

〈Research Note〉

Employment Choices, Working Hours, and Annual Earnings of Breast and Gynecologic Cancer Survivors

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Abstract:

More women than men who have been diagnosed with cancer are employed, and specifically, the number of women with breast, uterine, cervical, and ovarian cancers—cancers unique to women—is on the rise. This paper summarizes the government's cancer control measures to date, outlines the characteristics of cancers specific to women, and discusses the employment choices, working hours, and annual income of those affected by these cancers through empirical analysis. The results of our analysis indicate that workplace understanding, family support, and absence of complications increase the likelihood of continuing employment within the same company, while surgery for affected individuals increases the likelihood of opting for no work. Additionally, individuals holding management positions when they are diagnosed with cancer are more likely to change jobs because of the disease.

Keywords:

cancer control, risk factors, cancers specific to women, employment of cancer patients

1. Introduction

Cancer has been the most common cause of death among Japanese people since 1981, and the government has been working on cancer countermeasures based on the “Ten-Year Comprehensive Strategy for Cancer,” enacted in 1984. In 2006, “The Basic Act on Cancer Measures” was enacted to further enhance cancer measures. In 2007, “The Basic Plan for the Promotion of Cancer Measures” was formulated to promote comprehensive and systematic measures. The second-phase plan in 2012 included efforts to address social issues, including the employment of cancer patients, whereas the fourth-phase plan in 2023 included more specific plans for employment support (Ministry of Health, Labour and Welfare 2023).

Endo (2019) points out that advances in medical technology, increases in breast cancer morbidity, younger age at the onset of cervical cancer, and increases in the number of female workers are key factors driving the recent increase in cancer morbidity among the working generation. Therefore, the number of cancer survivors (in a narrow sense) working while continuing to treat their cancer is higher among females, although the number of cancer survivors and deaths is higher among males. In this study, to complement Takeuchi’s (2023) research using a unique web survey that analyzed the attributes of female-specific cancer patients and the factors that make them continue their work after diagnosis, we review the government’s efforts and the factors that affect female-specific cancer and treatment methods and introduce the results of the analysis related to job selection, working hours, and annual earnings.

The remainder of this paper is organized as follows. The next section provides an overview of the government’s efforts. Chapter 3 describes breast cancer, cervical cancer, uterine body cancer, and ovarian cancer and introduces their causes and treatment methods. Section 4 discusses the employment choices, working hours, and annual earnings of women affected by female-specific cancers using empirical analysis, and Section 5 concludes this paper.

2. Government Initiatives

Looking back on the progress of cancer countermeasures, the government formulated the “Ten-Year Comprehensive Strategy for Cancer” in 1984 and the “New Decade Strategy for Overcoming Cancer” in 1994. Since 2004, the government has been promoting the “Comprehensive Decade Strategy for Cancer Prevention” to promote cancer research and disseminate high-quality cancer medicine nation-wide to dramatically reduce cancer morbidity and mortality. In 2005, “The Action Plan for the Promotion of Cancer Countermeasures” was formulated to dramatically improve cancer countermeasures and achieve certain results.

However, considering that cancer remains a serious challenge for the lives and health of patients, “The Basic Act on Cancer Measures” was enacted in 2006 (Cancer Information Services 2013).

The Basic Act on Cancer Measures is the core policy framework for cancer control in Japan. This Act came into effect in April of 2017. It sets forth the basic principles of cancer treatment and highlights the responsibilities that the national and local governments, the public, and physicians should bear (Cancer Information Services 2013). In 2007, to promote cancer countermeasures comprehensively and systematically, the “Basic Plan for the Promotion of Cancer Measures” was approved by the Cabinet. Based on this plan, the “Ten-Year Cancer Research Strategy” was formulated in 2014, and the “Acceleration Plan for Cancer Measures,” which is based on the three pillars of prevention, treatment and research, and coexistence with cancer, will be formulated in 2015 (Cancer Research Promotion Foundation 2022).

However, along with initiatives centered on the Basic Act on Cancer Measures, new issues will emerge, such as the advancement of cancer treatment, an increase in the number of people who can play an active role in society even after treatment, and an increase in the number of people forced to retire for outpatient visits. Therefore, the revised Basic Act on Cancer Measures was enacted in 2016, which included improving the environment for a society in which cancer patients can live with peace of mind.

The Amendment Act establishes the responsibility of business owners on the corporate side and stipulates that consideration should be given to workers so that they can continue to work despite facing cancer. It also stipulates that the government and local governments should take the necessary measures to educate business owners regarding the employment of cancer patients and disseminate knowledge to them. In addition, to deepen the knowledge of cancer and the understanding of cancer patients, the Amendment Act has established the “Promotion of Education on Cancer” section, which calls for measures necessary to promote education on cancer (Japan Anti-Cancer Association 2023).

Furthermore, the Basic Plan for the Promotion of the Fourth Stage of Cancer Measures has been in effect since 2023 for the first five years in line with the Basic Act on Cancer Measures. Based on the overall goal of promoting cancer measures and overcoming cancer among all citizens, the three pillars of the Third Basic Plan, “Cancer Prevention,” “Enhancement of Cancer Medicine,” and “Harmony with Cancer,” have been established to address the current situation and issues in each field (Ministry of Health, Labour, and Welfare 2023). For cancer prevention, the target cancer screening rate has increased from 50% to 60% because it has been increasing in all cancer types. In cancer medicine, palliative care has been described as a challenge that should be addressed by healthcare professionals, and an article related to the rapid implementation of new technologies has been added. Furthermore, with regard to symbiosis with cancer, based on the

importance of supporting changes in the appearance associated with treatment, we will add the item “Appearance Care” to promote consultation support and the construction of an information provision system centered on base hospitals. In addition, the Basic Plan for the Promotion of the Fourth Stage of Cancer Measures added the promotion of digitization as a foundation for the efficient provision of medical services and accessibility improvement (Ministry of Health, Labour and Welfare 2023).

Simultaneously, the government has formulated the “Implementation Plan 2022 for All-Genome Analysis” (Ministry of Health, Labour and Welfare 2022), and has established a basic strategy for utilizing the results of all-genome analysis, etc. for research and drug discovery, for early introduction into daily medical care, and for realizing personalized medical care, etc. We aimed to overcome cancer by strategically accumulating data and promoting research and drug discovery.

In this plan, measures for social challenges such as cancer patients are specified as survivorship support. First, the current situation and issues include the enhancement of employment support for the prevention of turnover and reemployment of cancer patients in the working generation, the importance of medical support for appearance changes associated with treatment, appropriate support for patients at high suicide risk, and economic issues. Furthermore, measures to be taken include clarifying the effects and problems of compatible support systems for work and life, cooperation between medical institutions and industrial health support staff, and understanding the actual employment and turnover of cancer patients.

The budget for cancer prevention by the Ministry of Health, Labour, and Welfare for this fiscal year was 35.7 billion yen, with a breakdown of 14.4 billion yen for cancer prevention, 18.6 billion yen for cancer medicine, and 2.7 billion yen for coexistence with cancer (Cancer Prevention Promotion Council 2023). In addition, the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Economy, Trade and Industry allocated budgets. In the Ministry of Education, Culture, Sports, Science, and Technology, subsidies for the elucidation of cancer, the development of innovative therapies, and the development of specialist physicians are the main components of the budget, whereas in the Ministry of Economy, Trade, and Industry, subsidies for medical devices, technology development for drug discovery, and the creation of innovation are the main components (Welfare and Medical Organization 2023).

3. Types and Causes of Cancer in Women, Treatment Methods

Next, this section examines the sites of breast cancer, cervical cancer, uterine body cancer, and ovarian cancer and introduces the causes of the onset and treatment methods.

3.1. Types and Factors of Cancer in Women

Breast cancer can be found in a woman's chest; however, both uterine and ovarian cancers can be found in a woman's genital organs, making them easy to confuse. Specifically, uterine body cancer, found inside the uterus, and cervical cancer, found at the entrance of the uterus, are collectively called uterine cancers and are distinguished from ovarian cancers. Breast cancer is a disease of the surgical territory, whereas cervical, uterine body, and ovarian cancers are in the gynecological territory.

Both cancers have been on an increasing trend in recent years, but breast cancer, which is on an increasing trend regardless of country or race, has been found to have a significant effect on the female hormone, estrogen. In this context, having no birth experience and giving first birth at an older age are risk factors through increased frequency of menstruation cycles. In other words, women's social advancement in recent years may have been a factor in the increase in breast cancer through late marriage and childbirth. Similarly, obesity, drinking, and family history of cancer have been reported to be associated with the onset of breast cancer (Kinoshita and Tamura 2021). It has been pointed out that the detection rate of breast cancer is lower in Japan than in other developed countries, but regular examinations such as mammography are important to reduce the mortality rate.

However, the risk factors for gynecological cancers, such as cervical, uterine body, and ovarian cancers, are different. In cervical cancer, persistent infection with human papillomavirus (HPV) has been identified, and since most infections are caused by sexual intercourse, it is noted that the onset of cervical cancer is occurring in younger women as the age of sexual intercourse begins early. Smoking is also cited as a risk factor for cervical cancer (Gynecological Oncology Society of Japan 2020). In addition, as uterine body cancer is noted to involve estrogen, a female hormone, similar to breast cancer, the westernization of diet in relation to hyperlipidemia, obesity, hypertension, etc., as well as having no birth experience, is also said to be a factor in the increase in uterine body cancer (Gynecological Oncology Society of Japan 2020). Ovarian cancer, which has the lowest incidence, is thought to occur through the accumulation of various genetic mutations, but the underlying factors remain unknown (Gynecological Oncology Society of Japan 2020).

3.2. Methods of Treatment

Treatment of breast cancer is roughly divided into three types: surgery, drugs, and radiation, and these are often combined. Among these methods, surgery and radiation are referred to as "topical therapy" because they target breast cancer cells, while pharmacotherapy is referred to as "systemic therapy." Surgery includes "partial mastectomy" to preserve the breast, "mastectomy"

to remove the entire breast, “lymph node resection” to remove the lymph node under the dwarf, and “breast reconstruction” to restore the swelling of the breast. Radiotherapy transcribes high-energy X-rays and kills cancer cells, sometimes after partial excision. Pharmacotherapies are representative therapies such as “chemotherapy,” called anticancer drug therapy, “hormone therapy,” which suppresses the function of female hormones, and “molecular target therapy,” which inhibits the function of substances related to cancer cell proliferation (Kinoshita and Tamura 2021).

However, the basic treatment methods for gynecological cancers differ according to the disease stage. In cases of intraepithelial cancer due to severe dysplasia of cervical cancer, conical resection or total hysterectomy is performed. In stage I or II, extended or semi-extended total hysterectomy and pelvic lymph node dissection are performed. In addition, after stage III, the combination of anticancer drug therapy and radiotherapy or the corresponding anticancer drug therapy is achieved. In the case of uterine body cancer, there is a choice among simple total hysterectomy, semi-extended total hysterectomy, and extended total hysterectomy, independent of the stage of the disease; pelvic lymphadenectomy is another option. Ovarian cancer also requires surgery, and anticancer drug treatment is also used in combination with surgery, except in the initial stages. Total hysterectomy, bilateral adnexectomy, parapelvic aorta lymphadenectomy, and greater omentectomy are commonly performed (Kanao and Takeshima 2021). Surgery for gynecological cancer can be divided into laparotomy and laparoscopic surgery.

4. Results of the Empirical Analysis

The data used in the empirical analysis in this study are the same as those used by Takeuchi (2023), which was conducted by entrusting Macromill, Inc. The survey was conducted in January 2022, targeting female-specific cancer patients aged 25–55 years at the time of the survey, who were employed at the time of diagnosis and two years after diagnosis.

Tables 1 to 6 present the results of the two models that replace the explanatory variables from the type of cancer (Model 1) with therapy (Model 2); the dependent variables are job choice (working at the same company, job change for a reason other than cancer, job change for a reason of cancer, joblessness), working hours, and annual earnings. The analysis techniques used were a multinomial logit model, a Tobit model, and least squares (OLS). The control variables included educational background, age at present and at diagnosis, presence or absence of children, employment status at diagnosis, presence or absence of an understanding of the workplace, flexible working style and family support, stage of cancer, and presence or absence of complications.

We considered the results of the employment choice function at the time of the survey using the multinomial logit model in Table 1 (Model 1). The probability of continuation in the same firm decreases as age increases, and increases as age at diagnosis increases. It is also suggested that having children increases the probability of working for the same firm and may continue to work for the household budget. In addition, the higher the number of years of service at the time of diagnosis, the higher the probability of being employed at the same firm and the lower the probability of leaving work because of cancer. However, those who were in a management position at the time of diagnosis were more likely to change jobs because of cancer, and it is possible that heavy responsibilities prevented them from continuing to work. Understanding the workplace, family support, and absence of complications increases the probability of working for the same firm and reduces the probability of retiring owing to cancer. In addition, uterine body cancer (based on breast cancer) has the highest probability of job change because of cancer.

However, the analysis including the treatment methods in Table 2 (Model 2) also yielded similar results. In particular, laparotomy prevents patients from continuing to work at the same firm, increasing the probability of unemployment. Endoscopic surgery, breast-preserving surgery, and total mastectomy increase the probability of unemployment. Approximately 90% of women undergo these surgeries (Takeuchi 2023) indicating that the burden of surgery causes the affected to choose not to work if there are no factors to continue working, such as years of service or understanding of the workplace.

Tables 3 and 4 analyze working hours at the time of the survey using the Tobit model. Being a full-time employee at the time of diagnosis and working in a large firm positively affect working hours. Permanent workers may work longer hours than other workers. In terms of cancer type, uterine cancer requires longer working hours, and regarding the treatment methods listed in Table 4, radiation therapy for gynecologic cancer and chemotherapy for breast cancer may have reduced working hours. Many women with uterine cancer change jobs because of it, which might be induced by the temporary body load imposed after surgery; however, it may be possible that they change jobs in a workable workplace after their treatment is reduced.

Tables 5 and 6 present the results of the OLS analysis of annual earnings as the dependent variable. As shown in Table 5, the results are similar to those of usual wage functions. The coefficients associated with cancer showed a negative effect in the absence of complications and a positive effect in uterine cancer; however, all were at the 10% significance level. These results are similar to those of uterine cancer (Tables 1 and 3), and it is necessary to verify cases in which complications can be identified during cancer treatment and the body is temporarily burdened. The estimates that include the treatment method in Table 6 in the explanatory variables also show results that cannot be explained theoretically. For example, hormonal therapy for gynecologic

Table 1 Results of Analysis of Multinomial Logit Model on Employment Choice (Types of Cancer)

Model (1) Variables	Continue to work at the same company			Change jobs			Change jobs due to cancer			Jobless		
	dy/dx	Std. err.	P>z	dy/dx	Std. err.	P>z	dy/dx	Std. err.	P>z	dy/dx	Std. err.	P>z
Highly educated	0.055	0.047		-0.014	0.043		-0.026	0.035		-0.015	0.027	
Age	-0.024	0.005 ***		0.018	0.004 ***		0.008	0.003 ***		-0.002	0.003	
Age at diagnosis	0.022	0.005 ***		-0.018	0.004 ***		-0.005	0.003 *		0.001	0.003	
Have a child	0.086	0.049 *		-0.109	0.044 **		-0.018	0.034		0.041	0.031	
Husband's annual earnings	-5.47E-05	6.79E-05		3.40E-05	6.20E-05		-8.93E-05	4.90E-05 *		1.10E-04	3.78E-05 ***	
Tenure years at diagnosis	0.024	0.004 ***		4.41E-04	0.004		-0.020	0.005 ***		-0.005	0.004	
Managerial position at diagnosis	-0.015	0.067		-0.101	0.068		0.120	0.047 **		-0.003	0.042	
Permanent employee at diagnosis	0.071	0.050		-0.045	0.046		-0.044	0.038		0.017	0.032	
Large company at diagnosis	0.052	0.054		0.035	0.052		0.009	0.042		-0.097	0.047 *	
Public officer at diagnosis	0.966	43.718		0.655	32.278		-0.968	59.366		-0.652	68.282	
Workplace satisfaction at diagnosis	-0.015	0.051		0.001	0.047		-0.005	0.035		0.019	0.030	
Understanding of treatment at workplace	0.154	0.050 ***		-0.043	0.048		-0.114	0.034 ***		0.004	0.031	
Flexible work system	0.046	0.050		-0.093	0.049 *		0.088	0.038 **		-0.040	0.030	
Family support	0.128	0.070 *		0.009	0.062		-0.079	0.038 **		-0.058	0.035 *	
Stage II	0.042	0.058		-0.110	0.055 **		0.098	0.035 ***		-0.030	0.036	
Stage III	0.094	0.084		-0.153	0.083 *		0.024	0.057		0.035	0.041	
Stage IV	0.095	0.129		-0.176	0.139		-0.047	0.094		0.128	0.058 **	
No complications	0.113	0.049 **		-0.059	0.047		-0.061	0.033 **		0.007	0.028	
Uterine body cancer	-0.059	0.098		-0.105	0.102		0.228	0.047 ***		-0.064	0.065	
Cervical cancer	0.003	0.054		0.053	0.049		-0.019	0.037		-0.038	0.032	
Ovarian cancer	0.019	0.084		-0.057	0.082		0.051	0.059		-0.013	0.051	
Log likelihood							-329.7828					
Pseudo R2							0.2909					
Number of obs							389					

Notes: presents marginal effects, significant at the *** 1%, ** 5%, and * 10% levels.

Table 2 Results of Analysis of Multinomial Logit Model on Employment Choice (Methods of Treatment)

Model (2) Variables	Continue to work at the same company			Change job			Change jobs due to cancer			Jobless		
	dy/dx	Std. err.	P>z	dy/dx	Std. err.	P>z	dy/dx	Std. err.	P>z	dy/dx	Std. err.	P>z
Highly educated	0.048	0.047		-0.015	0.044		-0.019	0.038		-0.014	0.028	
Age	-0.025	0.005 ***		0.018	0.004 ***		0.007	0.003		3.95E-04	0.002	
Age at diagnosis	0.026	0.005 ***		-0.020	0.004 ***		-0.005	0.003		-4.01E-04	0.002	
Have a child	0.093	0.049 *		-0.089	0.045 **		-0.050	0.037		0.046	0.032	
Husband's annual earnings	-6.22E-05	6.73E-05		1.44E-05	6.36E-05		-5.39E-05	5.05E-05		1.02E-04	3.84E-05 ***	
Tenure years at diagnosis	0.027	0.004 ***		0.004	0.004		-0.024	0.005 ****		-0.006	0.004 *	
Managerial position at diagnosis	0.006	0.068		-0.117	0.069 *		0.108	0.049 **		0.003	0.043	
Permanent employee at diagnosis	0.040	0.050		-0.058	0.046		-0.022	0.039		-0.078	0.045	
Large company at diagnosis	0.059	0.052		0.036	0.051		-0.017	0.044		0.076	0.071 *	
Public officer at diagnosis	0.995	55.280		0.675	42.461		-1.065	83.754		-0.605	86.939	
Workplace satisfaction at diagnosis	-0.009	0.051		-0.006	0.048		0.001	0.037		0.013	0.031	
Understanding of treatment at workplace	0.185	0.051 ***		-0.054	0.049		-0.119	0.035 ***		-0.013	0.031	
Flexible work system	0.039	0.050		-0.085	0.049		0.091	0.039		-0.045	0.031	
Family support	0.130	0.068 *		0.012	0.061		-0.072	0.039 *		-0.070	0.034 **	
Stage II	0.089	0.060		-0.110	0.059 *		0.056	0.038		-0.035	0.035	
Stage III	0.135	0.092		-0.167	0.087 *		0.011	0.062		0.021	0.044	
Stage IV	0.099	0.138		-0.128	0.148		-0.083	0.106		0.112	0.064 *	
No complications	0.104	0.052 **		-0.062	0.050		-0.077	0.036 **		0.036	0.030	
Laparotomy surgery	-0.233	0.082 ***		0.032	0.082		0.085	0.055		0.117	0.053 **	
Laparoscopic surgery	-0.087	0.081		0.044	0.080		-0.071	0.055		0.114	0.054 **	
Robot-assisted laparoscopic surgery	1.981	251.264		-2.068	373.801		0.760	84.263		-0.673	109.602	
Radiation (Uterine · Ovarian cancer)	-0.065	0.112		-0.041	0.116		0.023	0.063		0.083	0.061	
Chemotherapy (Uterine · Ovarian cancer)	0.101	0.088		-0.132	0.089		0.030	0.057		0.001	0.057	
Hormone therapy (Uterine · Ovarian cancer)	-0.036	0.127		-0.140	0.125		0.081	0.069		0.095	0.068	
Others	0.487	30.819		0.484	24.461		-1.253	63.857		0.282	8.578	
Partial mastectomy surgery	-0.125	0.097		-0.075	0.095		0.039	0.067		0.161	0.072 **	
Mastectomy surgery	-0.108	0.102		0.023	0.099		-0.056	0.074		0.141	0.077 *	
Molecular target therapy	-0.048	0.121		0.087	0.114		-0.039	0.080		0.001	0.059	
Radiation (Breast cancer)	-0.027	0.078		0.023	0.078		-0.015	0.061		0.020	0.047	
Chemotherapy (Breast cancer)	-0.114	0.083		-0.031	0.083		0.120	0.065 *		0.026	0.044	
Hormone therapy (Breast cancer)	-0.008	0.076		0.046	0.073		-0.088	0.062		0.050	0.046	
Breast reconstruction surgery	0.341	25.866		0.309	19.161		0.136	12.500		-0.786	57.526	
Log likelihood							-312.97511					
Pseudo R2							0.327					
Number of obs							389					

Notes: presents marginal effects, significant at the *** 1%, ** 5%, and * 10% levels.

Table 3 Analytical Results of Tobit Model on Working Hours (Types of cancer)

Variables	Model (1)		
	Coef.	Std. err.	P>z
Highly educated	2.065	1.750	
Age	0.160	0.172	
Age at diagnosis	-0.043	0.175	
Have a child	-1.705	1.831	
Husband's annual earnings	-0.006	0.003	**
Tenure years at diagnosis	0.182	0.147	
Managerial position at diagnosis	3.609	2.315	
Permanent employee at diagnosis	10.092	1.887	***
Large company at diagnosis	5.979	1.957	***
Public officer at diagnosis	1.338	5.309	
Workplace satisfaction at diagnosis	-3.446	1.852	**
Understanding of treatment at workplace	2.360	1.936	
Flexible work system	0.896	1.888	
Family support	-0.083	2.350	
Stage II	1.024	2.048	
Stage III	-3.036	3.001	
Stage IV	-3.451	4.623	
No complications	-0.688	1.841	
Uterine body cancer	12.181	3.159	***
Cervical cancer	3.080	1.940	
Ovarian cancer	-0.138	3.235	
Constant term	13.164	6.844	*
Log likelihood		-1531.1155	
Pseudo R2		0.0342	
Number of obs		389	

Notes: The coefficients are significant at the *** 1%, ** 5%, and * 10% levels.

Table 4 Results of Analysis of Tobit Model on Working Hours (Methods of treatment)

Variables	Model (2)		
	Coef.	Std. err.	P>z
Highly educated	2.538	1.786	
Age	0.134	0.175	
Age at diagnosis	-0.054	0.180	
Have a child	-2.247	1.854	
Husband's annual earnings	-0.004	0.003	*
Tenure years at diagnosis	0.183	0.148	
Managerial position at diagnosis	3.390	2.388	
Permanent employee at diagnosis	10.192	1.904	***
Large company at diagnosis	5.895	1.968	***
Public officer at diagnosis	0.781	5.310	
Workplace satisfaction at diagnosis	-3.742	1.878	**
Understanding of treatment at workplace	2.331	1.980	
Flexible work system	1.240	1.895	
Family support	-0.675	2.342	
Stage II	1.205	2.199	
Stage III	-0.570	3.268	
Stage IV	-4.594	4.901	
No complications	-1.628	1.927	
Laparotomy surgery	0.030	2.829	
Laparoscopic surgery	-1.068	2.764	
Robot-assisted laparoscopic surgery	1.547	6.255	
Radiation (Uterine · Ovarian cancer)	-8.746	3.729	**
Chemotherapy (Uterine · Ovarian cancer)	3.012	3.149	
Hormone therapy (Uterine · Ovarian cancer)	0.723	4.034	
Others	-7.477	4.377	*
Partial mastectomy surgery	-3.304	3.337	
Mastectomy surgery	-5.870	3.624	
Molecular target therapy	1.828	4.449	
Radiation (Breast cancer)	-4.255	2.878	
Chemotherapy (Breast cancer)	-0.301	2.994	*
Hormone therapy (Breast cancer)	-0.192	2.786	
Breast reconstruction surgery	6.941	4.522	
Constant term	20.630	6.783	***
Log likelihood		-1529.0346	
Pseudo R2		0.0355	
Number of obs		389	

Notes: The coefficients are significant at the *** 1%, ** 5%, and * 10% levels.

Table 5 Results of OLS Analysis on Annual Income (Type of cancer)

Variables	Model (1)		
	Coef.	Std. err.	P>z
Highly educated	64.593	32.527	**
High school	-14.656	31.081	
College	18.973	30.552	
Technical school	4.762	33.545	
Age	0.724	1.038	
Have a child	-9.510	13.569	
Working hours	2.823	0.555	***
Tenure years	0.977	1.325	
Managerial position	88.691	23.339	***
Executive officer	244.915	58.021	***
Permanent employee	130.212	16.770	***
Large company	78.895	18.732	***
Public officer	184.758	66.276	***
Self-employed	226.890	93.500	**
affected by Covid-19	-20.522	18.396	
Stage I	-23.584	17.744	
Stage II	-9.971	34.945	
Stage IV	-19.483	53.473	
No complications	-28.413	15.937	*
Uterine body cancer	58.291	31.883	*
Cervical cancer	9.061	16.777	
Ovarian cancer	5.415	27.469	
Constant term	40.204	61.916	
R-squared		0.6279	
Number of obs		307	

Notes: The coefficients are significant at the *** 1%, ** 5%, and * 10% levels.

Table 6 Results of OLS Analysis on Annual Earnings (Methods of Treatment)

Variables	Model (2)		
	Coef.	Std. err.	P>z
Highly educated	100.830	33.273	***
High school	15.334	31.334	
College	49.561	30.981	
Technical school	41.326	34.574	
Age	-0.552	1.037	
Have a child	-12.926	13.428	
Working hours	2.895	0.552	***
Tenure years	1.298	1.299	
Managerial position	76.394	24.496	***
Executive officer	229.557	64.244	***
Permanent employee	127.941	16.121	***
Large company	69.377	18.234	***
Public officer	196.196	57.278	***
Self-employed	226.970	97.519	**
affected by Covid-19	-20.095	17.549	
Stage I	-34.303	19.667	*
Stage II	-19.827	35.566	
Stage IV	-24.188	55.382	
No complications	-32.839	16.233	**
Laparotomy surgery	37.155	25.908	
Laparoscopic surgery	8.528	24.650	
Robot-assisted laparoscopic surgery	39.657	37.783	
Radiation (Uterine · Ovarian cancer)	-20.376	35.077	
Chemotherapy (Uterine · Ovarian cancer)	-3.904	24.457	
Hormone therapy (Uterine · Ovarian cancer)	-64.685	30.324	**
Others	-32.484	36.350	
Partial mastectomy surgery	-58.945	27.232	**
Mastectomy surgery	-33.069	32.348	
Molecular target therapy	22.460	54.267	
Radiation (Breast cancer)	62.461	22.761	***
Chemotherapy (Breast cancer)	-17.646	27.272	
Hormone therapy (Breast cancer)	16.729	23.144	
Breast reconstruction surgery	83.492	31.561	***
Constant term	78.312	63.790	
R-squared		0.6479	
Number of obs		307	

Notes: The coefficients are significant at the *** 1%, ** 5%, and * 10% levels.

cancer and breast-conserving surgery for breast cancer negatively affect annual earnings, whereas radiotherapy for breast cancer and breast reconstruction positively affect annual earnings. It is necessary to examine the interpretation in conjunction with the possibility of choosing reconstructive surgery to continue working, and the medical positioning of radiotherapy.

5. Conclusion

More women than men are diagnosed with cancer, especially those with breast, uterine body, cervical, and ovarian cancers, which are female-specific. Motivated by this situation, this study summarizes previous government cancer measures and the characteristics of female-specific cancers, and empirically examines the employment choices, working hours, and annual earnings of those affected by these cancers. The results indicate that although surgery for affected individuals increases the probability of not choosing to work, workplace understanding, family support, and the absence of complications increase the probability of continuing to work in the same firm. In addition, those who were in management positions at the time of diagnosis were significantly more likely to change jobs because of cancer.

Overseas, there are numerous studies on the working situation of women with cancer, including breast cancer, and it seems essential to maintain data and accumulate research to efficiently support cancer survivors in Japan. Kindo et al. (2017) summarize firms' efforts to support cancer employment, with particular emphasis on the reasons for HR professionals to struggle with: a biased image of cancer (many people think it is harder to cure than it is in reality); cancer treatment is becoming more diverse, shifting to outpatient treatment; and the magnitude of the individuality of the impact. It is important to carefully grasp the current situation of the affected women with data and respond to this situation for the utilization of human resources with motivation and ability to work.

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