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The Impact of Cancer on Employment Outcomes

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The onset of cancer has a negative impact on careers. In this study, the Hygie administrative database was used in order to assess the effects of several cancers —one to five years after diagnosis— on labour market status. The results show that the likelihood of being employed for at least one trimester in the year decreases significantly compared with the year preceding the onset of the illness. The decrease in employment rate lasts for up to five years after the onset of cancer, resulting, in the short term, in higher rates of sick leave, and, in the medium term, non employment. However, the magnitude of these effects varies according to the type of cancer, the cancer's severity, and the gender and age of the patient when cancer is diagnosed.

In the female population, breast cancer, which is the most common type of cancer, has a significant negative impact on employment one year after diagnosis, which lasts for five years. Ovarian cancer is distinguished by the fact that it has the most pronounced negative effect on employment in the short term. Amongst men, the onset of prostate cancer leads to a moderate decrease in employability in the short term, but which becomes more acute over time. With regard to cancer sites that are common to both sexes, lung and bronchial cancer is most detrimental to employment, whereas thyroid cancer has little impact on careers.

The contrasting negative impacts on employment reflect the severity of the illness, treatment, and sequelae, and, also probably, the measures proposed by companies to improve working conditions and employment.

7 In 2015, in the OECD (Organisation for Economic Cooperation and Development) countries, cancer is the second leading cause of death (26% of all deaths), after diseases of the circulatory system (36%). In France, since the first Cancer Plan (2003–2007), the fight against cancer has increasingly become a major public health concern. In 2008, the number of persons aged 15 or over who were diagnosed with a cancer was around 3 million: 1,570,000 men and 1,412,000 women (Colonna, Mitton,

Grosclaude, 2014). The increase in the incidence of cancer was close to 109% between 1980 and 2012 (Binder *et al.*, 2013). The median age at diagnosis in 2015 was 68 for men and 67 for women (Inca, 2014). The age-standardised net survival rate* at ten years, for patients diagnosed between 1989 and 2010, was often very high and varied according to

¹ <http://www.e-cancer.fr/Professionnels-de-sante/Les-chiffres-du-cancer-en-France/Epidemiologie-des-cancers>

the type of illness and age (see Graph). Among cancers of the reproductive system, in all age groups, the survival rate

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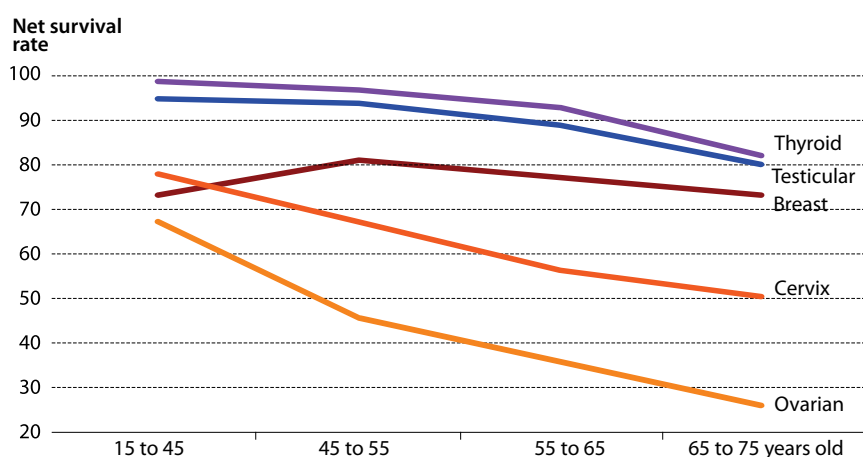
^h IRDES.

* The terms followed by an asterisk are defined in the glossary below (see Definition inset, p.2).

was 59% for cervical cancer, 31% for ovarian cancer, 94% for testicular cancer, and 76% for breast cancer. With regard to prostate cancer, the ratio increased considerably: from 56% between 1989 and 1993 to 84% between 1999 and 2004. For cancers common to both sexes, it was 95% for thyroid cancer and 52% for colon cancer. In contrast, the long-term survival rate was only 13% for lung cancer. Although mortality from cancer remains high, advances in the screening and treatment of cancer, and the postponing of the retirement age fully justify the issue of re-employment opportunities. Very few studies have been conducted in France to examine the impact of cancer on careers. This study attempts to answer this question by using the Hygie database, which has been compiled by matching the administrative databases of the French National Pension Fund (Caisse Nationale d'Assurance Vieillesse, CNAV) and the French Statutory Health Insurance

G

Age-standardised net survival rate at ten years after cancer diagnosis (for patients diagnosed between 1989 and 2010)



Source: INCA, INVS, Register of cancers.

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Fund (Caisse Nationale de l'Assurance Maladie, CNAM) [see "Sources" inset]. The identification of cancers was carried out through the long-term diseases (Affections de Longue Durée, or ALD)* recorded by the French Health System (Assurance Maladie). To assess the causal impact of the onset of cancer on employment status, the careers of people with cancer were compared with those of people without cancer with similar characteristics, by using the "difference-in-difference" approach (see "Method" inset).

There was a significant deterioration in employment opportunities resulting from the onset of breast and ovarian cancer, and cervical cancer

Women's cancers (breast cancer and cancers of the reproductive system) included in this study significantly impede employment opportunities, a fortiori if they are diagnosed at a young age (see Table 1). A year after the onset of breast cancer, the proportion of women in employment decreased by 9.9 percentage points (pp), resulting in a significant increase of 53.1 pp in the proportion of women on sick leave, which decreased over time. The magnitude of the decrease in employment declined slightly in the second year (-8.8 pp), and subsequently rose each year until the fifth year after admission to the long-term diseases (ALD), with a decrease

in employment of 11.3 pp, which resulted in long-term economic inactivity (+9.4 pp, five years after diagnosis). The withdrawal from the labour market may be linked to sequelae, which vary according to the type of breast cancer and the treatment received. But physical and mental fatigue, combined with pain, is often one of the principal causes of exclusion from the labour market (INCA, 2018). Furthermore, there were few transitions to unemployment.

The impact of cervical cancer on employment was more pronounced than that of breast cancer. Hence, the probability of being employed declined by 13.2 pp in the first year and by 5.4 pp in the second. Again, the decrease in employment was mainly due to the increased probability of being on sick leave (+36.2 pp in the first year and +16 pp in the second year). The decrease in employment and the increased probability of being on sick leave may be due to the disabling side-effects of anticancer treatments or incapacitating sequelae, which are incompatible with job retention. After two years, the impact of cancer on the probability of being employed was less significant: women were more likely to be unemployed or non employed. Furthermore, an increase of 10.5 pp in non employment was observed in the first year, which —although it declined

² For more results, particularly for other cancers, see Barnay et al., 2018.

Definitions

- Long-term diseases (Affections de Longue Durée, ALD): a disease on a list, established by decree. These diseases are requiring prolonged treatment and particularly costly therapeutic treatment. Patients' contributions are not required.
- Median age: the age that divides a sample population into two numerically equal groups.
- Age-standardised mortality rate: the mortality rate of a population adjusted according to an age-standardised distribution of the population. It is calculated as a weighted average of the age-specific mortality rates of a given population, in which the weighting coefficients correspond to the age distribution of the population concerned (Eurostat).
- Net survival rate at ten years: corresponds to the proportion of patients who survive ten years after the date of diagnosis if the only possible cause of death is the cancer targeted (Santé Publique France)

Indicators of employment status used in the study

- Sick leave: eligibility depends on paying into the health insurance scheme for at least one quarter a year.
- Unemployment: contributions for at least one quarter a year while unemployed and not while employed.
- Employment: contributions for at least one quarter a year while employed.
- Non employment: given the previous definitions, a person neither in a situation of employment, nor in a situation of unemployment.

SOURCE

The Hygie database has been compiled by matching the administrative databases of the French National Pension Fund (Caisse Nationale d'Assurance Vieillesse, CNAV) and the French National Health Insurance Fund (Caisse Nationale de l'Assurance Maladie, CNAM); the database relates exclusively to the private sector. The CNAV databases are based on data from the National Career Management System (Système National de Gestion des Carrières, SNGC), which comprises employees in the National Provider Statistics System (Système National Statistiques Prestataires, SNSP), which provides information on retired people. This data was then matched with health insurance benefits extracted from the National Inter-Regime Information System on Health Insurance (Système National d'Information Inter-Régimes de l'Assurance Maladie, SNIIRAM). The data from the French National Pension Fund (CNAV) was the point of entry of the constitution of the sample. It

was a random sample of beneficiaries aged between 22 and 70 in 2005, who had made at least one contribution to the General Pension Scheme (Régime Général de Retraite) during their lifetime. It was combined with the SNIIRAM data, which relates to the beneficiaries of the French Statutory Health Insurance Fund (Régime Général d'Assurance Maladie) and included beneficiaries who received healthcare on at least one occasion that was recorded in the years 2003, 2004, and 2005. The retrospective dimension was obtained through information on the individuals' careers, from the point at which they entered the labour market. Lastly, the Hygie database is a cohort database that was updated with the addition of new data in 2009. Hence, the population is aging and the average death rate per year is 0.38%. The data on careers relates to 552,048 working individuals who were beneficiaries of the French Statutory Health Insurance (Régime Général) and pensioners in 2005.

in the two following years— was 8.1 pp after five years. The probability of being unemployed increased slightly, but significantly (around 3 pp) between three and five years after diagnosis. One explanation for this could be the early onset of the cancer (compared to other cancers of the female reproductive sys-

tem), as women are often in employment at that age.

Lastly, the onset of ovarian cancer has the most significant negative impact on employment. The difficulty of early diagnosis of the tumour means that major surgical intervention is often required and is followed by chemo-

therapy, as combination therapy has a significant impact on patients' professional activities. There was a significant increase in sick leave in the first year (+55 pp). In the second year, the number of people on sick leave increased by 26.8 pp. The third and fourth years were characterised by a lower increase of 19.1 pp and 2.3 pp respectively. A year after the onset of ovarian cancer, the number of people in employment decreased by 15.8 pp. Withdrawal from the labour market largely led to non employment (+16.3 pp). The cumulative effect on aggregate employment remained significant with a decrease of 11.3 pp after five years.

In the medium term, withdrawal from the labour market continued to lead to non employment (+12.3 pp

five years after the onset of the illness). In contrast, few patients experienced periods of unemployment, which were only observed two and three years after the onset of cancer, on a small scale (+2.7 pp and +4.8 pp maximum).

Prostate and testicular cancer: men's careers were less affected

Cancers of the male reproductive system appeared to have a more moderate impact on employment than those of their female counterparts. There may be two explanations. On the one hand, prostate cancer is a cancer that occurs late in men's working lives. On the other hand, although testicular cancer occurs, a contrario, at a young age, the prognosis is very good (see Table 2).

After the onset of prostate cancer, the probability of being employed decreased slightly: by 3.9 pp in the first year and 4.1 pp in the second. This impact, which increased over time, corresponded to the effects of anticancer treatments and the first sequelae. Certain prostate cancer treatments, such as a complete prostatectomy, cause serious sequelae, including, in particular, incontinence problems and sexual dysfunction. Incontinence problems have a particularly negative impact on careers. As expected, the probability of being on sick leave increased, by 27.8 pp after the first year and by 16.8 pp after the second. Between three to five years after diagnosis, the probability of being employed decreased considerably: -7.9 pp in the third year and -14.1 pp in the fifth year. Non employment increased considerably

T1

Female cancers and careers

Effect on labour market outcomes*				
Years after diagnosis	Employment	Unemployment	Economic inactivity	Sick leave
Breast cancer				
1 year	-9.9**	-0.1	10.1**	53.1**
2 years	-8.5**	0.7**	7.8**	27.4**
3 years	-8.6**	1.5**	7.1**	14.8**
4 years	-8.8**	1.4**	7.4**	4.8**
5 years	-11.3**	1.9**	9.4**	5.0**
Cervical Cancer				
1 year	-13.2**	2.7**	10.5**	36.2**
2 years	-5.4**	1.2**	4.2**	16.0**
3 years	-8.2**	3.9**	4.3**	13.1**
4 years	-10.9**	2.9**	8.0**	7.0**
5 years	-11.4**	3.2**	8.1**	4.9**
Ovarian cancer				
1 year	-15.8**	-0.5	16.3**	55.0**
2 years	-15.6**	2.7**	12.9**	26.8**
3 years	-12.7**	4.8**	7.9**	19.1**
4 years	-15.6**	0.8	14.8**	2.3**
5 years	-11.3**	-1.0	12.3**	0.8

The asterisks indicate the level of the statistical significance of the results (* < 0; ** < 5%).

* The sum of the "Employment", "Unemployment", and "Economic inactivity" columns is equal to 0. The effect on the disease is interpreted separately from the effects on employment. The rate of disease is not added to the other rates. The effect is measured in percentage points.

Reading: Five years after diagnosis of breast cancer (t+5), the probability of being in employment compared with the year preceding diagnosis (t-1) decreased by 11.3 percentage points.

Scope: Private-sector employees who had made at least one contribution to the General Pension Scheme (Régime Général de Retraite) during their lifetime, and who had benefitted on at least one occasion from the French Statutory Health Insurance Fund (Régime Général d'Assurance Maladie) between 2003 and 2005.

Source: HYGIE 2005-2010.

[Download the data](#)

—which is specific to this cancer—, from 4.3 pp in t+1 to 15.8 pp in t+5. In view of the fact that people in employment suffering from prostate cancer were close to retirement age, one could speculate that they withdraw from the labour market earlier by taking greater advantage of early retirement opportunities.

The immediate effect of testicular cancer is a decrease of 3.1 pp in the probability of being employed and an increase in sick leave (+ 27.3 pp). The decrease in the probability of job retention, a year after the diagnosis of testicular cancer, remained relatively slight compared with other male cancers. However, young men suffering from testicular cancer experienced more labour market precarity. Hence, a year after the onset of testicular cancer, the percentage of economically inactive individuals (+3.1 pp) increased. Over a longer time frame, the average effect of testicular cancer on the incidence of sick leave due to illness decreased gradually over time. After the acute phase of surgery and chemotherapy, observed functional physical sequelae were relatively limited. The effect of testicular cancer on employment

remained relatively constant and moderate over time.

Lung, colon, and thyroid cancer: differential effects on employment

The cancers that are common to both sexes had diverse effects that reflected the severity of the prognoses associated with these cancers. Lung cancer is often associated with a poor prognosis and the treatment is incompatible with job retention. The severity of colon cancer varies, but the treatment causes sequelae that may affect a person's ability to return to employment or remain in the labour market. Lastly, thyroid cancer has a good prognosis and often requires hormonal treatment, which, if not balanced, may have adverse effects on health, requiring recurrent periods of sick leave, after the completion of treatment.

Lung cancer has a severe impact on employment, particularly for men. In the year following diagnosis, the probability of men with lung cancer being employed decreased by 17 pp in relation to men without cancer. In the case of women with a pulmonary tumour, the probability of job retention also decreased, but to a lesser degree (-11.9 pp). A year after the onset of the illness, lung cancer survivors had to receive intensive treatment (the incidence of sick leave increased, +62.9 pp for men and +59 pp for women, and economic inactivity increased: +19.4 pp and +11.3 pp respectively).

Returning to work after broncho-pulmonary cancer was difficult in both the short and medium term. Patients experienced a significant decrease in the proba-



This study is based on research funded by the French National Cancer Institute (Institut National du Cancer, INCA) and the Fondation ARC/INCA, which was published entirely in a report (Barnay et al., 2018).

bility of being employed throughout the observed period (-27.1 pp for men and -27.6 pp for women, after five years).

The effects of pulmonary tumours on other employment situations varied little according to gender. Hence, at the end of the follow-up period, most of the men and women with cancer had largely left their jobs, as the impact of the illness on the probability of being economically inactive increased over time, rising from 27.9 pp after two years to 33 pp after five years for men, and from 12.6 pp after two years to 35.8 pp after five years for women.

The severity of the illness and the persistence of sequelae caused by lung cancer were also reflected by the significant increase in the probability of being on sick leave five years after admission to the long-term diseases scheme (ALD) (+8.2 pp for men and +14.6 pp for women).

With regard to colon cancer, in the short term —a year after the onset of colon cancer—, the proportion of people in employment decreased by -5.7 pp for men and -6.9 pp for women respectively. The disease resulted in an increase in time spent on sick leave: +51.7 pp for men and +59 pp for women. Surgery is the common form of treatment, and is often followed by chemotherapy, and radiotherapy in the case of rectal cancer. The combination of these treatments requires an initial lengthy period of time away from work. Non employment increased significantly in the first year (+9.3 for men and +8.9 for women). For both sexes, the cumulative effect on employment after five years was -10.5 pp for men and -7.9 pp for women.

The effects of colorectal tumours on other employment situations varied more widely depending on gender. In

T2

Male cancers and careers

Effect on labour market outcomes*				
Years after diagnosis	Employment	Unemployment	Economic inactivity	Sick leave
Prostate cancer				
1 year	-3.9**	-0.4	4.3**	27.8**
2 years	-4.1**	-1.0*	5.1**	16.8**
3 years	-7.9**	1.0	6.9**	11.0**
4 years	-14.2**	4.9**	9.3**	4.5**
5 years	-14.1**	-1.8**	15.8**	0.8
Testicular cancer				
1 year	-3.1**	0.1	3.1**	27.3**
2 years	-2.1**	0.5**	1.6**	10.0**
3 years	-1.7**	2.1**	-0.4**	4.5**
4 years	-0.9	0.0	0.8**	1.3**
5 years	-1.4**	-0.2*	1.6**	1.8**

The asterisks indicate the level of the statistical significance of the results (* < 0; ** < 5%).

* The sum of the "Employment", "Unemployment", and "Economic inactivity" columns is equal to 0. The effect on the disease is interpreted separately from the effects on employment. The rate of disease is not added to the other rates. The effect is measured in percentage points.

Reading: Five years after diagnosis of prostate cancer (t+5), the probability of being in employment compared with the year preceding diagnosis (t-1) decreased by 14.1 percentage points.

Scope: Private-sector employees who had made at least one contribution to the General Pension Scheme (Régime Général de Retraite) during their lifetime, and who had benefitted on at least one occasion from the French Statutory Health Insurance Fund (Régime Général d'Assurance Maladie) between 2003 and 2005.

Source: HYGIE 2005-2010.

[Download the data](#)

T3

Cancers common to both sexes

Effect on labour market outcomes*	Men				Women			
	Employment	Unemployment	Economic inactivity	Sick leave	Employment	Unemployment	Economic inactivity	Sick leave
Lung cancer								
1 year	-17.0 **	-2.4 **	19.4 **	62.9 **	-11.9 **	0.6	11.3 **	59.0 **
2 years	-24.7 **	-3.2 **	27.9 **	45.8 **	-13.5 **	0.9	12.6 **	33.3 **
3 years	-25.3 **	-2.4 **	27.7 **	26.6 **	-27.1 **	6.0 **	21.1 **	12.6 **
4 years	-26.2 **	-3.4 **	29.6 **	10.3 **	-25.5 **	-4.6 **	30.1 **	12.8 **
5 years	-27.1 **	-5.9 **	33.0 **	8.2 **	-27.6 **	-8.2 **	35.8 **	14.6 **
Colon cancer								
1 year	-5.7 **	-3.6 **	9.3 **	51.7 **	-6.9 **	-1.9 **	8.9 **	59.0 **
2 years	-7.1 **	2.7 **	4.4 **	26.7 **	-8.9 **	0.5	8.3 **	29.9 **
3 years	-8.4 **	1.2 *	7.2 **	15.3 **	-6.3 **	-0.3	6.6 **	15.5 **
4 years	-11.9 **	-1.5 **	13.4 **	5.2 **	-4.3 **	0.5	3.8 **	4.3 **
5 years	-10.5 **	-3.2 **	13.7 **	1.1 **	-7.9 **	3.9 **	3.9 **	-1.3 **
Thyroid cancer								
1 year	-0.4	-0.3	0.7	18.5 **	-0.5	-2.2 **	2.7 **	22.1 **
2 years	-1.9 *	0.4	1.6 **	6.6 **	-2.8 **	0.8 **	2.1 **	11.7 **
3 years	-3.3 **	0.8 *	2.5 **	2.4 **	-1.3 **	-0.9 **	2.2 **	9.0 **
4 years	-2.9 **	-0.8	3.7 **	3.9 **	-7.5 **	-0.4	7.9 **	7.2 **
5 years	-2.8 **	-2.6 **	5.4 **	2.1 **	-4.5 **	-0.3	4.9 **	1.5 **

The asterisks indicate the level of the statistical significance of the results (* < 0; ** < 5%).

* The sum of the "Employment", "Unemployment", and "Economic inactivity" columns is equal to 0. The effect on the disease is interpreted separately from the effects on employment. The rate of disease is not added to the other rates. The effect is measured in percentage points.

Reading: Five years after diagnosis of lung cancer (t+5), the probability of being in employment compared with the year preceding diagnosis (t-1) decreased by 27.1 percentage points.

Scope: Private-sector employees who had made at least one contribution to the General Pension Scheme (Régime Général de Retraite) during their lifetime, and who had benefitted on at least one occasion from the French Statutory Health Insurance Fund (Régime Général d'Assurance Maladie) between 2003 and 2005.

Source: HYGIE 2005-2010.

[Download the data](#)

the case of men, there was a significant increase in the rate of economic inactivity after four and five years (+13.4 and +13.7 pp respectively). In contrast, in the case of women, the impact on the rate of economic inactivity decreased over time and stabilised at a little under 4 pp after

four and five years. However, they experienced an increase in unemployment after five years (+ 3.9 pp), whereas men with colorectal cancer were less likely to be looking for work after four and five years (-1.5 and -3.2 pp respectively). Hence, men with colorectal tumours

were more likely to withdraw from the labour market, and women were more likely to be involved in searching for employment.

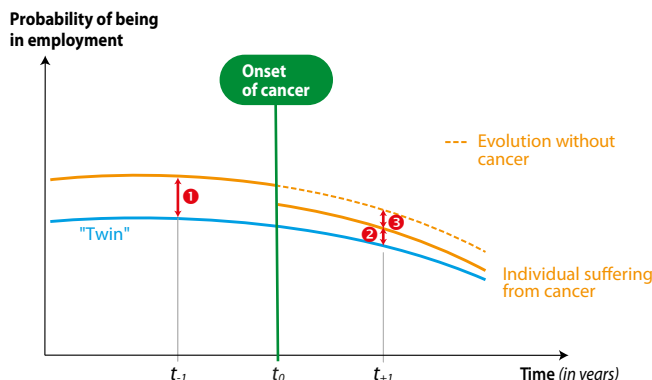
Thyroid cancer generally has a good prognosis. During the initial treatment,

METHOD

The difference-in-difference method with exact matching is part of public policy evaluation methods (Fougère, 2010). This method aims to estimate the net effects of the onset of cancer on subsequent occupational situations (sick leave, employment, unemployment, and economic inactivity). It makes it possible, on the one hand, to eliminate the effect of the various sources of individual heterogeneity, whether it is or is not observable but which is invariant over time, and, on the other hand, the temporal effects linked to macroeconomic changes in the labour market and medical advances.

The estimation can be divided into three phases (targeting the probability of being in employment):

- First phase (not illustrated): for individuals suffering from cancer, the difference between the occupational situation from one to five years after cancer diagnosis and the occupational situation a year before the onset of cancer was calculated.
- Second phase: the patients were matched with individuals who had not been registered as suffering from a long-term disease (ALD). The difference between the occupational situations of the patients and those without cancer was calculated, between the year preceding the onset of the illness and a period of one to five years after diagnosis.
- Third phase: the difference between the change in the patients' occupational situations and the change in the occupational situations of individuals without cancer was calculated. The difference-in-difference was then calculated using an exact formula, by specifically taking into account the correlations resulting from 'twins' in various studies.



Reading: ① The difference between a person a year before the onset of cancer and his/her "twin"; ② The difference between a person a year after the onset of cancer and his/her "twin"; ③ Double difference: the impact of cancer on the probability of being in employment (② - ①).

it does not affect employment status. In the case of patients with thyroid cancer, the incidence of sick leave was quite high in the first year, and then gradually decreased over time. It increased by 22.1 pp for women and 18.5 pp for men. The increase in the incidence of sick leave is attributable to the intensive nature of the medical treatment that requires patients to stay away from work for a lengthy period in the first year after diagnosis. However, in the long term, the increase gradually became less significant: 11.7 pp for women and 6.6 pp for men in the second year, 9 pp for women and 2.4 pp for men in the third year, and only 1.5 pp for women and 2.1 pp for men in the fifth year after diagnosis. People with thyroid cancer

also experienced a significant increase in the frequency of non employment over time. Nevertheless, the effects of thyroid cancer were globally less significant than those of other cancers common to both sexes, particularly when the five-year period is considered.

* * * *

Thanks to advances in screening techniques and innovations in treatment (hormone therapy, immunotherapy, conformal radiation therapy, interventional radiology, etc.), most of the cancers now tend to become chronic illnesses. However, they do have significant negative effects on careers. All the cancers in this study, with the excep-

tion of thyroid cancer, resulted in a significant decrease in employment and a considerable rise in the incidence of sick leave in the first year after diagnosis. The effects on employment did not decrease with time, and even increased in the case of certain cancer sites (breast, prostate, lung, colon, and thyroid cancer). Hence, returning to work and job retention are very important issues. Government policies relating to employment and occupational health therefore play a major role in encouraging companies to improve and adapt working conditions during the critical cancer treatment periods, and put in place safeguards against the risk of discrimination, which can be detrimental to career prospects. ♦

FOR FURTHER INFORMATION

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