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The positive effect of workplace accommodations on the continued employment of cancer survivors five years after diagnosis

Authors: Caroline ALLEAUME¹, Alain PARAPONARIS^{2,3}, Marc-Karim BENDIANE¹, Anne-Déborah BOUHNİK¹, Patrick PERETTI-WATEL⁴.

¹Aix Marseille Univ, INSERM, IRD, SESSTIM, Sciences Economiques & Sociales de la Santé & Traitement de l'Information Médicale, Marseille, France.

²Aix Marseille Univ, CNRS, EHESS, Centrale Marseille, AMSE, Marseille, France.

³Southeastern Health Observatory (ORS PACA), Marseille, France.

⁴Aix Marseille Univ, IRD, AP-HM, SSA, VITROME, IHU-Méditerranée Infection, ORS PACA, Observatoire régional de la santé Provence-Alpes-Côte d'Azur, Marseille, France.

Abstract

Purpose. To evaluate the effect of workplace accommodations on the continued employment of cancer survivors five years after diagnosis.

Population and methods. This study is based on VICAN5, a French survey conducted in 2015-2016 to examine the living conditions of cancer survivors five years after diagnosis. Two subsamples, one with and one without workplace accommodations, were matched using a propensity score to control for the individual, professional, and medical characteristics potentially associated with receipt of workplace accommodations.

Results. The study sample was composed of 1,514 cancer survivors aged 18-54 and employed as salaried at diagnosis. Among them, 61.2% received workplace accommodations within five years after diagnosis: 35.5% received a modified workstation, 41.5% received a modified schedule, and 49.2% received reduced hours. After matching, receipt of workplace accommodations appeared to improve the continued employment rate five years after cancer diagnosis from 77.8% to 89.0%.

Conclusion. Receipt of workplace accommodations strongly increases the continued employment of cancer survivors five years after diagnosis. More research is needed to better understand the differences in receipt of workplace accommodations along with the related selection effect.

Keywords: Cancer survivors; Workplace accommodations; Continued employment; VICAN5; France.

Introduction

In developed countries, increased early screening and improved treatments have led to more frequent diagnosis of cancer and to a rise in the number of cancer survivors. In France, the estimated prevalence of cancer survivors among individuals aged over 15 is around three million [1]. In this context, researchers are paying more and more attention to the living conditions of cancer survivors. The international literature has documented the negative effect of the disease on economic well-being, and, in particular, on the professional career of working-age individuals. Studies have shown that the main indicators of professional life deterioration after cancer diagnosis are lower employment rate, decrease in the likelihood of being employed, and working time reduction [2–6]. Moreover, this effect was found to be socially differentiated: the most vulnerable individuals on the labour market are also the most likely to experience a deterioration of their professional life (especially task performers, temporary contract workers, and the oldest workers). This negative effect stems mostly from damage to physical and psychological health which can have chronic or permanent effects on survivors.

In view of the above, French law now encourages employers to effectively redeploy employees diagnosed with cancer and to adjust their workload (Labour Code Article L1226-2). However, the implementation of workplace accommodations is not mandatory, and there are no guidelines on how they should be put in place. Some studies have identified a positive association between receipt of workplace accommodations after cancer diagnosis and return to work [2,4,7–9]. However, two systematic reviews analysed studies about interventions made to enhance return-to-work for cancer patients and highlighted the lack of study about the evaluation of professional intervention as workplace accommodation for cancer survivors [10,11]. Yet, while between a quarter and a half of cancer survivors receive workplace accommodations upon returning to work [7], very few studies have specifically analysed the effect of these accommodations on return to work after cancer diagnosis. To our knowledge, the study by Duguet et al. is the only one that examined this effect in the context of France: It found that men and women who receive workplace accommodations return to work more quickly after sick leave than those who do not [7].

In this study, we continued the research conducted by Duguet et al.[7], but instead of analysing the effect of workplace accommodations on return to work after sick leave, we examined the effect of these accommodations on continued employment five years after cancer diagnosis.

Population and methods

VICAN5 survey

The VICAN5 national survey was conducted in France to explore the life conditions of individuals aged 18-82, living in metropolitan France, and diagnosed five years earlier with a first malignant cancer located in one of 12 common tumour sites [12]. These 12 tumour sites, which account for 88% of global cancer incidence in France, are as follows: breast, lung, upper aerodigestive tracts, colon-rectum, prostate, bladder, kidney, thyroid, melanoma, lymphoma, cervix, and uterus. Participants were interviewed between 2015 and 2016, namely five years after being diagnosed with cancer. The data collected for VICAN5 came from three sources: 1) a patient questionnaire administered mostly by phone; 2) a medical questionnaire administered to the physician who initiated the cancer treatment; and 3) the medico-administrative databases of the French National Health Insurance Fund known as *Système National d'Information Interrégimes de l'Assurance Maladie* (SNIIRAM).

Study population

As the aim of our study was to assess the effect of workplace accommodations on continued employment five years after cancer diagnosis, only individuals employed at diagnosis (n=1,921) were included in the analysis. Moreover, our study population was restricted to individuals aged under 55 at diagnosis (n=1,690) to ensure that sample participants would be under statutory retirement age (i.e., 60 years in France). Lastly, individuals who did not provide their employment status and those who did not answer the questions about workplace accommodations were excluded from the analysis. Thus, of the 4,174 individuals who participated in the VICAN5 survey, 1,514 were included in this study.

Statistical analyses and main indicators

Student's t-tests and Chi-square tests were performed to compare receipt of workplace accommodations according to different individual, professional, and medical characteristics.

Using propensity score matching, two groups of comparable cancer survivors were constituted to measure the effect of workplace accommodations on continued employment: the first group received workplace accommodations (treatment group) and the second did not (control group). The propensity score was estimated from a probit model performed on the probability to receive workplace accommodations after cancer diagnosis according to different explanatory variables (matching variables) [13–15]. These explicative variables were defined based on the assumption that they simultaneously affected both the treatment variables and the performance variable. Since we measured the effect of four treatment variables cited below, we performed four different matching.

The performance variable was being employed at the time of the survey (yes/no). Its effect was separately estimated for each following treatment variables: 1) having received a modified work station (yes/no) (for example, having switched from construction to warehouse work); 2) having

received a modified schedule (yes/no) (for example, having switched from night to day schedule); 3) having received reduced hours (yes/no) (for example, therapeutic part-time work); and 4) having received at least one of the workplace accommodations above (yes/no). The matching variables were: sex (male/female), age at diagnosis (continuous variable ranging from 18 to 54), education level (less than high school/high school degree or more), type of employment contract at diagnosis (permanent/temporary), sector of employment (public/private), company size (microenterprise/other), socio-professional category (task performer/manager), receipt of chemotherapy (yes/no), and comorbidity score at diagnosis (continuous variable).

Based on these variables, individuals in the treatment group were matched with their nearest neighbours in the control group. These neighbours were defined by a Mahalanobis distance that accounted for variance and correlation between covariates.

The neighbours were selected in the nearest neighbourhood according to the Caliper method (with a 0.005 threshold) [17]. The balancing property needed to be satisfied. To obtain a more accurate estimation of the effect of the treatment variables on the performance variable, we used a 95% confidence interval calculated with the bootstrap method. This effect, which is presented in the Results section, corresponds to the mean of the treatment effects calculated for each 1,000 sample replicates [15].

Finally, we performed sensitivity analyses to test the robustness of our results. We began by stratifying samples by sex and by sick leave duration. We then tested the only type of workplace accommodation for which detailed data was available: therapeutic part-time work. Specifically, we sought to determine whether the timing and duration of this specific type of accommodation contributed to continued employment among cancer survivors.

Other indicators

Aggregated socio-professional category: This categorical variable (task performer/manager) provided information on the socio-professional category of the job held at diagnosis. Managers, company directors, and some intermediate professions were grouped together in the “manager” category, while blue collar workers, employees, shopkeepers, craftsmen, and farmers were all classified as “task performers”.

Adverse cancer event: This categorical variable (yes/no) created from the SNIIRAM databases provided information on the evolution of the disease in the five years after diagnosis. Individuals presenting metastases or diagnosed with recurrence or a second cancer were considered as having had an adverse

126 cancer event. Individuals who were treated with chemotherapy, radiotherapy, and/or targeted
127 therapy and those who received palliative care in the three years before survey were also considered
128 as having had an adverse cancer event.

129 Comorbidity score at diagnosis: This continuous variable was measured using a score of individual
130 chronic conditions (excluding cancer) based on the SNIIRAM databases [18].

131 Duration of sick leave: This categorical variable (less than one month/one month or more) was
132 constructed for each individual from the number of successive days of paid sick leave, as recorded in
133 the SNIIRAM databases. The one-month threshold was selected because employees in France are
134 required to undergo a medical examination with an occupational physician one month after the start
135 of sick leave.

Sample description

The study population was mostly female, as only 19.4% of participants aged 18-54 and employed at diagnosis were men. Mean age was around 44 years old; it was slightly higher for men (45 years old) than for women (44 years old), and this difference was statistically significant. Breast cancer concerned half (55.2%) of the sample, and each other type of cancer represented from 3.2% (lung cancer) to 10.2% (thyroid cancer) of the sample. This distribution may be explained by the epidemiological characteristics of the studied diseases: namely, the high frequency and high survival rate of breast cancer, the low survival rate of lung cancer, and, finally, the low frequency of bladder cancer, kidney cancer, and prostate cancer in the age group selected for the study [19]. Furthermore, the majority of survivors employed at diagnosis had a permanent contract (62.4%), held a full-time job (76.3%), and worked in the private sector (74.1%). Around half of the study population received chemotherapy (50.9%), and less than one in five (18.4%) had an adverse cancer event within five years after diagnosis.

Receipt of workplace accommodations

In our study, three in five (63.7%) cancer survivors received workplace accommodations (modified work station, modified schedule, and/or reduced hours) within five years after diagnosis.

Receipt of workplace accommodations was strongly associated with the individual, professional, and medical characteristics listed in Table 1. First, receipt of workplace accommodations varied by sex, as 63.3% of female survivors received at least one type of workplace accommodation against only 52.6% of male survivors. Second, receipt of workplace accommodations was significantly and positively associated with two professional characteristics, namely company size larger than a microenterprise and permanent contract at diagnosis. Lastly, receipt of workplace accommodations was strongly associated with tumour site (i.e., it was more frequent among individuals diagnosed with breast cancer or with Non-Hodgkin lymphoma) and with receipt of chemotherapy (i.e., it was significantly more frequent among individuals treated with chemotherapy), except in the case of modified work stations.

More specifically, 35.5%, 41.5%, and 49.2% of the study population received a modified work station, a modified schedule, and/or reduced hours, respectively. These different types of workplace accommodation were not exclusive: some survivors received two or three types of accommodation, whether simultaneously or not. Among individuals who received at least one type of workplace accommodation, seven in ten (70.3%) received several types of accommodation within five years after cancer diagnosis. Half of these (50.8%) received all three types of accommodation and the other half received two out of three. The most common pair was reduced hours and modified schedule.

Furthermore, of the three in ten survivors (29.7%) who received only one type of accommodation, 51.1% received reduced hours, 36.1% received a modified work station, and only 12.8% received a modified schedule.

Lastly, the association between receipt of workplace accommodations and individual, professional, and medical characteristics varied by type of workplace accommodation. Thus, being over 40 at diagnosis was significantly and negatively associated with receipt of a modified schedule. Moreover, despite the fact that managers received workplace accommodations more frequently than task performers, this difference in frequency was significant only when the accommodation was a modified work station. Finally, receipt of reduced hours and receipt of a modified schedule were associated with receipt of chemotherapy and adverse cancer event, but receipt of a modified work station was not.

Table 1. Prevalence of receipt of workplace accommodations according to individual, professional, and medical characteristics (N=1,514).

Variables	Type of workplace accommodation received			At least one type of workplace accommodation received	
	Modified workstation	Modified Schedule	Reduced hours	Yes	No
	% row				
All	35.5	41.5	49.2	61.2	38.8
Sex	*	***	***	***	***
Male	29.3	31.9	37.6	52.6	47.4
Female	36.9	43.7	51.9	63.3	36.7
Age		*			
18-39	37.9	47.8	50.8	62.2	37.8
40-49	34.4	38.9	49.2	60.8	39.2
50-54	35.9	41.7	47.4	61.3	38.7
Education level					
< high school degree	34.5	40.4	47.8	60.4	39.6
≥ high school degree or more	36.1	42.1	50.0	61.7	38.3

Marital status					
Couple	35.1	42.0	49.1	61.3	38.7
Single	37.5	38.9	49.7	60.6	39.4
Dependent child(ren)					
Yes	36.1	40.9	48.8	61.0	39.0
No	35.2	41.7	49.3	61.3	38.7
Sector of employment					
Public	37.3	40.1	48.9	63.8	36.2
Private	34.8	41.9	49.3	60.3	39.7
Company size	**		*	*	*
Microenterprise	28.3	37.6	43.8	55.9	44.1
Other ¹	37.5	42.6	50.7	62.8	37.2
Working time at diagnosis	\$				
Full-time	36.8	41.6	49.6	62.4	37.6
Part-time	31.5	42.0	48.7	57.9	42.1
Type of contract	*			*	*
Temporary	28.0	36.1	44.0	52.9	47.1
Permanent	36.5	42.2	49.9	62.4	37.6
Socio-professional category	*				
Task performer	32.8	40.7	48.8	60.1	39.9
Manager	38.3	42.2	49.6	62.4	37.6
Tumour site	\$	**	***	***	***
Breast	38.6	46.0	56.1	66.3	33.7
Lung	40.5	44.4	46.0	63.3	36.7
Colon-rectum	31.8	34.1	47.6	59.6	40.4
UADT	25.9	33.6	42.6	52.7	47.3
Bladder-kidney-prostate	30.8	29.2	35.8	50.9	49.1
Thyroid	32.8	35.3	36.0	49.9	50.1
NH Lymphoma	38.3	49.5	54.5	69.4	30.6
Melanoma	24.0	32.7	31.7	50.3	49.7
Uterus	33.7	33.1	38.8	52.0	48.0

¹ SMEs, intermediate companies, and large companies were grouped together due to their similar distribution in terms of workplace accommodations. Microenterprises (less than ten employees) presented a different distribution and were therefore considered separately.

Chemotherapy		***	***	***	***
Yes	36.9	45.9	58.3	67.0	33.0
No	34.0	36.9	39.7	55.3	44.7
Adverse cancer event		\$	**		
Yes	33.4	46.6	56.7	65.6	34.4
No	35.9	40.3	47.5	60.2	39.8
Comorbidity score		*	***	*	*
Mean (SD)	0.686 (0.344)	0.694 (0.347)	0.708 (0.345)	0.698 (0.342)	0.631 (0.335)
<p>***p-value < 0.001; **p-value < 0.01; *p-value < 0.05; \$p-value < 0.1 (Student's t-test and Chi-square test).</p> <p>Note that 29.3% of men and 36.9% of women received a modified work station within five years after cancer diagnosis.</p>					

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183 Continued employment among cancer survivors five years after diagnosis

184 85.1% of the study population was still employed five years after cancer diagnosis (i.e., at the time of
185 the survey). Receipt of workplace accommodations was strongly associated with continued
186 employment, as 89.7% of individuals who received workplace accommodations were employed at the
187 time of the survey against 77.8% who were not (odds ratio was estimated at 2.48 with a 95%
188 confidence interval [1.860; 3.305]). This association was observed for each type of workplace
189 accommodation studied.

190

***p-value < 0.001; **p-value < 0.01 (Chi-square test).

Figure 1. Continued employment rate five years after cancer diagnosis according to type of workplace accommodation received (N=1,514)

Positive effect of workplace accommodations on the continued employment of cancer survivors five years after diagnosis

As shown in Table presented in supplementary files, the balancing property was satisfied, and data were properly matched.

Among comparable cancer survivors, receipt of workplace accommodations significantly increased the continued employment rate five years after diagnosis irrespective of the type of accommodation received, as shown in Table 2. Receipt of at least one type of workplace accommodation increased the continued employment rate from 77.8% to 95.0%².

Table 2. Estimated effect of workplace accommodation on continued employment five years after a cancer diagnosis

Performance variable	Type of workplace accommodation			
	Modified work station	Modified schedule	Reduced hours	At least one of type of accommodation
Average treatment effect on the treated (standard deviation of the estimated effect), confidence interval	0.062** (0.028), IC95%=[0,007 ; 0,117]	0.081** (0.027), IC95%=[0,027 ; 0,135]	0.114*** (0.028), IC95%=[0,059 ; 0,170]	0.172*** (0.029), IC95%=[0,114 ; 0,229]

***p-value < 0.001; **p-value < 0.01 (Student's t-test).

The positive effect of workplace accommodations was higher for men than for women

Given the high proportion of women in our study population, sensitivity analyses were conducted to test the validity of our results. These analyses were stratified by sex: the effect of receiving at least one type of workplace accommodation on continued employment five years after cancer diagnosis was

² This number was calculated by adding together the continued employment rate for cancer survivors who did not receive workplace accommodations (as presented in Table 1) and the estimated effect of workplace accommodations (as presented in Table 2).

estimated separately for women and for men. This effect remained unchanged for women: receipt of workplace accommodations increased the continued employment rate from 73.0% to 86.6%, compared to 77.8% to 93.1% for the entire study population. The effect was much stronger for men: receipt of workplace accommodations increased the continued employment rate from 64.6% to 80.9%. However, given the small number of men in the sample, no clear conclusions could be drawn from the differences observed between men and women.

Receipt of workplace accommodations had an especially positive effect on cancer survivors who took a short sick leave (less than one month)

We stratified also the sample according to duration of sick leave taken within five years after cancer diagnosis: the first subsample was made of individuals who took a long sick leave (one month or more) ($n=1,263^3$), and the second subsample included individuals who took a short sick leave (less than one month) ($n=235$). After matching, the effect of workplace accommodations on the continued employment of cancer survivors five years after diagnosis was significantly positive in both subsamples. However, this effect was significantly higher in the second subsample: receipt of workplace accommodations increased the continued employment rate from 68.8% to 86.3% (difference of 17.5 points) for cancer survivors who took a short sick leave compared to an increase from 78.9% to 88.2% (increase of 9.3 points) for individuals who took a long sick leave.

The case of therapeutic part-time work

In our study, 27.8% of cancer survivors had their hours temporarily reduced for therapeutic reasons. On average, this hour reduction was granted 17.5 months after diagnosis and lasted 3.9 months. The estimated effect of therapeutic part-time work on continued employment five years after diagnosis was 0.095 ($SD=0.028$, $p\text{-value} < 0.001$). Specifically, this type of accommodation increased the continued employment rate from 82.3% to 91.8%.

³ Individuals for whom this information was not available were excluded from our analyses ($n=16$).

Our study shows that receipt of workplace accommodations (modified work station, modified schedule, and/or reduced hours) among individuals diagnosed with cancer is not systematic. Indeed, we found that only six in ten cancer survivors 61.2% aged 18-54 and employed at diagnosis received workplace accommodations within five years after diagnosis. As receipt of workplace accommodations varied by individual, professional, and medical characteristics, two subsamples (one with and one without workplace accommodations) were matched using a propensity score to estimate the effect of workplace accommodations on the continued employment of cancer survivors five years after diagnosis. Among comparable cancer survivors, this effect was positive and estimated at around 17.2 percentage points.

Strengths and limitations of the study

To our knowledge, this is the first study to explore the effect of workplace accommodations on continued employment in a representative sample of cancer survivors in France. Moreover, VICAN5 is the first survey to provide such a wide range of individual, professional, and medical data on cancer survivors.

Our study, however, has some limitations. The first limitation is due to the cross-sectional nature of the data involving that the estimations are all conditional to cancer survival. In the survey, we know nothing about the occupational status and potential arrangements of workstation of people diagnosed with a cancer five years before and who died before the survey or were out of sight. In addition, our analysis was limited by the lack of data on the mode of implementation of workplace accommodations. In particular, with the exception of therapeutic part-time work, we lacked information on the timing and duration of the accommodations provided after cancer diagnosis. Yet given the sequelae and treatments reported, we can assume that the workplace accommodations examined here were cancer-related, and that they were consequently implemented within three years after cancer diagnosis to facilitate the return to work of survivors (three years being the maximum duration of paid sick leave in France). Second, all job-related data were collected with a patient questionnaire and were therefore declarative data. Some individuals may have forgotten that they received workplace accommodations or may have failed to perceive them as such. However, this possibility is unlikely considering the high prevalence of receipt of workplace accommodations in our sample.

Prevalence of receipt of workplace accommodations

In our study, more than six in ten cancer survivors (61.2%) received at least one of type of workplace accommodation within five years after cancer diagnosis: 49.2% received reduced hours, 41.5%

received a modified schedule, and 35.5% received a modified work station. These percentages are higher than those reported in similar studies conducted two years after diagnosis (i.e., 29.3%, 22.5%, and 17.4% for reduced hours, modified schedule, and modified work station, respectively) [20]. By extending the period of observation to five years, we were able to study the provision of workplace accommodations to individuals who returned to work after at least two years of sick leave [21]. However, we had no information on the timing and duration of workplace accommodations, which means that these could have been implemented any time between diagnosis and survey. We can nevertheless assume that their implementation occurred within three years after diagnosis. This assumption is supported by the first findings of the VICAN5 survey published by the French National Institute of Cancer: therapeutic part-time work (a form of reduced hours) was implemented on average two and a half years after cancer diagnosis, which corresponds to the end of the first sick leave [21].

Differences in receipt of workplace accommodations according to medical, individual, and professional characteristics

First, as expected, receipt of workplace accommodations varied by medical characteristics: individuals who were diagnosed with breast cancer, lung cancer, or lymphoma, those who received chemotherapy, those who had an adverse cancer event, and those who had comorbidities before diagnosis were more likely to receive workplace accommodations. This finding supports the hypothesis that workplace accommodations are implemented in order to ensure the continued employment of cancer survivors [9].

Second, receipt of workplace accommodations varied by individual characteristics, as it was systematically more frequent in women than in men. This finding is consistent with the literature [7,21] and raises questions regarding the pervasiveness of gender representations in the labor market. For instance, is working time reduction more acceptable for female workers than for male workers due to the already high prevalence of part-time work among women? Conversely, are men less likely to reduce their working hours because they are still viewed as the main breadwinner in the household [22]? Or is it due to the intrinsic characteristics of the male occupations that may be less suitable for accommodations?

Third, receipt of workplace accommodations varied by professional characteristics. Cancer survivors who were more likely to receive workplace accommodations had the most favourable professional characteristics (for example, being under 40, having a permanent contract at diagnosis, or holding a management position in the case of receipt of a modified work station). There are several possible explanations for this selection effect. It may be that employees who are more likely to remain in the company after cancer diagnosis request workplace accommodations with greater frequency, and that,

conversely, such employees are more often offered workplace accommodations by their employers. Furthermore, given that workplace accommodations are usually recommended by occupational physicians in France, we can assume that companies that have an occupational health department are more likely to provide workplace accommodations to their employees than those who have not such department. Finally, company policy may have an effect on the continued employment of employee after cancer diagnosis. Indeed, companies with a high turnover rate may be less likely to provide workplace accommodations to their employees than companies that favour staff stability.

Effect of workplace accommodations on the continued employment of cancer survivors five years after diagnosis

In our study, 85.1% of cancer survivors were still employed five years after diagnosis, a rate that is fairly higher than that reported in the first published findings of the VICAN5 survey [21]. This difference can be explained by the fact that 115 individuals who did not answer the questions about workplace accommodations were excluded from our study sample, on the assumption that they were no longer on the labour market at the time of the survey.

Given the differences in receipt of workplace accommodations that have been previously presented, the effect of this reception was estimated after adjusting for medical characteristics (receipt of chemotherapy and comorbidity score at diagnosis), individual characteristics (sex, age at diagnosis, and education level), and professional characteristics (type of employment contract at diagnosis, sector of employment, company size and socio-professional category).

According to our estimates, receipt of workplace accommodations significantly favoured the continued employment of cancer survivors five years after diagnosis. Indeed, receipt of at least one type of accommodation increased the continued employment rate from 77.8% to 95.0%. Moreover, additional analyses have shown that the estimated effect increased with the number of accommodations received but this increase was no significant. The threshold effect was thus found from receiving one accommodation. There are several possible explanations for this positive effect. First, it may be that adapting working conditions to the new physical and psychological capacities of employees helps them cope with the sequelae of cancer in the short term, and thereby reduces both the termination rate and the rate of dismissal due to medical inability. On the one hand, the provision of workplace accommodations entails a change in perspective: it is no longer employees who must adapt to the workplace, but the workplace that must be adapted to meet the employee needs. On the other hand, survivors who receive workplace accommodations enjoy better working conditions, which in turn encourages them to remain at work. Second, it may be that receipt of workplace accommodations allows for a progressive return to work that is beneficial to long-term health. In fact, even temporary

workplace accommodations (such as therapeutic part-time work, which lasts four months on average [21]) can be kept in place when they meet the expectations of both employee and employer, and can thereby preserve the long-term health of cancer survivors. Conversely, it may be that cancer survivors who do not receive workplace accommodations must work harder to maintain the expected productivity level, which in turn contributes to the deterioration of their physical and psychological health and may drive them to exit the labour market.

Lastly, the effect of workplace accommodations on continued employment five years after cancer diagnosis was especially strong in survivors who took a short sick leave or no sick leave at all. For these specific survivors, the continued employment rate increased by 17.5 percentage points.

The above results suggest that the provision of workplace accommodations ensures the continued employment of cancer survivors, and not just their return to work.

Conclusion

To our knowledge, this is the first study to assess the effect of workplace accommodations on the continued employment of cancer survivors five years after diagnosis. Our study suggests that workplace accommodations are an important tool for ensuring the continued employment of cancer survivors, and not just their return to work. In view of these findings, we recommend the systematic provision of workplace accommodations to all workers concerned. Further studies are needed to describe in greater detail the mode of implementation of workplace accommodations as well as the most favourable conditions for this implementation.

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Ethics approval

The survey methodology was approved by three national ethics commissions: the CCTIRS (Comité Consultatif sur le Traitement de l'Information en Matière de Recherche dans le Domaine de la Santé, study registered under no 11-143), the ISP (Institute of Public Health, study registered under no C11-63) and the CNIL (French Commission on Individual Data Protection and Public Liberties, study registered under no 911290). Confidentiality is assured for all participants with regard to any personal responses and information provided, as all data collected are anonymized.

References

- [1] the French Network of Cancer Registries (FRANCIM), Colonna M, Mitton N, Bossard N, Belot A, Grosclaude P. Total and partial cancer prevalence in the adult French population in 2008. *BMC Cancer* 2015;15. doi:10.1186/s12885-015-1168-2.
- [2] Spelten ER, Sprangers MAG, Verbeek JHAM. Factors reported to influence the return to work of cancer survivors: a literature review. *Psychooncology* 2002;11:124–31.
- [3] Boer AGEM de, Taskila T, Ojajärvi A, Dijk FJH van, Verbeek JHAM. Cancer Survivors and Unemployment: A Meta-analysis and Meta-regression. *JAMA* 2009;301:753–62. doi:10.1001/jama.2009.187.
- [4] Mehnert A. Employment and work-related issues in cancer survivors. *Critical Reviews in Oncology/Hematology* 2011;77:109–30. doi:10.1016/j.critrevonc.2010.01.004.
- [5] Alleaume C, Bendiane M-K, Bouhnik A-D, Rey D, Cortaredona S, Seror V, et al. Chronic neuropathic pain negatively associated with employment retention of cancer survivors: evidence from a national French survey. *J Cancer Surviv* 2018;12:115–26. doi:10.1007/s11764-017-0650-z.
- [6] Torp S, Paraponaris A, Van Hoof E, Lindbohm M-L, Tamminga SJ, Alleaume C, et al. Work-Related Outcomes in Self-Employed Cancer Survivors: A European Multi-country Study. *J Occup Rehabil* 2018. doi:10.1007/s10926-018-9792-8.
- [7] Duguet E, Clainche CL. Une évaluation de l'impact de l'aménagement des conditions de travail sur la reprise du travail après un cancer. *Revue économique* 2016;67:49–80. doi:10.3917/reco.pr2.0053.
- [8] Tamminga SJ, Boer AGEM de, Verbeek JH a. M, Frings-Dresen MHW. Return-to-work interventions integrated into cancer care: a systematic review. *Occupational and Environmental Medicine* 2010;67:639–48. doi:10.1136/oem.2009.050070.
- [9] Lindbohm M-L, Viikari-Juntura E. Cancer survivors' return to work: importance of work accommodations and collaboration between stakeholders. *Occup Environ Med* 2010;67:578–9. doi:10.1136/oem.2009.051847.
- [10] de Boer AGEM, Taskila TK, Tamminga SJ, Feuerstein M, Frings-Dresen MHW, Verbeek JH. Interventions to enhance return-to-work for cancer patients. *Cochrane Database Syst Rev* 2015;CD007569. doi:10.1002/14651858.CD007569.pub3.
- [11] Caron M, Durand M-J, Tremblay D. [Interventions to support the return-to-work process after cancer: a literature review]. *Sante Publique* 2017;29:655–64. doi:10.3917/spub.175.0655.
- [12] Bouhnik A-D, Bendiane M-K, Cortaredona S, Sagaon Teyssier L, Rey D, Berenger C, et al. The labour market, psychosocial outcomes and health conditions in cancer survivors: protocol for a nationwide longitudinal survey 2 and 5 years after cancer diagnosis (the VICAN survey). *BMJ Open* 2015;5:e005971–e005971. doi:10.1136/bmjopen-2014-005971.

- [13] Rubin DB. Matching to Remove Bias in Observational Studies. *Biometrics* 1973;29:159–83. doi:10.2307/2529684.
- [14] Rosenbaum PR, Rubin DB. The central role of the propensity score in observational studies for causal effects. *Biometrika* 1983;70:41–55. doi:10.1093/biomet/70.1.41.
- [15] Becker SO, Ichino A. Estimation of average treatment effects based on propensity scores. *The Stata Journal* n.d.;2:358–377.
- [16] Carstairs V. Deprivation indices: their interpretation and use in relation to health. *Journal of Epidemiology & Community Health* 1995;49:S3–8. doi:10.1136/jech.49.Suppl_2.S3.
- [17] Austin PC. Optimal caliper widths for propensity-score matching when estimating differences in means and differences in proportions in observational studies. *Pharm Stat* 2011;10:150–61. doi:10.1002/pst.433.
- [18] Cortaredona S, Pambrun E, Verdoux H, Verger P. Comparison of pharmacy-based and diagnosis-based comorbidity measures from medical administrative data: Comorbidity Measures. *Pharmacoepidemiology and Drug Safety* 2017;26:402–11. doi:10.1002/pds.4146.
- [19] INCa. *Survie attendue des patients atteints de cancer: état des lieux 2010* 2010.
- [20] INCa. *La vie deux ans après un diagnostic de cancer - De l'annonce à l'après-cancer*. 2014.
- [21] INCa. *La vie cinq ans après un diagnostic de cancer* 2018:364.
- [22] Bodier M, Buisson G, Lapinte A, Robert-Bobée I. *Couples et familles - Edition 2015* 2015.