


Marital status and stage of cancer at diagnosis: A systematic review

A. Buja MD, PhD¹  | L. Lago HA² | S. Lago RN³ | A. Vinelli MD⁴ |
C. Zanardo MD⁴ | V. Baldo MD, Full professor¹

¹Dept. of Cardiologic, Vascular, Thoracic Sciences and Public Health, Laboratory of Health Care Services and Health Promotion Evaluation, Unit of Hygiene and Public Health, University of Padova, Padova, Italy

²Master course in Sciences of the Public Health and Prevention Professions, University of Padova, Padova, Italy

³Nursing School, University of Padova, Padova, Italy

⁴School of Hygiene and Preventive Medicine, University of Padova, Padova, Italy

Correspondence

Alessandra Buja, Dept. of Cardiologic, Vascular, Thoracic Sciences and Public Health, Laboratory of Health Care Services and Health Promotion Evaluation, Unit of Hygiene and Public Health, University of Padova, Padova, Italy.

Email: alessandra.buja@unipd.it

Early cancer detection is fundamental to the promotion of better health in the community, but disparities remain in the likelihood of cancer being detected at an early stage, some of which relate to socio-demographic factors such as marital status. The aim of this study was to conduct a systematic review of research on the association between marital status and stage at diagnosis of different types of cancer. A comprehensive systematic literature search was run in the Medline and Scopus databases (from January 1990 to June 2014), identifying 245 and 208 articles on PubMed and Scopus respectively. Of these 453 studies, 18 were judged eligible for this systematic review. A quality assessment was performed on the studies using the 22 items in the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist. This review confirmed the important influence of being married on the earlier detection of cancer. None of the studies considered identified more cases of cancer in a later stage among married patients, and the majority of them reported a statically significant association between marital status and stage at diagnosis, with a positive effect of marriage on the likelihood of cancer being diagnosed at an early stage, for various types of malignancy. In particular, our meta-analysis showed that the unmarried have higher odds of having a later stage of breast cancer (OR = 1.287 95% CI: 1.025–1.617) or melanoma (OR = 1.350 95% CI: 1.161–1.570) at diagnosis. Specific interventions should be developed for the unmarried population to improve their chances of any neoplasms being diagnosed at an early stage, thereby reducing health disparities in the population at large.

KEYWORDS

cancer epidemiology, marital status, neoplasm, stage at diagnosis, systematic review

1 | INTRODUCTION

Numerous studies have been published on the association between marital status and different outcomes in cancer patients, focusing on the disease's incidence and stage at diagnosis, and the patient's survival and quality of life after being diagnosed with cancer. One systematic review showed an association between social support and cancer progression in breast cancer patients (Nausheen, Gidron, Peveler, &

Moss-Morris, 2009), and other studies on the link between marital status and survival in patients with bladder (Datta, Neville, Kawachi, Datta, & Earle, 2009), lung (Tannenbaum et al., 2013) and testis cancer (Abern, Dude, & Coogan, 2012) reported a longer survival among people who were married.

Early diagnosis is obviously a key survival factor for most tumours, and there are now numerous recommended secondary prevention services that can make it easier to detect cancers in their

early stages, when they are more amenable to therapy. Despite the cost-effectiveness (Centers for Disease Control and Prevention, 2009) of many of these services, the percentage of adults who are aware of how to benefit from them is low. Understanding the social determinants of early cancer detection could be useful with a view to ensuring the widespread use of clinical prevention services, and concentrating on population groups at a particular disadvantage when it comes to early cancer diagnosis. In fact, the vision of Personalised Cancer Medicine includes a future in which individual cancer patients are treated on the basis of personal factors, which means not only their clinical features and the molecular characteristics of their particular tumour, but also environmental information, and a patient's socio-demographic characteristics and personal preferences. For this vision to become reality, scientific knowledge must disentangle the factors that contribute to predicting outcomes in order to differentiate between prevention and treatment strategies (Siebert et al., 2015).

Numerous published studies addressed the association between marital status and the timing of cancer diagnosis, with variable results, but none provided a review of the literature. The aim of the present study was to conduct a systematic review of such studies to clarify the possible association between marital status and cancer stage at diagnosis for given types of neoplasm.

2 | METHODS

2.1 | Search strategy

A comprehensive systematic literature search was performed in the Medline and Scopus databases, yielding 245 and 208 articles on PubMed and Scopus respectively. The search process involved combining the terms "cancer", "tumour", "neoplasm", "stage" and "diagnosis" with the terms "marital status" and "civil status". Only studies published in the English language from January 1990 to June 2014 were considered.

Two reviewers (L.L., A.V.) checked the search hits by reading the article titles and abstracts. The full text of each potentially relevant study was then obtained and assessed independently by the reviewers, and included if the following criteria were met: (1) the study was a cohort, case-control, or cross-sectional study; (2) it was original and the results were not duplicated in other studies; (3) it reported a measure of the association between marital status and stage of cancer at diagnosis. If the results of a study were published more than once, only the most recent and complete article was considered in the analysis. Consensus was reached by the reviewers. The reference lists in the papers included in our analysis were also assessed.

Figure 1 shows a flow chart of the article selection process. The initial search yielded 453 citations. After the authors (L.L., A.V.) had reviewed all the abstracts, 25 studies were judged potentially relevant for the purposes of this review. On assessing the full texts for eligibility in the light of the agreed exclusion and inclusion criteria, 18 of the articles met our criteria.

2.2 | Quality assessment criteria

The same authors considered several characteristics of each study and scored them for quality. The variables considered in this quality assessment process on the studies included in the review were drawn from the 28 listed in the Strengthening the Reporting of Observational Studies in Epidemiology statement (STROBE), generating a checklist of 22 items applicable to three analytical observational study designs (cohort, case-control, and cross-sectional studies).

2.3 | Data extraction

All data were independently extracted by means of a standardised data collection form. The characteristics of the studies were recorded as follows: first author's name, year of publication, country of origin, characteristics of the study sample, i.e., size and distribution by age and gender, assessment of measures of outcome and exposure, and confounding factors controlled for (adjusted), measure of the relative odds of marital status being associated with cancer stage at diagnosis (with the corresponding confidence interval) and the authors' conclusions.

2.4 | Meta-analysis

A meta-analysis was conducted for melanoma and breast cancer, for which more studies were available. To place the studies on a common scale, marital status was simply classified as married or unmarried (including single, widowed and divorced in the latter category). We extracted the data for cases and controls in the two categories. Where data were lacking, we estimated them based on the total numbers of cases or controls provided. All the results were checked for statistical heterogeneity with the Cochran Q test. Due to the marked heterogeneity between the studies, we estimated ORs and 95% CIs using a random-effects model. All tests were 2-sided and statistical significance was assumed for $p \leq .05$. The analyses were performed with Stata 14 (StataCORP, College Station, TX, USA).

3 | RESULTS

3.1 | Features of the studies and measure of association

Our systematic review focused on 18 studies. The characteristics of the subjects, the study designs and the measures of the association are shown in Table 1 by type of tumour. The quality scores awarded to the studies ranged from 11 to 18 out of a maximum of 22, with a mean score of 16.

Five out of six studies on the association between marital status and stage at diagnosis for breast cancer showed that unmarried women were more likely to be diagnosed with more advanced disease (Aizer et al., 2013; Ali, Mathews, & Rajan, 2008; Celaya et al., 2010; Davidson, Bastani, Nakazono, & Carreon, 2005; Osborne, Ostir, Du, Peek, & Goodwin, 2005). One author found this correlation applied to

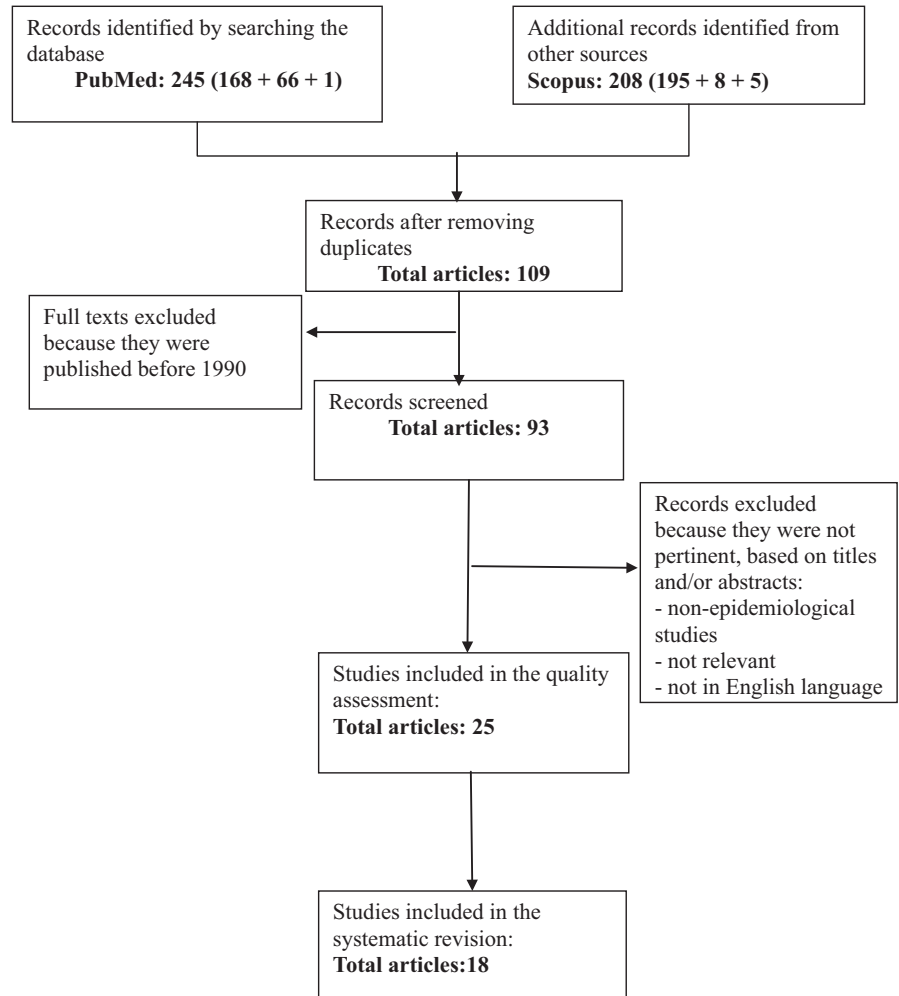


FIGURE 1 Flow chart of the articles selection process

women who had never been married, and also to those who were divorced, widowed or separated (Davidson et al., 2005). Only the study of Hahn et al. (2007) found no significant difference in cancer stage at diagnosis between unmarried and married breast cancer patients. Our meta-analysis indicated that unmarried women have higher odds of having a later stage (stage II, III and IV) of breast cancer at diagnosis than married women (OR = 1.287 95% CI: 1.025–1.617). Three out of four studies on melanoma (McLaughlin, Fisher, & Paskett, 2011; Reyes Ortiz, Freeman, Kuo, & Goodwin, 2007; Van Durme et al., 2000) likewise found married status associated with an earlier stage of melanoma at diagnosis, while only one study reported no such association (Pollitt, Clarke, Shema, & Swetter, 2008). Our meta-analysis again showed that unmarried people have higher odds of having later stage melanoma (with regional or distant involvement) at diagnosis than married people (OR = 1.350 95% CI: 1.161–1.570). Two out of three studies on the influence of marital status on stage of prostate cancer at diagnosis found married patients are at a significantly lower risk of presenting with metastatic disease or advanced stage than unmarried patients (Aizer et al., 2013; Carpenter et al., 2010); the third study found no significant difference in the proportion of patients diagnosed with late-stage prostate cancer by marital status (Abdollah et al., 2011). Two out of three studies focusing on cervical cancer

found widowed/divorced (Kaku, Mathew, & Rajan, 2008) or unmarried patients (Ferrante, Gonzalez, Roetzheim, Pal, & Woodard, 2000) at higher risk of late-stage diagnosis than married patients, while one study (Ibrahim, Rasch, Pukkala, & Aro, 2011) reported no statistically significant difference in cancer stage at diagnosis between single and married patients.

For cancer sites considered in only one study, the authors consistently reported that being married carried a lower risk of late stage at diagnosis. The study of Thuret et al. (2013) on squamous cell carcinoma of the penis showed a higher risk of advanced tumour stage and grade at diagnosis among unmarried men (OR = 1.5; 95% CI: 1.22–1.82). Another study on glioblastoma multiforme (Chang & Barker, 2005) found larger tumours at the time of diagnosis in unmarried patients (adjusted OR = 1.16; 95% CI: 1.05–1.29). Aizer et al. (2013) considered non-Hodgkin lymphoma and reported that being unmarried was associated with metastatic disease (adjusted OR for married patients 0.93; 95% CI: 0.89–0.97). Smith, Ziogas, and Anton-Culver (2012) likewise found a positive correlation between advanced stage at diagnosis and unmarried status among patients with Hodgkin lymphoma (adjusted OR = 1.21; 95% CI: 1.07–1.36). Aizer et al. (2013) investigated a number of tumour sites (lung, colon, pancreas, head-neck, oesophagus, lung, intrahepatic bile duct, ovary), always demonstrating that unmarried

TABLE 1 Characteristics of epidemiological studies on marital status and cancer stage at diagnosis

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Melanoma						
McLaughlin et al. (2011)	USA 192,014 patients with melanoma from 1973 to 2006 Age ≥ 18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: stage at diagnosis dichotomised using SEER summary staging as early (in situ or localised) or late (regional or distant) International Classification of Diseases for Oncology, third edition, ICD-O-3 codes C440-C449, types 8720-8790	Data sources: clinical data from the Surveillance Epidemiology and End Results Exposure categories: marital status categorised as: • Married (including common-law marriages) • Single (never married) • Divorced or separated • Widowed	Adjusted OR: late versus early stage (cutaneous melanoma diagnosis) Men (reference married): • single (never married) OR: 1.56 (95% CI: 1.47–1.66) • divorced or separated OR: 1.60 (95% CI: 1.47–1.73) • widowed OR: 1.31 (95% CI: 1.20–1.42) Women (reference married): • single (never married) OR: 1.25 (95% CI: 1.16–1.35) • divorced or separated OR: 1.57 (95% CI: 1.44–1.71) • widowed OR: 1.92 (95% CI: 1.80–2.05)	Age, race, year of diagnosis, tumour histology, anatomical site, socioeconomic status, and SEER site	Unmarried patients, both men and women, had a higher risk of being diagnosed at a late stage when compared with married patients; widows were the women most likely to be diagnosed at a late stage, and widowers were the men least likely to be diagnosed at a late stage
Reyes Ortiz et al. (2007)	USA 5 years of follow-up 14,630 patients with melanoma diagnosed between 1991–1999 Age: ≥65 years	Data sources: Surveillance, Epidemiology, and End Results (SEER) registries Medicare-linked database (Health Care Financing Administration-HCFA) Outcome definition: ICD-O-3 SEER codes—4 types of melanoma: nodular (8721), LM (8742), superficial spreading (8743), acral lentiginous (8744), other (8722, 8723, 8730, 8740, 8741, 8745, 8760, 8761, 8770, 8771, 8772, 8773, 8780), not specified (8720) Outcome stage dichotomised as late (regional or distant) versus early (in situ or local)	Data sources: Surveillance, Epidemiology, and End Results (SEER) registries Medicare-linked database (Health Care Financing Administration (Health Care Financing Administration -HCFA) Exposure categories: marital status categorised as: • married • single • separated/divorced • widowed	Adjusted OR: Late-stage melanoma at diagnosis (reference married) • single OR: 1.34 (95% CI: 1.09–1.64) • separated/divorced OR: 1.21 (95% CI: 0.93–1.57) • widowed OR: 1.31 (95% CI: 1.13–1.52)	Age, gender, income, ethnicity, tumour characteristics (histology and site)	Single and widowed patients were more likely to have late-stage melanoma at diagnosis than were married persons

(continues)

TABLE 1 (Continued)

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Van Durme et al. (2000)	USA (Florida) population-based study 1,884 incident cases of melanoma in 1994 Age: 13–99 years	Data sources: Incident cases were identified from the Florida Cancer Data System (FCDS), Florida's population-based statewide cancer registry; clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: Stage at diagnosis was classified as early (in situ or local) or late (regional or distant)	Data sources: clinical data from the Surveillance Epidemiology and End Results Exposure categories: • married • unmarried	Adjusted OR: ORs for late diagnosis-regional or distant metastases- (reference married) • unmarried OR: 1.53 (95% CI 1.08–2.16)	Adjusted for age, sex, race, education, income level, smoking status, medical insurance, and urban versus rural residence	Unmarried patients were more likely to be diagnosed with late-stage melanoma. To detect these cancers at an earlier stage and improve outcomes, there should be increased specific public education efforts targeting these patients to increase self-surveillance and surveillance of partners
Pollitt et al. (2008)	USA (California) 4,558 men and women diagnosed with invasive cutaneous and metastatic melanoma from 1998 to 1999 Age: 15–64 years	Data sources: California Cancer Registry (CCR) records. Stage at diagnosis was defined according to SEER summary staging Outcome definition: ICD-O 2nd ed. Stage dichotomised as early (localised cutaneous disease) and late (regional and visceral metastasis)	Data sources: California Cancer Registry records Exposure categories: • married • unmarried	Adjusted OR: ORs for late-stage melanoma (reference married) • unmarried OR: 1.07 (95% CI: 0.86–1.31)	Neighbourhood socioeconomic status (SES), race/ethnicity, age, gender, histology, year of diagnosis	Marital status was not associated with late-stage diagnosis, but men had significantly higher odds of having metastatic disease than women
Squamous cell carcinoma of the penis						
Thuret et al. (2013)	USA 1,884 patients from 1988 to 2006 Mean age: 66.8 (17–102)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: Tenth revision of the International Classification of Disease for Oncology second edition (ICD-O-2) [C60.0–60.9] and the ICD-O-3 codes for histological subtype (squamous carcinoma type; ICD-O-3: 8070–8076). ¹⁹ Stage and grade at primary tumour excision versus locally advanced stage (T3–4/N1–3/M1) or high grade (III or IV) (LASG) at PTE	Data sources: clinical data from the Surveillance Epidemiology and End Results Exposure categories: • married • unmarried (single, widowed, divorced or separated)	Adjusted OR: Locally advanced versus localised tumour stage (reference married) • unmarried OR: 1.5 (95% CI: 1.22–1.82)	Age at PTE, race (white versus black versus other), SEER registries, year of PTE, SES	Unmarried men tend to present with less favourable disease stage of squamous cell carcinoma of the penis

(continues)

TABLE 1 (Continued)

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Prostate cancer						
Abdollah et al. (2011)	USA Population-based study 1988–2006 163,697 patients Age: 34–94 years	Data sources: Surveillance Epidemiology and End Results (SEER) tumour registries' clinical records from 1988 to 2006 Outcome definition: histologically confirmed non-metastatic prostatic adenocarcinoma (International Classification of Disease for Oncology code 8140) treated with radical prostatectomy Cancer defined as localised (tumour stage T1) versus locally advanced (tumour stage T3/T4) and/or lymph node invasion	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries from 1988 to 2006 Exposure categories: • married • never married • SDW (separated/divorced-widowed)	Adjusted OR: ORs for prediction of locally advanced prostate cancer: (reference married) • never married OR: 1.02 (95% CI: 0.96–1.09) • SDW OR: 1.10 (95% CI: 1.04–1.16)	Socioeconomic status, age group, race, tumour grade, tumour stage, lymph node stage, year bracket of surgery	SWD men had a higher risk of being diagnosed with locally advanced prostate cancer than their married counterparts
Aizer et al. (2013)	United States 44,344 unmarried, and 146,304 married patients from 2004 to 2008 Age: ≥18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition, Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV.)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-widowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.52 (95% CI: 0.50–0.55)	Age, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients were at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant
Carpenter et al. (2010)	USA 18,067 men diagnosed with prostate cancer between 1994 and 2002. Age: ≥65 years	Data sources: Surveillance, Epidemiology, and End Results (SEER) tumour registries merged with Medicare data (1994–2002) Outcome definition: Surveillance Epidemiology and End Results (SEER) tumour registries clinical records on Cancer (AJCC) staging criteria, distinguishing between early stage (stage 1 or 2) and advanced stage (stage 3 or 4)	Data sources: Surveillance, Epidemiology, and End Results (SEER) tumour registries merged with Medicare data (1994–2002) Exposure categories: marital status dichotomised as: • married • unmarried	Adjusted OR: ORs of advanced versus early-stage prostate cancer (reference unmarried) • married OR: 0.82 (95% CI: 0.75–0.90)	Age at diagnosis, year of diagnosis, comorbidity score, geographic region, median household income, and surgery/related procedures	Compared with married men, unmarried men had a higher risk of advanced cancer stage at diagnosis. More frequent or systematic PSA screening may be a way to reduce racial differences in prostate cancer stage at diagnosis

(continues)

TABLE 1 (Continued)

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Breast cancer						
Osborne et al. (2005)	USA 3 years of follow-up 32,268 women with breast cancer (diagnosed from 1991 to 1995) Age: ≥ 65 years	Data sources: Surveillance, Epidemiology, and End Results (SEER) tumour registries merged with Medicare data (1991–1995) Outcome definition: ICD9 CM not included breast cancer ICD9 CM codes of 174x; American Joint Committee on Cancer Stage (AJCC) breast cancer stages II–IV (late stage) versus stage I or in situ (early stage)	Data sources: Surveillance, Epidemiology, and End Results (SEER) tumour registries merged with Medicare data (1991–1995) Exposure categories: marital status recorded: • married • unmarried (including: never married, separated/divorced, widowed)	Adjusted OR: OR of diagnosis in stages II–IV versus stages I or in situ (reference married): • unmarried OR: 1.17 (95% CI: 1.12–1.23)	Age, race, comorbidities, household income and education at census tract level, cancer stage, tumour size, tumour grade, oestrogen receptor status, and SEER area	Married women were at lower risk of stages II–IV (advanced) breast cancer at diagnosis than their unmarried counterparts
Ali et al. (2008)	India (Trivandrum, Kerala) 522 patients 2006 Age: below 50 years versus 50 and above)	Data sources: Hospital-Based Cancer Registry, Regional Cancer Centre (RCC) Outcome definition: Stage at diagnosis dichotomised as early stage (stages I–II) versus late stage (stages III–IV)	Data sources: Hospital-Based Cancer Registry, Regional Cancer Centre (RCC) Exposure categories: marital status recorded: • married • single • divorced/widowed	Adjusted OR: ORs of late-stage diagnosis (reference married) • unmarried OR: 3.31 (95% CI: 1.10–9.96) • widowed/divorced OR: 1.46 (95% CI: 0.89–2.37)	District of residence, religion, education, occupation and income	A higher risk of late stage at diagnosis was reported among breast cancer patients who were unmarried or widowed/divorced
Aizer et al. (2013)	United States 75,689 unmarried, 107,907 married patients from 2004 to 2008 Age: ≥ 18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition. Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV.)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-widowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.60 (95% CI: 0.58–0.63)	Age, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients were at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant

(continues)

TABLE 1 (Continued)

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Celaya et al. (2010)	USA (New Hampshire) 5,966 women diagnosed from 1998 to 2004, (5,833 with known marital status) Age: ≥40 years	Data sources: population-based New Hampshire State Cancer Registry (NHSCR) Outcome definition: The NHSCR records stage at diagnosis classified according to the American Joint Commission on Cancer (AJCC) and TNM Staging System. Stage at diagnosis was dichotomised as: early (in situ and stage I) and late (stage II–IV)	Data sources: population-based New Hampshire State Cancer Registry (NHSCR) Exposure categories: marital status categorised as: • married • unmarried (single, separated, divorced, widowed)	Adjusted OR: OR of later stage diagnosis (reference unmarried) • married OR: 0.80 (95% CI: 0.71–0.90)	Age, Medicaid coverage, health insurance status, urban/rural residence, driving distance/time, time of year of diagnosis	New Hampshire women were more likely to be diagnosed with later-stage breast cancer if they were not married ($p < .001$); this subgroup may benefit from targeted interventions to improve early detection
Davidson et al. (2005)	USA (California) population-based 112,471 patients from 1994 to 1999 Age: ≥18 years	Data sources: California Cancer Registries (CCR; 1994–1994) California's statewide population-based cancer surveillance system Outcome definition: using the American Joint Committee on Cancer staging system (AJCC) and TNM Staging System, cases were diagnosed as in situ (stage 0), local (stage I), regional (stages II–III), or distant (stage IV)	Data sources: California Cancer Registries (CCR; 1994–1994) Exposure categories: marital status categorised as: • married • never married • separated, divorced or widowed	Adjusted ORs (reference married) Model 1: in situ versus local/regional/distant • never married OR: 1.03 • widowed/divorced/separated OR: 0.84 Model 2: in situ/local versus regional/distant • never married OR: 0.87 • widowed/divorced/separated OR: 0.84 Model 3: local versus regional/distant • never married OR: 0.84 • widowed/divorced/separated OR: 0.86 Model 4: distant versus local/regional • never married OR: 1.85 • widowed/divorced/separated OR: 1.42	Age at diagnosis, race/ethnicity, reporting hospital, insurance status	Never married, divorced, widowed and separated women were less likely to be diagnosed with early-stage breast cancer

(continues)

TABLE 1 (Continued)

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Hahn et al. (2007)	USA (Atlanta, Georgia) population-based case-control study on 829 women diagnosed between 1990 and 1992 Age: 20–54 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer staging manual 3rd edition	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • formerly married • never married	Adjusted ORs: (reference married) Stage IIA versus stage I • formerly married OR: 0.86 (95% CI: 0.59–1.27) • never married OR: 0.81 (95% CI: 0.45–1.45) Stage IIB versus stage I • formerly married OR: 0.79 (95% CI: 0.51–1.25) • never married OR: 0.87 (95% CI: 0.44–1.69) Stage III/IV versus stage I • formerly married OR: 0.73 (95% CI: 0.45–1.17) • never married OR: 0.99 (95% CI: 0.51–1.90)	Race, age, menopausal status, marital status, comorbidities, smoking, family history, education, insurance status, poverty index	No statistically significant association emerged between marital status and late-stage cancer diagnosis in the population analysed
Ovary						
Aizer et al. (2013)	United States 7,096 unmarried, and 8,426 married patients from 2004 to 2008 Age: ≥18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition. Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV.)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-windowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.84 (95% CI: 0.79–0.90)	Age, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients are at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant

(continues)

TABLE 1 (Continued)

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Cervical cancer						
Ferrante et al. (2000)	USA (Florida) 852 incident cases of invasive cervical cancer occurring during 1994 Age: not stated	Data sources: Florida Cancer Data System (FCDS), Florida's population-based statewide cancer registry Outcome definition: International Classification of Diseases, Ninth Revision, Clinical Modification. Stage at diagnosis, defined using the SEER staging guide, was classified as early (local) or late (regional and distant)	Data sources: Florida Cancer Data System (FCDS), Florida's population-based statewide cancer registry Exposure categories: marital status categorised as: • currently married • not married	Adjusted OR: OR of late-stage diagnosis (reference currently married) • unmarried OR: 1.63 (95% CI: 1.18–2.25)	Age, education level, income level, marital status, insurance status, race, smoking status, comorbidity, and residence using multiple logistic regression	Being unmarried was associated with 63% higher odds of a late-stage diagnosis
Kaku et al. (2008)	India (Tiruvandrum, Kerala, South India) Population-based analysis on 473 cervical cancer patients 2006 Age: from 30 to 93 years	Data sources: Hospital-based Cancer registry, Regional Cancer Centre (RCC) Outcome definition: Tumour classified using the FIGO (Federation Internationale de Gynecologie et d'Obstetrique) classification. Group staging: stages I&II were identified as "early" and stages III and IV as "late"	Data sources: Hospital-based Cancer registry, Regional Cancer Centre (RCC) Exposure categories: marital status categorised as: • married • unmarried • widowed/divorced	Adjusted OR: OR of late versus early stage at diagnosis (reference married) • unmarried OR: 2.31 (95% CI: 0.32–16.4) • widowed/divorced/separated OR: 2.08 (95% CI: 1.24–3.50)	Age, district, religion, income, education, occupation	A higher risk of stage at diagnosis was reported among cervical cancer patients who were widowed or divorced
Ibrahim et al. (2011)	Africa (Sudan) Cross-sectional study 197 women diagnosed with cervical cancer in 2007 Age: ≥55 years	Data sources: the cancer registry at the Radiation and Isotopes Centre in Khartoum Outcome definition: Tumour classified using the FIGO (Federation Internationale de Gynecologie et d'Obstetrique) classification. Group staging: stages I&II were identified as "early" and stages III and IV as "advanced"	Data sources: the cancer registry at the Radiation and Isotopes Centre in Khartoum, the only specialised cancer hospital in Sudan Exposure categories: marital status categorised as: • married • single	Adjusted OR: (reference single) OR of advanced stage at diagnosis • married OR: 0.8 (0.43–1.45)	Age, marital status education level, ethnicity, geographical area, health insurance	Married women were more likely to be diagnosed at an early stage of cervical cancer than unmarried women, possibly due to more frequent obstetric and gynaecological care received. No statistically significant association was demonstrated, however, between marital status and stage at diagnosis

(continues)

TABLE 1 (Continued)

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Glioblastoma multiforme (GM)						
Chang & Barker (2005)	USA 10,987 adult patients with GM between 1988 and 2001 (6,240 of known marital status) Age: ≥18 years	Data sources: Surveillance, Epidemiology, and End Results public use database 1988–2001 (11 SEER geographic registries) + Alaska native Tumour Registry Outcome definition: International Classification of Diseases-Oncology new diagnoses of GM (ICD-O-3rd edition-code 9440), giant cell GM or gliosarcoma (ICD-O 3 codes 9441–9442), supratentorial (ICD-O-3 topography codes C71.0-71.5, C71.8-71.9); ICD-9-CM code 9440. SEER category of size of primary tumour at the time of diagnosis (coded in mm) was used	Data sources: Surveillance, Epidemiology, and End Results 1988–2001 (11 SEER geographic registries) + Alaska native Tumour Registry Exposure categories: Marital status recorded: • married (including common-law marriage) • unmarried (never married, separated, divorced, widowed)	Adjusted OR: larger tumour size at the time of diagnosis (reference married) • unmarried OR: 1.16 (95% CI: 1.05–1.29) Adjusted OR: lack of histologic diagnosis (reference married) • unmarried OR: 1.45 (95% CI: 1.23–1.69)	Age, gender, race, socio-economic status (poverty level quartile), tumour size and histology, year of diagnosis and SEER registry	Unmarried patients with GM tend to present with larger tumours when compared with married patients, even after adjusting for treatment and other prognostic factors. Unmarried status was also found to significantly predict the lack of a histological diagnosis during life
Liver, intrahepatic bile duct						
Aizer et al. (2013)	United States 5,884 unmarried, and 8,185 married patients from 2004 to 2008 Age: ≥18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition. Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-widowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.90 (95% CI: 0.84–0.97)	Age, sex, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients were at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant
Oesophageal						
Aizer et al. (2013)	United States 3,630 unmarried, and 5,373 married patients from 2004 to 2008 Age: ≥18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition. Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-widowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.90 (95% CI: 0.83–0.97)	Age, sex, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients were at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant

(continues)

TABLE 1 (Continued)

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Head/neck						
Aizer et al. (2013)	United States 9,552 unmarried, and 12,850 married patients from 2004 to 2008 Age: ≥18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition. Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV.)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-widowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.73 (95% CI: 0.65–0.83)	Age, sex, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients were at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant
Non-Hodgkin lymphoma						
Aizer et al. (2013)	United States 19,909 unmarried, and 29,926 married patients from 2004 to 2008 Age: ≥18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition. Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV.)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-widowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.93 (95% CI: 0.89–0.97)	Age, sex, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients were at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant
Hodgkin lymphoma						
Smith et al. (2012)	Retrospective case-only analyses on 7,343 incident cases of Hodgkin lymphoma diagnosed between 1988 and 2006 Age: 15–40 years	Data sources: CCR database—clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: International Classification of Diseases for Oncology (ICD-O). HL was defined by morphology codes 9650 through 9667. Two categories of disease stage: regional HL and advanced HL	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • single • divorced/separated/widowed-unknown	Adjusted OR: Likelihood of having advanced HL (reference married) • single OR: 1.21 (95% CI: 1.07–1.36) • divorced/separated/widowed OR: 0.97 (95% CI: 0.77–1.23)	Gender, race/ethnicity, age, birthplace, marital status, SES, and insurance status	Multivariate logistic regression analysis demonstrated a significant impact of being single on the likelihood of advanced HL stage at the time of diagnosis

(continues)

TABLE 1 (Continued)

Author and year of publication	Country; population size and distribution by age and gender, study design	Outcome assessment	Exposure assessment	Measure of association	Covariates	Conclusion
Pancreatic cancer						
Aizer et al. (2013)	United States 7,795 unmarried, and 11,430 married patients from 2004 to 2008 Age: ≥18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition. Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV.)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-windowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.93 (95% CI: 0.89–0.98)	Age, sex, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients were at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant
Colorectal cancer						
Aizer et al. (2013)	United States 44,526 unmarried, and 61,483 married patients from 2004 to 2008 Age: ≥18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition. Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV.)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-windowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.82 (95% CI: 0.79–0.84)	Age, sex, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients were at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant
Lung cancer						
Aizer et al. (2013)	United States 57,303 unmarried, and 67,277 married patients from 2004 to 2008 Age: ≥18 years	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Outcome definition: American Joint Committee on Cancer 6th edition. Stage at diagnosis dichotomised as metastatic versus non-metastatic cancer. (In patients with non-Hodgkin lymphoma, metastatic refers to stage IV.)	Data sources: clinical records of the Surveillance Epidemiology and End Results (SEER) tumour registries Exposure categories: marital status categorised as: • married • unmarried (single-separated-divorced-windowed)	Adjusted OR: metastatic disease at diagnosis (reference unmarried) • married OR: 0.93 (95% CI: 0.91–0.95)	Age, sex, race, income, education, urban versus rural residence and primary site	Even after adjusting for known confounders, all subgroups of unmarried patients were at significantly higher risk of presenting with metastatic cancer. The association between marital status and stage at diagnosis was significant

TABLE 2 Summary of findings of the different studies

Type of cancer—authors	McLaughlin et al. (2011)	Reyes Ortiz et al. (2007)	Van Durme et al. (2000)	Pollitt et al. (2008)	Thuret et al. (2013)	Abdollah et al. (2011)	Aizer et al. (2013)	Carpenter et al. (2010)
Melanoma	+	+/=	+	=				
Squamous cell cancer of the penis					+			
Prostate						=/+ ^a	+	+
Breast							+	
Ovary							+	
Cervix								
Glioblastoma multiforme								
Liver, intrahepatic bile duct							+	
Oesophagus							+	
Head-neck							+	
Non-Hodgkin lymphoma							+	
Hodgkin lymphoma								
Pancreas							+	
Colon-rectum							+	
Lung							+	

^a= Never married (NM) versus married, + Separated/widowed/divorced (SWD) versus married.

^b= Never married versus married, + SWD versus married.

^c+ Never married versus married; = SWD versus married.

patients had higher odds of metastatic disease at diagnosis than married patients. Table 2 summarises the findings of the various studies.

4 | DISCUSSION

This systematic review confirms that unmarried, widowed, separated or divorced patients diagnosed with any of the malignancies considered here are more likely to present with advanced stage disease. None of the 18 studies contained evidence of a higher risk of cancer being diagnosed at a later stage among married patients. For all the sites considered, the majority of the reports indicated a statistically significant association between marital status and cancer stage at diagnosis, with a positive effect of marriage on the likelihood of various types of malignancy being diagnosed at an early stage.

The consistent demonstration of the impact of marriage on earlier stage cancer detection goes to show how important it is for secondary prevention and social support services to address particular population groups differently with a view to removing this substantial inequality in patient care. The likelihood of curing early-stage cancer among unmarried patients could be improved by investing in targeted support interventions (Aizer et al., 2013). To improve the outcomes, health care services should increase their educational efforts to improve physicians' awareness of this issue (Thuret et al., 2013), and public intervention to promote health and prevent cancer should be

tailored to different population groups to strive for an equal surveillance and an equal compliance with screening programs, and timely access to diagnostic services (McLaughlin et al., 2011).

To address this inequality of care relating to marital status, it is important to understand how this disparity is generated. Various explanations as to why being married leads to an earlier diagnosis (and induces health care disparities) have been advanced in the literature (Goodwin, Hunt, Key, & Samet, 1987; Nayeri, Pitaro, & Feldman, 1992). For instance, this may reflect generally better financial circumstances among the married, and/or a greater tendency of married people to avoid risky or unhealthy behaviour because of their family responsibilities or social control (Umberson, Crosnoe, & Reczek, 2010). One study mentioned that marital status is likely to influence lifestyle for a number of reasons: a spouse may represent an economic advantage (Lillard & Waite, 1995), contribute to the pool of knowledge, help in the processing of important information, and provide practical assistance and care (e.g., by improving a patient's food intake).

Aizer et al.'s study (2013) highlights the importance of other features of marriage, e.g., spouses may encourage patients to seek medical attention for alarming symptoms (Goldzweig et al., 2010). Widowhood is a condition associated with severe emotional stress (pain, sorrow), loss of social support (shrinkage of networks) and loss of material support (lower income) that could lead individuals to pay less attention to their health, and seek care less promptly even when symptoms develop (Reyes Ortiz et al., 2007).

Osborne et al. (2005)	Ali et al. (2008)	Celaya et al. (2010)	Davidson et al. (2005)	Hahn et al. (2007)	Ferrante et al. (2000)	Kaku et al. (2008)	Ibrahim et al. (2011)	Chang & Barker (2005)	Smith et al. (2012)
+	=/+ ^c	+	+	=					
						+	=/+ ^b	=	
									+
									=/+c

Some researchers focused particularly on the influence of marital status on breast cancer diagnosis, rather than on treatment and survival (Aizer et al., 2013; Ali et al., 2008; Celaya et al., 2010; Davidson et al., 2005; Hahn et al., 2007; Osborne et al., 2005): they consistently found unmarried women more likely to be diagnosed with more advanced disease, and less likely to receive definitive treatment. Osborne et al. (2005) suggested that spouses promote a more positive health-related behaviour, a greater use of screening tests, or more regular visits to the doctor, which would increase the chances of an earlier diagnosis. In a retrospective cohort study on Indian breast cancer patients, Ali et al. (2008) suggested that husbands serve as a source of economic support, thus making it easier for wives to seek medical treatment.

The benefits afforded by marriage probably consist in a combination of the previously mentioned aspects of structural and functional support, including instrumental, informational and emotional support (Osborne et al., 2005), and these factors would result in an overall biological, psychological and economic advantage that may make patients more health-aware and more empowered (Thuret et al., 2013).

4.1 | Limitations

Our study suffers from several limitations. The first was identified during our data analysis and concerns the classification of marital status, which was not always classified in the same way in the studies considered. Using different categories for marital status—such as unmarried

as opposed to never married, separated or divorced, married or formally married—may have affected our final results. Second, marital status is just one of the structural components of social relationships and it cannot capture the multifaceted dimensions of the quality of these relationships (Helweg-Larsen, Kjoller, & Thoning, 2003; Manzoli, Villari, Pirone, & Boccia, 2007). Marital discord, hostility and depression in married couples (which are a potential source of stress strongly associated with mortality) have not been captured (Manzoli et al., 2007). Third, the studies also adopted heterogeneous classifications for cancer staging, although our systematic review captured the same higher risk of more advanced stage disease in the unmarried; however, cancer staging was classified. Finally, none of the studies analysed considered the interaction between gender and marital status in any depth. Further studies would be needed to better elucidate whether and how marital status influences stage of cancer at diagnosis differently for male and female patients.

5 | CONCLUSION

This review confirms that marriage positively influences the likelihood of early diagnosis for all types of cancer. Although the real mechanism(s) underlying the association between marital status and cancer stage at diagnosis are still largely unknown, more attention should be paid to the early detection of disease in the unmarried,

separated, divorced and widowed. These individuals are at greater risk of already having advanced-stage disease if and when they are diagnosed with cancer, with a consequently worse prognosis, and a generally shorter life expectancy.

ACKNOWLEDGEMENTS

Funding for this study was provided by 60% research grants from the University of Padua.

CONFLICT OF INTEREST

The authors declare not to have any financial or other relationship that might lead to a conflict of interest.

REFERENCES

- Abdollah, F., Sun, M., Thuret, R., Abdo, A., Morgan, M., Jeldres, C., ... Karakiewicz, P. (2011). The effect of marital status on stage and survival of prostate cancer patients treated with radical prostatectomy: A population-based study. *Cancer Causes & Control*, 22(8), 1085–1095.
- Abern, M., Dude, A., & Coogan, C. (2012). Marital status independently predicts testis cancer survival—An analysis of the SEER database. *Urologic Oncology: Seminars and Original Investigations*, 30(4), 487–493.
- Aizer, A., Chen, M., McCarthy, E., Mendu, M., Koo, S., Wilhite, T., ... Nguyen, P. (2013). Marital status and survival in patients with cancer. *Journal of Clinical Oncology*, 31(31), 3869–3876.
- Ali, R., Mathews, A., & Rajan, B. (2008). Effects of socio-economic and demographic factors in delayed reporting and late-stage presentation among patients with breast cancer in a major cancer hospital in South India. *Asian Pacific Journal of Cancer Prevention*, 9, 703–707.
- Carpenter, W., Howard, D., Taylor, Y., Ross, L., Wobker, S., & Godley, P. (2010). Racial differences in PSA screening interval and stage at diagnosis. *Cancer Causes & Control*, 21(7), 1071–1080.
- Celaya, M., Berke, E., Onega, T., Gui, J., Riddle, B., Cherala, S., & Rees, J. (2010). Breast cancer stage at diagnosis and geographic access to mammography screening (New Hampshire, 1998–2004). *Rural and Remote Health*, 10(2), 1361.
- Centers for Disease Control and Prevention (2009). *Promoting preventive services for adults 50–64*, 1st ed.. Atlanta, GA: National Association of Chronic Disease Directors.
- Chang, S., & Barker, F. (2005). Marital status, treatment and survival in patients with glioblastoma multiforme. A population-based study. *Cancer*, 104, 1975–1984.
- Datta, G., Neville, B., Kawachi, I., Datta, N., & Earle, C. (2009). Marital status and survival following bladder cancer. *Journal of Epidemiology & Community Health*, 63(10), 807–813.
- Davidson, P., Bastani, R., Nakazono, T., & Carreon, D. (2005). Role of community risk factors and resources on breast carcinoma stage at diagnosis. *Cancer*, 103(5), 922–930.
- Ferrante, J., Gonzalez, E., Roetzheim, R., Pal, N., & Woodard, L. (2000). Clinical and demographic predictors of late-stage cervical cancer. *Archives of Family Medicine*, 9, 439–455.
- Goldzweig, G., Andritsch, E., Hubert, A., Brenner, B., Walach, N., Perry, S., & Baider, L. (2010). Psychological distress among male patients and male spouses: What do oncologists need to know? *Annals Oncology*, 21, 877–833.
- Goodwin, J., Hunt, W., Key, C., & Samet, J. (1987). The effect of marital status on stage, treatment, and survival of cancer patients. *Journal of the American Medical Association*, 258, 3125–3130.
- Hahn, K., Bondy, M., Selvan, M., Lund, M., Liff, J., Flagg, E., ... Coates, R. (2007). Factors associated with advanced disease stage at diagnosis in a population-based study of patients with newly diagnosed breast cancer. *American Journal of Epidemiology*, 166(9), 1035–1044.
- Helweg-Larsen, M., Kjoller, M., & Thoning, H. (2003). Do age and social relations moderate the relationship between self-related health and mortality among adult Danes? *Social Science & Medicine*, 57, 1237–1247.
- Ibrahim, A., Rasch, V., Pukkala, E., & Aro, A. (2011). Predictors of cervical cancer being at an advanced stage at diagnosis in Sudan. *International Journal of Women's Health*, 3, 385–389.
- Kaku, M., Mathew, A., & Rajan, B. (2008). Impact of socio-economic factors in delayed reporting and late-stage presentation among patients with cervix cancer in a major cancer hospital in South India. *Asian Pacific Journal Cancer Prevention*, 9, 589–594.
- Lillard, L., & Waite, L. (1995). Til death do us part: Marital disruption and mortality. *American Journal of Sociology*, 100, 131–156.
- Manzoli, L., Villari, P., Pirone, G., & Boccia, A. (2007). Marital status and mortality in the elderly: A systematic review and meta-analysis. *Social Science & Medicine*, 64, 77–94.
- McLaughlin, J., Fisher, J., & Paskett, E. (2011). Marital status and stage at diagnosis of cutaneous melanoma. *Cancer*, 117(9), 1984–1993.
- Nausheen, B., Gidron, Y., Peveler, R., & Moss-Morris, R. (2009). Social support and cancer progression: A systematic review. *Journal of Psychosomatic Research*, 67(5), 403–415.
- Nayeri, K., Pitaro, G., & Feldman, J. (1992). Marital status and stage at diagnosis in cancer. *New York State Journal of Medicine*, 92, 8–11.
- Osborne, C., Ostir, G., Du, X., Peek, M., & Goodwin, J. (2005). The influence of marital status on the stage at diagnosis, treatment, and survival of older women with breast cancer. *Breast Cancer Research and Treatment*, 93(1), 41–47.
- Pollitt, R., Clarke, C., Shema, S., & Swetter, S. (2008). California Medicaid enrollment and melanoma stage at diagnosis. A population-based study. *American Journal of Preventive Medicine*, 35(1), 7–13.
- Reyes Ortiz, C., Freeman, J., Kuo, Y., & Goodwin, J. (2007). The influence of marital status on stage at diagnosis and survival of older persons with melanoma. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 62(8), 892–898.
- Siebert, U., Jahn, B., Rochau, U., Schnell-Inderst, P., Kisser, A., Hunger, T., ... Gastl, G. (2015). Oncotyrol – Center for personalised cancer medicine: Methods and applications of health technology assessment and outcomes research. *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen*, 109(4–5), 330–340.
- Smith, E., Ziogas, S., & Anton-Culver, H. (2012). Association between insurance and socioeconomic status and risk of advanced-stage Hodgkin lymphoma in adolescents and young adults. *Cancer*, 118, 6179–6187.
- Tannenbaum, S., Zhao, W., Koru-Sengul, T., Miao, F., Lee, D., & Byrne, M. (2013). Marital status and its effect on lung cancer survival. *SpringerPlus*, 2(1), 504.
- Thuret, R., Sun, M., Budaus, L., Abdollah, F., Liberman, D., Shariat, S., ... Karakiewicz, P. (2013). A population-based analysis of the effect of marital status on overall and cancer-specific mortality in patients with squamous cell carcinoma of the penis. *Cancer Causes & Control*, 24, 71–79.
- Umberson, D., Crosnoe, R., & Reczek, C. (2010). Social relationships and health behavior across life course. *Annual Review of Sociology*, 36, 139–157.
- Van Durme, D., Ferrante, J., Pal, N., Wathington, D., Roetzheim, R., & Gonzalez, E. (2000). Demographic predictors of melanoma stage at diagnosis. *Archives of Family Medicine*, 9, 606–611.

How to cite this article: Buja A, Lago L, Lago S, Vinelli A, Zanardo C, Baldo V. Marital status and stage of cancer at diagnosis: A systematic review. *Eur J Cancer Care*. 2017;e12755. <https://doi.org/10.1111/ecc.12755>