



# BMJ Open Impact of cancer on income, wealth and economic outcomes of adult cancer survivors: a scoping review

Colene Bentley <sup>1,2</sup>, Paulos Teckle,<sup>1,3</sup> Lisa McQuarrie,<sup>1,2</sup> Stuart Peacock,<sup>1,4</sup> Shiraz El Adam <sup>1,2</sup>

**To cite:** Bentley C, Teckle P, McQuarrie L, *et al*. Impact of cancer on income, wealth and economic outcomes of adult cancer survivors: a scoping review. *BMJ Open* 2022;**12**:e064714. doi:10.1136/bmjopen-2022-064714

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-064714>).

Received 11 May 2022

Accepted 16 August 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

<sup>1</sup>Cancer Control Research, BC Cancer Agency, Vancouver, British Columbia, Canada

<sup>2</sup>Canadian Centre for Applied Research in Cancer Control, Vancouver, British Columbia, Canada

<sup>3</sup>School of Population and Public Health, The University of British Columbia, Vancouver, British Columbia, Canada

<sup>4</sup>Faculty of Health Sciences, Simon Fraser University, Burnaby, British Columbia, Canada

## Correspondence to

Dr Colene Bentley;  
cbentley@bccrc.ca

## ABSTRACT

**Objective** To summarise peer-reviewed evidence on the effect of a cancer diagnosis on the different sources of income of individuals diagnosed with cancer during adulthood (age ≥18 years).

**Design** A scoping review following the Joanna Briggs Institute's methodological framework for conducting scoping reviews and reporting results following the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews checklist.

**Data sources** Ovid MEDLINE, PsycINFO, CINAHL, EMBASE, Econ-Lit and Evidence-based Medicine Reviews, and reference lists of evidence syntheses. Published literature of any study type in English was searched from January 2000 to December 2020.

**Eligibility and criteria** Study participants were individuals diagnosed with cancer during adulthood (age ≥18 years). Studies from any country and/or healthcare system were included. Primary outcomes were employment income (eg, individual or household); investment income (eg, stocks/bonds, properties, savings); government transfer payments (eg, disability income/pension); debt and bankruptcy.

**Data extraction and synthesis** Findings are summarised descriptively and in tabular form.

**Results** From 6297 citations retrieved, 63 studies (67 articles) met our inclusion criteria. Most (51%) were published in 2016–2020; 65% were published in the USA or Scandinavia. Survivors incurred debt (24 studies), depleted savings (13 studies) and liquidated stocks/bonds (7 studies) in response to a cancer diagnosis. 41 studies reported changes to employment income; of these, 12 case–control studies reported varying results: 5 reported survivors earned less than controls, 4 reported no significant differences, 2 reported mixed results and 1 reported income increased. Initial declines in income tended to lessen over time.

**Conclusions** Cancer's impact on survivors' income is complex and time-varying. Longitudinal studies are needed to document the trend of initial declines in income, with declines lessening over time, and its variations. Study designs using standardised income measures and capturing treatment type and follow-up time will improve our understanding of cancer's impact on survivors' income.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ A health sciences librarian guided the development of the search strategy for six online databases over a 20-year period.
- ⇒ The literature search was limited to evidence from English-language peer-reviewed publications.
- ⇒ We followed established guidelines in the conduct and reporting of scoping reviews.
- ⇒ The review synthesises primary studies with a variety of study designs, contexts and types of evidence.
- ⇒ No quality assessment of studies was conducted, as it is not required of scoping reviews.

## INTRODUCTION

The incidence of new cancer cases is on the rise across the globe.<sup>1 2</sup> Encouragingly, individuals diagnosed with cancer are living longer, with almost two-thirds of adults estimated to survive more than 5 years after their diagnosis.<sup>2–5</sup> Yet, many adult survivors experience long-term and late effects from their treatment, like nausea, neuropathy, anxiety and depression, and reduced cognitive and physical capabilities.<sup>6 7</sup> For cancer survivors—defined as individuals with direct cancer experience from diagnosis to end of life<sup>8 9</sup>—the long trajectory of survivorship means many will live with the physical, psychosocial and financial repercussions of cancer long after their diagnosis.<sup>10–12</sup>

There is a growing body of literature on the impact of a cancer diagnosis on the economic well-being of survivors, including several evidence syntheses on the topic.<sup>13–21</sup> Several syntheses focus on financial hardship or 'toxicity' experienced by survivors as a result of their diagnosis.<sup>14–16 20</sup> 'Financial toxicity' describes the financial side-effects of a cancer diagnosis, particularly the distress and hardship endured by some survivors due to the rising costs associated with cancer treatment.<sup>22 23</sup> High out-of-pocket medical expenses and treatment harms may have similar effects, in that they negatively impact

patients' well-being and create barriers to accessing quality cancer care. Out-of-pocket medical expenses include travel to hospitals, physician fees, and over-the-counter medications not reimbursed by governments or insurers. Other evidence syntheses emphasise survivors' diminished earning potential following a cancer diagnosis, including reduced hours or days of work, forced early retirement, prolonged sick leave and unpaid absences caused by treatment-related fatigue, cognitive limitations and anxiety.<sup>17–19</sup>

This body of evidence on survivors' return to work and financial burden provides an important but somewhat limited illustration of the financial toll of a cancer diagnosis on individuals and their families. Specifically, these reviews often exclude income entirely, or exclude sources of income from outside of the workplace, such as investment assets, material wealth and welfare benefits. Recent explorations of survivors' wealth management in terms of cash flow, investment assets and debt have emerged, but these studies have yet to be synthesised into an understanding of survivors' overall income and its fluctuations following a cancer diagnosis.<sup>24–27</sup>

To address this critical gap in knowledge, this scoping review aims to summarise peer-reviewed evidence on the effect of a cancer diagnosis on the different sources of income of individuals diagnosed with cancer during adulthood (age  $\geq 18$  years). Our specific objectives are to:

- ▶ Provide an overview of income definitions and measurements used in the current literature.
- ▶ Present review findings in a tabular form displaying study design, methods and key findings including effect, with a narrative summary.
- ▶ Compare the effect of cancer on various sources of income by cancer type, age, sex and/or gender, and other variables of interest (eg, country of residence, follow-up time).
- ▶ Identify gaps in the current literature in terms of cancer type, study design, methodology and outcome definitions and measurements.

## METHODS

This review follows the Joanna Briggs Institute's methodological framework for conducting scoping reviews.<sup>28</sup> Our summary of results follows the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews<sup>29</sup> (online supplemental material 1 is the protocol for this review). Our methods are also outlined in our protocol publication.<sup>30</sup>

### Eligibility criteria

Included studies involved individuals diagnosed with cancer during adulthood (age  $\geq 18$  years), regardless of sex/gender, tumour type, cancer treatment or follow-up time. Studies of adolescent and young adults were included if results relating specifically to survivors aged  $\geq 18$  years could be extracted. There were no limits on country of publication or healthcare system. We included primary qualitative, quantitative and mixed-methods

research studies in English. Quantitative studies included cohort (prospective and retrospective), case-control and cross-sectional designs.

The outcomes of interest were derived from Barr's definition of income as 'the flow deriving from a stock of wealth', where wealth includes physical wealth, financial wealth, and human capital resulting from past investments in education and training or natural talent.<sup>31</sup> Our specific income categories were:

- ▶ Employment income (eg, individual or household income, salary, earnings)
- ▶ Investment income (from physical and financial wealth, such as assets, properties, shares, government bonds and bank accounts)
- ▶ Government transfer payments (GTPs) (eg, disability income or pension, unemployment income, government assistance)
- ▶ Debt
- ▶ Bankruptcy

Studies on employment, unmet financial needs, out-of-pocket costs, financial toxicity or financial burden were excluded, unless one or more of the income categories above-mentioned was measured.

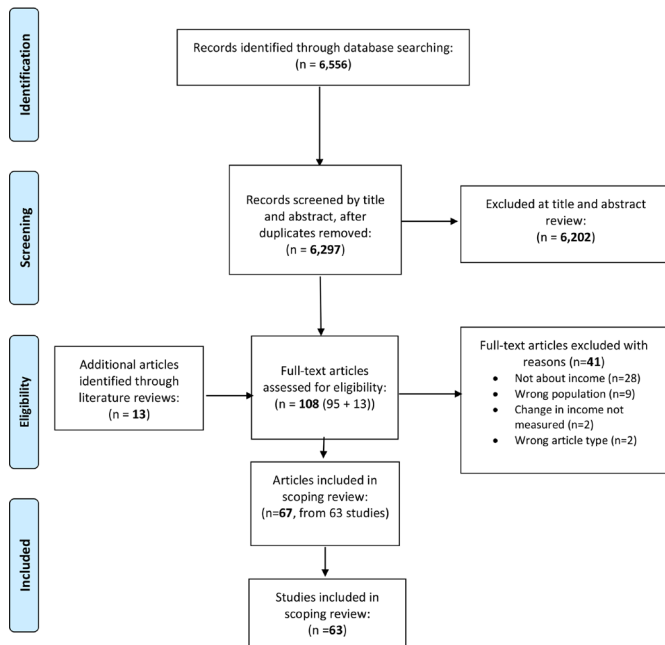
### Information sources and literature search

With the assistance of a health sciences librarian, we developed a preliminary search strategy using keywords and Medical Subject Headings (MeSH) terms based on our research question and from similar search strategies in published reviews. The search strategy was piloted in Ovid MEDLINE and refined iteratively after evaluating results with the research team. The search terms were adjusted to operationalise the strategy for the additional databases consulted—PsycINFO, CINAHL, EMBASE, Econ-Lit and Evidence-based Medicine Reviews—from 1 January 2000 to 31 December 2020. References from nine relevant literature review articles were also searched to identify additional studies.

### Study selection process

Pairs of reviewers (PT and CB, SEA or LM) independently reviewed and screened the titles and abstracts of all citations identified by our search strategy using a pilot-tested (n=10) screening form. Citations were allocated to three categories: relevant, not relevant and potentially relevant. Two reviewers independently read the full text of all potentially relevant studies, with inter-rater discrepancies resolved by a third reviewer and in discussion with the research team.

For full-text review, a data extraction template was developed. Pairs of reviewers (PT and CB, SEA or LM) piloted the template by independently extracting data from 10 studies. The template was modified iteratively, based on consensus among the research team. The final template was applied to all included studies, which were subjected to full-text review independently by two reviewers. Disagreements were resolved by a third reviewer and in discussion with the research team.



**Figure 1** PRISMA flow diagram for study selection. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-analyses.

### Charting and synthesising the data

The data extracted during full-text review included: publication characteristics (author, date, country of publication); study characteristics (methods, study design, data source); study sample (number of survivors, number of controls (as applicable), type of cancer(s)); outcomes measured (employment income, investment income, GTP, debt, bankruptcy); and main findings relevant to our outcomes. Following Johnson and Moore,<sup>32</sup> data source was coded as administrative data for data collected to run government programmes or survey data for data collected for research purposes.

Frequencies were used to synthesise the data abstracted for all variables except study sample and main findings, given the heterogeneity of these results.

### Patient and public involvement

There was no active engagement of patients and/or members of the public in this study.

## RESULTS

### Article inclusion

The article selection process is detailed in [figure 1](#).<sup>33</sup> After duplicates were removed, 6297 citations were identified through the systematic search of the six databases and screened by title and abstract for eligibility; of these, 6202 were excluded. The remaining 95 citations, plus 13 citations identified from nine literature reviews, yielded a total of 108 papers retrieved for full-text review.

Of the 108 papers reviewed in full, 41 were excluded because they did not match our inclusion criteria for income. Online supplemental material 2 shows excluded studies and reasons for exclusion, and literature reviews

consulted. Ultimately, 63 studies (67 articles) met our inclusion criteria. Online supplemental material 3 shows all studies included in this review and the income categories reported per study.

### Characteristics of included studies

There was a dramatic increasing trend in the number of studies published over the review's 20-year period (2000–2020), with the majority of studies (32, 51%) published in 2016–2020 ([table 1](#)). Most studies were published in the USA (29, 46%), followed by Scandinavia (12, 19%) and Europe (7, 11%). Survey data (47, 74.6%) were more commonly used than administrative data (16, 25.4%).

Several studies included more than one cancer type. Twenty-nine studies included all cancer types, with breast (15 studies) and colorectal (8 studies) cancers being the top two single-site cancers studied. Similarly, some studies reported more than one outcome of interest. Forty-one studies reported on employment income, followed by debt (24 studies), GTP (18 studies), investment (16 studies) and bankruptcy (10 studies).

Below are descriptive summaries of key findings from the 63 included studies, by each of the five income categories. Each descriptive summary highlights findings from studies comparing cases with controls and those reporting statistically significant results (eg,  $p < 0.05$ , HRs, CIs) for the income category, and for treatment modality when reported for the outcome of interest. Most studies reported outcomes on a non-monetary scale (eg, percentage of survivors experiencing bankruptcy, percentage decline in income, themes in qualitative studies). Studies reporting outcomes in monetary values ( $n = 14$ ) are reported in 2020 US dollars to facilitate comparisons across studies.

Specific characteristics of all included studies are presented in tabular form by each income category in online supplemental material 4. Each table reports key findings, study characteristics, and article authorship and citation for the specific income category.

### Employment income

Employment income was the most frequently reported category of income. Employment income was variously defined in the literature as personal income, household income, total market earnings, annual earnings, log hourly wages or simply income. Forty-one studies (65%) assessed employment income of cancer survivors; of the studies conducting hypothesis testing, 15 reported a statistically significant loss of income due to cancer (online supplemental table 1). The largest portion of studies was published in the USA (15, 38%), followed by Scandinavia (6, 15%). Fourteen studies (34.1%) compared cases and controls.

Declines in employment income were most often reported on the scale of percentage change ( $n = 11$ ),<sup>34–44</sup> rather than in dollar values. Of the studies reporting a loss as the average percentage change in employment income ( $n = 5$ ),<sup>35–38–40–44</sup> the estimated reduction ranged

**Table 1** Descriptive characteristics of included studies (n=63)

Descriptive characteristics*	n=number of studies (% of 63 studies)
Year of publication	
2000–2005	2 (3)
2006–2010	6 (9.5)
2011–2015	23 (36.5)
2016–2020	32 (51)
Country of publication	
USA	29 (46)
Scandinavia—Norway (5), Sweden (5), Denmark (2)	12 (19)
Europe	7 (11)
Asia—China (1), Malaysia (2), Japan (2)	5 (7.9)
UK	3 (4.7)
Canada	2 (3.1)
Australia	2 (3.1)
New Zealand	1 (1.5)
Israel	1 (1.5)
Brazil	1 (1.5)
Research method	
Quantitative	54 (86)
Qualitative	8 (12.5)
Mixed	1 (1.5)
Data source	
Survey	47 (74.6)
Administrative	16 (25.4)
Descriptive characteristics	n=frequency across all studies†
Type of cancer	
All cancers	29
Breast	15
Colorectal (8)+rectal (1)	9
Lung	3
Prostate	4
Gynaecological	1
Thyroid	1
Head and neck	1
Cervical	3
Glioma (1)+brain (1)	2
Lymphoma	2
Haematological	3
Testicular	2
Outcome of interest	
Employment income	41

Continued

**Table 1** Continued

Descriptive characteristics	n=frequency across all studies†
Debt	24
Government transfer payment	18
Investment	16
Bankruptcy	10

\*For studies having multiple publications, information is drawn from the initial study publication.  
†Some studies included more than one cancer type and/or income outcome, so the total frequency will exceed 63.

widely from 6.6% to 65%. Differing welfare plans across countries of study may explain the disparity. For instance, the lowest percentage is from a 2012 Norwegian study (all cancers) reporting significant cancer-related declines in income for both men and women of 6.6% (men: 95% CI 5.3 to 7.9; women: 95% CI 5.6 to 7.6).<sup>40</sup> This small reduction may be due to the inclusion of compensatory benefits in the measure of income. The greatest percentage is from a 2018 US study (all cancers), which found that annual income is reduced by 65% in the first 5 years post-diagnosis, for men and women combined.<sup>35</sup>

When the employment income of cancer survivors was compared with a non-cancer control group, effects varied. Of the 12 studies comparing employment income of cancer and non-cancer groups,<sup>34 36 37 39 44–53</sup> 5 studies reported survivors earned less than controls,<sup>34 37 40 44 51–53</sup> 4 reported no significant difference in employment income<sup>46 47 49 50</sup> and 2 studies reported mixed results.<sup>45 48</sup> One 2002 US study found no significant difference in the earnings of breast cancer survivors and controls within 2 years of diagnosis, but at 3 or more years post-diagnosis, survivors earned 26% ( $p < 0.10$ ) more than controls.<sup>36</sup> These results are similar to another US study (not case-control) reporting annual income increased by 6.7% ( $p < 0.01$ ) to 16.2% ( $p < 0.01$ ) for female-specific cancers in the intermediate and long term, respectively, but no statistically significant effect in the short term.<sup>35</sup>

Even among studies reporting statistically significant declines in income of survivors compared with controls, the magnitude of the effect varied. For instance, a 2017 Canadian study found that survivors (all cancers) earned significantly less than controls (\$9660 or 9.8%;  $p < 0.001$ ) over a 3-year period.<sup>34</sup> Other studies found the income gap between survivors and controls narrowed as the length of time since diagnosis increased. For instance, a 2016 Israeli study (testicular cancer) compared income at 4 years post-diagnosis with 2 years pre-diagnosis and found that survivors did not have a higher risk of decline in income than controls (OR: 1.41, 95% CI: 0.84 to 2.36).<sup>50</sup> A 2012 Norwegian study reported a significantly higher proportion of employed breast cancer survivors than controls experienced reduced employment income



>10% in 1–4 years post-diagnosis; after 5 years post-diagnosis, the difference was not significant.<sup>37</sup>

Qualitative studies revealed survivors experienced financial struggles from loss of income due to cancer (n=8).<sup>54–61</sup> Income declined for survivors despite receiving disability benefits or other compensatory payments, according to three studies.<sup>54 59 61</sup>

### Debt

Twenty-four (38%) studies assessed debt incurred by survivors or their families due to cancer (online supplemental table 2). Half (12, 50%) of the studies reported cancer significantly increased levels of debt. Two-thirds (16, 66.6%) of studies assessing debt were published in 2016–2020, and three-quarters (18, 75%) were conducted in the USA.

Debt was variously defined in the literature. Often debt was reported using general measures (eg, self-reported debt in cross-sectional surveys) and via composite indices created to measure material financial hardship or burden. We did not report results for composite indices, only for debt. In studies reporting specific types of debt, the most commonly reported were borrowing from banks (n=9),<sup>43 55 60–66</sup> borrowing from family or friends (n=7),<sup>26 43 61–64 67</sup> and credit card debt (n=6).<sup>26 60 62 64–66</sup>

A few studies (n=8) reported debt in monetary values.<sup>26 43 65 68–72</sup> Of these, five studies (all USA) reported the proportion of survivors with debt accumulation to ≥\$10 000.<sup>24 68–70 72</sup> Two studies reported mean amounts of debt: one study (colon cancer) reported mean debt of \$30 569<sup>43</sup> and another reported \$38 125 mean debt among young adult cancer survivors.<sup>65</sup>

Three studies (all cancers) were case–control.<sup>25–27</sup> Of these, two reported that the initial stage of cancer care was associated with increased debt, indicating cancer survivors' first coping strategy could be borrowing.<sup>26 27</sup>

Cancer survivors aged <65 years were significantly more likely to experience debt compared with survivors aged 65+ years, indicating a considerable impact of a cancer diagnosis on working-age survivors.<sup>71 73–76</sup>

Two US studies (all cancers) reported the effect of cancer on debt by treatment modality, with survivors receiving chemotherapy, compared with those not receiving chemotherapy, having a higher likelihood of indebtedness (OR: 3.23; 95% CI: 2.14 to 4.88)<sup>76</sup> and debt over \$10 249 (OR: 3.05; 95% CI: 1.53 to 6.09).<sup>69</sup>

Two US studies that focused on ethnicity found significantly higher levels of debt among minority survivors compared with white survivors (p<0.04–p<0.001).<sup>64 67</sup>

### Government transfer payments

Under GTP, we captured studies reporting supplemental income (or benefits) paid through government-administered programmes to cancer survivors having reduced work ability due to cancer-related illness. Disability pension, disability benefits, sick leave or sickness benefit, social security, food stamps and child support fell under GTP. Eighteen (18, 29%) studies analysed GTP

benefits; of the studies conducting hypothesis testing, 13 (72.2%) reported statistically significant results (online supplemental table 3). Half (9, 50%) of the studies were published in 2010–2015, and one-third (6, 33.3%) were published in 2016–2020.

Two-thirds (12, 66.6%) of GTP studies compared GTP benefits uptake among cancer survivors with controls.<sup>36 37 45 46 49 52 77–82</sup> With the exception of Gudbergsson *et al*, all studies reported survivors were significantly more likely to receive GTP or to receive higher amounts of GTP than controls (p<0.001–p<0.01).

Treatment modality and time since diagnosis impacted survivors' risk of claiming GTP benefits; receipt of chemotherapy tended to elevate this risk. Patients with testicular cancer who received four chemotherapy courses had high rates (Relative Risk: 1.60, 95% CI: 1.19 to 2.15) of claiming disability pension compared with matched controls.<sup>82</sup> Similarly, chemotherapy-radiation treatment was more prevalent in a group of long-term survivors of cervical cancer with disability pension than those with paid work (p=0.002) in a 2020 Norwegian study.<sup>83</sup> Type of surgical treatment—abdominoperineal compared with anterior resection—elevated the annual risk of disability pension for rectal cancer survivors (Incidence Rate Ratio: 1.44, 95% CI: 1.19 to 1.75) in a 2015 Swedish study.<sup>81</sup>

Several studies tracked the prevalence of GTP from time of diagnosis, often showing an increased risk of receiving GTP over time. For long-term cervical cancer survivors in Sweden, the likelihood of receiving disability pension increased from 9.2% before diagnosis to 25.3% 2 years after diagnosis, compared with 7.7% at inclusion and 9.9% at 2 years for controls; at 10 years post-diagnosis, survivors were more than twice as likely to receive disability benefit than controls (32.7% vs 14.1%).<sup>78</sup> A 2015 study (Hodgkin's lymphoma) reported an elevated risk of disability pension or sick leave for survivors compared with controls up to 15 years post-diagnosis.<sup>77</sup> However, a 2015 Swedish study showed a decreased risk of receiving GTP over time, with 76% of cervical cancer survivors having full or partial sick leave or disability pension at 1 year after diagnosis, 39% at 2 years and 32% at 3 years post-diagnosis, compared with 12%–15% for controls.<sup>79</sup>

### Investment income

Investment income included income from physical wealth (eg, assets, properties, vehicles) and financial wealth (eg, shares, government bonds, savings and retirement accounts). One-quarter (16, 25.3%) of all studies focused on investment income; of the studies conducting hypothesis testing, four reported a significant negative effect of cancer on investment income (online supplemental table 4).<sup>25–27 47</sup> The most commonly reported changes to investment income were spending down savings (13, 81%), selling stocks and bonds (7, 44%), and selling or refinancing homes (5, 31%).

Studies showed that 16%–29.9% of cancer survivors withdrew all or most of their savings or retirement funds due to cancer. The lower value of 16% was from

a 2019 US study (all cancers) on the financial sacrifices made by survivors aged <65 years; the study reported on results from open-ended survey questions only, and non-response bias may explain the lower value.<sup>24</sup> The higher value of 29.9% was from a 2012 US study reporting that survivors receiving adjuvant chemotherapy treatment for colon cancer are more likely to spend down savings.<sup>43</sup>

Of the seven studies reporting on income from stocks and bonds, two US longitudinal case-control studies reported that survivors (all cancers) increased their monetary assets following a cancer diagnosis.<sup>26 27</sup> The 2019 study reported survivors increased their emergency cash equivalent to 15 days of living expenses following a diagnosis and decreased their investment asset-to-net-worth ratio by 0.4%; every 2 years after diagnosis, survivors increased cash holdings by a further 5 days and decreased investment asset-to-net-worth ratio by a further 0.3%.<sup>27</sup> The 2020 study reported similar results, showing a 17.2%–28.0% increase in cash and cash-equivalent assets 2 years post-diagnosis.<sup>26</sup> This same study reported significant reductions in stocks and bonds ( $p<0.01$ ) and business equity ( $p<0.05$ ), and increases in unsecured debt ( $p<0.01$ ), which contributed to an average decline of \$125 832 ( $p<0.01$ ) in household assets in the year after diagnosis.

All five case-control studies were published in the USA.<sup>25–27 47 51</sup> In addition to the above-mentioned longitudinal studies, one study (all cancers) reported survivors aged 45–54 years had significantly lower family home ownership compared with controls (59.0% vs 67.1%,  $p=0.001$ ).<sup>25</sup> The remaining two studies found no<sup>51</sup> or only marginally significant ( $p=0.04$ )<sup>47</sup> difference in net worth for men and no significant difference for women between cancer and non-cancer populations for investment income.

### Bankruptcy

Bankruptcy refers to a specific legal process undertaken by individuals who are unable to repay their debts and seek relief from creditors, and is thus distinguished from debt. Of the 10 studies reporting bankruptcy among cancer survivors, 6 (60%) were published in 2016–2020 and 9 (90%) were from the USA, indicating recent attention to bankruptcy in the cancer survivorship literature, especially in the USA (online supplemental table 5).

Studies showed that between 0.2% and 3.1% of survivors filed for bankruptcy due to cancer. The lowest rate of 0.2% was reported in a study examining the financial burden of older, female, long-term cancer survivors (average age: 79 years).<sup>76</sup> The highest rate of 3.1% was found in US working-age (18–64 years) survivors in a study (all cancers) examining debt and bankruptcy among survivors or a family member as a consequence of cancer; the rate may be high due to the inclusion of family members in that value.<sup>70</sup> Two US studies found cancer survivors are 2.65 to nearly 4 times more likely to declare bankruptcy than the US general population.<sup>62 84</sup>

Several studies found an association between the age of survivors and filing for bankruptcy. A 2013 US study (all cancers) linking federal bankruptcy records with survey data reported that younger survivors had two to five times higher rates of bankruptcy than survivors aged 65+ years.<sup>84</sup> However, three subsequent US studies (all cancers) using survey data did not find any significant difference between <65 and 65+ age groups for bankruptcy among survivors, but did find overall financial hardship (ie, material or psychological hardship) to be greater for survivors aged <65 years than survivors aged 65+ years.<sup>73–75</sup>

### DISCUSSION

To our knowledge, this is the first scoping review to summarise the peer-reviewed evidence on changes in all sources of income of individuals diagnosed with cancer during adulthood (age  $\geq 18$  years). Our review revealed a growing interest in this topic over the review period, with 51% of studies published in the last 5 years (2016–2020). Our focus on all sources of income—employment income, debt, bankruptcy, investment income and GTP—identifies the impact of a cancer diagnosis on adults regardless of their employment or financial status, thus shedding new light on the complex relationship between a cancer diagnosis and the economic wealth of survivors.

Our review found variation in cancer's impact on employment income. Although there is strong evidence that survivors' incomes declined following a cancer diagnosis, some studies reported no significant difference in income between cancer and non-cancer populations, and a few reported income increased post-diagnosis. This variability may be explained, in part, by differences in health-care systems (eg, publicly funded or largely privatised) and welfare systems (eg, availability of disability benefits and/or pension, sick leave) in the country of study. Our findings support previous studies concluding that cancer's impact on employment earnings is complex, and may be influenced by specific factors like cancer type and treatment modality, as well as gender, household and labour market structures,<sup>35 36 53</sup> and social ideologies. These complexities limit the ability to make comparisons across countries. Further research is needed to tease out the specific factors influencing cancer's impact on earnings.

Follow-up time from diagnosis may also explain the variation in cancer's impact on survivors' income documented in this review. The dominant trend from several longitudinal studies shows cancer's impact on income lessens as time since diagnosis increases,<sup>34 37 44 48</sup> suggesting survivors experience the largest declines in income in the first few years post-diagnosis. Other longitudinal studies reported exceptions to this trend, however, with some studies reporting insignificant effects of cancer on income in the short term<sup>35 45</sup> and one cross-sectional study finding a positive effect of cancer on survivors' earnings compared with controls at 3 or more years post-diagnosis.<sup>36</sup> These results indicate follow-up time is an important, if not yet

well-understood, factor in estimating changes in income following a cancer diagnosis. Further variation in results may occur when studies estimate cancer's impact on income at different follow-up times or combine survivors across different follow-up times in a single study. These studies will arrive at different estimates of cancer's effect on survivors' income.

Our review showed that many survivors depleted their savings and retirement funds following their diagnosis. Some altered their investment portfolios to increase cash holdings by as much as 28% to act as a 'financial buffer' against unexpected medical expenses and the possibility of cancer recurrence.<sup>26</sup> Others sold or refinanced their homes. This evidence, coupled with the fluctuations in survivors' income post-diagnosis, nuances our understanding of the wealth management behaviour of cancer survivors and implies a relationship between them.

We identified a number of gaps in the existing literature, including a shortage of cross-sectional studies reporting time since diagnosis. The literature indicates declines in income can lessen over time, but these findings can vary. Future work is recommended to compile an evidence base on the relationship between a cancer diagnosis and changes in income over time in longitudinal studies. There is also a shortage of studies measuring the effect of treatment type and cancer stage on income. What evidence we have indicates receiving chemotherapy increased survivors' likelihood of indebtedness and receiving disability pension, and reduced their savings, but the evidence is not robust, indicating the need for further research in this area. New better-tolerated treatments may lessen this likelihood, making it important for future studies to document treatment's effect on income to support policymakers in managing their treatment budgets and welfare programmes.

### Limitations to making economic comparisons

Consistent with other evidence syntheses on this topic, it was challenging to make economic comparisons across countries.<sup>14 85</sup> For our review, differences in healthcare and welfare systems between countries, in types of income reported (eg, employment income, after-tax income) and unit of income (eg, on the log, dollar or percentage scales) added to these challenges. Moreover, many studies combined employment-related income and welfare benefits in a single measure of income, thus making it difficult to distinguish between types of income and to determine if—and to what extent—employment income post-diagnosis may be compensated by the welfare state.

### Limitations of this review

Our objective in this study was to understand what the evidence says about the impact of a cancer diagnosis on adults' income and wealth, worldwide from 2000 to 2020. We selected a scoping review methodology because we anticipated variability in study design and contexts among primary studies, and accepted the challenge of

comparing results across studies and healthcare systems or contexts.

There are some limitations to the findings from this study. Grey literature and non-English language studies were not searched, so we may have missed important evidence from these sources. We only reported changes in specific types of income or debt related to survivors' employment; consequently, we did not capture any changes in expenditures that can impact survivors' financial well-being, and we did not capture cancer's impact on caregivers' financial and employment outcomes. We did not attempt to link income measures from the studies we reviewed to concepts of 'hardship' or 'economic hardship', which are often found in the literature on financial toxicity. We may have missed articles not indexed by MeSH or keywords cancer, neoplasm or survivor, but nonetheless measure income changes for survivors. No quality assessment of studies was conducted, as it is not required of scoping reviews.<sup>29</sup>

Not all important factors influencing cancer's impact on income—for example, sex, income at baseline, race, age—could be included in this review. This meant we were inevitably selective about which results were reported, which may render our summary of evidence incomplete.

### CONCLUSION

Our findings indicate that the effect of a cancer diagnosis on survivors' income is time-varying and complex. In the first years following a cancer diagnosis, a pattern emerged: survivors' employment income often declined, they spent down savings and liquidated assets to increase emergency cash holdings. Cancer's impact on income also tended to lessen over time, suggesting early financial support for survivors is important. More longitudinal studies are needed to determine the strength of this overall pattern and explain variations—for instance, survivors' earnings may increase over time because they need to work more to compensate for depleted savings and increased debt. Study designs using standardised income measures and capturing cancer stage, treatment type and follow-up time will improve our understanding of cancer's impact on survivors' income and wealth.

**Twitter** Colene Bentley @ColeneBentley and Shiraz El Adam @ShirazElAdam1

**Acknowledgements** We would like to thank Claire de Oliveira and Jean Yong for reviewing and providing feedback on the manuscript.

**Contributors** Conceptualisation—SEA, SP, PT and LM. Methodology—CB and SEA. Data analysis—LM, PT, CB and SP. Draft manuscript—CB and LM. Final manuscript review and approval—CB, LM, PT, SP and SEA. Guarantor—CB.

**Funding** This work was supported by funding from the Canadian Cancer Research Institute (grant #2020-706936) and the Canadian Partnership Against Cancer.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not required.

**Ethics approval** Ethics approval was not required for this study because it is based on reviewing and collecting data from publicly available materials.



**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** All data relevant to the study are included in the article or uploaded as supplemental information.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

#### ORCID iDs

Colene Bentley <http://orcid.org/0000-0003-3938-450X>

Shiraz El Adam <http://orcid.org/0000-0002-8036-2495>

## REFERENCES

- Allemani C, Matsuda T, Di Carlo V, *et al*. Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. *Lancet* 2018;391:1023-75.
- Miller KD, Siegel RL, Lin CC, *et al*. Cancer treatment and survivorship statistics, 2016. *CA Cancer J Clin* 2016;66:271-89.
- Malvezzi M, Bertuccio P, Rosso T, *et al*. European cancer mortality predictions for the year 2015: does lung cancer have the highest death rate in Eu women? *Ann Oncol* 2015;26:779-86.
- Lagergren P, Schandl A, Aaronson NK, *et al*. Cancer survivorship: an integral part of Europe's research agenda. *Mol Oncol* 2019;13:624-35.
- Walters S, Maringe C, Butler J, *et al*. Breast cancer survival and stage at diagnosis in Australia, Canada, Denmark, Norway, Sweden and the UK, 2000-2007: a population-based study. *Br J Cancer* 2013;108:1195-208.
- Aaronson NK, Mattioli V, Minton O, *et al*. Beyond treatment - Psychosocial and behavioural issues in cancer survivorship research and practice. *EJC Suppl* 2014;12:54-64.
- Hewitt M, Rowland JH, Yancik R. Cancer survivors in the United States: age, health, and disability. *J Gerontol A Biol Sci Med Sci* 2003;58:M82-91.
- American Cancer Society. Cancer treatment and survivorship facts and figures 2019-2021. *American Cancer Society* 2019.
- National Cancer Institute. Statistics, graphs, and definitions. Available: <https://cancercontrol.cancer.gov/ocs/definitions>
- Leach CR, Weaver KE, Aziz NM, *et al*. The complex health profile of long-term cancer survivors: prevalence and predictors of comorbid conditions. *J Cancer Surviv* 2015;9:239-51.
- Teckle P, Peacock S, McBride ML, *et al*. Long-term effects of cancer on earnings of childhood, adolescent and young adult cancer survivors - a population-based study from British Columbia, Canada. *BMC Health Serv Res* 2018;18:826.
- Truant TLO, Varcoe C, Gotay CC, *et al*. Toward equitably high-quality cancer survivorship care. *Can Oncol Nurs J* 2019;29:156-62.
- Butow P, Laidsaar-Powell R, Konings S, *et al*. Return to work after a cancer diagnosis: a meta-review of reviews and a meta-synthesis of recent qualitative studies. *J Cancer Surviv* 2020;14:114-34.
- Longo CJ, Fitch MI, Banfield L, *et al*. Financial toxicity associated with a cancer diagnosis in publicly funded healthcare countries: a systematic review. *Support Care Cancer* 2020;28:4645-65.
- Mols F, Tomalin B, Pearce A, *et al*. Financial toxicity and employment status in cancer survivors. A systematic literature review. *Support Care Cancer* 2020;28:5693-708.
- Zhu Z, Xing W, Zhang X, *et al*. Cancer survivors' experiences with financial toxicity: a systematic review and meta-synthesis of qualitative studies. *Psychooncology* 2020;29:945-59.
- Altice CK, Banegas MP, Tucker-Seeley RD, *et al*. Financial Hardships experienced by cancer survivors: a systematic review. *J Natl Cancer Inst* 2017;109:djw205.
- Kamal KM, Covvey JR, Dashputre A, *et al*. A systematic review of the effect of cancer treatment on work productivity of patients and caregivers. *J Manag Care Spec Pharm* 2017;23:136-62.
- Duijts SFA, van Egmond MP, Spelten E, *et al*. Physical and psychosocial problems in cancer survivors beyond return to work: a systematic review. *Psychooncology* 2014;23:481-92.
- Iragorri N, de Oliveira C, Fitzgerald N, *et al*. The out-of-pocket cost burden of cancer Care-A systematic literature review. *Curr Oncol* 2021;28:1216-48.
- Iragorri N, de Oliveira C, Fitzgerald N, *et al*. The indirect cost burden of cancer care in Canada: a systematic literature review. *Appl Health Econ Health Policy* 2021;19:325-41.
- Zafar SY. Financial toxicity of cancer care: it's time to intervene. *J Natl Cancer Inst* 2016;108. doi:10.1093/jnci/djv370. [Epub ahead of print: 11 12 2015].
- Zafar SY, Abernethy AP. Financial toxicity, part I: a new name for a growing problem. *Oncology* 2013;27:80-149.
- Banegas MP, Schneider JL, Firemark AJ, *et al*. The social and economic toll of cancer survivorship: a complex web of financial sacrifice. *J Cancer Surviv* 2019;13:406-17.
- Doroudi M, Coughlan D, Banegas MP. Is cancer history associated with assets, debt, and Net Worth in the United States? *JNCI Cancer Spectrum* 2018;2.
- Pak T-Y, Kim H, Kim KT. The long-term effects of cancer survivorship on household assets. *Health Econ Rev* 2020;10:2.
- Svynarenko R, Zhang Q, Kim H. The financial burden of cancer: financial ratio analysis. *J Fam Econ Issues* 2019;40:165-79.
- Peters MDJ GC, McInerney P, Munn Z. Chapter 11: Scoping reviews (2020 version). *Joanna Briggs Institute Reviewer's Manual* 2020.
- Tricco AC, Lillie E, Zarin W, *et al*. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467-73.
- El Adam S, Bentley C, McQuarrie L, *et al*. Impact of a cancer diagnosis on the income of adult cancer survivors: a scoping review protocol. *BMJ Open* 2021;11:e047315.
- Barr N. *The economics of the welfare state*. 3. Oxford: Oxford University Press, 1993.
- Johnson B, Moore K. *Compendium of Federal Estate Tax and Personal Wealth Studies: Chapter 9 - Comparing Administrative and Survey Data*. Washington, DC: US Government, 2011.
- Moher D, Liberati A, Tetzlaff J, *et al*. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 2009;6:e1000097.
- Jeon S-H. The long-term effects of cancer on employment and earnings. *Health Econ* 2017;26:671-84.
- Osmani AR, Okunade AA. Cancer survivors in the labor market: evidence from recent us micro-panel data. *Econ Model* 2019;80:202-21.
- Bradley CJ, Bednarek HL, Neumark D. Breast cancer survival, work, and earnings. *J Health Econ* 2002;21:757-79.
- Hauglann B, Benth Jüratè Šaltytė, Fosså SD, *et al*. A cohort study of permanently reduced work ability in breast cancer patients. *J Cancer Surviv* 2012;6:345-56.
- Zajacova A, Dowd JB, Schoeni RF, *et al*. Employment and income losses among cancer survivors: estimates from a national longitudinal survey of American families. *Cancer* 2015;121:4425-32.
- Su TT, Azzani M, Tan FL, *et al*. Breast cancer survivors: return to work and wage loss in selected hospitals in Malaysia. *Support Care Cancer* 2018;26:1617-24.
- Syse A, Tønnessen M. Cancer's unequal impact on incomes in Norway. *Acta Oncol* 2012;51:480-9.
- van Muijen P, Duijts SFA, van der Beek AJ, *et al*. Prognostic factors of work disability in sick-listed cancer survivors. *J Cancer Surviv* 2013;7:582-91.
- Khera N, Chang Y-hui, Hashmi S, *et al*. Financial burden in recipients of allogeneic hematopoietic cell transplantation. *Biol Blood Marrow Transplant* 2014;20:1375-81.
- Shankaran V, Jolly S, Blough D, *et al*. Risk factors for financial hardship in patients receiving adjuvant chemotherapy for colon cancer: a population-based exploratory analysis. *J Clin Oncol* 2012;30:1608-14.
- Syse A, Tretli S, Kravdal Øystein. Cancer's impact on employment and earnings—a population-based study from Norway. *J Cancer Surviv* 2008;2:149-58.
- Heinesen E, Kolodziejczyk C. Effects of breast and colorectal cancer on labour market outcomes-average effects and educational gradients. *J Health Econ* 2013;32:1028-42.
- Gudbergsson SB, Fosså SD, Borgeraas E, *et al*. A comparative study of living conditions in cancer patients who have returned to work after curative treatment. *Support Care Cancer* 2006;14:1020-9.



- 47 Norredam M, Meara E, Landrum MB, *et al.* Financial status, employment, and insurance among older cancer survivors. *J Gen Intern Med* 2009;24 Suppl 2:438–45.
- 48 Pacheco-Figueiredo L, Lunet N. Health status, use of healthcare, and socio-economic implications of cancer survivorship in Portugal: results from the fourth National health survey. *J Cancer Surviv* 2014;8:611–7.
- 49 Eaker S, Wigertz A, Lambert PC, *et al.* Breast cancer, sickness absence, income and marital status. A study on life situation 1 year prior diagnosis compared to 3 and 5 years after diagnosis. *PLoS One* 2011;6:e18040.
- 50 Rottenberg Y, Ratzon NZ, Jacobs JM. Unemployment risk and income change after testicular cancer diagnosis: a population-based study. *urologic oncology: seminars and original investigations* 2016;34:e27–5.e33.
- 51 Chirikos TN, Russell-Jacobs A, Cantor AB. Indirect economic effects of long-term breast cancer survival. *Cancer Pract* 2002;10:248–55.
- 52 Chirikos TN, Russell-Jacobs A, Jacobsen PB. Functional impairment and the economic consequences of female breast cancer. *Women Health* 2002;36:1–20.
- 53 Syse A, Tretli S, Kravdal O. The impact of cancer on spouses' labor earnings: a population-based study. *Cancer* 2009;115:4350–61.
- 54 Fitch MI, Longo CJ, Chan RJ. Cancer patients' perspectives on financial burden in a universal healthcare system: analysis of qualitative data from participants from 20 provincial cancer centers in Canada. *Patient Educ Couns* 2021;104:903–10.
- 55 Kayser K, Smith L, Washington A, *et al.* Living with the financial consequences of cancer: a life course perspective. *J Psychosoc Oncol* 2021;39:17–34.
- 56 Lueckmann SL, Schumann N, Hoffmann L, *et al.* 'It was a big monetary cut'-A qualitative study on financial toxicity analysing patients' experiences with cancer costs in Germany. *Health Soc Care Community* 2020;28:771–80.
- 57 Blum-Barnett E, Madrid S, Burnett-Hartman A, *et al.* Financial burden and quality of life among early-onset colorectal cancer survivors: a qualitative analysis. *Health Expect* 2019;22:1050–7.
- 58 Amir Z, Wilson K, Hennings J, *et al.* The meaning of cancer: implications for family finances and consequent impact on lifestyle, activities, roles and relationships. *Psychooncology* 2012;21:1167–74.
- 59 Kong Y-C, Rauf N, Subramaniam S, *et al.* Working after cancer: in-depth perspectives from a setting with limited employment protection policies. *J Cancer Surviv* 2021;15:706–12.
- 60 Bradley S, Sherwood PR, Donovan HS, *et al.* I could lose everything: understanding the cost of a brain tumor. *J Neurooncol* 2007;85:329–38.
- 61 Timmons A, Gooberman-Hill R, Sharp L. 'It's at a time in your life when you are most vulnerable': a qualitative exploration of the financial impact of a cancer diagnosis and implications for financial protection in health. *PLoS One* 2013;8:e77549.
- 62 Mongelli MN, Giri S, Peipert BJ, *et al.* Financial burden and quality of life among thyroid cancer survivors. *Surgery* 2020;167:631–7.
- 63 Hanly P, Maguire R, Ceilleachair AO, *et al.* Financial hardship associated with colorectal cancer survivorship: the role of asset depletion and debt accumulation. *Psychooncology* 2018;27:2165–71.
- 64 Jaggi R, Pottow JAE, Griffith KA, *et al.* Long-Term financial burden of breast cancer: experiences of a diverse cohort of survivors identified through population-based registries. *J Clin Oncol* 2014;32:1269–76.
- 65 Landwehr MS, Watson SE, Macpherson CF, *et al.* The cost of cancer: a retrospective analysis of the financial impact of cancer on young adults. *Cancer Med* 2016;5:863–70.
- 66 Regenbogen SE, Veenstra CM, Hawley ST, *et al.* The personal financial burden of complications after colorectal cancer surgery. *Cancer* 2014;120:3074–81.
- 67 Hastert TA, Banegas MP, Hamel LM, *et al.* Race, financial hardship, and limiting care due to cost in a diverse cohort of cancer survivors. *J Cancer Surviv* 2019;13:429–37.
- 68 Haider SA, Asmaro K, Kalkanis SN, *et al.* The economic impact of glioma survivorship: the cost of care from a patient perspective. *Neurology* 2020;95:e1575–e81.
- 69 Ketterl TG, Syrjala KL, Casillas J, *et al.* Lasting effects of cancer and its treatment on employment and finances in adolescent and young adult cancer survivors. *Cancer* 2019;125:1908–17.
- 70 Banegas MP, Guy GP, de Moor JS, *et al.* For working-age cancer survivors, medical debt and Bankruptcy create financial Hardships. *Health Aff* 2016;35:54–61.
- 71 Su M, Lao J, Zhang N, *et al.* Financial hardship in Chinese cancer survivors. *Cancer* 2020;126:3312–21.
- 72 Gilligan AM, Alberts DS, Roe DJ, *et al.* Death or debt? National estimates of financial toxicity in persons with Newly-Diagnosed cancer. *Am J Med* 2018;131:e5:1187–99.
- 73 Han X, Zhao J, Zheng Z, *et al.* Medical financial hardship intensity and financial sacrifice associated with cancer in the United States. *Cancer Epidemiol Biomarkers Prev* 2020;29:308–17.
- 74 Yabroff KR, Dowling EC, Guy GP, *et al.* Financial hardship associated with cancer in the United States: findings from a population-based sample of adult cancer survivors. *J Clin Oncol* 2016;34:259–67.
- 75 Whitney RL, Bell JF, Reed SC, *et al.* Predictors of financial difficulties and work modifications among cancer survivors in the United States. *J Cancer Surviv* 2016;10:241–50.
- 76 Hastert TA, Young GS, Pennell ML, *et al.* Financial burden among older, long-term cancer survivors: results from the LILAC study. *Cancer Med* 2018;7:4261–72.
- 77 Glimelius I, Ekberg S, Linderth J, *et al.* Sick leave and disability pension in Hodgkin lymphoma survivors by stage, treatment, and follow-up time—a population-based comparative study. *J Cancer Surviv* 2015;9:599–609.
- 78 Paalman CH, van Leeuwen FE, Aaronson NK, *et al.* Employment and social benefits up to 10 years after breast cancer diagnosis: a population-based study. *Br J Cancer* 2016;114:81–7.
- 79 Everhov Åsa H, Ekberg S, Hirschberg AL, *et al.* Lost workdays in uterine cervical cancer survivors compared to the general population: impact of treatment and relapse. *J Cancer Surviv* 2016;10:514–23.
- 80 Horsboel TA, Nielsen CV, Andersen NT, *et al.* Risk of disability pension for patients diagnosed with haematological malignancies: a register-based cohort study. *Acta Oncol* 2014;53:724–34.
- 81 Chen L, Glimelius I, Neovius M, *et al.* Risk of disability pension in patients following rectal cancer treatment and surgery. *Br J Surg* 2015;102:1426–32.
- 82 Nord C, Olofsson S-E, Glimelius I, *et al.* Sick leave and disability pension among Swedish testicular cancer survivors according to clinical stage and treatment. *Acta Oncol* 2015;54:1770–80.
- 83 Dahl AA, Bentzen AG, Fosså SD, *et al.* Long-Term cervical cancer survivors on disability pension: a subgroup in need of attention from health care providers. *J Cancer Surviv* 2020;14:578–85.
- 84 Ramsey S, Blough D, Kirchoff A, *et al.* Washington state cancer patients found to be at greater risk for bankruptcy than people without a cancer diagnosis. *Health Aff* 2013;32:1143–52.
- 85 Coumoundouros C, Ould Brahim L, Lambert SD, *et al.* The direct and indirect financial costs of informal cancer care: a scoping review. *Health Soc Care Community* 2019;27:e622–36.