.03-3.93)
					No comorbidities						0.40 (0.17-0.95)
					Yes comorbidities						0.78 (0.13-4.71)
					Compliance with intervention ≥75%						0.39 (0.16-0.40)
					Compliance with intervention <75%						0.38 (0.16-0.98)
					Physical activity ≥150 minutes						0.50 (0.15-1.73)
					Physical activity <150 minutes						0.33 (0.11-0.98)
Physical activity 0 minutes	0.41 (0.12-1.40)										
Physical activity ≥150 minutes with vigorous	0.63 (0.14-2.77)										
Physical activity ≥150 minutes without vigorous	0.20 (0.03-1.49)										
	0.42 (0.12-1.44)										

				<150 minutes	0.41 (0.12-1.40)	
				0 minutes	0.63 (0.15-2.77)	
				Face to face intervention	0.24 (0.05-1.17)	
				Telephone intervention	0.37 (0.10-1.44)	
				Secondary endpoint		
				Disease free survival (Exercise: 25 events; usual care 23 events)	0.66 (0.38-1.17) P=0.16	Randomization factors as above*
				Disease free survival	0.65 (0.36-1.17), P=0.15	Study, age, body mass index, presence of comorbidities and disease stage
				Age <55 years	0.56 (0.27-1.16)	Randomization factors as above*
				Age >=55 years	0.84 (0.34-2.07)	
				BMI <25	0.63 (0.24-1.64)	
				BMI 25 to 29.9	0.75 (0.29-1.95)	
				BMI >=30	0.62 (0.22-1.77)	
				Disease stage I	0.89 (0.27-2.91)	
				Disease stage II-III	0.53 (0.27-1.04)	
				No comorbidities	0.94 (0.17-5.13)	
				Yes comorbidities	0.64 (0.35-1.16)	
				Compliance with intervention >=75%	0.61 (0.32-1.53)	
				Compliance with intervention <75%	0.76 (0.33-1.77)	
				Physical activity >=150 minutes	0.47 (0.22-1.02)	
				Physical activity <150 minutes	0.82 (0.38-1.77)	
				Physical activity 0 minutes	0.81 (0.28-2.36)	
				Physical activity >=150 minutes with vigorous	0.25 (0.06-1.06)	

					Physical activity >=150 minutes without vigorous <150 minutes	0.64 (0.27- 1.48)		
					0 minutes	0.82 (0.38- 1.77)		
					Face to face intervention	0.81 (0.28- 2.36)		
					Telephone intervention	0.28 (0.09- 0.87)		
						0.51 (0.20- 1.29)		
Courneya 2014 The Supervised Trial of Aerobic versus Resistance Training (START), Canada	Women ≥ 18 years of age with stage I-IIIa breast cancer who were beginning first-line adjuvant chemotherapy (n=242) 33% response rate	Computer- generated randomization (randomly assigned to aerobic exercise training (AET), resistance exercise training (RET), or usual care (UC) in a 1:1:1 ratio	Supervised aerobic exercise training/ resistance exercise training, commenced 1-2 weeks after starting chemotherapy and ended 3 weeks after completing chemotherapy Usual care: no exercise during chemotherapy but offered a 1- month exercise crossover post- intervention (30.5% of the control group)	Median of 89 months Compliance: Resistant (68,2%) and aerobic (72%) attended sessions	Secondary endpoint Overall survival (Exercise: 13 events; usual care 11 events)	Resistant (n=82) and aerobic (n=78) exercises combined vs. Usual care (n=82)	0.60 (0.27- 1.33)	Randomisation factors: age at random assignment, body mass index, disease stage, primary tumour size, nodal status, tumour grade, ER status, progesterone receptor status, Intrinsic subtype, extent of surgery, chemotherapy regimen, average RDI, adjuvant radiation therapy, adjuvant endocrine therapy, adjuvant herceptin (yes/no)
					Overall survival		0.72 (0.31- 1.67)	Centre, chemotherapy regimen, ER status, tumour size, nodal status, extent of surgery, age
					Primary endpoint Disease-free survival (Exercise: 25 events; usual care 18 events)		0.68 (0.37- 1.24)	Randomisation factors as above
					Disease-free survival		0.76 (0.40- 1.43)	Centre, chemotherapy regimen, ER status, tumour size, nodal status, extent of surgery, age
					Disease-free Age <50		0.77 (0.32- 1.84)	
					Age ≥50		0.55 (0.23- 1.31)	
					Normal weight		0.85 (0.30- 2.45)	
					Overweight/Obese		0.59 (0.27- 1.27)	
					Disease stage I		1.04 (0.26- 4.17)	
					Disease stage II/III		0.61 (0.31- 1.20)	
Oestrogen receptor negative		1.10 (0.43- 2.86)						
Oestrogen receptor positive		0.58 (0.26- 1.29)						

				Luminal	0.86 (0.33-2.22)	
				HER2	0.21 (0.04-1.02)	
				Triple negative	1.25 (0.40-3.95)	
				Chemotherapy protocol: non-taxane	0.95 (0.41-2.22)	
				Chemotherapy protocol: Taxane	0.46 (0.19-1.15)	
				Disease-free survival Average relative dose intensity <85%	1.22 (0.35-4.17)	
				Average relative dose intensity >85%	0.50 (0.25-1.01)	
				Secondary endpoint Distant disease-free survival (Exercise: 20 events; usual care 16 events)	0.62 (0.32-1.19)	Randomisation factors as above
				Distant disease-free survival	0.72 (0.36-1.42)	Centre, chemotherapy regimen, ER status, tumour size, nodal status, extent of surgery, age
				Secondary endpoint Recurrence free survival (Exercise: 20 events; usual care 17 events)	0.58 (0.30-1.11)	Randomisation factors as above
				Recurrence free survival	0.61 (0.31-1.21)	Centre, chemotherapy regimen, ER status, tumour size, nodal status, extent of surgery, age
				Age <50	0.61 (0.25-1.52)	
				Age >=50	0.50 (0.20-1.29)	
				Normal weight	0.88 (0.27-2.86)	
				Recurrence free survival Overweight/Obese	0.46 (0.20-1.05)	
				Disease stage I	0.91 (0.22-3.79)	
				Disease stage II/III	0.52 (0.23-1.16)	
				Oestrogen receptor negative	0.85 (0.28-2.52)	

					Oestrogen receptor positive	0.52 (0.23-1.16)	
					Luminal	0.70 (0.26-1.85)	
					Recurrence free survival HER2	0.21 (0.04-1.02)	
					Triple negative	1.17 (0.31-4.37)	
					Chemotherapy protocol: non-taxane	0.67 (0.27-1.65)	
					Chemotherapy protocol: Taxane	0.52 (0.21-1.32)	
					Average relative dose intensity <85%	1.47 (0.68-5.90)	
					Average relative dose intensity >85%	0.38 (0.18-0.81)	
Note: Intention-to-treat analysis in both publications							

Supplementary Table 7 Hazard ratios (95% CI) for non-linear analysis of recreational physical activity after diagnosis and breast cancer prognosis outcomes

All-cause mortality		Breast cancer-specific mortality
Physical activity (MET-h/week)	HR (95% CI)	HR (95% CI)
0	1.00 (ref)	1.00 (ref)
5	0.79 (0.72-0.87)	0.81 (0.71-0.91)
10	0.65 (0.55-0.77)	0.69 (0.57-0.85)
15	0.57 (0.46-0.70)	0.64 (0.51-0.80)
20	0.53 (0.43-0.66)	0.62 (0.49-0.78)
25	0.52 (0.42-0.64)	0.62 (0.50-0.76)
30	0.53 (0.44-0.63)	0.63 (0.52-0.76)
35	0.55 (0.46-0.65)	0.64 (0.52-0.77)
40	0.57 (0.48-0.67)	0.64 (0.52-0.79)
45	0.60 (0.50-0.72)	0.65 (0.52-0.82)
50	0.62 (0.50-0.78)	0.66 (0.51-0.86)
	p-Wald test<0.001	p-Wald test<0.001
Ten studies included in non-linear meta-analysis for all-cause mortality and ten studies included in non-linear meta-analysis of breast cancer mortality.		

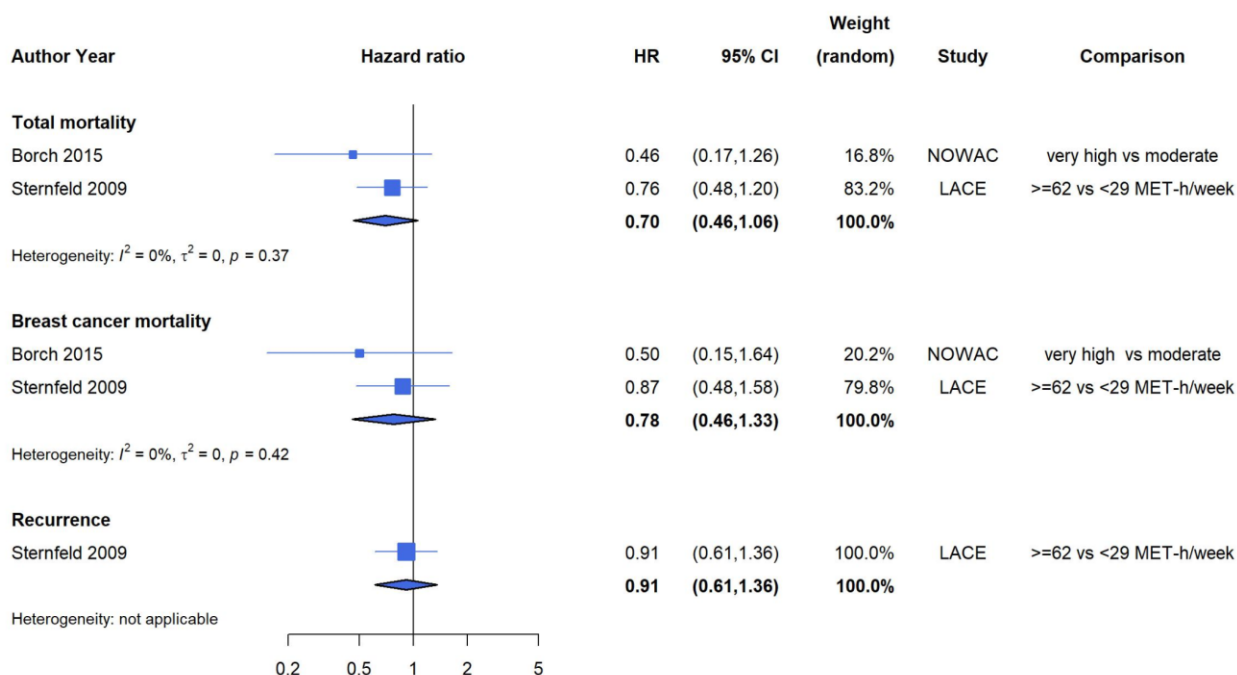
Supplementary Table 8 Summary of the judgement of the WCRF Expert Panel

DIET, NUTRITION, PHYSICAL ACTIVITY AND SURVIVAL IN WOMEN WITH BREAST CANCER									
2020 Decision from evidence judgement	Decreases risk								
	Limited-suggestive evidence	Exposure	Outcomes	Summary of findings			Conclusions		
	Recreational physical activity		N studies, (N publications)	Summary HR (95% CI) per 10 MET-h/week	Heterogeneity		Small study effects		
						I ²		Q value, Q p-value	Egger's p-value
			All-cause mortality	12 (9)	0.85 (0.78-0.92)	87%	62, <0.01	0.01	Evidence was limited but generally consistent in direction and magnitude. There is a dose-response relationship for all-cause mortality and breast-specific mortality, but the evidence may be limited in methodological quality. The strong risk reductions observed for the highest versus lowest physical activity levels are not plausible in context. Reverse causation and residual confounding cannot be ruled out, although the studies consistently reported a beneficial effect.
			Breast cancer-specific mortality	11 (8)	0.86 (0.77-0.96)	65%	23, 0.01	0.05	
			Recurrence	6 (3)	0.97 (0.91-1.05)	68%	6, 0.05	-	
					Summary HR (95% CI) Highest vs. Lowest meta-analyses				
			All-cause mortality	15 (12)	0.56 (0.49-0.64)	30%	17, 0.12	0.34	
			Breast cancer-specific mortality	12 (9)	0.58 (0.44-0.77)	54%	16, 0.08	0.11	
			Recurrence	6 (3)	0.80 (0.56-1.14)	60%	5, 0.08	-	

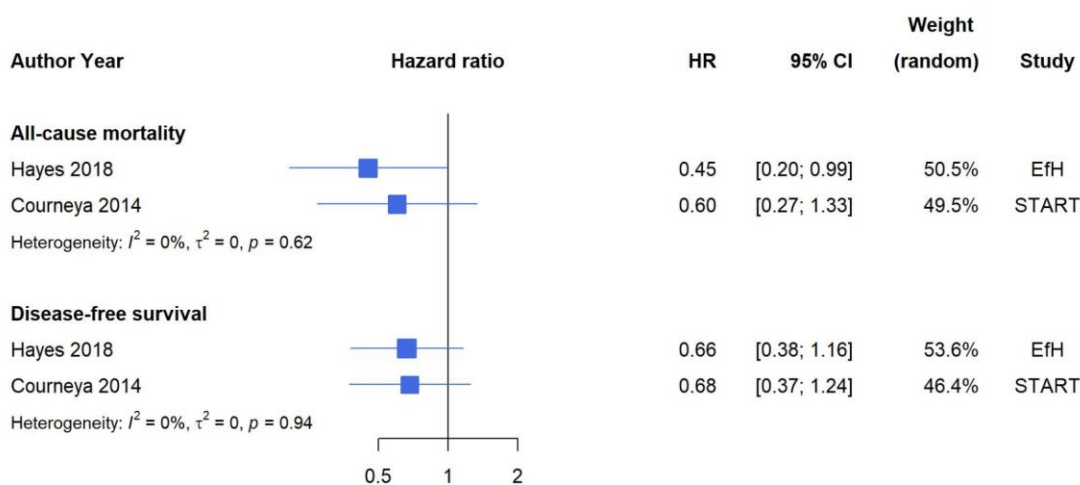
Limited evidence: These criteria are for evidence that is too limited to permit a probable or convincing judgement, but where there is evidence suggestive of a direction of effect. The evidence may have methodological flaws, or be limited in amount, but shows a generally consistent direction of effect. This level of evidence would not generally be used to justify making specific recommendations.

Supplementary Figures

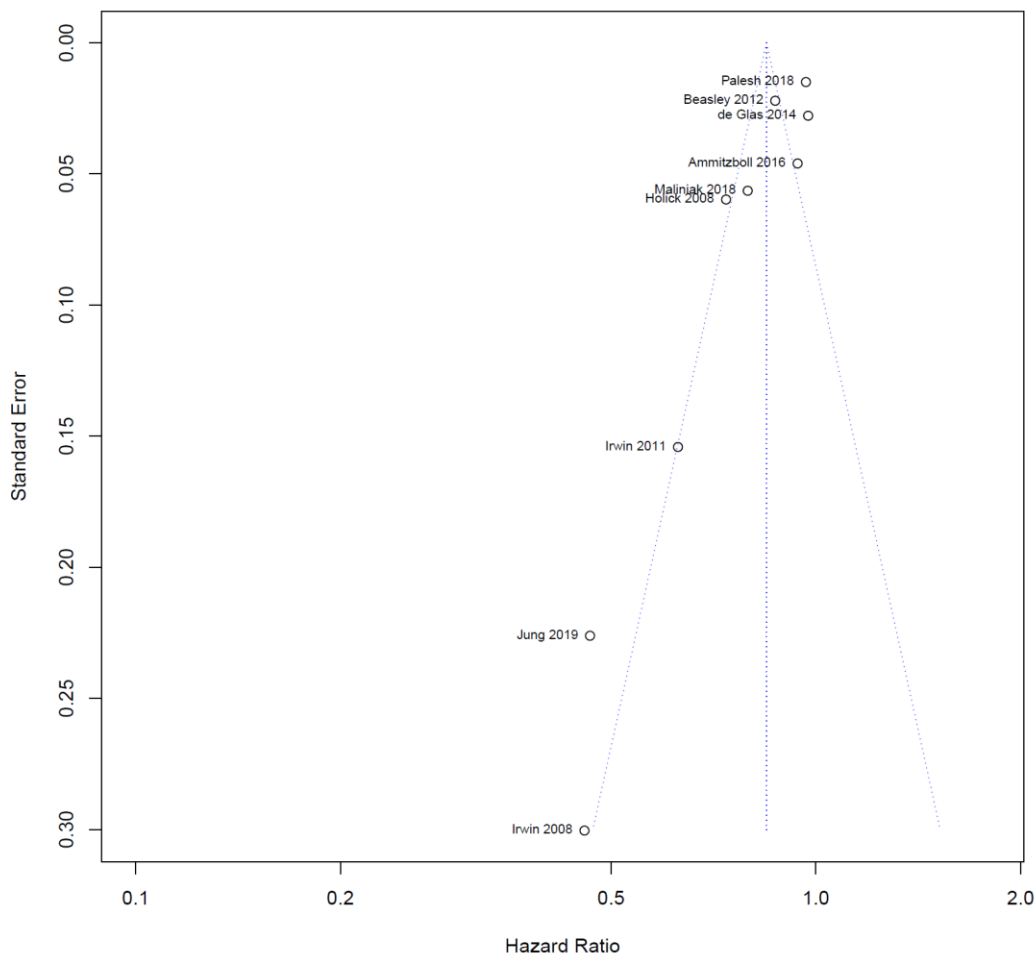
Supplementary Figure 1 Summary hazard ratio (95% CI) of all-cause mortality, breast cancer-specific mortality and recurrence for the highest compared with the lowest level of total physical activity after diagnosis.



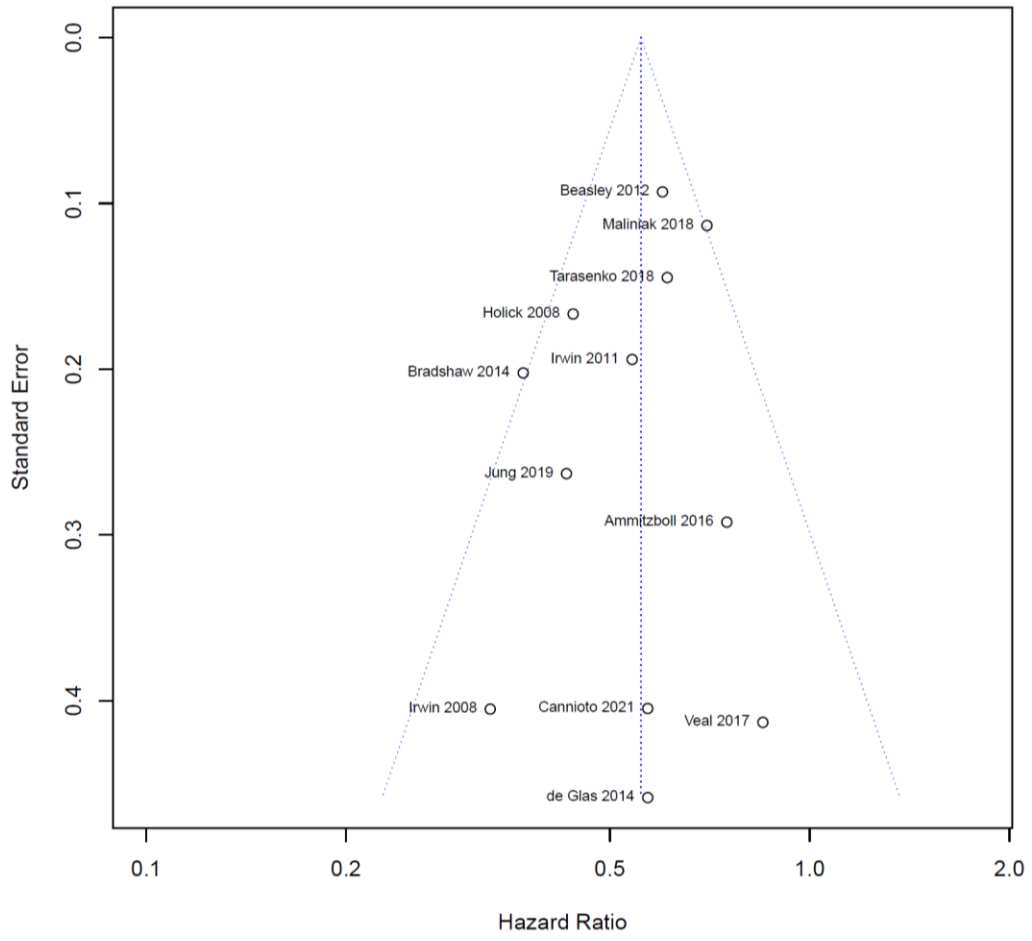
Supplementary Figure 2 Effects of exercise during and after adjuvant treatment on breast cancer outcomes – follow-up observational analyses of patients enrolled in clinical trials (no pooling).



Supplementary Figure 3 Funnel plot of studies included in the dose-response analysis for recreational physical activity and all-cause mortality. Horizontal axis shows logit transformed hazard ratios and the standard error of the logit transformed hazard ratios is plotted on the vertical axis. Each dot represents an individual study, and the vertical line represents the summary hazard ratio from a random-effects meta-analysis. The diagonal lines represent pseudo 95% confidence limits ($p=0.01$, Egger's test).

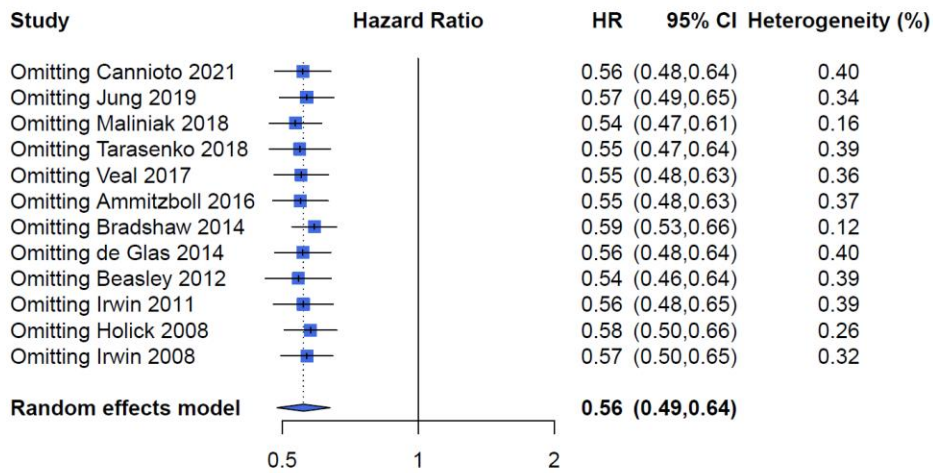


Supplementary Figure 4 Funnel plot of studies included in the high versus low analysis for recreational physical activity and all-cause mortality. Horizontal axis shows logit transformed hazard ratios and the standard error of the logit transformed hazard ratios is plotted on the vertical axis. Each dot represents an individual study, and the vertical line represents the summary hazard ratio from a random-effects meta-analysis. The diagonal lines represent pseudo 95% confidence limits ($p=0.34$, Egger's test).

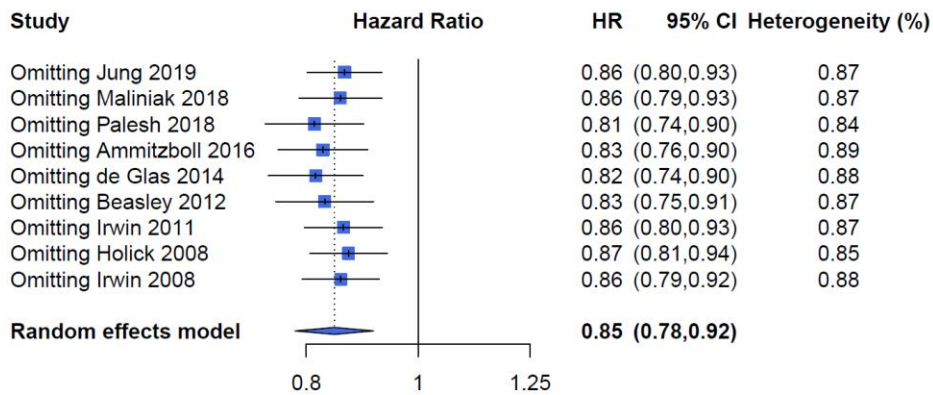


Supplementary Figure 5 Sensitivity (leave-one-out) analysis for (A) high versus low recreational physical activity and all-cause mortality and (B) dose-response meta-analysis for all-cause mortality Diamond represents the summary hazard ratio of the original meta-analysis with the nine publications. Each square represents the hazard ratio estimate when each indicated study is removed and the horizontal line across each square represents the 95% confidence interval (CI) of the hazard ratio estimate.

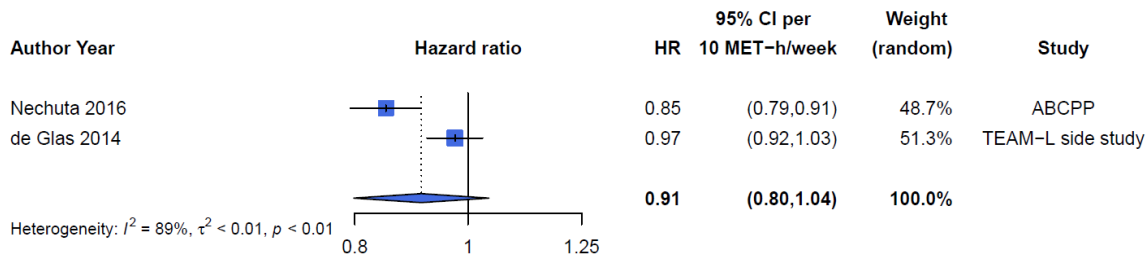
(A)



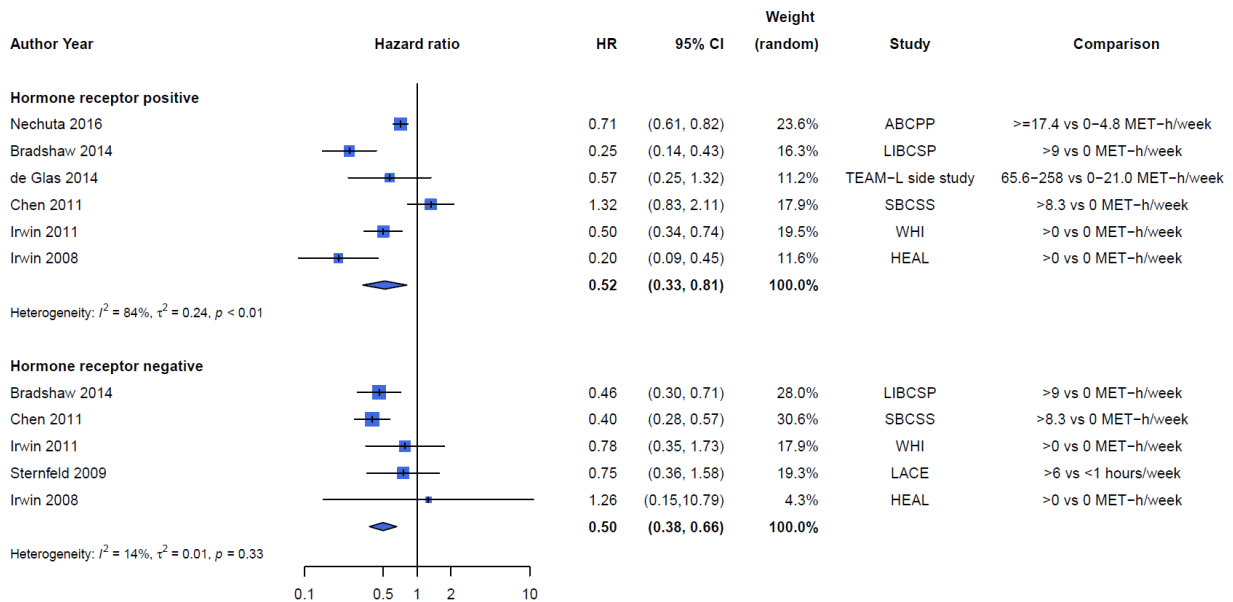
(B)



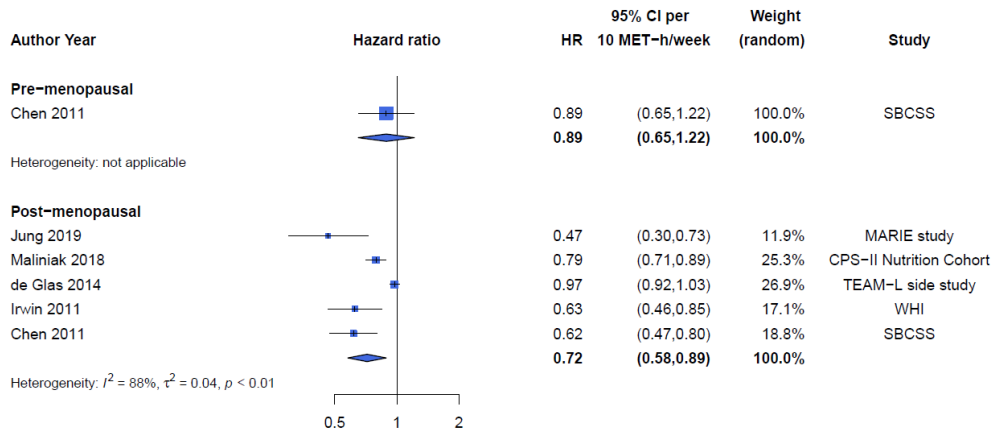
Supplementary Figure 6 Summary hazard ratio estimate (95% CI) of all-cause mortality for 10 MET-h/week of recreational physical activity after diagnosis in women with hormone receptor positive tumours. Note: ABCPP (Nechuta) included data from three US cohort studies i.e., LACE, NHS, WHEL.



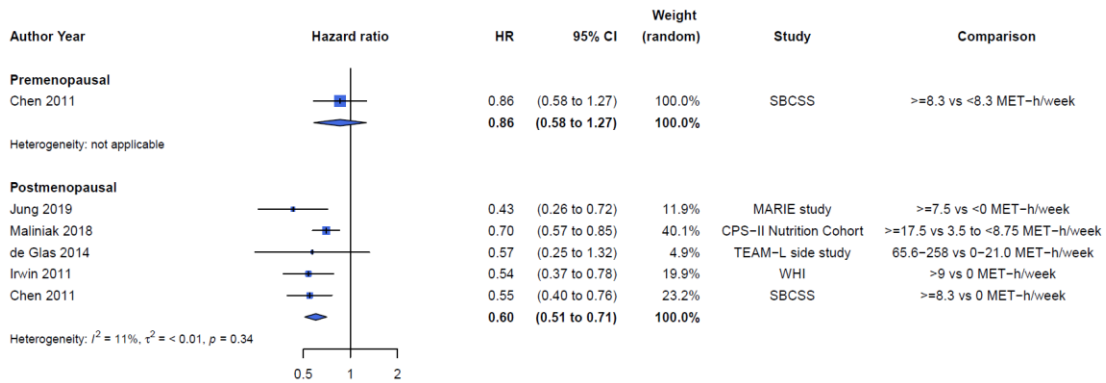
Supplementary Figure 7 Summary hazard ratio estimate (95% CI) of all-cause cancer mortality for the highest compared with the lowest level of recreational physical activity after diagnosis, by hormone receptor status. Note: ABCPP (Nechuta) included data from three US cohort studies i.e., LACE, NHS, WHEL.



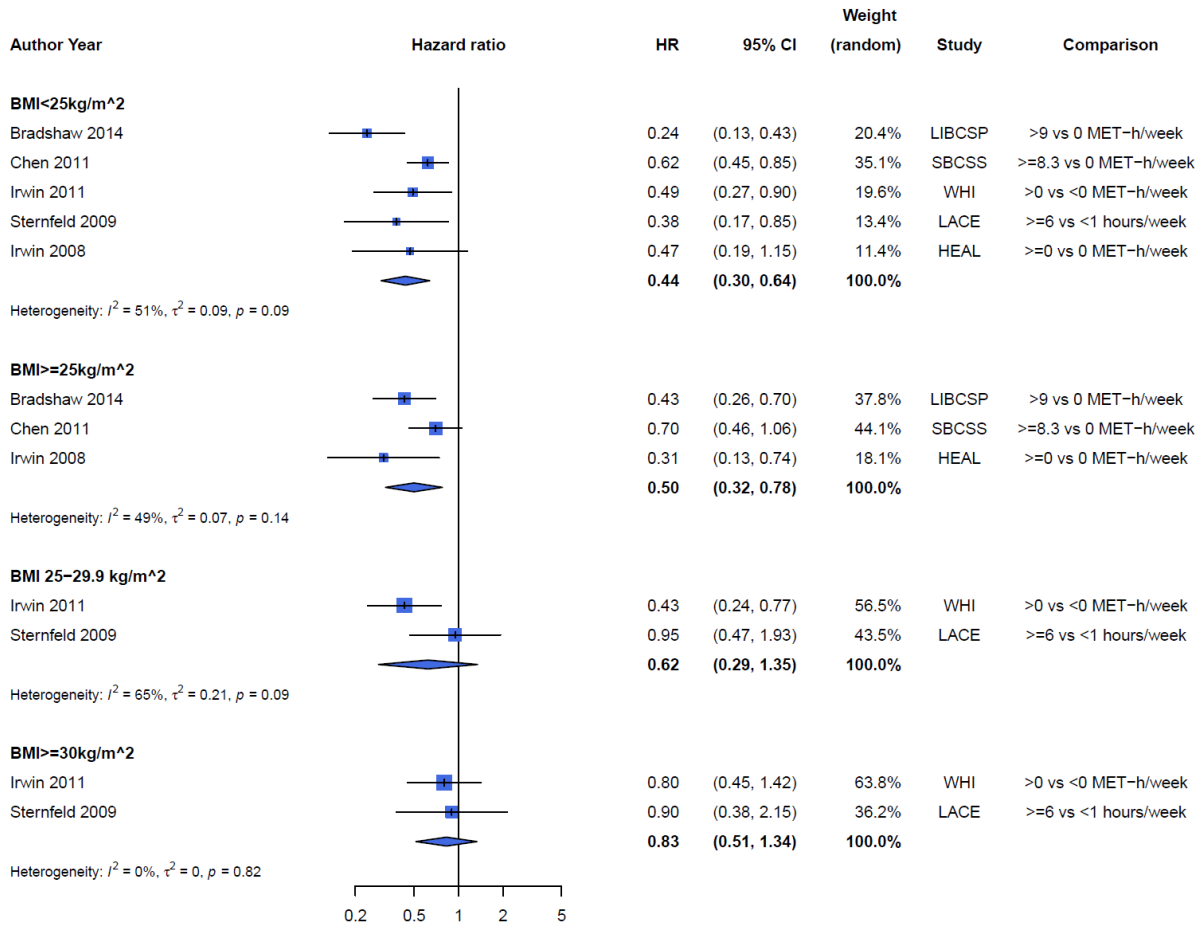
Supplementary Figure 8 Summary hazard ratio estimate (95% CI) of all-cause mortality for 10 MET-h/week of recreational physical activity after diagnosis, by menopausal status.



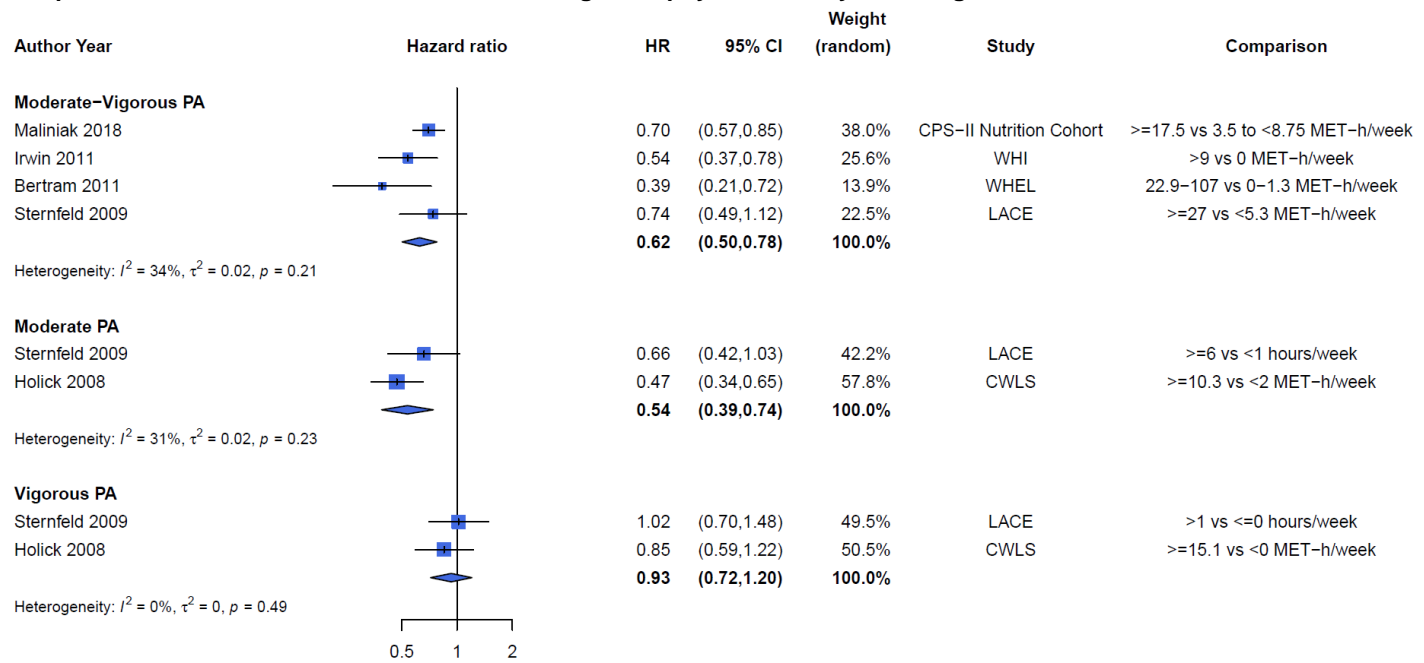
Supplementary Figure 9 Summary hazard ratio estimate (95% CI) of all-cause mortality for the highest compared with the lowest level of recreational physical activity after diagnosis, by menopausal status.



Supplementary Figure 10 Summary hazard ratio estimate (95% CI) of all-cause mortality for the highest compared with the lowest level of recreational physical activity after diagnosis, by BMI subgroup.

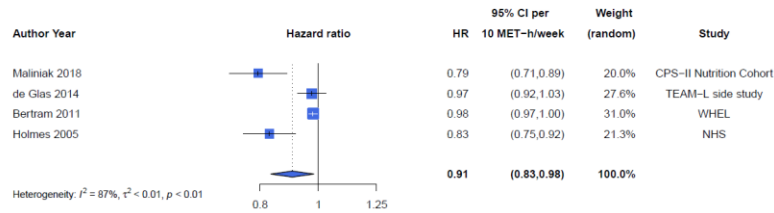


Supplementary Figure 11 Summary hazard ratio estimate (95% CI) of all-cause mortality for the highest compared with the lowest level of moderate and vigorous physical activity after diagnosis.

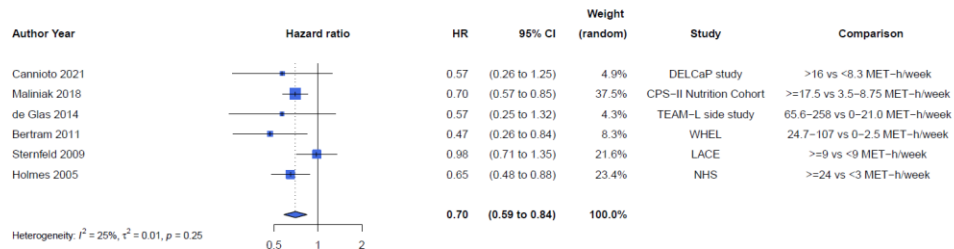


Supplementary Figure 12 Summary hazard ratio estimate (95% CI) of (A) all-cause mortality for 10 MET-h/week of recreational physical activity, in analysis restricted to studies that collected information after the primary treatment for cancer was finished and (B) summary hazard ratio estimate (95% CI) of all-cause mortality for the highest compared with the lowest level of recreational physical activity, in analysis restricted to studies that collected information after the primary treatment for cancer was finished.

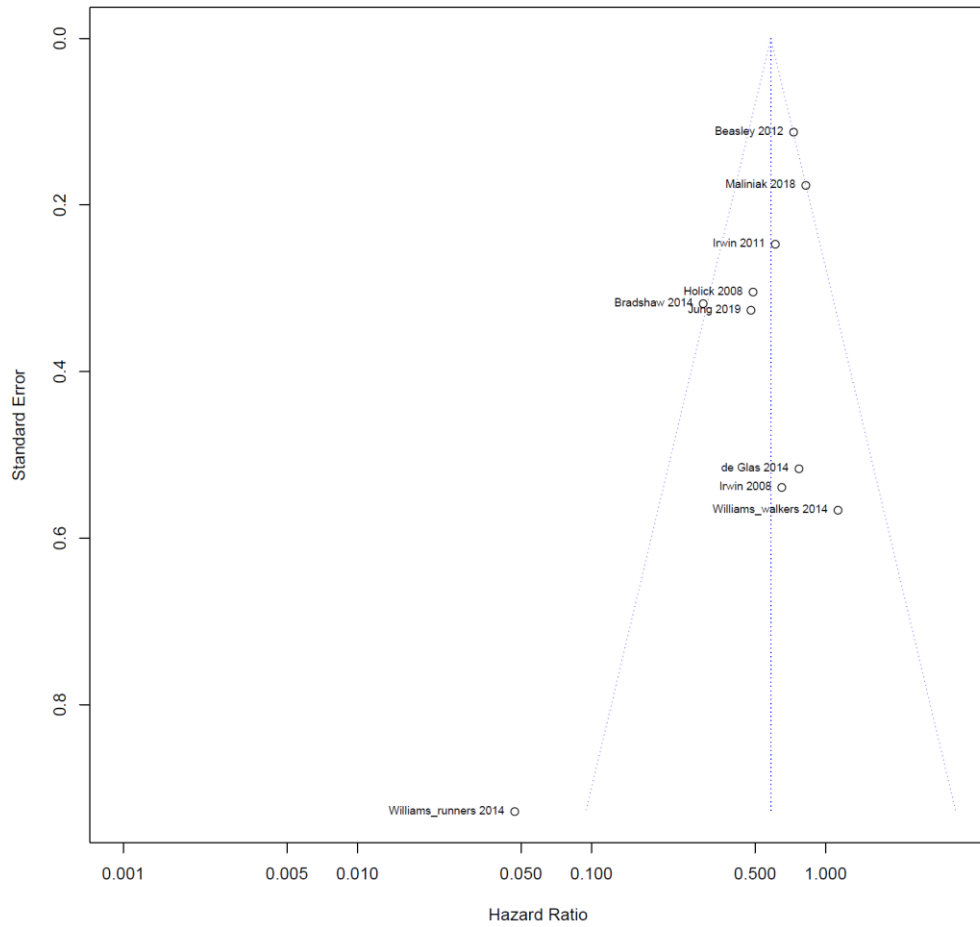
(A)



(B)

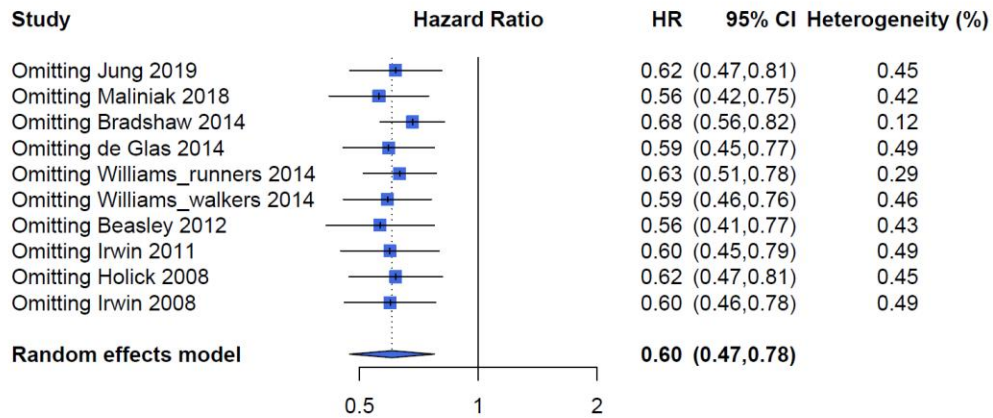


Supplementary Figure 13 Funnel plot of studies included in the high versus low meta-analysis for recreational physical activity and breast cancer-specific mortality. Horizontal axis shows logit transformed hazard ratios and the standard error of the logit transformed hazard ratios is plotted on the vertical axis. Each dot represents an individual study, and the vertical line represents the summary hazard ratio from a random-effects meta-analysis. The diagonal lines represent pseudo 95% confidence limits ($p=0.11$, Egger's test).

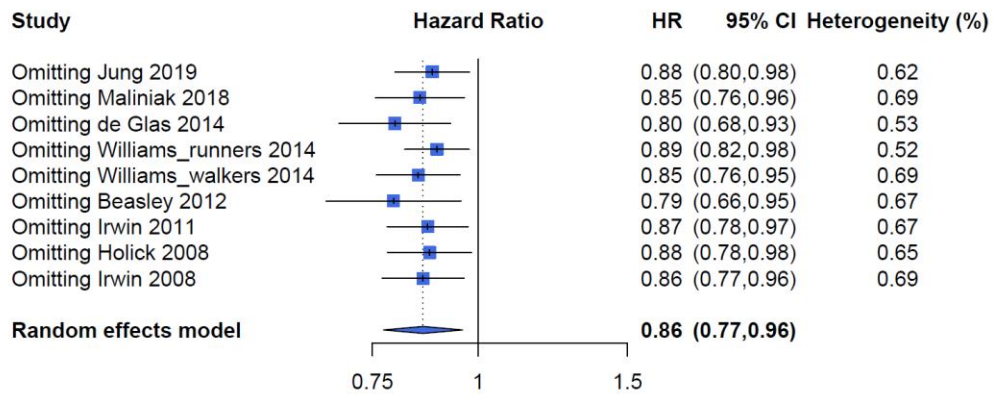


Supplementary Figure 14 Sensitivity (leave-one-out) analysis for (A) high versus low recreational physical activity and all-cause mortality and (B) dose-response meta-analysis for breast cancer-specific mortality
 Diamond represents the summary hazard ratio of the original meta-analysis with the nine publications. Each square represents the hazard ratio estimate when each indicated study is removed and the horizontal line across each square represents the 95% confidence interval (CI) of the hazard ratio estimate.

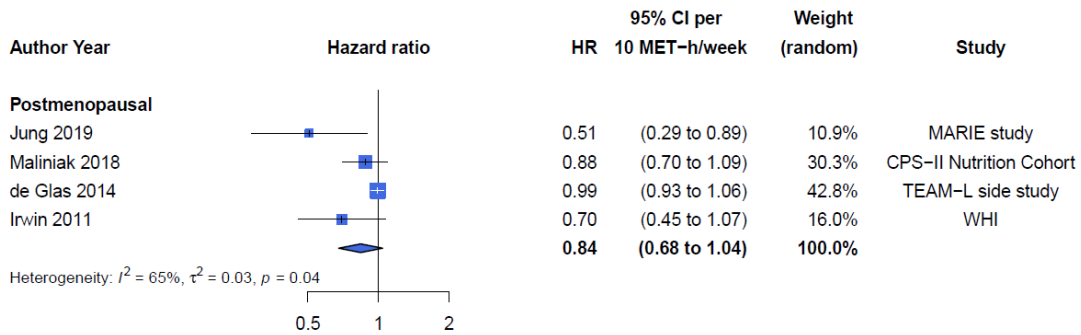
(A)



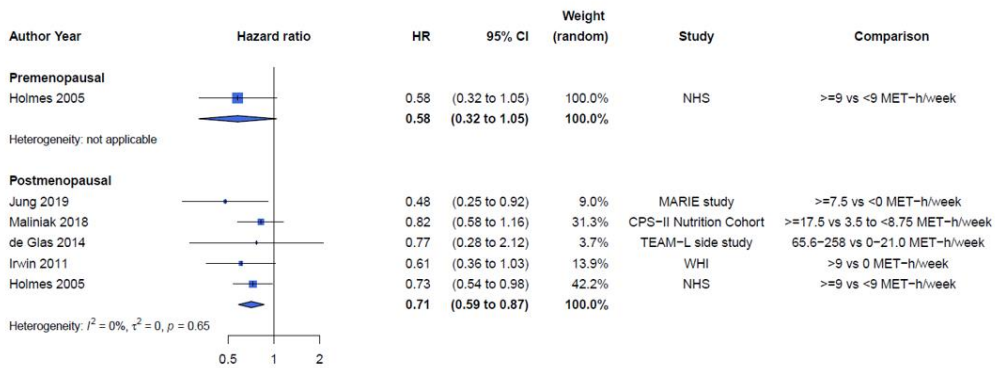
(B)



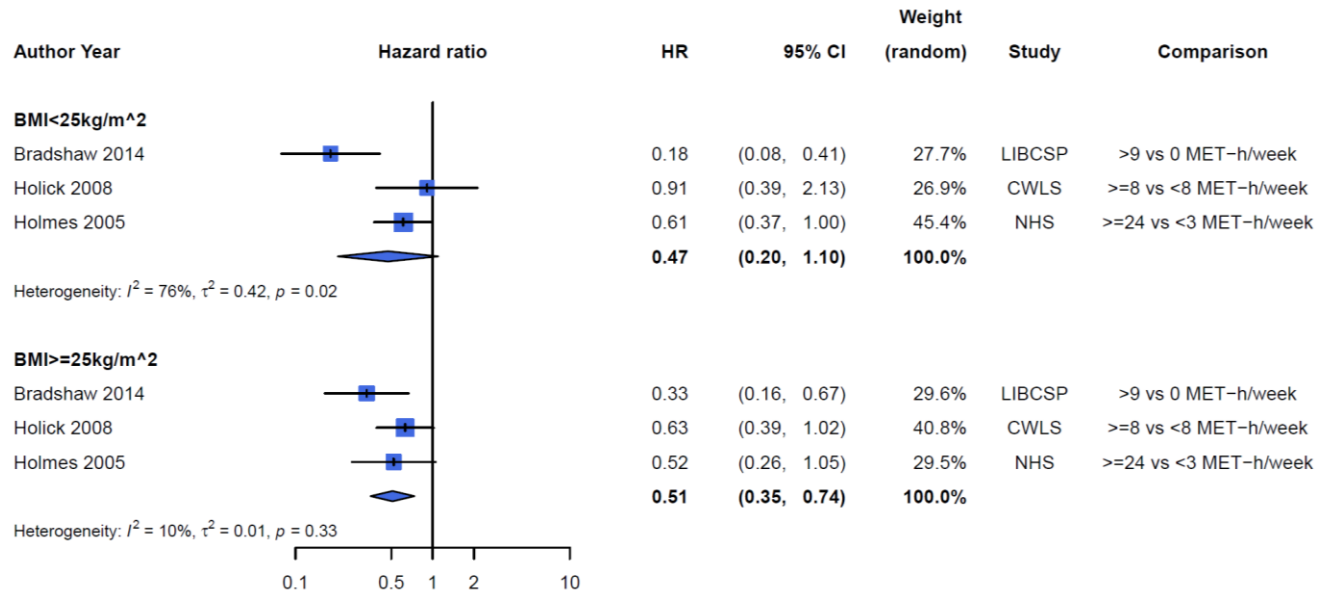
Supplementary Figure 15 Summary hazard ratio estimate (95% CI) of breast cancer-specific mortality for 10 MET-h/week of recreational physical activity after diagnosis, by menopausal status.



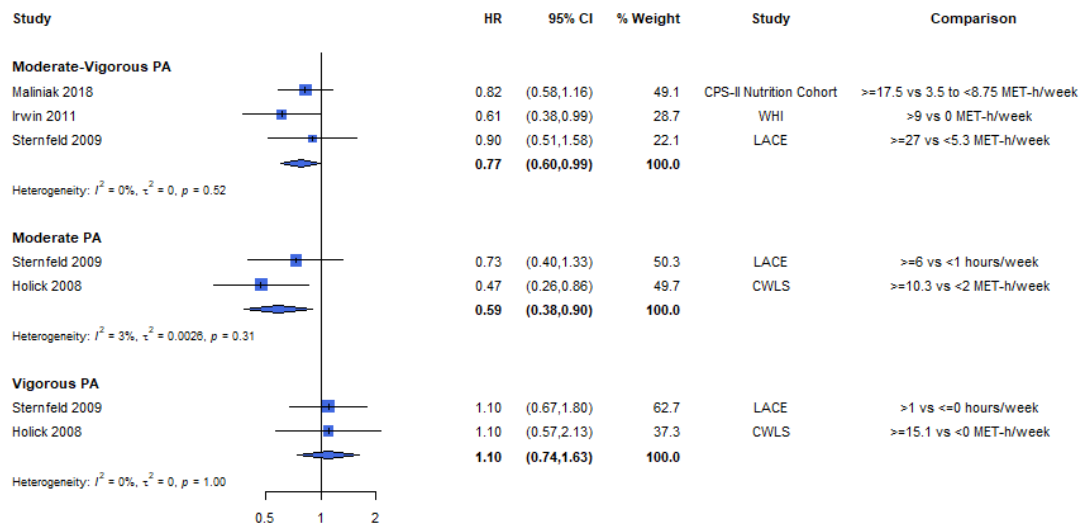
Supplementary Figure 16 Summary hazard ratio estimate (95% CI) of breast cancer-specific mortality for the highest compared with the lowest level of recreational physical activity after diagnosis, by menopausal status.



Supplementary Figure 17 Summary hazard ratio estimate (95% CI) of breast cancer-specific mortality for the highest compared with the lowest level of recreational physical activity after diagnosis, by BMI subgroup.

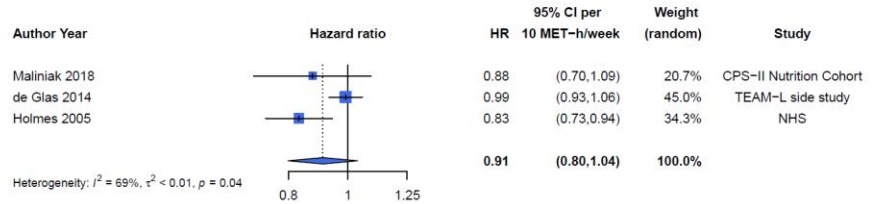


Supplementary Figure 18 Summary hazard ratio estimate (95% CI) of breast cancer-specific mortality for the highest compared with the lowest level of moderate and vigorous physical activity after diagnosis.

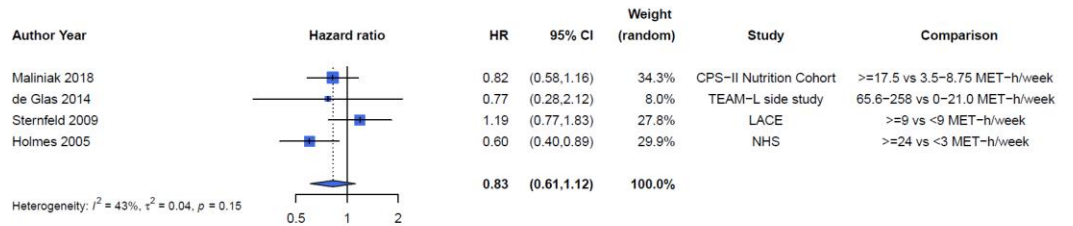


Supplementary Figure 19 Summary hazard ratio estimate (95% CI) of (A) breast cancer-specific mortality for 10 MET-h/week of recreational physical activity, in analysis restricted to studies that collected information after the primary treatment for cancer was finished and (B) summary hazard ratio estimate (95% CI) of breast cancer mortality for the highest compared with the lowest level of recreational physical activity, in analysis restricted to studies that collected information after the primary treatment for cancer was finished.

(A)



(B)



APPENDIX 2

Details for physical activity estimations for dose-response analyses

The median or mean physical activity level in each category was assigned to the corresponding HR for each study. If studies reported the range of physical activity levels, we used the midpoint for each category. If the highest or lowest category was open-ended, we assumed its width to be the same as the adjacent category. If studies reported only categorical results, number of events and denominator data (person-years of follow-up or total number of persons) were required for inclusion in the meta-analysis for at least three categories of physical activity. When only the total number of events or person years was reported, and physical activity was categorised in quantiles, the distribution of persons or person years was calculated by dividing the total number of persons or person years by the number of quantiles.

APPENDIX 3

Physical activity changes from before to after diagnosis and breast cancer prognosis Physical activity change from before diagnosis to after diagnosis and all-cause mortality

Seven studies¹⁻⁷ examining changes in physical activity before and after breast cancer diagnosis in relation to all-cause mortality were identified. In general, there is a tendency for better survival in women who increase post-diagnosis physical activity and worse survival in women with reduced post-diagnosis physical activity although the studies are limited by small sample sizes.

In the HEAL study,⁵ null associations were observed for women who increased physical activity in the second year after diagnosis by 3 MET-h/week or more (HR=0.55, 95%CI 0.22-1.38; deaths=7), as well as for those who maintained physical activity levels within 3 MET-h/week (HR=1.55, 95%CI 0.64-3.80; deaths=11). Women who decreased physical activity after diagnosis by more than 3 MET-h/week had higher risk of death (HR=3.95, 95%CI 1.45-10.50, deaths=19) compared with women who were inactive both before and after diagnosis (0 MET-h/week). The results were similar after excluding 24 women who had an adverse event (recurrence, new primary, or death) within the two years after completing the post diagnosis physical activity questionnaire.

In the WHI study,⁴ physical activity was assessed before diagnosis and at the third and sixth year of follow-up. Post-diagnosis physical activity was the closest assessment after diagnosis during follow-up. Women who increased or maintained physical activity of nine or more MET-h/week after diagnosis had lower risk of all-cause mortality (HR=0.67, 95%CI, 0.46–0.96, deaths=69) than women who were inactive before and after diagnosis (none or <9 MET-h/week before and close after diagnosis; deaths=46). No change in risk of all-cause mortality was observed in women who decreased physical activity (HR decrease compared to no change 1.06, 95%CI 0.73–1.54, deaths=53).

In the WHEL study,¹ four categories for change in physical activity were defined according to following a guideline of 10 MET-h/week before and one year after diagnosis. The association of women who never met the guideline compared to those who were meeting physical activity guidelines both at baseline and at one-year follow-up was null (HR=0.89, 95%CI 0.49-1.64). No reduction in risk of all-cause mortality was observed in women who were meeting physical activity guidelines at only a single time point (either before or after cancer diagnosis).

In the DCH study,² the influence of post-diagnosis physical activity on all-cause mortality was not modified by pre-diagnosis physical activity. In NOWAC,³ women who reduced physical activity levels had higher risk of all-cause mortality (HR=1.76, 95%CI 1.21–2.56) than those women who maintained their constant activity level.

In the MARIE study,⁶ women who were increasingly active compared to those who were insufficiently active had a higher risk of all-cause mortality (HR=0.50, 95% CI 0.31–0.82). A similar pattern to all-cause mortality was observed for breast cancer-specific mortality and recurrence but the 95%CI crossed the null value. In the publication by Akdeniz et al 2021⁷ no associations were observed for all-cause mortality and physical activity changes, the 95%CI crossed the null value in multivariate analyses.

Physical activity change from before diagnosis to after diagnosis and breast cancer-specific mortality

Four studies examining changes in physical activity before and after breast cancer diagnosis in relation to breast cancer mortality were identified. In HEAL⁵, no change in risk of breast cancer-specific mortality was observed in women who increased physical activity in the second year after diagnosis in 3 MET-h/week, compared to women who were inactive both before and after diagnosis (0 MET-h/week) (HR=0.82, 95%CI 0.29-2.34; deaths=6). The association was also null for women who either maintained (within 3 MET-h/week) or decreased their physical activity levels (by more than 3 MET-h/week) after diagnosis (HR=2.47, 95%CI 0.78-7.78; deaths=7 and HR=3.69, 95%CI 0.88-15.92, deaths=7, respectively).

In the WHI study⁴, compared to women with no physical activity change after diagnosis, no significant changes in breast cancer risks were observed in women who increased or maintained physical activity of 9 or more MET-h/week (HR=0.91, 95% CI, 0.51-1.64, deaths=32) or decreased physical activity from >9 to <9 MET-h/week or to no activity (HR=1.06, 95%CI 0.59–1.88, deaths=22). In NOWAC³, women who reduced physical activity levels had higher risk of all-cause mortality (HR=2.05, 95%CI 1.35-3.10) than women who maintained their constant activity level.

In the MARIE study⁶ a similar pattern to all-cause mortality was observed for increasing levels of physical activity and breast cancer-specific mortality but the 95%CI crossed the null value.

Physical activity change from before diagnosis to after diagnosis and breast cancer recurrence

Three studies (WHEL, MARIE study, publication by Akdeniz 2021) examining changes in physical activity before and after breast cancer diagnosis in relation to additional breast cancer events was identified. In this study,¹ women who never met the guideline of 10 MET-h/week either before or after diagnosis, did not have a lower risk of additional breast cancer events compared to women who met physical activity guidelines both before and at one year after diagnosis (HR=0.93, 95%CI

0.70-1.24, events=103 events). Higher risk of additional breast cancer events was observed in women who were meeting physical activity guidelines only after diagnosis (HR=1.44, 95%CI 1.02-2.03, events=49) but the association was null for those who met physical activity guidelines only before cancer diagnosis (HR=1.22, 95%CI 0.81-1.83, events=31).

In the MARIE study⁶ a similar pattern to all-cause mortality was observed for increasing levels of physical activity and breast cancer-specific mortality but the 95%CI crossed the null value. In the publication by Akdeniz et al 2021⁷ patients who started exercising after breast cancer diagnosis had lower risk of disease-free survival compared to those who did not do any exercise (HR=0.13, 95% CI 0.04–0.44, $p=0.001$).

REFERENCE LIST

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