ORIGINAL ARTICLE

European Journal of Cancer Care WILEY

Use of sickness benefits by patients with metastatic breast cancer—A Swedish cohort study

Renske Altena[1,2] | Sofie A. M. Gernaat[3] | Ulla Wilking[1] | Narsis A. Kiani[4,5] | Aina Johnsson[1,6,7] (iD) | Elham Hedayati[1,2] (iD)

[1]Department of Oncology-Pathology, Bioclinicum, Karolinska Institutet, Stockholm, Sweden

[2]Breast Cancer Center, Cancer Theme, Karolinska University Hospital and Karolinska CCC, Stockholm, Sweden

[3]Department of Medicine, Division of Clinical Epidemiology, Karolinska Institute, Stockholm, Sweden

[4]Department of Oncology-Pathology, Center of Molecular Medicine, Karolinska Institutet, Stockholm, Sweden

[5]Algorithmic Dynamics Lab, Center of Molecular Medicine, Karolinska Institutet, Stockholm, Sweden

[6]Department of Neurobiology, Care Science and Society, Karolinska Institutet, Huddinge, Sweden

[7]Department of Oncology, South Hospital, Stockholm, Sweden

Correspondence
Elham Hedayati, Department of Oncology-Pathology, Karolinska Institute and University Hospital, Stockholm SE-17176, Sweden.
Email: elham.hedayati@ki.se

Abstract

Objective: The objective of this study is to determine the prevalence and predictors of sickness absence (SA) and disability pension (DP) in women with metastatic breast cancer (mBC).

Methods: Data were obtained from Swedish registers concerning 1,240 adult women diagnosed 1997–2011 with mBC, from 1 year before (y−1) to 2 (y1) and 2 (y2) years after diagnosis. SA and DP prevalence was calculated. Odds ratios (AOR) were determined for factors associated with using long-term (SA > 180 days or DP > 0 days) sickness benefits.

Results: Prevalence of SA and DP was 56.0% and 24.8% during y−1, 69.9% and 28.9% during y1, and 64.0% and 34.7% during y2, respectively. Odds of using long-term sickness benefits were higher y1 and y2 in patients using long-term sickness benefits the year before diagnosis (AOR = 3.82, 95% CI 2.91–5.02; AOR = 4.31, 95% CI 2.96–6.29, respectively) and y2 in patients with mBC diagnosis 1997–2000 (AOR = 1.84, 95% CI 1.10–3.08) and using long-term sickness benefits the year after diagnosis (AOR = 22.10, 95% CI 14.33–34.22).

Conclusions: The prevalence of sickness benefit utilisation was high and increased after mBC diagnosis, particularly for patients using long-term sickness benefits prior to diagnosis. Additional study is needed to determine factors that might reduce the need for sickness benefits and enhance work ability in these patients.

KEYWORDS
disability pension, financial consequences, metastatic breast cancer, quality of life, sickness absence

1 | INTRODUCTION

Globally, breast cancer (BC) is the most prevalent malignant disease in women (Ferlay et al., 2021). Up to 10% of patients with BC present with metastatic breast cancer (mBC) and are thus considered to have synchronous metastasis (Cardoso et al., 2018). In addition, up to 30% of patients with early breast cancer (eBC) develop metastases later and are thus considered to have metachronous metastasis (EBCTCG, 2018; O'Shaughnessy, 2005). It is estimated that 15,000 women in Sweden are living with mBC at any given time (SALAR, 2021).

The Swedish Social Insurance Agency (SSIA) provides sickness benefits when residents are unable to work. These benefits include compensated sickness absence (SA) for temporary illness and disability pension (DP) for permanent impairment. When SSIA assesses that the incapacity for work is permanent, SA is replaced by DP. The amount of benefits depends on the severity of the incapacity and can be granted at 25%, 50%, 75%, or 100% levels (Ministry of Health and Social Affairs, 2021).

Despite the availability of sickness benefits, the economic burden of BC from both individual and societal perspectives is substantial. For example, a Finnish study has shown that BC has a negative impact on women's employment earnings (Vaalavuo, 2021). On top of that, the amounts of productivity loss and associated indirect costs for patients with mBC in the United States were shown to be significantly higher than for those with eBC or in the general population (Wan et al., 2013).

Advances in treatment have led to improved progression-free survival and life expectancy for patients with mBC (Deluche et al., 2020; Sundquist et al., 2017), as well as a median overall survival of 2 to 3 years in western countries (Cardoso et al., 2018). Novel treatments may also be enhancing the ability to return to work for the half of women globally who have mBC and are of working-age (Blinder & Gany, 2019; Caswell-Jin et al., 2018; Deluche et al., 2020; Vila et al., 2020).

Many cancer survivors are forced because of illness to leave full-time work (Cardoso et al., 2016; Stergiou-Kita et al., 2014; Tamminga et al., 2012). For women with mBC, there are specific patient- and tumour-related factors that can impact their prognosis and employment status, including age, performance status, sites of metastases and disease-free intervals between primary BC and metastases (Gernaat et al., 2020), as well as minority ethnicity, symptom burdens and capacity to work full-time (Glare et al., 2017; Samuel et al., 2020; Tevaarwerk et al., 2016).

Despite such reports concerning the role of these factors in patients with mBC, we are not aware of any studies exploring the extent to which patients with mBC utilise sickness benefits or the factors affecting that utilisation. Thus, in this study, we aimed to determine the prevalence of SA and DP in working-age women with a new diagnosis of mBC in Sweden, over a 3-year period extending from the year before to 2 years after their diagnosis. We also aimed to determine factors that were associated with the use of long-term sickness benefits by these patients.

2 | METHODS

This study was complied with the Declaration of Helsinki and was approved by the Regional Ethics Review Board at the Karolinska Institute (Dnr 2012/745-31). By law, patients registered in national quality registers in Sweden do not need to provide written informed consent for their data to be included in healthcare research; however, they are notified that their data are included in registers and that they can opt out.

2.1 | Data sources

Patient data from the following registers were linked using the unique national identification number assigned to each resident in Sweden at birth or when establishing permanent residency.

Diagnostic data were obtained from two national Swedish registers: (i) the Breast Cancer Registry (RBC), for patients from the Stockholm-Gotland healthcare region diagnosed with mBC from January 1997 through December 2007, and (ii) the National Quality Register for Breast Cancer (NKBC), for patients from the same region diagnosed with mBC from January 2008 through December 2011. The Swedish Social Insurance Agency (SSIA) Microdata for Analyses of Social Insurance (MiDAS) database (Swedish Social Insurance Agency, 2021) was used to retrieve data about SA and DP benefits from January 1996 through December 2013. The MIDAS database contains information from the SSIA about all sickness benefit payments, beginning on day 15 of any sick leave episode. The Swedish Cause of Death Register, maintained by the Swedish National Board of Health and Welfare, was used to collect information about the time of death. The Swedish Longitudinal Integrated Database for Health Insurance and Labour Market Studies (LISA) was used to collect data about marital status.

2.2 | Study population

We identified all patients who were registered in the RBC and NKBC with a diagnosis of eBC and who then received a diagnosis of mBC from January 1997 through December 2011. Patients were included in this study if they were female and ages 18 to 63 years at the time of mBC diagnosis (pension age is 65 years) and if they had data available from the MiDAS database on SA or DP covering the full 12 months before and the full 24 months (or at least 12 months, if they died) after mBC diagnosis.

2.3 | Sickness benefits in Sweden

From ages 16 to 65 years, all Swedish residents who have had an income from work or received unemployment benefits, and who then experience a reduced capacity to work because of disease or injury, may be granted sickness benefits by SSIA. Employers are required to pay for SA benefits up to the first 14 days of sick leave for each separate episode. Thus, only sick leave episodes longer than 14 days are recorded in the SSIA register and are included in this study. In addition, Swedish residents ages 19 to 65 years may be granted DP if they permanently lose at least 25% (and up to 50%, 75% or 100%) of their capacity to work because of disease or injury. DP benefits are paid by SSIA commencing with the first day disability.

2.4 | Covariates

For each patient, we recorded age (less than 45, 45 to 55 or more than 55 years), calendar year (1997–2000, 2001–2004, 2005–2008

or 2009–2012) and marital status (married/cohabiting or not married/cohabiting), all at the time of the initial mBC diagnosis. We categorised age in this way because patients under 45 years old often have a more biologically aggressive tumour, those between 45 and 55 years old are less likely to have comorbidities, and those over 55 years old are less likely to receive optimal oncological treatment, given comorbidities, less aggressive tumours and/or a higher risk of adverse treatment effects.

We also recorded whether metastasis was synchronous (i.e., primary mBC or development of mBC within 6 months after eBC diagnosis) or metachronous (i.e., development of mBC more than 6 months after eBC diagnosis). We logged the site of first distant metastasis (bone only, visceral non-brain only, brain only, non-visceral only or not determined if multiple sites), based on International Classification of Diseases, Ninth Edition (ICD-9) codes (Table S1). We noted the number of distant metastases present at the time of mBC diagnosis (1, 2, 3, 4 or not determined). Finally, for use as covariates in some of the analyses, we categorised SA and DP in patients 1 year before mBC diagnosis and 1 year after mBC diagnosis into one of the following groups: no SA and DP; 1 to 180 days of SA with no DP or more than 180 days of SA or any DP.

2.5 | Outcome measures

The outcome measures used were prevalence of use of SA, DP and long-term sickness benefits during the first and second years after an mBC diagnosis. We calculated annual SA net days by multiplying the level of SA benefit (i.e., 25%, 50%, 75% or 100%) by the total number of SA days taken during the year. Then, we categorised SA as either 0, 1 to 30, 31 to 90, 91 to 180 or more than 180 net days. We calculated annual DP net days in a similar manner and then dichotomised these as either none or any, including part- and full-time disability. We defined *long-term sickness benefits* as SA more than 180 net days and/or any DP per year.

2.6 | Reference population

We used a previously published nationwide Swedish cohort study to provide reference populations for our study and to allow comparison of our outcomes (Kvillemo et al., 2017). This was a study of the annual prevalence of SA and DP over 5 years among 3,547 women living in Sweden ages 20 to 65 years, first diagnosed with primary breast cancer (PBC) in 2005 and without relapse, and it included a matched cohort of 14,188 patients without malignancy. The reference population after PBC diagnosis and our cohort during the year prior to mBC diagnosis were similar in that patients in both groups had BC, were relapse-free and were of similar ages and country of residence. In addition, compliance with national treatment guidelines for BC is known to be high in Sweden (SALAR, 2021), suggesting that both populations had likely received similar treatments for their BC.

2.7 | Statistical methods

Age at the time of mBC diagnosis and intervals between eBC and mBC were reported using medians and interquartile ranges (IQR). Categorical covariates were described with frequencies and percentages. SA and DP net day categories were stratified by year and presented using frequencies and percentages as well as means and standard deviations (SD). The frequencies and percentages of patients who died during years 1 and 2 after the diagnosis of mBC were also reported.

Univariable and multivariable logistic regression analyses for the outcome of long-term sickness benefits were performed to estimate crude odds ratios (OR) and adjusted odds ratios (AOR) with 95% confidence intervals (CI) for selected covariates, and these were done separately for the cohorts in years 1 and year 2 after mBC diagnosis. For the crude analyses, covariates of age and calendar year of mBC diagnosis, site of first metastasis and type of metastasis (synchronous or metachronous) were used as categorical variables. SA and DP in the year before mBC diagnosis were used as categorical variables in the analysis for the first year after mBC diagnosis, and SA and DP in the year before and the first year after mBC diagnosis were used as categorical variables in the analysis for the second year after mBC diagnosis. AOR values were determined by controlling for age and calendar year of mBC diagnosis, and for net days of SA and DP in the year before mBC diagnosis, all used as continuous variables. Data analyses were performed with the Statistical Package for the Social Sciences (SPSS), version 25 (SPSS, Armonk, NY).

3 | RESULTS

3.1 | Patient characteristics

The study population was comprised of 1,240 patients, in whom the initial diagnosis of BC had been made between 1 January 1979 and 31 December 2011. In the 1,131 (91.2%) patients with metachronous mBC, the median (IQR) time interval between the initial diagnoses and metastasis was 3 (1 to 6) years (Table 1). The median (IQR) age of the study patients at the time of mBC diagnosis was 53 (46 to 58) years old.

3.2 | The annual prevalence rates of sickness benefits

During the year before mBC diagnosis, of all 1,240 patients, 694 (56.0%) had any SA, and 308 (24.8%) had any DP. During the first year after mBC diagnosis, 867 (69.9%) had any SA, and 358 (28.9%) had any DP. Two years post-diagnosis, 805 patients remained in the analysis, and 515 (64.0%) had any SA, and 277 (34.4%) had any DP (Table 2 and Figure 1).

TABLE 1 Demographic and clinical characteristics of 1,240 female patients with a new diagnosis of metastatic breast cancer (mBC), Stockholm-Gotland healthcare region, Sweden, January 1997 through December 2011

Characteristics	Patients n (%)
Total patients	1,240 (100.0)
Age at mBC diagnosis, *years*	
<45	247 (19.9)
45–55	522 (42.1)
>55	471 (38.0)
Calendar year of mBC diagnosis	
1997–2000	387 (31.2)
2001–2004	416 (33.6)
2005–2008	304 (24.5)
2009–2012	133 (10.7)
Site of first distant metastasis	
Bone only	416 (33.5)
Visceral non-brain only	434 (35.1)
Brain only	74 (6.0)
Non-visceral only	73 (5.9)
Undetermined[a]	243 (19.6)
Total first distant metastasis sites	
1	758 (61.2)
2	223 (18.0)
3	66 (5.3)
4	21 (1.7)
Undetermined[b]	172 (13.9)
Type of metastasis	
Synchronous[c]	109 (8.8)
Metachronous[d]	1,131 (91.2)
Marital status	
Married/cohabiting	632 (51.9)
Not married/cohabiting	585 (47.2)
Data missing	23 (1.9)
Sickness absence (SA) in year before mBC diagnosis	
None	546 (44.0)
Any	694 (56.0)
Disability pension (DP) in year before mBC diagnosis	
None	932 (75.2)
Any	308 (24.8)

[a]Because of multifocality, the first site could not be determined.
[b]Because of multifocality, the number of sites could not be determined.
[c]Synchronous mBC defined as the development of mBC within 6 months after a primary breast cancer diagnosis.
[d]Metachronous mBC defined as the development of mBC more than 6 months after a primary breast cancer diagnosis.

During the first year after mBC diagnosis, 435 (35.1%) of the 1,240 patients analysed died.

During the second year after mBC diagnosis, 218 (27.0%) of the 805 patients analysed died (Table 3 and Figure 2).

3.3 | Factors associated with long-term sickness benefits

In the first year after mBC diagnosis, patients had significantly lower odds of using long-term sickness benefits who had brain-only metastasis (AOR 0.37, 95% CI 0.19–0.72) as compared to non-visceral metastasis (Table 4). Patients had significantly higher odds of using long-term sickness benefits who had SA more than 180 net days or any DP (AOR 3.82, 95% CI 2.91–5.02), compared to those who had SA 180 or less net days and no DP, during the year before mBC diagnosis.

In the second year after mBC diagnosis, patients had significantly higher odds of using long-term sickness benefits who were diagnosed with mBC from 1997 to 2000 (AOR 1.84, 95% CI 1.10–3.08) compared to those diagnosed from 2009 to 2012; had SA more than 180 net days or any DP during the year before the mBC diagnosis (AOR 4.31, 95% CI 2.96–6.29) compared to those who had SA 180 or less net days and no DP and had SA more than 180 net days or any DP during the first year after diagnosis (AOR 22.10, 95% CI 14.33–34.22) compared to those who had SA 180 or less net days and no DP (Table 5).

3.4 | Comparisons to reference populations

The prevalence of SA was 11.3% and of DP was 19.6% in the matched Swedish reference population without breast cancer (Table 6). In the PBC reference population, the prevalence change from the first to fifth years after diagnosis was 71.4% to 19.0% for SA and 20.8% to 23.4% for DP (Table 6).

4 | DISCUSSION

To our knowledge, this large, population-based Swedish cohort study is one of the more extensive published reports describing the prevalence of sickness benefits (SA and DP) used by patients with mBC, and it may be the first such study to assess whether patient- and disease-related factors, including calendar year of mBC diagnosis and mBC tumour burden (sites and numbers of metastases), influence the utilisation of long-term sickness benefits after an mBC diagnosis.

We compared patients in our study population 1 and 2 years after mBC diagnosis. During the first year after mBC diagnosis, the prevalence of SA was 69.9%, and of DP was 28.9%, whereas during the second year, the prevalence of SA decreased to 64.0% and of DP increased to 34.4%. We used a previously published nationwide Swedish cohort study conducted over approximately the same period to provide reference populations including both female patients with PBC and a matched population without malignancy to allow comparison of our outcomes (Kvillemo et al., 2017). We compared our cohort with the PBC reference population, during a time when both had only localised BC. During the year before mBC diagnosis in our cohort, the prevalence of SA was 56.0% and of DP was 24.8%, whereas in the

TABLE 2 Sickness absence (SA) and disability pension (DP) used by female patients with metastatic breast cancer (mBC), during the year before diagnosis and 1 and 2 years after diagnosis, Stockholm-Gotland healthcare region, Sweden, January 1997 through December 2011

	Net days[a] n	Time relative to diagnosis of metastatic disease		
		Year before[b] n (%)	Year after[c] n (%)	2 years after[d,e] n (%)
Population alive		1,240 (100.0)	1,240 (100.0)	805 (100.0)
Sickness absence (SA)	0	546 (44.0)	373 (30.1)	290 (36.0)
	1–30	154 (12.4)	64 (5.2)	32 (4.0)
	31–90	130 (10.5)	98 (7.9)	74 (9.2)
	91–180	126 (10.2)	138 (11.1)	75 (9.3)
	>180	284 (22.9)	567 (45.7)	334 (41.5)
Disability pension (DP)	0	932 (75.2)	882 (71.1)	528 (65.6)
	>0	308 (24.8)	358 (28.9)	277 (34.4)

[a]Net days calculated by multiplying level of SA or DP benefits used (i.e., 25%, 50%, 75% or 100%) by number of days in year that benefits used.

[b]During the year before mBC diagnosis, of the 546 patients who had no SA, 204 (37.4%) had DP; of the 410 patients who had SA between 1 and 180 net days, 60 (14.6%) had DP and of the 284 patients who had SA more than 180 net days, 44 (15.5%) had DP. Of the 308 patients who had any DP, 204 (66.2%) had no SA, 60 (19.5%) had SA between 1 and 180 net days and 44 (14.3%) had SA more than 180 net days.

[c]During the first year after mBC diagnosis, of the 373 patients who had no SA, 245 (65.7%) had DP; of the 300 patients who had SA between 1 and 180 net days, 41 (13.7%) had DP and of the 567 patients who had SA more than 180 net days, 72 (12.7%) had DP. In addition, of the 358 patients who had any DP, 245 (68.4%) had no SA, 41 (11.5%) had SA between 1 and 180 net days SA and 44 (20.1%) had SA more than 180 net days.

[d]Total of 435 patients excluded from analysis in year 2 because they died in the previous year.

[e]During this second year after mBC diagnosis, of the 290 patients who had no SA, 185 (63.8%) had DP; of the 181 patients who had SA between 1 and 180 net days, 55 (30.4%) had DP and of the 334 patients who had more than 180 net days SA, 37 (11.1%) had DP. In addition, of the 277 patients who had DP, 185 (66.8%) had no SA, 55 (19.9%) had SA between 1 and 180 net days SA and 37 (13.3%) had SA more than 180 net days.
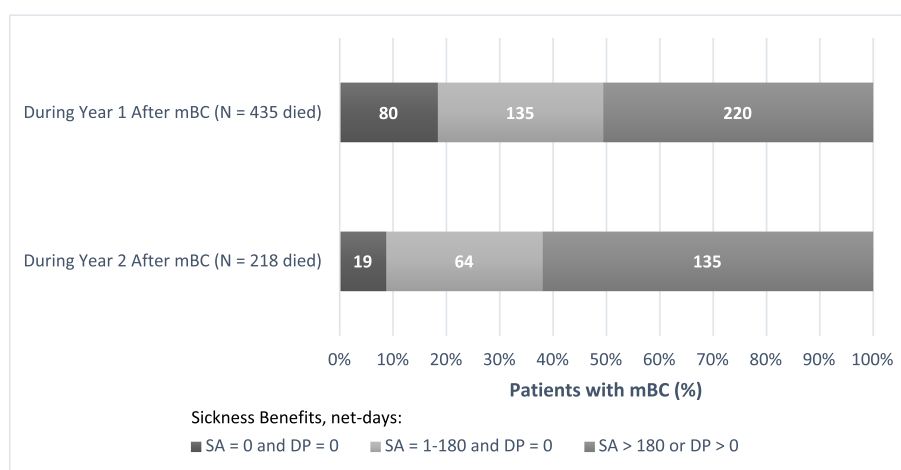
FIGURE 1 Distribution of sickness benefits used by 1,240 female patients during the year before and the first and second years after diagnosis of metastatic breast cancer (mBC), Stockholm-Gotland healthcare region, Sweden, January 1997 through December 2011. Net days calculated by multiplying level of sickness absence (SA) or disability pension (DP) benefits used (i.e., 25%, 50%, 75% or 100%) by number of days in year that benefits used. Of patients still alive, long-term sickness benefits (i.e., >80 net days SA or any DP) were used during the first year before mBC diagnosis by 548 (44.2%) patients, during the first year after mBC diagnosis by 853 (68.8%) patients and during the second year after mBC diagnosis by 574 (71.3%) patients
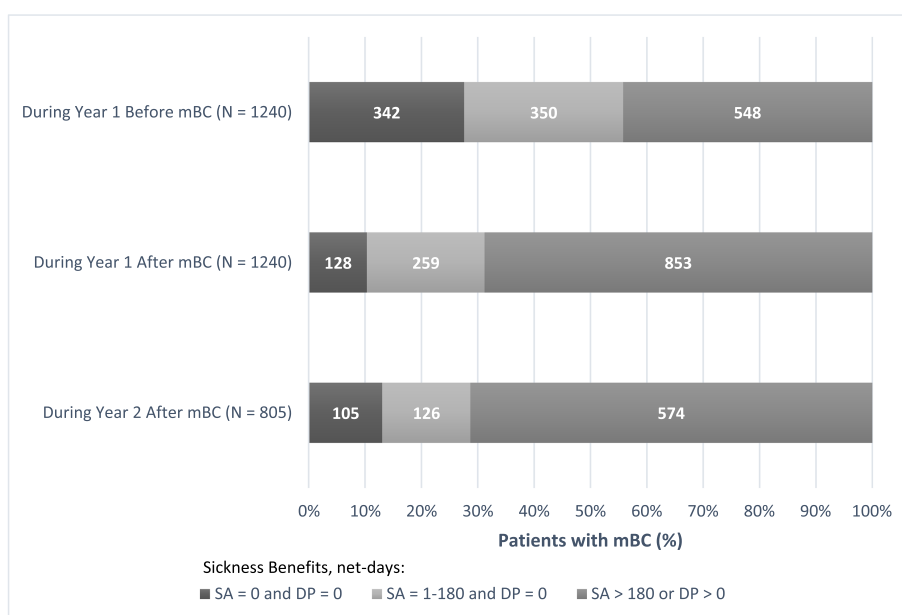
TABLE 3 Distribution of sickness benefits used by 1,240 female patients during the 2 years after diagnosis of metastatic breast cancer (mBC), by whether alive or deceased, Stockholm-Gotland healthcare region, Sweden, January 1997 through December 2011

| | Time relative to diagnosis of metastatic disease | | | | | |
| | During year one after diagnosis | | | During year two after diagnosis | | |
Sickness benefits, net days[a]	Total n (%)	Alive n (%)	Deceased n (%)	Total n (%)	Alive n (%)	Deceased n (%)
Total population	1,240 (100)	805 (100)	435 (100)	805 (100)	587 (100)	218 (100)
SA = 0 and DP = 0	128 (10.3)	48 (6.0)	80 (18.4)	105 (13.0)	86 (14.7)	19 (8.7)
SA = 1–180 and DP = 0	259 (20.9)	124 (15.4)	135 (31.0)	126 (15.7)	62 (10.6)	64 (29.4)
SA > 180 or DP > 0	853 (68.8)	633 (78.6)	220 (50.6)	574 (71.3)	439 (74.7)	135 (61.9)

[a]Net days calculated by multiplying level of sickness absence (SA) or disability pension (DP) benefits used (i.e., 25%, 50%, 75% or 100%) by number of days in year that benefits used.

FIGURE 2 Distribution of sickness benefits used by female patients who died during the first or second year after diagnosis of metastatic breast cancer (mBC), Stockholm-Gotland healthcare region, Sweden, January 1997 through December 2011. Net days calculated by multiplying level of sickness absence (SA) or disability pension (DP) benefits used (i.e., 25%, 50%, 75%, or 100%) by number of days in year that benefits used. Long-term sickness benefits (i.e., > 180 net days SA or any DP) were used during the first year after mBC diagnosis by 220 (50.6%) of the 435 patients who died that same year, and during the second year after mBC diagnosis by 135 (61.9%) of the 218 patients who died that same year

PBC reference population 5 years after diagnosis, the prevalence of SA was 19.0% and of DP was 23.4%.

We also observed that the changes in the prevalence of SA and DP after an mBC diagnosis differed from those occurring in a reference population after a PBC diagnosis: SA and DP in patients with mBC decreased 5.9% and increased 5.8%, respectively, from the first to second years after diagnosis, whereas they decreased 52.4% and increased 2.6%, respectively, from the first to fifth years after PBC diagnosis.

The use of long-term sickness benefits before mBC diagnosis was predictive of future use of those benefits. Specifically, patients using long-term sickness benefits during the year before mBC diagnosis had 3.8 and 4.3 times higher odds of using those benefits during both the first and second years after the diagnosis, respectively. In addition, those using long-term sickness benefits in the first year after diagnosis

had 22.1 times higher odds of doing the same in the second year after diagnosis.

On a related note, we observed that the proportion of patients in our study using long-term sickness benefits were initially high at 44% in the year before mBC diagnosis and then increased further to 69% in the first year and 71% in the second year after diagnosis. Similarly, the proportion of patients using DP started high and increased each year. These results support the findings of others that the use of SA may be a strong predictor of an escalating prevalence in the use of DP (Salonen et al., 2018, 2020; Vaalavuo, 2021).

Possible explanations for the high prevalence of use of long-term sickness benefits in the year before mBC diagnosis include the presence of comorbidities and the onset of prodromal illness just prior to the discovery of advanced cancer; indeed, the frequent use of SA has been shown to be a proxy for both of these (Gernaat et al., 2020;

TABLE 4 Odds ratios of receiving long-term sickness benefits[a] during the first year after the diagnosis of metastatic breast cancer (mBC), by patient- and disease-related factors, in 1,240 female patients, Stockholm-Gotland healthcare region, Sweden, January 1997 through December 2011

Factors	Patients receiving long-term sickness benefits[a]/all patients n/n (%)	Crude odds ratio (95% CI)	Adjusted odds ratio[b] (95% CI)
Age at mBC diagnosis, years			
<45	173/247 (70.0)	1.05 (0.75–1.47)	1.07 (0.76–1.50)
45–55	355/522 (68.0)	0.96 (0.73–1.25)	(0.73–1.25)
<55	325/471 (69.0)	1	1
Calendar year of mBC diagnosis			
1997–2000	271/387 (70.0)	1.12 (0.74–1.69)	1.12 (0.74–1.69)
2001–2004	265/416 (63.7)	1.30 (0.86–1.97)	1.31 (0.87–1.98)
2005–2008	214/304 (70.3)	1.30 (0.84–2.00)	1.30 (0.84–2.01)
2009–2012	86/133 (64.6)	1	1
Site of first distant metastasis			
Bone only	310/416 (74.5)	1.26 (0.73–2.18)	1.25 (0.73–2.17)
Visceral non-brain	297/434 (68.4)	0.94 (0.55–1.60)	0.93 (0.54–1.60)
Brain only	34/74 (45.9)	**0.37 (0.19–0.72)**	**0.37 (0.19–0.72)**
Non-visceral	51/73 (69.8)	1	1
Undetermined[c]	161/243 (66.2)	0.85 (0.48–1.49)	0.84 (0.48–1.48)
Type of metastasis			
Synchronous[d]	80/109 (73.3)	1	1
Metachronous[e]	773/1131 (68.3)	0.78 (0.50–1.22)	0.79 (0.51–1.24)
Sickness benefits during year before mBC diagnosis, net days[f]			
SA ≤ 180 and DP = 0	397/692 (57.4)	1	1
SA > 180 or DP > 0	456/548 (83.2)	**3.68 (2.81–4.82)**	**3.82 (2.91–5.02)**

Note: Statistically significant results appear in bold font.

Abbreviation: CI, confidence interval.

[a]Long-term sickness benefits defined as sickness absence (SA) more than 180 net days or any disability pension (DP) during the year.

[b]Adjusted odds ratios (AOR) calculated by adjusting crude odds ratios (OR) for age and calendar year of mBC diagnosis and for net days of SA and DP during the year before mBC diagnosis, all as continuous variables.

[c]Because of multifocality, the first site could not be determined.

[d]Synchronous mBC defined as the development of mBC within 6 months after a primary breast cancer diagnosis.

[e]Metachronous mBC defined as the development of mBC more than 6 months after a primary breast cancer diagnosis.

[f]Net days calculated by multiplying level of SA or DP benefits used (i.e., 25%, 50%, 75% or 100%) by number of days in year that benefits used.

Hauglann et al., 2014; Kvillemo et al., 2017; Plym et al., 2019; Sjövall et al., 2012). Another potential explanation for this high prevalence could be the sequelae of the treatment of eBC. However, this seems less likely, as another Swedish study has shown that the use of sickness benefits begins to approach that of the normal population within 3 years after the diagnosis and treatment of eBC (Kvillemo et al., 2017).

With the evidence from our study of the high prevalence of the use of SA, DP and long-term sickness benefits in patients with mBC, we highlight the medical burdens of mBC. Yet, particularly in a country with a robust social security system, there are also non-medical burdens. Many women either experience a drop in their earnings or lose their foothold in the labour market as a result of BC (Salonen et al., 2018, 2020; Vaalavuo, 2021). In addition, both treatment and progression are associated with a low likelihood of women with BC returning to work (Cardoso et al., 2016; Corneliussen-James, 2011; Islam et al., 2014; Mayer & Grober, 2021), and the burdens of metastatic disease and adverse effects of its treatment often limit functional abilities and work participation (Bergman & Sörenson, 1987; Bouknight et al., 2006; Buckwalter et al., 2007; Hauglann et al., 2014; Sjövall et al., 2012).

Furthermore, the evidence from our study that the past use of long-term sickness benefits predicts the future use of long-term sickness benefits in patients with mBC underscores the importance of clinicians identifying and focusing on this subgroup of patients with mBC, to better address their medical needs and to help encourage employers to provide more workplace support. Improved workplace flexibility and accommodations for these patients could lead to earlier

TABLE 5 Odds ratios of receiving long-term sickness benefits[a] during the second year after the diagnosis of metastatic breast cancer (mBC), by patient- and disease-related factors, in 1,240 female patients, Stockholm-Gotland healthcare region, Sweden, January 1997 through December 2011

Factors	Patients receiving long-term sickness benefits[a]/all patients n/n (%)	Crude odds ratio (95% CI)	Adjusted odds ratio[b] (95% CI)
Age at mBC diagnosis, years			
<45	53/174 (30.4)	0.96 (0.63–1.44)	0.90 (0.59–1.37)
45–55	96/353 (27.2)	1.12 (0.79–1.59)	1.08 (0.76–1.54)
>55	82/278 (29.5)	1	1
Calendar year of mBC diagnosis			
1997–2000	62/244 (25.4)	**1.78 (1.07–2.98)**	**1.84 (1.10–3.08)**
2001–2004	70/257 (27.2)	1.62 (0.98–2.69)	1.61 (0.96–2.67)
2005–2008	65/214 (30.4)	1.39 (0.83–2.33)	1.41 (0.84–2.38)
2009–2012	34/90 (37.8)	1	1
Site of first distant metastasis			
Bone only	82/331 (24.8)	1.52 (0.82–2.82)	1.53 (0.82–2.85)
Visceral non-brain	67/242 (27.7)	1.31 (0.69–2.46)	1.31 (0.69–2.47)
Brain only	8/17 (47.1)	0.56 (0.19–1.70)	0.53 (0.17–1.61)
Non-visceral	18/54 (33.3)	1	1
Undetermined[c]	56/161 (34.8)	0.94 (0.49–1.80)	0.94 (0.48–1.82)
Type of metastasis			
Synchronous[d]	25/83 (30.1)	1	1
Metachronous[e]	206/722 (28.5)	1.08 (0.66–1.77)	0.98 (0.59–1.63)
Sickness benefits during year before mBC diagnosis, net days[f]			
SA ≤ 180 and DP = 0	187/490 (38.2)	1	1
SA > 180 or DP > 0	44/315 (14.0)	**3.80 (2.63–5.49)**	**4.31 (2.96–6.29)**
Sickness benefits during first year after mBC diagnosis, net days[f]			
SA ≤ 180 and DP = 0	136/172 (79.1)	1	1
SA > 180 or DP > 0	95/633 (15.0)	**21.40 (13.96–32.80)**	**22.10 (14.33–34.22)**

Note: Statistically significant results appear in bold font.

Abbreviation: CI, confidence interval.

[a]Long-term sickness benefits defined as sickness absence (SA) more than 180 net days or any disability pension (DP) during the year.

[b]Adjusted odds ratios (AOR) calculated by adjusting crude odds ratios (OR) for age and calendar year of mBC diagnosis and for net days of SA and DP during the year before mBC diagnosis, all as continuous variables.

[c]Because of multifocality, the first site could not be determined.

[d]Synchronous mBC defined as the development of mBC within 6 months after a primary breast cancer diagnosis.

[e]Metachronous mBC defined as the development of mBC more than 6 months after a primary breast cancer diagnosis.

[f]Net days calculated by multiplying level of SA or DP benefits used (i.e., 25%, 50%, 75% or 100%) by number of days in year that benefits used.

or smoother returns to the labour market, improved earnings and enhanced quality of life. Related to this, it may be helpful in the future to study patients with mBC and a longer than median survival, to determine which other factors might influence the ability to work in this population.

Finally, patients who had mBC diagnosed in the earliest calendar cohort (1997 to 2000) had significantly higher odds of using long-term sickness benefits during the second year after diagnosis. A likely explanation for this is that better treatment options since 2003 have decreased disease progression and adverse effects, resulting in gradual improvements in survival rates and treatment tolerance over the last two decades (O'Shaughnessy, 2005).

4.1 | Strengths and limitations

The study has strong internal validity because of the use of data from high-quality patient registers, the low dropout rate, the relatively high rates of employment in females and the complete coverage of sickness benefits by insurance in Sweden (Lundh et al., 2014; Sjövall et al., 2012). In addition, the diagnoses used for SA in Swedish registers have been shown to be highly accurate when compared with the diagnoses listed in medical records (Ludvigsson et al., 2016). These strengths suggest that our findings can be generalised to patients who have been diagnosed with mBC and who live in countries with comparable female employment rates and sickness benefits.

TABLE 6 Sickness absence (SA) and disability pension (DP) used by female patients with breast cancer in Sweden, comparing the results of a reference study (Kvillemo et al., 2017) to the current study

	Net days[a] n	Time relative to diagnosis					
		Reference Study (Kvillemo et al., 2017) Primary Breast Cancer (PBC)			Current study metastatic breast Cancer (mBC)		
		During first year after PBC n (%)	During fifth year after PBC[b] n (%)	Matched cohort (no PBC)[c] n (%)	During year before mBC n (%)	During first year after mBC n (%)	During second year after mBC[d] n (%)
Population alive		3,547 (100)	2,641 (100)	11,266 (100)	1,240 (100)	1,240 (100)	805 (100)
Sickness absence (SA)	0	1,015 (28.6)	2,138 (81.0)	9,989 (88.7)	546 (44.0)	373 (30.1)	290 (36.0)
	1–30	360 (10.1)	219 (8.3)	647 (5.7)	154 (12.4)	64 (5.2)	32 (4.0)
	31–90	484 (13.6)	109 (4.1)	301 (2.7)	130 (10.5)	98 (7.9)	74 (9.2)
	91–180	410 (11.6)	76 (2.9)	189 (1.7)	126 (10.2)	138 (11.1)	75 (9.3)
	>180	1,278 (36.0)	99 (3.7)	140 (1.2)	284 (22.9)	567 (45.7)	334 (41.5)
Disability pension (DP)	0	2,810 (79.2)	2,024 (76.6)	9,060 (80.4)	932 (75.2)	882 (71.1)	526 (65.3)
	>0	737 (20.8)	617 (23.4)	2,206 (19.6)	308 (24.8)	358 (28.9)	279 (34.7)

[a]Net days calculated by multiplying level of SA or DP benefits used (i.e., 25%, 50%, 75% or 100%) by number of days in year that benefits used.
[b]Diagnosed with primary breast cancer (PBC) in 2005 (Kvillemo et al., 2017).
[c]Matched comparison cohort of 4 controls, all with no record of previous or subsequent breast cancer between 1958 and 2010, for each woman with breast cancer, randomly selected from the Longitudinal Integration Database for Health Insurance and Labor Market Studies; cohort living in Sweden in 2004 and alive at exact date in 2005 of diagnosis of matched woman with primary breast cancer (PBC); cohort also matched with study population for age, educational level, type of living area, and birth region in 2004 (Kvillemo et al., 2017).
[d]Total of 435 patients excluded from analysis in Year 2 because they died in the previous year.

The study has several limitations. First, we did not have data regarding socioeconomic status (SES), earnings or specific comorbidities to use in our analysis of factors potentially influencing the use of long-term sickness benefits. Indeed, a future study looking at these factors as well as employment status, BC subtypes and eBC treatment types would provide a more complete understanding of whether any of these other factors impact the use of sickness benefits by patients with mBC. Second, we were unable to include as outcomes the specific financial costs and loss of productivity associated with mBC diagnosis. A future investigation that includes these as outcome measures would be valuable. Third, the reference groups that we used for comparison may not have been an ideal match for our population. For example, given that our patients all eventually developed mBC, most may have had more aggressive forms of eBC than those in the PBC reference group. As another example, we did not have data on the adjuvant therapy for PBC received by the patients in the reference group, and it is possible that the types of adjuvant therapy received may have differed between the two populations.

4.2 | Conclusions

Many women in Sweden with mBC used long-term sickness benefits during the year before their diagnosis. The use of long-term sickness benefits prior to mBC diagnosis was a significant predictor of the use of these benefits during the years after diagnosis, which underscores the importance of clinicians identifying and focusing on this subgroup of patients with mBC, to better address their medical needs and to help encourage employers to provide more workplace support. We plan a future study of patients with mBC and a longer than median survival, to determine which patient- and tumour-related factors might influence not only the use of sickness benefits, but also the ability to work in this population.

CONFLICT OF INTEREST

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ORCID
Aina Johnsson https://orcid.org/0000-0001-6722-0540
Elham Hedayati https://orcid.org/0000-0003-1352-4332

REFERENCES

Bergman, B., & Sörenson, S. (1987). Return to work among patients with small cell lung cancer. *European Journal of Respiratory Diseases*, 70(1), 49–53.

Blinder, V. S., & Gany, F. M. (2019). Impact of cancer on employment. *Journal of Clinical Oncology*, 38(4), 302–309. https://doi.org/10.1200/jco.19.01856

Bouknight, R. R., Bradley, C. J., & Luo, Z. (2006). Correlates of return to work for breast cancer survivors. *Journal of Clinical Oncology*, 24(3), 345–353. https://doi.org/10.1200/jco.2004.00.4929

Buckwalter, A. E., Karnell, L. H., Smith, R. B., Christensen, A. J., & Funk, G. F. (2007). Patient-reported factors associated with discontinuing employment following head and neck cancer treatment. *Archives of Otolaryngology – Head & Neck Surgery*, 133(5), 464–470. https://doi.org/10.1001/archotol.133.5.464

Cardoso, F., Harbeck, N., Mertz, S., & Fenech, D. (2016). Evolving psychosocial, emotional, functional, and support needs of women with advanced breast cancer: Results from the count us, know us, Join us and Here & Now Surveys. *The Breast*, 28, 5–12. https://doi.org/10.1016/j.breast.2016.04.004

Cardoso, F., Spence, D., Mertz, S., Corneliussen-James, D., Sabelko, K., Gralow, J., Cardoso, M.-J., Peccatori, F., Paonessa, D., Benares, A., Sakurai, N., Beishon, M., Barker, S.-J., & Mayer, M. (2018). Global analysis of advanced/metastatic breast cancer: Decade report (2005-2015). *Breast (Edinburgh, Scotland)*, 39, 131–138. https://doi.org/10.1016/j.breast.2018.03.002

Caswell-Jin, J. L., Plevritis, S. K., Tian, L., Cadham, C. J., Xu, C., Stout, N. K., Sledge, G. W., Mandelblat, J. S., & Kurian, A. W. (2018). Change in survival in metastatic breast cancer with treatment advances: Meta-analysis and systematic review. *JNCI cancer Spectrum*, 2(4), pky062. https://doi.org/10.1093/jncics/pky062

Corneliussen-James, C. J. (2011). International survey identifies key support and lifestyle needs of metastatic breast cancer (MBC) patients. *Breast (Edinburgh)*, 20(suppl 4), S53. https://doi.org/10.1016/j.breast.2011.08.120

Deluche, E., Antoine, A., Bachelot, T., Lardy-Cleaud, A., Dieras, V., Brain, E., Debled, M., Jacot, W., Mouret-Reynier, M. A., Goncalves, A., Dalenc, F., Patsouris, A., Ferrero, J. M., Levy, C., Lorgis, V., Vanlemmens, L., Lefeuvre-Plesse, C., Mathoulin-Pelissier, S., Petit, T., ... Delaloge, S. (2020). Contemporary outcomes of metastatic breast cancer among 22,000 women from the multicentre ESME cohort 2008-2016. *European Journal of Cancer*, 129, 60–70. https://doi.org/10.1016/j.ejca.2020.01.016

EBCTCG (Early Breast Cancer Trialists' Collaborative Group). (2018). Long-term outcomes for neoadjuvant versus adjuvant chemotherapy in early breast cancer: meta-analysis of individual patient data from ten randomised trials. *Lancet Oncology*, 19(1), 27–39. https://doi.org/10.1016/s14702045(17)30777-5

Ferlay, J., Colombet, M., Soerjomataram, I., Parkin, D. M., Piñeros, M., Znaor, A., & Bray, F. (2021). Cancer statistics for the year 2020: An overview. *International Journal of Cancer*, 149(4), 778–789. https://doi.org/10.1002/ijc.33588

Gernaat, S. A. M., Johnsson, A., Altena, R., Wilking, U., & Hedayati, E. (2020). Sickness absence and disability pension among swedish women prior to breast cancer relapse with a special focus on the roles of treatment and comorbidity. *European Journal of Cancer Care*, 30(1), e13353. https://doi.org/10.1111/ecc.13353

Glare, P. A., Nikolova, T., Alickaj, A., Patil, S., & Blinder, V. (2017). Work experiences of patients receiving palliative care at a Comprehensive Cancer Center: Exploratory analysis. *Journal of Palliative Medicine*, 20(7), 770–773. https://doi.org/10.1089/jpm.2016.0478

Hauglann, B. K., Šaltytė Benth, J., Fosså, S. D., Tveit, K. M., & Dahl, A. A. (2014). A controlled cohort study of sickness absence and disability pension in colorectal cancer survivors. *Acta Oncologica*, 53(6), 735–743. https://doi.org/10.3109/0284186X.2013.844354

Islam, T., Dahlui, M., Majid, H. A., Nahar, A. M., Mohd Taib, N. A., & Su, T. T. (2014). Factors associated with return to work of breast cancer survivors: A systematic review. *BMC Public Health*, 14(Suppl 3), S8. https://doi.org/10.1186/1471-2458-14-S3-S8

Kvillemo, P., Mittendorfer-Rutz, E., Branstrom, R., Nilsson, K., & Alexanderson, K. (2017). Sickness absence and disability pension after breast cancer diagnosis: A 5-year nationwide cohort study. *Journal of Clinical Oncology*, 35(18), 2044–2052. https://doi.org/10.1200/jco.2015.66.0613

Ludvigsson, J. F., Almqvist, C., Bonamy, A. K., Ljung, R., Michaelsson, K., Neovius, M., & Ye, W. (2016). Registers of the Swedish total population and their use in medical research. *European Journal of Epidemiology*, 31(2), 125–136. https://doi.org/10.1007/s10654-016-0117-y

Lundh, M. H., Lampic, C., Nordin, K., Ahlgren, J., Bergkvist, L., Lambe, M., & Johansson, B. (2014). Sickness absence and disability pension following breast cancer - a population-based matched cohort study. *Breast*, 23(6), 844–851. https://doi.org/10.1016/j.breast.2014.09.007

Mayer, M., & Grober, S. (2021). Silent voices: Women with advanced (metastatic) breast cancer share their needs and preferences for information, support and practical resources. LBBC Research, May 9, 2014. Retrieved from https://www.lbbc.org/news-opinion/silent-voices-women-advanced-metastatic-breast-cancer-share-their-needs-and-preferences

Ministry of Health and Social Affairs [Socialdepartementet], Sweden. (2021). Social Insurance Code [Socialförsäkringsbalk] SFS 2010:110. Retrieved from https://www.government.se/government-policy/social-insurance/

O'Shaughnessy, J. (2005). Extending survival with chemotherapy in metastatic breast cancer. *The Oncologist*, 10(S3), 20–29. https://doi.org/10.1634/theoncologist.10-90003-20

Plym, A., Johansson, A. L. V., Bower, H., Voss, M., Holmberg, L., Fredriksson, I., & Lambe, M. (2019). Causes of sick leave, disability pension, and death following a breast cancer diagnosis in women of working age. *The Breast*, 45, 48–55. https://doi.org/10.1016/j.breast.2019.02.012

SALAR (Swedish Association of Local Authorities and Regions). (2021). National Quality Registry [Nationella Kvalitetsregister] for Breast Cancer 2020. Retrieved from https://skr.se/en/kvalitetsregister/hittaregister/registerarkiv/brostcancer.44178.html

Salonen, L., Blomgren, J., & Laaksonen, M. (2020). From long-term sickness absence to disability retirement: Diagnostic and occupational class differences within the working-age Finnish population. *BMC Public Health*, 20(1), 1–11. https://doi.org/10.1186/s12889-020-09158-7

Salonen, L., Blomgren, J., Laaksonen, M., & Niemelä, M. (2018). Sickness absence as a predictor of disability retirement in different occupational classes: A register-based study of a working-age cohort in Finland in 2007-2014. *BMJ Open*, 8(5), e020491. https://doi.org/10.1136/bmjopen-2017-020491

Samuel, C. A., Spencer, J. C., Rosenstein, D. L., Reeder-Hayes, K. E., Manning, M. L., Sellers, J. B., & Wheeler, S. B. (2020). Racial differences in employment and cost-management behaviors in patients with metastatic breast cancer. *Breast Cancer Research and Treatment*, 179(1), 207–215. https://doi.org/10.1007/s10549-019-05449-9

Sjövall, K., Attner, B., Englund, M., Lithman, T., Noreen, D., Gunnars, B., Thomé, B., Olsson, H., & Petersson, I. F. (2012). Sickness absence among cancer patients in the pre-diagnostic and the post-diagnostic phases of five common forms of cancer. *Supportive Care in Cancer*, 20(4), 741–747. https://doi.org/10.1007/s00520-011-1142-8

Stergiou-Kita, M., Grigorovich, A., Tseung, V., Milosevic, E., Hebert, D., Phan, S., & Jones, J. (2014). Qualitative meta-synthesis of survivors' work experiences and the development of strategies to facilitate return to work. *Journal of Cancer Survivorship*, 8(4), 657–670. https://doi.org/10.1007/s11764-014-0377-z

Sundquist, M., Brudin, L., & Tejler, G. (2017). Improved survival in metastatic breast cancer 1985–2016. *The Breast*, 31, 46–50. https://doi.org/10.1016/j.breast.2016.10.005

Swedish Social Insurance Agency [Försäkringskassan]. (2021). Statistics and analysis. Statistics in the field of illness. Retrieved from https://www.forsakringskassan.se/statistik/sjuk/sjukpenning-rehabiliteringspenning

Tamminga, S. J., de Boer, A. G., Bos, M. M., Fons, G., Kitzen, J. J., Plaisier, P. W., Verbeek, J. H., & Frings-Dresen, M. H. (2012). A hospital-based work support intervention to enhance the return to work of cancer patients: A process evaluation. *Journal of Occupational Rehabilitation*, 22(4), 565–578. https://doi.org/10.1007/s10926-012-9372-2

Tevaarwerk, A. J., Lee, J.-W., Terhaar, A., Sesto, M. E., Smith, M. L., Cleeland, C. S., & Fisch, M. J. (2016). Working after a metastatic cancer diagnosis: Factors affecting employment in the metastatic setting from ECOG-ACRIN's symptom outcomes and practice patterns study: Working after a metastatic diagnosis. *Cancer*, 122(3), 438–446. https://doi.org/10.1002/cncr.29656

Vaalavuo, M. (2021). The unequal impact of ill health: Earnings, employment, and mental health among breast cancer survivors in Finland. *Labour Economics*, 69, 101967. https://doi.org/10.1016/j.labeco.2021.101967

Vila, M. M., Barco Berron, S. d., Gil-Gil, M., Ochoa-Arnedo, C., & Vázquez, R. V. (2020). Psychosocial aspects and life project disruption in young women diagnosed with metastatic hormone-sensitive HER2-negative breast cancer. *The Breast*, 53, 44–50. https://doi.org/10.1016/j.breast.2020.06.007

Wan, Y., Gao, X., Mehta, S., Wang, Z., Faria, C., & Schwartzberg, L. (2013). Indirect costs associated with metastatic breast cancer. *Journal of Medical Economics*, 16(10), 1169–1178. https://doi.org/10.3111/13696998.2013.826228

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.