Electronic supplementary material (ESM 1)

Table E1. Studies on the relationship between selenium (Se intake or selenium measured in serum or plasma) and survival from colorectal cancer, breast cancer and cancer in general.

Study design	Type of cancer	Type of material in which Se was measured and dietary factors investigated	No. of CRC or breast cancer patients/ participants	Timepoint related to diagnosis	Length of follow-up	Outcomes assessed	Results	Origin of data
Reference: Schrauzer GN, White DA, Schneider CJ. Cancer mortality correlation studies--III: statistical associations with dietary selenium intakes. Bioinorg Chem. 1977;7(1):23-31. doi: 10.1016/s0006-3061(00)80126-x. PMID: 856291.								
ecological study	colon and rectal cancers	diet, blood (secondary analysis) selenium intake	Human populations of 27 countries	not applicable	not applicable	the association between Se-intake and the age-corrected mortality from cancers of colon and rectum	Significant inverse correlations were observed between the dietary Se intakes and the age-corrected mortalities from cancers of the colon and rectum.	27 countries
Reference: Slattery ML, French TK, Egger MJ, Lyon JL. Diet and survival of patients with colon cancer in Utah: is there an association? Int J Epidemiol. 1989 Dec;18(4):792-7. doi: 10.1093/ije/18.4.792. PMID: 2559896.								
cohort study	colon cancer	diet (total calories, fat, protein, and dietary fiber intake) **no mentioned selenium**	571 (410 included)	Data were obtained 5 year preceding diagnosis (the 1st study) and 2 years preceding diagnosis (the 2nd study).	unknown	colon cancer survival	The highest quartile of dietary fiber intake was associated with decreased survival compared with the lowest quartile (HRR=1.53). The hazard rate ratios (HRRs), after adjustment, by proportional hazards regression models, comparing highest to lowest quartile of intake for total calories, fat, protein were: 0.60 (CI:0.37-0.98); 0.81 (CI: 0.52-1.26); 0.66 (CI: 0.41-1.05), respectively.	Utah
Reference: Dray X, Boutron-Ruault MC, Bertrais S, Sapinho D, Benhamiche-Bouvier AM, Faivre J. Influence of dietary factors on colorectal cancer survival. Gut. 2003 Jun;52(6):868-73. doi: 10.1136/gut.52.6.868. PMID: 12740344; PMCID: PMC1773686.								
cohort study	colorectal cancer	diet (plant product intake, animal product intake, energy intake) **no mentioned selenium**	From 171 previously included 23 cases were excluded from survival analysis giving 148 CRC patients finally.	Questionnaire concerning diet in the year preceding diagnosis	--	5-year relative risk of death according to specific nutrients	5 year RR of death for the highest vs. the two lowest tertiles of energy intake was 0.18 (0.07-0.44). This effect was similar for both sexes, for the colon and the rectum. No other foods and nutrients influenced 5-year survival.	France
Reference: Sun JW, Shu XO, Li HL, Zhang W, Gao J, Zhao LG, Zheng W, Xiang YB. Dietary selenium intake and mortality in two population-based cohort studies of 133 957 Chinese men and women. Public Health Nutr. 2016 Nov;19(16):2991-2998. doi: 10.1017/S1368980016001130. Epub 2016 May 20. PMID: 27197889; PMCID: PMC5063694.								
prospective cohort studies	cancer	diet (selenium intake)	73 854 women 60 103 men (133 957 adults)	FFQ assessed dietary habits during the preceding year	An average follow-up of 13.90 years in the SWHS and 8.37 years in the SMHS study	all-cause mortality, CVD mortality, and cancer mortality risks associated with dietary selenium intake	Dietary Se intake was inversely associated with all-cause mortality (Q5 vs Q1: for women: HR=0.79; CI:0.71-0.88; for men: HR=0.79; CI: 0.70-0.89) and CVD mortality (Q5 vs Q1: women: HR=0.80; CI:0.66-0.98; men: HR=0.66; CI:0.54-0.82). No significant associations were found for cancer mortality in both men and women.	China

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Reference: Holmes MD, Stampfer MJ, Colditz GA, Rosner B, Hunter DJ, Willett WC. Dietary factors and the survival of women with breast carcinoma. Cancer. 1999 Sep 1;86(5):826-35. doi: 10.1002/(sici)1097-0142(19990901)86:5<826::aid-cncr19>3.0.co;2-0. Erratum in: Cancer 1999 Dec 15;86(12):2707-8. PMID: 10463982.								
cohort	breast carcinoma	diet (fat, protein, dairy products, red meat, and nutrients intake, i.e. selenium intake; in total: 85 nutrients and 7 food groups)	1982 females	No information about the period of time regarding reporting dietary habits by respondents	157 months (mean duration of follow-up)	Time to death from any cause	In multivariate analyses of diet after diagnosis, no apparent association was found between fat intake and mortality. The relative risk (and 95% confidence interval) of mortality comparing the highest with the lowest quintile of protein intake was 0.65 (0.47– 0.88). There was no association between red meat and mortality. These associations were similar in analyses with breast carcinoma death as the outcome.	USA
Reference: Harris HR, Bergkvist L, Wolk A. Selenium intake and breast cancer mortality in a cohort of Swedish women. Breast Cancer Res Treat. 2012 Aug;134(3):1269-77. doi: 10.1007/s10549-012-2139-9. Epub 2012 Jun 27. PMID: 22736377.								
cohort	breast cancer	diet (selenium intake)	3.146 women diagnosed with invasive breast cancer in the population-based Swedish Mammography Cohort	previous 6 months (1987) or 1 year (1997)	28.172 person-years of follow-up; median follow-up time was 9.0 years (ranging 1 month to 22 years)	breast cancer-specific mortality overall mortality	Women in the highest quartile of Se intake had a multivariable HR (95 % CI) of death from breast cancer of 0.69 (0.52–0.92) compared with those in the lowest quartile. Women in the highest quartile of Se intake had a multivariable HR ((95 % CI) of death from: non-breast cancer of 0.78 (0.62-0.99); from any cause of 0.75 (0.63-0.90).	Sweden
Reference: Psathakis D, Wedemeyer N, Oevermann E, Krug F, Siegers CP, Bruch HP. Blood selenium and glutathione peroxidase status in patients with colorectal cancer. Dis Colon Rectum. 1998 Mar;41(3):328-35. doi: 10.1007/BF02237487. PMID: 9514428.								
cohort study	colorectal cancer	serum (selenium level)	106 colorectal cancer patients	no data available	Mean follow-up time was 41 (range, 1-152) months.	cancer-related mean survival time; 5-year and 10-year survival rates	CRC patients with a selenium level <70µg/l had a significantly lower mean survival time and a lower cumulative cancer-related survival rate than patients with a selenium level >70µg/l (p=0.0009).	Germany
Reference: Guo W, Zheng W, Li JY, Chen JS, Blot WJ. Correlations of colon cancer mortality with dietary factors, serum markers, and schistosomiasis in China. Nutr Cancer. 1993;20(1):13-20. doi: 10.1080/01635589309514266. PMID: 8415126.								
ecological study	colon cancer	diet (intake of animal foods, salt-preserved vegetables, beer, green vegetables) serum (level of total cholesterol, urea nitrogen, lipid peroxide,β-carotene, α-tocopherol, vitamin C, selenium)	unknown (only abstract is available) only information: 49 Chinese rural counties were examined.	not applicable	not applicable	colon cancer mortality; association between colon cancer and serum selenium and other nutrients measured in serum	No appreciable association was found between colon cancer and serum levels of selenium, beta-carotene, alpha-tocopherol, vitamin C. Increased mortality of colon cancer was associated with high consumption of animal foods, beer, and salt-preserved vegetables, opposite to intake of green vegetables decreasing mortality.	China

Study design	Type of cancer	Type of material in which Se was measured and dietary factors investigated	No. of CRC or breast cancer patients/ participants	Timepoint related to diagnosis	Length of follow-up	Outcomes assessed	Results	Origin of data
Reference: Hughes, D., Fedirko, V., Umesh, S., Schomburg, L., Méplan, C., Hybsier, S., Riboli E, Jenab, M. Selenium status and survival from colorectal cancer in the European prospective investigation of cancer and nutrition. Revue d'Épidémiologie et de Santé Publique. 2018; 66 (5):S290. https://doi.org/10.1016/j.respe.2018.05.142. (https://www.sciencedirect.com/science/article/pii/S0398762018308423).								
cohort study	colorectal cancer	serum (selenium level, selenoprotein P level)	unknown (only abstract is available)	unknown	unknown	colorectal cancer mortality overall mortality	No major association between selenium status markers and survival after CRC diagnosis was found. Although CRC mortality did not decrease with higher levels of Se and SELENOP, a study presented an association of SELENOP with overall mortality.	Unknown
Reference: Baker JR, Umesh S, Jenab M, Schomburg L, Tjønneland A, Olsen A, Boutron-Ruault MC, Rothwell JA, Severi G, Katzke V, Johnson T, Schulze MB, Masala G, Agnoli C, Simeon V, Tumino R, Bueno-de-Mesquita HB, Gram IT, Skeie G, Bonet C, Rodriguez-Barranco M, Houerta JM, Gylling B, Van Guelpen B, Perez-Cornago A, Aglago E, Freisling H, Weiderpass E, Cross AJ, Heath AK, Hughes DJ, Fedirko V. Prediagnostic Blood Selenium Status and Mortality among Patients with Colorectal Cancer in Western European Populations. Biomedicines. 2021 Oct 22;9(11):1521. doi: 10.3390/biomedicines9111521. PMID: 34829750; PMCID:PMC8614984								
cohort study	colorectal cancer	serum (selenium level and SELENOP level)	995 CRC cases	Se and SELENOP serum concentrations were measured on average 46 months before CRC diagnosis	Median follow-up time: 113 months (SD=70)	CRC-specific mortality; overall mortality	Participants with Se concentrations in the highest quintile (≥100µg/L) had a multivariable-adjusted hazard ratio (HR) of 0.73 (95% CI: 0.52–1.02; p^{trend}=0.06) for CRC-specific mortality and 0.77 (95% CI: 0.57–1.03; p^{trend}=0.04) for overall mortality, compared with the lowest quintile (≤67.5 µg/L). Similarly, participants with SELENOP concentrations in the highest (≥5.07 mg/L) compared with the lowest quintile (≤3.53 mg/L) had HRs of 0.89 (95% CI: 0.64–1.24; p^{trend}=0.39) for CRC-specific mortality and 0.83 (95% CI: 0.62–1.11; p^{trend}=0.17) for overall mortality.	Multicentre: the UK, Germany, Greece, Italy, Spain, Sweden, France, Denmark. The Netherlands, Norway
Reference: Lubinski J, Marciniak W, Muszynska M, Huzarski T, Gronwald J, Cybulski C, Jakubowska A, Debniak T, Falco M, Kladny J, Kotsopoulos J, Sun P, Narod SA. Serum selenium levels predict survival after breast cancer. Breast Cancer Res Treat. 2018 Jan;167(2):591-598. doi: 10.1007/s10549-017-4525-9. Epub 2017 Oct 17. PMID: 29043463.								

Study design	Type of cancer	Type of material in which Se was measured and dietary factors investigated	No. of CRC or breast cancer patients/ participants	Timepoint related to diagnosis	Length of follow-up	Outcomes assessed	Results	Origin of data
cohort study	breast cancer	serum (selenium level)	546 women were diagnosed with a first primary invasive breast cancer between 2008-2015 in Szczecin, Poland	a blood sample was taken within three months of the date of diagnosis, before treatment.	3.8 years (mean follow up)	all-cause mortality breast cancer-specific mortality The 5-year overall survival	The 5-year overall actuarial survival was 68.1% for women in the lowest (<64.4 µg/L) and 82.5% for those in the highest (>81.0 µg/L) quartile of serum selenium. In a fully adjusted model HR of death from all-cause was 2.49 (Q1 vs Q2-Q4) (95% CI: 1.53-4.04, p=0.0002). The HR for breast cancer-specific mortality associated with low serum Se was 2.03 (Q1 vs. Q2-Q4) (95% CI: 1.12-3.65; p=0.02).	Poland
Reference: Szwiec M, Marciniak W, Derkacz R, Huzarski T, Gronwald J, Cybulski C, Dębniak T, Jakubowska A, Lener M, Falco M, Kładny J, Baszuk P, Duszyński J, Kotsopoulos J, Narod SA, Lubiński J. Serum Selenium Level Predicts 10-Year Survival after Breast Cancer. Nutrients. 2021 Mar 16;13(3):953. doi: 10.3390/nu13030953. PMID: 33809461; PMCID: PMC7998294.								
cohort study	breast cancer	serum (selenium level)	538 breast cancer females	blood was collected before initiation of treatment	7.9 years (mean follow-up)	10-year survival of patients with breast cancer and 10-year overall survival Overall mortality Breast cancer specific mortality	The 10-year actuarial cumulative survival was 65.1% for women in the lowest quartile of serum selenium, compared to 86.7% for women in the highest quartile (p<0.001 for difference). The 10-year breast cancer specific survival rates were lower for women with a selenium level in quartile 1 (76.7%) than for women in the other three quartiles (84.2% for quartile 2, 83.4% for quartile 3, 87.9 for quartile 4) and the difference was statistically significant (p-long rank= 0.014). Compared to women in quartile 4, the univariate hazard ratio (HR) for breast cancer-specific mortality for women in quartile 1 was 2.31 (95% CI: 1.24–4.31, p = 0.008).	Poland
Reference: Sandsveden M, Nilsson E, Borgquist S, Rosendahl AH, Manjer J. Prediagnostic serum selenium levels in relation to breast cancer survival and tumor characteristics. Int J Cancer. 2020 Nov 1;147(9):2424-2436. doi: 10.1002/ijc.33031. Epub 2020 May 18. Erratum in: Int J Cancer. 2021 Jul 1;149(1):E1-E2. PMID: 32378183.								
cohort study	breast cancer	serum (selenium level)	1066 (survival analysis) 1003 (risk analysis) 1186 (included controls)	blood samples were collected before diagnosis	10.3 years (mean follow-up) 10 949 person-years	breast cancer-specific mortality overall mortality	Lower overall mortality was found among women in the highest Se quartile compared to the lowest using an adjusted Cox proportional hazard model, HR= 0.63 (95%CI= 0.44-0.89). For breast cancer-specific mortality similar results were found 0.60 (0.37-0.98).	Sweden
Reference: Demircan K, Bengtsson Y, Sun Q, Brange A, Vallon-Christersson J, Rijntjes E, Malmberg M, Saal LH, Rydén L, Borg Å, Manjer J, Schomburg L. Serum selenium, selenoprotein P and glutathione peroxidase 3 as predictors of mortality and recurrence following breast cancer diagnosis: A multicentre cohort study. Redox Biol. 2021 Nov;47:102145. doi: 10.1016/j.redox.2021.102145. Epub 2021 Sep 21. PMID: 34563873; PMCID: PMC8476451.								

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cohort study	breast cancer	serum (selenium level, levels of: SELENOP and GPx3)	1996 patients with a new diagnosis of primary invasive breast cancer	blood samples were collected at time of diagnosis, before surgery	13,306 person years of follow-up	overall survival recurrence free survival	In fully adjusted Cox models, all three biomarkers correlated inversely with mortality (p_{trend} <0.001) and compared with the lowest quintile, hazard ratios (95% confidence interval) for overall survival in the highest quintile of selenium, SELENOP and GPx3 were 0.42 (0.28-0.63), 0.51 (0.36-0.73) and 0.52 (0.36-0.75), respectively. Low GPx3 activity was associated with more recurrences (Q5 vs Q1: fully adjusted HR (95%CI); 0.57 (0.35-0.92), (p_{trend} = 0.005).	Sweden
Reference: Bleys J, Navas-Acien A, Guallar E. Serum selenium levels and all-cause, cancer, and cardiovascular mortality among US adults. Arch Intern Med. 2008 Feb 25;168(4):404-10. doi: 10.1001/archinternmed.2007.74. PMID: 18299496.								
cohort	cancer CVD all-cause	serum (selenium level)	13 887 NHANES III participants	unknown	study participants were followed up for mortality for up to 12 years.	all-cause mortality; cancer mortality; cardiovascular mortality	The multivariate adjusted hazard ratios (HRs) comparing the highest with the lowest serum selenium level tertile were 0.83 (95% CI: 0.72-0.96) for all-cause mortality, 0.69 (95% CI: 0.53-0.90) for cancer mortality, and 0.94 (95% CI: 0.77-1.16) for cardiovascular mortality.	US