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Residual work capacity and (in)ability to work fulltime among a year cohort of cancer survivors who claim a disability benefit

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Abstract

Purpose Residual work capacity (RWC) and inability to work fulltime (IWF) are important outcomes in disability benefit assessments for workers diagnosed with cancer. The aim of this study is to gain insight into the prevalence of both outcomes, the associations of disease-related and socio-demographic factors and if these differ across cancer diagnosis groups.

Methods A year cohort of anonymized register data of cancer survivors who claim a disability benefit after 2 years of sick leave ($n = 3690$, age 53.3 ± 8.8, 60.4% female) was used. Having no RWC was defined as having no possibilities to perform any work at all, whereas IWF was defined as being able to work less than 8 h per day.

Results The prevalence of being assessed with no RWC was 42.6%. Of the applicants with RWC (57.4%), 69.8% were assessed with IWF. Cancers of the respiratory organs showed the highest odds for having no RWC, whereas lymphoid and haematopoietic cancers showed the highest odds for IWF. Within specific cancer diagnosis groups, different associations were identified for both outcomes.

Conclusion The prevalence of no RWC and IWF in applicants of work disability benefits diagnosed with cancer is high compared to the prevalence in other diagnoses. The odds for no RWC, IWF, and associated factors differ per cancer diagnosis group.

Implications for Cancer Survivors Being diagnosed with cancer has an enormous impact on work (dis)ability. Our results show that 2 years after being diagnosed with cancer, the majority of the disability benefit applicants are assessed with RWC; however, only 15% of all applicants with cancer had a normal ability to work fulltime, and therefore, it is of great importance to accompany them in their return to work.

Keywords Cancer · Disability benefit · Assessment · Long-term work disability

Introduction

In Europe, each year 3.5 million persons are newly diagnosed with cancer [1]. Of these, 40 to 50% are of working age at time of diagnosis [2, 3]. Due to early diagnostic methods and effective treatment strategies, individuals are more likely to survive a cancer diagnosis. As a result, an increasing part of the cancer patients is able to return to work, or to (partly) stay at work during treatment [4]. A systematic literature review by Mehnert shows that about two-thirds of the people diagnosed with cancer return to work at some point after diagnosis [5]. Twelve months after diagnosis, approximately 60% of the working patients had returned to work or stayed at work; 24 months after diagnosis, this percentage increased up to 89% [5].

For people diagnosed with cancer, being able to work is central to their quality of life and is associated with multifaceted psychological, social, and economic benefits. Besides financial necessity, work resumption also re-establishes identity and the former structure of everyday life [6–8]. In cancer patients, it has been found that the disease and its treatment frequently led to health worries and distress, fatigue, cognitive problems, and other

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health problems which can persist for years after treatment [9–13]. Some of these health problems, such as fatigue and pain, are related to all types of cancer. Other health problems such as lymphedema, dyspnea, and depression usually occur with specific types of cancer, like breast and lung cancer, or with specific treatment options (neuropathy as a result of chemotherapy) [14]. These health problems interfere negatively with the ability to work (fulltime) and may result in poor work outcomes, such as prolonged sick leave, job loss, and long-term work disability [9, 10, 15]. Once returned to work, it might cause lower levels of work functioning [16].

A growing number of studies have documented the impact of cancer on employment outcomes [16–20]. These studies included populations of workers during the onset of a sick leave period [21, 22], or after people returned to work [16, 21, 23] or from the first day of sick leave until they applied for a disability benefit [24]. The majority of these study samples consisted of (female) patients with breast cancer, and no comparison between cancer diagnosis groups was made.

In the Netherlands, long-term sick-listed employees may apply for disability benefit to compensate for income loss after 2 years of sick leave. The insurance physician of the Dutch Social Security Institute: the Institute for Employee Benefits Schemes (UWV) assesses the health situation of an applicant and whether the applicant has residual work capacity [25]. When applicants are assessed with no residual work capacity, they have no possibilities to perform in any work at all. If the applicant is assessed with residual work capacity, the insurance physician also assesses the applicant's (in)ability to work fulltime. The assessment of (in) ability to work fulltime is expressed by the number of hours per day and/or per week the applicant is able to work, due to mental, physical, and energetic limitations and restrictions for work. Both residual work capacity and (in)ability to work fulltime are therefore important outcomes of disability assessments. These usually lead to the decision of granting disability benefit yes or no, and determine to a significant extent if an applicant could start with reintegration in work. Also in many other European countries, assessing residual work capacity and inability to work fulltime have become part of current work disability assessments [26, 27].

Up to date, little is known about the prevalence of (no) residual work capacity and the (in)ability to work fulltime among working-age cancer survivors. Our previous study across chronic diseases showed that several socio-demographic characteristics and disease-related factors are associated with inability to work fulltime [28]. Especially in cancer patients, it is of great interest to distinguish between the types of cancer, since the prognosis and treatment strategies of the different types of cancers differ so much [29]. Therefore, for each type of cancer, different socio-demographic characteristics and disease-related factors may be associated with inability to work fulltime.

Within this background, the aim of this study is to gain insight into (1) the prevalence of no residual work capacity, (2) the prevalence and degree of inability to work fulltime in the case of residual work capacity, and (3) the associations of socio-demographic and disease-related factors with no residual work capacity and the inability to work fulltime in a representative sample of applicants for a work disability benefit after 2 years of sick leave, diagnosed with different types of cancers as the primary diagnosis.

Methods

Institutional setting

In the Dutch social security system, workers (employed or receiving unemployment benefit) can apply for a long-term disability benefit after 2 years of sick leave according to the Work and Income Act Netherlands [30]. Incidentally, sick-listed workers suffering from severe diseases and fearing they will not return to work can apply for a full and permanent disability benefit at an earlier stage than 2 years after sick leave. In both cases, insurance physicians assess whether applicants have no residual work capacity if (1) they lose their total work capacity within 3 months, (2) when they have a terminal disease with such a bad life expectancy that they will lose their total work capacity within foreseeable time, (3) they have fluctuating work capacity, (4) they are hospitalized, or (5) they are not self-reliant due to a severe mental disorder or a physical disorder [31]. In that case, the insurance physician can conclude to (permanent or non-permanent) full work disability. If applicants are assessed with residual work capacity, the possible limitations in their mental and physical functioning caused by their disease are indicated as well. This part of the assessment results in a conclusion about their (in)ability to work fulltime, reported as the number of hours one can sustain working activities per day. In these cases, an additional assessment by a labor expert follows to indicate whether the applicants are incentivized to continue in paid (part-time) employment at their current employer or should enroll in a new, more appropriate (part-time) job, according to their residual work capacity.

Design and sample

The study is a cross-sectional register-based cohort study among applicants for a long-term disability benefit according to the Work and Income Act, in the year 2016. Data were derived from the UWV register forms completed by the insurance physicians and labor experts at the time of assessment and anonymized by UWV. For this study, only

applicants whose primary diagnosis was cancer (ICD-10 disease group Neoplasms, containing all cancer diagnoses) were included [32]. Subgroups of specific cancer diagnoses having less than 40 applicants, and other unspecified cancer diagnoses, were excluded from the data analyses. Approval by a Medical Ethical Committee was not necessary under Dutch law, as the study is a register-based study and therefore not subject to the Medical Research Involving Human Subjects Act (WMO).

Outcome variables

Residual work capacity (yes/no) was based on the insurance physicians' assessment. The insurance physician assessed and registered the degree of (in)ability to work fulltime using 1 = at least 8 h per day; 2 = no more than 8 h per day; 3 = no more than roughly 6 h per day; 4 = no more than roughly 4 h per day; and 5 = no more than 2 h per day. Being able to work 8 or more hours per day (categories 1–2) was considered normal ability to work fulltime, all else (categories 3–5) was considered an inability to work fulltime, according to the guideline [33].

Independent variables

Socio-demographic data included gender (male/female), age, and educational level. For educational level, three classes were differentiated based on the highest level of completed education: low (primary school, lower vocational education, lower secondary school), middle (intermediate vocational education, upper secondary school), and high (upper vocational education, university). Educational level is usually registered by the labor expert, and therefore only part of the assessment when an applicant has residual work capacity. As a consequence, educational level is often missing for applicants without residual work capacity, and therefore left out of the analyses on residual work capacity.

Disease-related data included type of cancer and multimorbidity. The type of cancer was determined using the first diagnosis code. Insurance physicians use the Dutch Classification of Occupational Health and Social Insurance (CAS) to categorize diagnoses, derived from the International Statistical Classification of Disease and Related Health Problems (ICD-10) [32]. For generalizability, the primary, secondary, and tertiary (when available) CAS diagnoses were recoded to the 22 chapters of the ICD-10 disease groups. Multimorbidity (yes/no) was defined as having one or more additional diagnosis from a different ICD-10 disease group than cancer.

Statistical methods

First, descriptive statistics were used to gain insight into the number of applicants with a primary diagnosis of cancer and with or without residual work capacity. Differences between applicants with and without residual work capacity were compared using *t*-tests for continuous data and chi^2 tests for categorical and ordinal data. Only specific cancer diagnosis groups including more than 40 applicants were included in the analyses. Second, within the applicants with residual work capacity and complete data on all variables, the prevalence and degree of inability to work fulltime were studied for the total group and for each specific cancer diagnosis group. Third, univariable and multivariable logistic regression analyses were performed to study the association of each socio-demographic variable (age, gender, and educational level) and disease-related variable (cancer group and multimorbidity) with no residual work capacity (yes/no) and the inability to work fulltime (yes/no). Analyses on the ability to work fulltime also included educational level. Fourth, univariable and multivariable logistic regression analyses (adjusted for age, gender, multimorbidity, and educational level for the analyses on inability to work fulltime) were performed to study the association of the specific cancer diagnosis groups with no residual work capacity and inability to work fulltime. Fifth, multivariable logistic regression analyses were performed, stratified to the cancer diagnosis groups including more than 100 applicants (to have enough power), to study the association of each socio-demographic variable (age, gender for no residual work capacity, and additionally educational level for inability to work fulltime) and disease-related variable (multimorbidity) with no residual work capacity and inability to work fulltime within the specific cancer diagnosis groups.

Analyses were performed using IBM SPSS Statistics version 25. For all analyses, a p-level of < 0.05 was considered to indicate statistical significance.

Results

Data from 40,263 applicants for a disability benefit in 2016 were available. The mean age of the sample was 48.7 years, 53.6% women, and 9.3% had cancer as the primary diagnosis (mean age 53.3 years; 60.3% women). After removal of applicants with another primary diagnosis than cancer, and those with specific cancer diagnoses with less than 40 applicants, the dataset included 3690 disability benefit applicants with cancer as a primary diagnosis, of these 6.8% applied for a full and permanent disability benefit at an earlier stage than 2 years after sick leave. An overview of the inclusion flow is presented in Fig. 1.

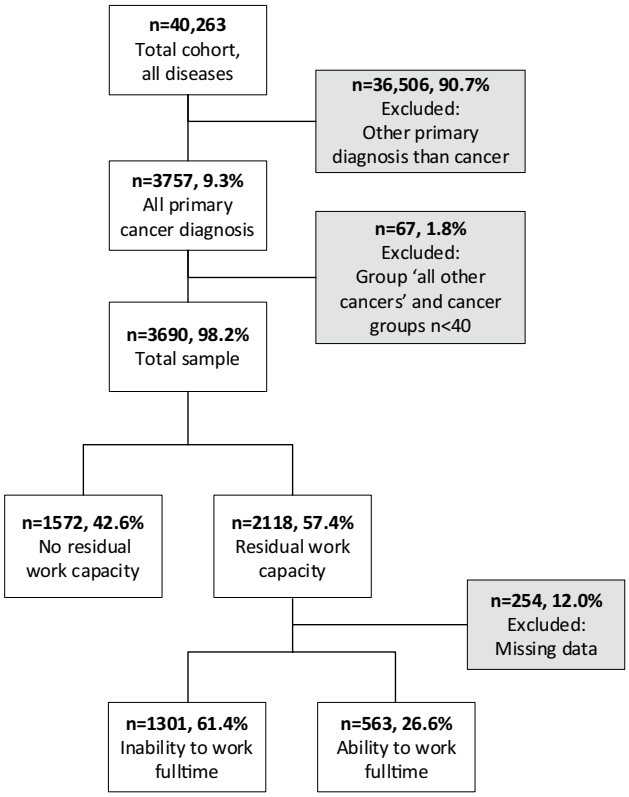

Fig. 1 Overview of the inclusion flow

No residual work capacity

Of the 3690 applicants, 1572 applicants (42.6%) had no residual work capacity (Fig. 1). Applicants without residual work capacity were older, more often male, and had less often multimorbidity than applicants with residual work capacity ($n=2118$, 57.4%). Educational level was difficult to compare due to a high percentage of missing data, especially in the group without residual work capacity. Applicants diagnosed with cancers of digestive organs, respiratory organs, urinary tract, and skin significantly more often had no residual work capacity, while applicants diagnosed with cancers of breast, nervous system, and lymphoid and haematopoietic tissue were more often assessed with residual work capacity (Table 1).

Inability to work fulltime

Of the 2118 applicants with residual work capacity, only 1864 had complete data on all variables (Fig. 1). Of these 1864, 1301 (69.8%) had an inability to work fulltime and 563 (30.2%) was assessed as being able to work fulltime (Fig. 1). Of the applicants with missing data on educational level ($n=254$), the majority (52.8%) had a normal ability to work fulltime, which was higher compared to included applicants with complete data, of which 30.2% had a normal ability to work fulltime ($p<0.001$).

Applicants with an inability to work fulltime were significantly older. Gender, educational level, and multimorbidity did not differ significantly between applicants with an ability and an inability to work fulltime. Of all the cancer groups, only being diagnosed with lymphoid and haematopoietic cancers resulted significantly more often in an inability to work fulltime. Furthermore, applicants diagnosed with cancer of the locomotor system were significantly more often assessed as able to work fulltime. Of the applicants that were assessed with an inability to work fulltime, the majority (58.0%) was considered to be able to work about four hours per day (Table 1).

Socio-demographic and disease-related associations with no residual work capacity and inability to work fulltime

Age, gender and multimorbidity were significantly associated with no residual work capacity in the multivariable analysis, where higher age resulted in higher odds, and female gender and multimorbidity resulted in lower odds for no residual work capacity (OR 1.01, 95%CI 1.01-1.02 for age, OR 0.86, 95%CI 0.75-0.99 for female gender, and OR 0.24, 95%CI 0.20-0.28 for multimorbidity). Age and gender also showed significant associations with the inability to work fulltime in the multivariable analysis, where higher age and female gender resulted in higher odds for inability to work fulltime (OR 1.02, 95%CI 1.01-1.03 for age and OR 1.28, 95%CI 1.04-1.58 for female gender). Educational level and multimorbidity were not significantly associated with inability to work fulltime (Table 2).

Of the specific cancer diagnosis groups, cancers of the digestive organs (OR 1.69, 95%CI 1.42–2.01), respiratory organs (OR 2.22, 95%CI 1.78–2.77), urinary tract (OR 1.40, 95%CI 1.02–1.91), and skin (OR 1.85, 95%CI 1.16–2.96) showed significant higher odds for no residual work capacity in the multivariable logistic regression analyses. Additionally, cancers of the breast, nervous system, and lymphoid, and haematopoietic cancers showed significant lower odds for no residual work capacity (Table 3).

With regard to inability to work fulltime, only lymphoid and haematopoietic cancers showed significant higher odds for the inability to work fulltime (OR 1.89, 95%CI 1.39–2.57), whereas being diagnosed with cancer of the locomotor system resulted in significantly lower odds for being assessed with an inability to work fulltime (OR 0.41, 95%CI 0.18–0.96) (Table 3).

Associations with no residual work capacity and inability to work fulltime within specific cancer diagnosis groups

Within the eight cancer diagnosis groups with $n>100$ (cancers of the breast, digestive organs, lymphoid and

Table 1 Characteristics and differences between disability benefit applicants with cancer regarding residual work capacity and ability to work fulltime

	Total group ($n=3690$) N (%)	No residual work capacity ($N=1572$, 42.6%) N (%)	Residual work capacity ($N=2118$, 57.4%) N (%)	p-value	Total group ($n=1864$) N (%)	Inability to work fulltime ($N=1301$, 69.8%) N (%)	Ability to work fulltime ($N=563$, 30.2%) N (%)	p-value
Age (years) (mean ± sd)	53.3 ± 8.8	53.8 ± 8.7	52.9 ± 9.0	.002	52.8 ± 9.1	53.2 ± 8.9	51.7 ± 9.5	.001
Female gender	2230 (60.4%)	900 (57.3%)	1330 (62.8%)	.001	1178 (63.2%)	839 (64.5%)	339 (60.2%)	.079
Educational level [a]				.002				.224
Low	845 (41.8%)	87 (55.4%)	758 (40.7%)		758 (40.7%)	520 (40.0%)	238 (42.3%)	
Middle	746 (36.9%)	44 (28.0%)	702 (37.7%)		702 (37.7%)	485 (37.3%)	217 (38.5%)	
High	430 (21.3%)	26 (16.6%)	404 (21.7%)		404 (21.7%)	296 (22.8%)	108 (19.2%)	
Multimorbidity	1448 (39.2%)	331 (21.1%)	1117 (52.7%)	< .001	1009 (54.1%)	688 (52.9%)	321 (57.0%)	.100
Degree of ability to work fulltime								< .001
> 8 h per day					391 (21.0%)	-	391 (69.4%)	
≤ 8 h per day					172 (9.2%)	-	172 (30.6%)	
≤ 6 h per day					237 (12.7%)	237 (18.2%)	-	
≤ 4 h per day					755 (40.5%)	755 (58.0%)	-	
≤ 2 h per day					309 (16.6%)	309 (23.8%)		
Cancer diagnosis group								
Cancers of breast	1042 (28.2%)	322 (20.5%)	720 (34.0%)	< .001	648 (34.8%)	437 (33.6%)	211 (37.5%)	.106
Cancers of digestive organs	753 (20.4%)	412 (26.2%)	341 (16.1%)	< .001	296 (15.9%)	205 (15.8%)	91 (16.2%)	.826
Lymphoid and haematopoietic cancers	452 (12.2%)	128 (8.1%)	324 (15.3%)	< .001	292 (15.7%)	229 (17.6%)	63 (11.2%)	< .001
Cancers of respiratory organs	430 (11.7%)	266 (16.9%)	164 (7.7%)	< .001	137 (7.3%)	105 (8.1%)	32 (5.7%)	.070
Cancers of nervous system	361 (9.8%)	128 (8.1%)	233 (11.0%)	.004	199 (10.7%)	127 (9.8%)	72 (12.8%)	.052
Cancers of urinary tract	197 (5.3%)	101 (6.4%)	96 (4.5%)	.011	82 (4.4%)	54 (4.2%)	28 (5.0%)	.426
Cancers in the female genital organs	148 (4.0%)	74 (4.7%)	74 (3.5%)	.063	69 (3.7%)	52 (4.0%)	17 (3.0%)	.305
Cancers in the male genital organs	108 (2.9%)	47 (3.0%)	61 (2.9%)	.845	53 (2.8%)	38 (2.9%)	15 (2.7%)	.760
Cancers of skin	83 (2.2%)	47 (3.0%)	36 (1.7%)	.009	32 (1.7%)	19 (1.5%)	13 (2.3%)	.195
Cancers of endocrine glands	68 (1.8%)	26 (1.7%)	42 (2.0%)	.462	33 (1.8%)	25 (1.9%)	8 (1.4%)	.452
Cancers of the locomotor system	48 (1.3%)	21 (1.3%)	27 (1.3%)	.871	23 (1.2%)	10 (0.8%)	13 (2.3%)	.006

[a]Frequencies do not add up to the total n due to missing values

haematopoietic cancers, cancers of the respiratory organs, nervous system, urinary tract, female genital organs, and male genital organs), only multimorbidity was associated with no residual work capacity. Having an additional diagnosis was negatively associated with no residual work capacity within all these cancer diagnosis groups (Table 4).

For cancers of the breast, digestive system, respiratory organs, nervous system, and lymphoid and haematopoietic cancers, multivariable logistic regression analyses were

Table 2 Associations of socio-demographic and disease-related variables with the no residual work capacity and inability to work fulltime (univariable and multivariable logistic regression analyses)

	No residual work capacity ($n=3690$)						Inability to work fulltime ($n=1864$)					
	Univariable analyses			Multivariable analyses			Univariable analyses			Multivariable analyses		
	OR	95%CI	*p*-value	OR	95%CI	*p*-value	OR	95%CI	*p*-value	OR	95%CI	*p*-value
Age (years)	1.01	1.00–1.02	.002	1.01	1.01–1.02	<.001	1.02	1.01–1.03	.001	1.02	1.01–1.03	<.001
Female gender	0.79	0.70–0.91	.001	0.86	0.75–0.99	.038	1.20	0.98–1.47	.079	1.28	1.04–1.58	.020
Educational level (low = ref)												
Middle							1.02	0.82–1.28	.841	1.03	0.83–1.29	.773
High							1.25	0.96–1.64	.098	1.24	0.95–1.64	.118
Multimorbidity	0.24	0.21–0.28	<.001	0.24	0.20–0.28	<.001	0.85	0.69–1.03	.100	0.83	0.67–1.01	.063

performed to study the associations with the inability to work fulltime for each cancer diagnosis group. For applicants with cancers of breast, higher age showed increased odds for inability to work fulltime (OR 1.03, 96%CI 1.01–1.05), whereas for applicants with lymphoid and haematopoietic cancers, female gender was significantly associated with higher odds for inability to work fulltime (OR 3.13, 95%CI 1.57–6.24). Within the other three cancer diagnosis groups, no significant associations with inability to work fulltime were found (Table 4).

Discussion

Our results show that 42.6% of a year cohort of disability benefit applicants with cancer as their primary diagnosis were assessed with no residual work capacity. Specifically, applicants diagnosed with cancers of the digestive organs, respiratory organs, urinary tract, and skin showed significant higher odds for no residual work capacity. Although the majority of the applicants (57.4%) had residual work capacity, almost 70% of this sample was assessed with an inability to work fulltime. Of the applicants assessed with inability to work fulltime, 81.8% could work no more than 4 h per day. For inability to work fulltime, lymphoid and haematopoietic cancers showed significantly higher odds, and cancers of the locomotor system significantly lower odds. Age and gender were significantly associated with both outcomes. Multimorbidity was associated with residual work capacity in all cancer groups. Within cancer groups, higher age, for applicants with cancers of the breast, and female gender, for applicants with lymphoid and haematopoietic cancers, were significantly associated with higher odds for inability to work fulltime.

In our study, only 15.3% of all applicants with cancer were assessed with a normal ability to work fulltime. Although this outcome can be seen as proof of the severity of cancer and its impact on work capacity, our findings also point out that a small majority (57.4%) of the applicants with cancer had residual work capacity, i.e. that they could work with or despite limitations and restrictions for work [31]. We could not find many studies on (no) residual work capacity and inability to work fulltime as outcome of work disability assessment in cancer patients. Most previous research focusses on actual return to work or being employed and work functioning. One study by Van Muijen and colleagues studied assessment outcomes within cancer patients [24]. Their results showed that 17.4% of sick-listed employed cancer survivors were assessed with no residual work capacity 2 years after sick leave. The possible cause of this lower percentage, compared to our study, is the difference in study sample. We included a year cohort of disability benefit applicants who were, mostly, already 2 years on sick leave. In the study of Van Muijen, 531 sick-listed (employed) workers were included at the first day of sick leave and followed until the disability assessment, 24 months later [24]. In our recently published study, using data of all applicants for a disability benefit in 2016 with residual work capacity, we found that the prevalence of inability to work fulltime was 39.4% [28]. In the current study, only including applicants with a cancer diagnosis from the same cohort, the prevalence is extremely higher, namely 69.8%. This extremely higher percentage indicates the severity of cancer compared to other diseases with regard to work capacity. However, the distribution of the degree of inability to work fulltime within the current study is comparable to the year cohort including all diseases [28].

Breast cancer survivors were the largest cancer group in our sample. They had a significant lower risk of being assessed with no residual work capacity, and no significant associations with inability to work fulltime. This is not a surprising result, considering that studies have shown that the 5-year survival rate for breast cancer patients is high (88%) [29]. This implies that breast cancer patients might return to work after being treated for their cancer, and will not lose their total work capacity within foreseeable time. Although

Table 3 Associations of the cancer groups with no residual work capacity and inability to work fulltime (univariable and multivariable logistic regression analyses, adjusted for age, gender, educational level (only analyses on inability to work fulltime), and multimorbidity)

	No residual work capacity ($n = 3690$)						Inability to work fulltime ($n = 1864$)					
	Univariable analyses			Multivariable analyses			Univariable analyses			Multivariable analyses		
	OR	95%CI	*p*-value	OR	95%CI	*p*-value	OR	95%CI	*p*-value	OR	95%CI	*p*-value
Cancers of breast	0.50	0.43–0.58	<.001	0.56	0.47–0.65	<.001	0.84	0.69–1.04	.106	0.86	0.70–1.05	.141
Cancers of digestive organs	1.85	1.58–2.18	<.001	1.69	1.42–2.01	<.001	0.97	0.74–1.27	.826	0.97	0.73–1.28	.969
Lymphoid and haematopoietic cancers	0.49	0.40–0.61	<.001	0.46	0.36–0.57	<.001	1.70	1.26–2.29	.001	1.89	1.39–2.57	<.001
Cancers of respiratory organs	2.43	1.97–2.98	<.001	2.22	1.78–2.77	<.001	1.46	0.97–2.19	.071	1.47	0.97–2.23	.069
Cancers of nervous system	0.72	0.57–0.90	.004	0.67	0.53–0.86	.001	0.74	0.54–1.00	.053	0.81	0.59–1.11	.188
Cancers of urinary tract	1.45	1.09–1.93	.012	1.40	1.02–1.91	.035	0.83	0.52–1.32	.427	0.83	0.51–1.33	.434
Cancers in the female genital organs	1.36	0.98–1.90	.064	1.38	0.97–1.95	.075	1.34	0.77–2.33	.306	1.43	0.82–2.50	.214
Cancers in the male genital organs	1.04	0.71–1.53	.845	0.99	0.66–1.49	.962	1.10	0.60–2.02	.760	1.05	0.57–1.93	.882
Cancers of skin	1.78	1.15–2.77	.010	1.85	1.16–2.96	.010	0.63	0.31–1.28	.199	0.67	0.32–1.37	.268
Cancers of endocrine glands	0.83	0.51–1.36	.463	0.88	0.52–1.48	.626	1.36	0.61–3.03	.453	1.46	0.65–3.28	.358
Cancers of the locomotor system	1.05	0.59–1.86	.871	1.23	0.67–2.27	.506	0.33	0.14–0.75	.008	0.41	0.18–0.96	.039

*For cancers of the breast, female and male genital organs, gender was left out of the multivariable analysis due to the small number of male or female applicants within these cancer groups

breast cancer survivors have increased physical impairment and physical health problems over a longer period of time after being diagnosed and treated, they do not have a consistently poorer psychosocial functioning [34]. On the other hand, a study by Dorland and colleagues showed that within a sample of breast cancer survivors who had returned to work, about 80% did have a persistently low and moderate to high work functioning over time. These results might suggest that there is still residual work capacity for this group, but there are work limitations and restrictions with regard to work functioning [16].

Compared to other cancers, in patients with respiratory cancers, the survival rate is relatively low (lung cancer: 20% 5-year survival, [29]) and the disease has an enormous (negative) impact on energy levels, employment, and earnings [20, 35]. This may explain that in our sample applicants with cancer of the respiratory organs had the highest risk of having no residual work capacity (OR 2.22). Additionally, 76.6% of the applicants with respiratory cancer and residual work capacity were assessed with inability to work fulltime.

The lymphoid and haematopoietic cancer group, with cancer types like leukaemia and (non)Hodgkin lymphoma, had a significant low association (OR 0.46) with no residual work capacity. It also was the only cancer group with a significant positive association with inability to work fulltime. The fact that these patients have a relatively long survival (5 years survival rates from 24 to 87% leukaemia and 62–86% for (non) Hodgkin tumours [29]) with fatigue as the most prevalent long-term functional complication for non-Hodgkin survivors could be reflected in our results [34]. The latter study described that fatigue in patients after non-Hodgkin lymphoma may in part result from not returning to pre-diagnosis levels of physical activity despite overall good health [34]. Cancers of the locomotor system in our sample had the lowest significant association with inability to work fulltime. This is in line with the finding of our previous study on inability to work fulltime including all disease groups [28] where applicants with diseases of the locomotor system also significantly had the lowest odds for inability to work fulltime. In our previous study, we argued that musculoskeletal diseases are more likely responsible for physical work limitations than inability to work fulltime, which is in line with the findings by Stein describing a higher risk on physical impairments for bone cancer (a cancer of the locomotor system) [34].

Our findings showed that being diagnosed with an additional disease other than cancer lowered the odds for no residual work capacity. This seems counter intuitive, because one should expect that when diagnosed with more than one disease would have larger impact on work ability. In order to find an explanation, we discussed these results with insurance physicians. They thought a possible explanation might be that when they assess applicants with such a severe disease, of which the impact on work capacity is so obvious,

Table 4 Associations of gender, age, multimorbidity, and educational level (for inability to work fulltime) with no residual work capacity and inability to work fulltime stratified to cancer groups with n > 100 (multivariable logistic regression analyses)

	Gender (male = ref) OR (95%CI)	Age OR (95%CI)	Educational level (low = ref)		Multimorbidity OR (95%CI)
			Middle OR (95%CI)	High OR (95%CI)	
No residual work capacity					
Cancers of breast ($n = 1042$)	n.a.[a]	0.99 (0.98–1.01)	-	-	0.34 (0.25–0.45)*
Cancers of digestive organs ($n = 753$)	1.12 (0.81–1.53)	1.00 (0.98–1.02)	-	-	0.18 (0.13–0.25)*
Lymphoid and haematopoietic cancers ($n = 452$)	1.14 (0.73–1.77)	1.01 (0.98–1.03)	-	-	0.38 (0.24–0.59)*
Cancers of respiratory organs ($n = 430$)	1.19 (0.77–1.85)	1.02 (0.99–1.06)	-	-	0.12 (0.07–0.19)*
Cancers of nervous system ($n = 361$)	0.95 (0.61–1.48)	1.02 (0.99–1.04)	-	-	0.47 (0.29–0.77)*
Cancers of urinary tract ($n = 197$)	0.87 (0.42–1.78)	0.99 (0.95–1.03)	-	-	0.27 (0.15–0.50)*
Cancers in the female genital organs ($n = 148$)	n.a.[a]	1.00 (0.97–1.04)	-	-	0.17 (0.08–0.38)*
Cancers in the male genital organs ($n = 108$)	n.a.[a]	1.00 (0.95–1.05)	-	-	0.13 (0.05–0.34)*
Inability to work fulltime					
Cancers of breast ($n = 648$)	n.a.[a]	1.03 (1.01–1.05)*	1.04 (0.71–1.53)	1.43 (0.91–2.26)	0.95 (0.68–1.33)
Cancers of digestive organs ($n = 296$)	1.29 (0.87–2.56)	1.03 (1.00–1.07)	1.11 (0.63–1.93)	1.18 (0.56–2.45)	0.88 (0.53–1.47)
Lymphoid and haematopoietic cancers ($n = 292$)	3.13 (1.57–6.24)*	1.00 (0.97–1.03)	0.66 (0.34–1.27)	0.59 (0.27–1.28)	0.77 (0.43–1.38)
Cancers of respiratory organs ($n = 137$)	2.27 (0.94–5.47)	1.05 (0.99–1.10)	1.99 (0.70–5.68)	1.95 (0.56–6.82)	0.62 (0.25–1.53)
Cancers of nervous system ($n = 199$)	1.18 (0.65–2.11)	1.00 (0.98–1.03)	0.86 (0.44–1.66)	1.04 (0.47–2.31)	0.79 (0.44–1.43)

*$p < .05$

[a]*n.a.* not applicable, gender was left out of the multivariable analysis due to the small number of male or female applicants

they feel that further exploration of the medical situation is unnecessary. In these cases, they usually do not register any additional diagnosis. The dataset used for our study only included data registered by the insurance physicians at the time of the assessment, data supporting this possible explanation of the insurance physicians cannot be verified by our dataset. However, we did not see this association of multimorbidity for the specific cancer groups with inability to work fulltime; in none of the specific cancer groups, an association of multimorbidity was found with inability to work fulltime. This might indicate that the cancer diagnosis itself already has such a major impact on work capacity, that an additional diagnosis does not increase the risk for being assessed with an inability to work fulltime.

Strengths and limitations

In this study, we used register data of a year cohort of applicants assessed for a long-term work disability benefit after (in most cases) 2 years of sick leave. Using register data is a strength of our study, as it covers the entire Dutch population. Another strength of our study is the large sample size of work disability benefit assessments by skilled insurance physicians adhering to professional guidelines and assessment methods. Furthermore, our sample seems representative, as the prevalence of the specific cancer groups in our sample is in line with prevalence nation- and worldwide [36]. The prevalence of cancers of the male genital organs in our sample was, however, lower than in the society. This might be due to the fact that this type of cancer is specifically higher prevalent among older males, who are not part of the working population anymore.

A study limitation is that register data was not collected for research purposes and did not contain data on other possible determinants such as severity of diseases, time from cancer diagnosis, stage of cancer, the treatment received, and physical and psychosocial work demands. Although the UWV uses a biopsychosocial approach in the work disability

assessment, important factors described in this model, as mentioned above, are lacking in the register data. The absence of these determinants can also affect the generalizability of the findings. Furthermore, for the analysis on inability to work fulltime, we had to exclude 254 cases due to missing data on educational level. This might have impacted our outcomes, as the majority of the excluded cases had a normal ability to work fulltime, whereas in our study sample the majority of the applicants were assessed with an inability to work fulltime. Furthermore, because of the cross-sectional design we cannot draw conclusions about causal relationships.

Implications for practice and future research

The findings in the present study show that more than half of all applicants with cancer have abilities to work but often cannot work fulltime. This implies that (supporting) return to work is of great importance among cancer patients, and adjustments in work, like working hours, could be beneficial for their return to original or adapted work. Several studies have evaluated the effectiveness of intervention strategies to help people with cancer to return to work. For instance, Van Egmond et al. did not find a significant effect of a tailored return to work program carried out by reintegration coaches [37]. Furthermore, De Boer et al. evaluated in their review interventions to enhance return to work in cancer patients and found moderate-quality evidence that multidisciplinary interventions enhance the return to work of patient with cancer [38]. The findings among the different types of cancers and of the socio-demographic determinants could help to develop tailored interventions for enhancing work participation of specific cancer survivors. Furthermore, our findings can contribute to a more evidence-based assessment of residual work capacity and inability to work fulltime in disability claim assessments. Our study provides insight into which workers within specific cancer diagnosis groups are at risk for no residual work capacity and inability to work fulltime and can contribute to the development of interventions for work adjustments and reintegration.

Our study aimed to explore two important work outcomes of the disability benefit assessment, using register data from the UWV. Future studies could focus on the effect of other indicators on no residual work capacity and inability to work fulltime, such as the individual diagnosis, treatment, and other personal and environmental factors. Additionally, future longitudinal studies should be conducted on the work trajectories from the onset of sick leave, or the date of diagnosis, until after the disability assessment of patients diagnosed with different types of cancer. Linkage of data from, for example, the National Cancer Registry and/or occupational health services, with data on disability benefit assessment, will provide insight into the ability to work of cancer patients before the disability benefit assessment, from the onset of the diagnosis, and compare return to work between different types of cancer on the short term. It also will provide insight into the effect of being assessed with (in)ability to work fulltime on actual (return to) work after the assessment.

Conclusion

The findings of this study showed that the prevalence of cancer patients who have no work capacity 2 years after being diagnosed is high (42.6%). Additionally, of those who have residual work capacity, about 70% is assessed as being unable to work fulltime. This means that only 15% of all applicants with cancer are assessed by the insurance physician with a normal ability to work fulltime 2 years after the start of their sick leave. Our findings show that the type of cancer seems to be important in terms of residual work capacity and the ability to work fulltime as shown by significant differences on these assessment outcomes between the specific diagnosis. The findings of this study can contribute to a more evidence-based assessment of residual work capacity and inability to work fulltime in disability claim assessments, providing insight into which workers within specific cancer diagnosis groups are at risk for no residual work capacity and inability to work fulltime.

Author contribution All authors contributed to the study conception and design. Material preparation, data collection, and analyses were performed by Henk-Jan Boersema and Tialda Hoekstra. The first draft of the manuscript was written by Henk-Jan Boersema and Tialda Hoekstra, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Availability of data, material, and code The data that support the findings of this study are available from UWV, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of UWV.

Declarations

Ethics approval and consent to participate We received permission from the Social Security Institute to use their anonymized registration data for this study. Under Dutch law, approval by a Medical Ethical Committee was not necessary, as the study is a register-based study and therefore not subject to the Medical Research Involving Human Subjects Act (WMO).

Consent for publication Not applicable.

Conflict of interest The authors declare no competing interests.

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