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QUALITY OF LIFE, TREATMENTS, AND PATIENTS' WILLINGNESS TO PAY FOR A COMPLETE REMISSION OF CERVICAL CANCER IN TAIWAN

HUI-CHU LANG[a], KOYIN CHANG[b] and YUNG-HSIANG YING[c,*]

[a]*Institute of Hospital and Health Care Administration, National Yang-Ming University, Taipei, Taiwan*
[b]*Department of Healthcare Information and Management, Ming Chuan University, Taoyuan, Taiwan*
[c]*Institute of Economics, National Sun Yat-sen University, Kaohsiung, Taiwan*

ABSTRACT

Cervical cancer is one of the leading causes of cancer deaths in Taiwan. To investigate the disease cost and then raise awareness of the importance of screening for cervical cancer and promote early detection, this paper employs contingent valuation and willingness to pay (WTP) method to study how health-related quality of life, disease severity, and after-treatment disease status affect patients' WTP for a complete remission of the disease. The inclusive criteria for the study were primary case outpatients at least 3 months after they had received therapy at the time of our study period. Face-to-face interviews were conducted for the retrospective format of the survey. The result of the study indicates a lifetime WTP of $US21 221.96 for Taiwanese cervical cancer patients, which is significantly higher than the cost of screening for early detection. Disease stages do not show a consistent pattern in influencing WTP, but patients with surgery are willing to pay a significantly higher amount for a complete remission from the disease than patients without. In addition, mental health, positive attitudes toward life, and quality of life also are key factors that influence WTP. Copyright © 2011 John Wiley & Sons, Ltd.

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KEY WORDS: cervical cancer; willingness to pay; quality of life; treatment

1. INTRODUCTION

Cervical cancer follows breast cancer as the second most common cancer in women worldwide and the leading cause of cancer deaths in developing countries. Although incidence and mortality rates of cervical cancer have fallen significantly in developed countries, 83% of all new cases that occur annually and 85% of all deaths from the disease occur in developing countries (Anorlua, 2008). In Taiwan, each year, approximately 6000 women are diagnosed with cervical cancer, and on average, 1.5 people die of this disease every hour, ranking it eighth as the cause of cancer death for Taiwanese women (Bureau of Health Promotion, 1999). The mortality rate and prevalence rate are 6.6 and 47.4, respectively, per 100 000 women (DOH, 2005). The incidence of cervical cancer for women in Taiwan is more than five times higher than that for women in the USA (DOH, 2006; Brawley, 2003). This may be caused by the low screening rate of Pap test for women in this country (Liao *et al.,* 2006; Wang and Lin, 1996). Thus, this study aims to investigate patients with cervical cancer by understanding their health-related quality of life (HRQoL), disease conditions, and their willingness to pay (WTP) for a complete remission of the disease.

Over the past two decades, it has been increasingly recognized that mortality rate provides only limited information on the outcome of treatment, and numerous surveys have been developed in an effort to assess the HRQoL of the patient after cancer diagnosis. To understand patients' suffering from cervical cancer, this paper

*Correspondence to: National Sun Yat-sen University, Department of Economics, No. 70, Lian Hai Rd., Kaohsiung 804, Taiwan. E-mail: yying@mail.nsysu.edu.tw

investigates how HRQoL, disease severity, and after-treatment disease status affect patient's WTP for a complete remission of the disease holding the patients' demographic and some other background characteristics constant. WTP is one of the approaches to valuing the benefits associated with changes in health and mortality risks (Bleichrodt and Quiggin, 1999; Hammitt, 2002). The idea employed in this study is consistent with the conventional WTP concept, and the perceived health changes (or risk reduction) for each subject are the differences between the health state before treatment and a state of complete remission of cervical cancer. Although patients with this disease may only feel minor symptoms, psychological and emotional distress can be the main torment. Besides, the treatment process of cervical cancer also can be an ordeal including the side effects of chemotherapy, radiation, and suffering during recovery after surgery. So far, there is no known cure for the disease, so the concept of WTP for a complete remission is a tool to understand patient torment as measured by a monetary value. Usually, the higher value of WTP and the greater suffering and torment the disease brings, which implies that a higher degree of attention is needed to help patients alleviate their affliction. Heterogeneity in preferences, prognosis, and level of suffering contribute to differences across individuals in WTP for risk reductions. A similar concept of WTP questionnaires can be found in Liu *et al.* (2000), Negrín *et al.* (2008) and Chang (2010).

However, no previous literature discusses the WTP for a complete remission of cervical cancer. Most of the existing research focuses on the preventive costs and WTP for a screening procedure on a narrower scale (Philips *et al*., 2003). This paper contributes to the knowledge of the determinants of WTP for an imaginary pill that treats the disease including disease stages, HRQoL, and patient demographic background. This paper will serve as a useful reference for cross-disease comparisons regarding patients' HRQoL and WTP. Possibly, we also can raise awareness of the importance of screening for cervical cancer and promote early detection once people realize how serious this disease can be.

The arrangement of the paper is as follows. The next section describes the research method. Section 3 introduces the implementation procedures. Results of the paper are presented in the fourth section, followed by a discussion of the special findings of the study. Research limitations are presented in Section 6. Lastly, the seventh section concludes the paper and gives final remarks.

2. METHOD

2.1. Contingent valuation method

To investigate the WTP for a complete remission of the disease, this study employs contingent valuation method (CVM) because it is the most widely used method for evaluating nonmeasurable economic benefit or cost where intangible attributes are important (Olsen and Smith 2001; Mitchell and Carson 2005) and has been extensively discussed in the previous literature (Brookshire and David, 1987; Field, 1994; Liu *et al*., 2000; Jan *et al*., 2005; Ozdemir *et al*., 2009). One advantage of CVM is its ability to assess the monetary value of a technology that is not yet available in the market (Sadri *et al*., 2005). This is suitable for our study for the notion of an imaginary pill is used in the hypothetical scenario. It also is more comprehensive than valuing disease cost using medical cost obtained directly because it also includes the intangible attributes of the dimensions in the questions (Olsen and Smith, 2001). The method is referred to as a 'contingent' valuation method because it tries to make people to say how they would act if they were placed in a certain possible and imaginable situation. In this paper, we use double-bounded dichotomy CV method that improves the traditional CVM in its efficiency. The traditional CVM is conducted by asking a series of questions, with differing amounts of payment to ascertain the WTP with as little loss of information as possible (Hanemann *et al*., 1991; Liu *et al*., 2000). In contrast, the double-bounded model of CVM survey involves asking an individual with two bids (Boyle and Bishop, 1985). This method also is superior to single-bounded dichotomous choice question by improving its statistical efficiency (Hanemann *et al*., 1991; Liu *et al*., 2000).

In the double-bounded model of CVM survey, the level of the second bid is contingent upon the response to the first bid. If the individual responds 'yes' to the first bid, the second bid (to be noted as B_i^H) is some amount

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greater than the first bid; if the individual responds 'no' to the first bid, the second bid (B_i^L) is some amount smaller than the first bid ($B_i^L < B_i < B_i^H$). Thus, there are four possible outcomes: (i) both answers are 'yes'; (ii) both answers are 'no'; (iii) a 'yes' followed by a 'no'; and (iv) a 'no' followed by a 'yes'. The likelihoods of these outcomes are π^{YY}, π^{NN}, π^{YN}, and π^{NY}, respectively.

With N respondents, where $B_i; B_i^L, \quad or B_i^H$ are the bids used for the ith respondent, the log-likelihood function takes the following form

$$lnL(\theta) = \sum_{i=1}^{N} \left\{ d_i^{YY} ln\pi^{YY}\left(B_i, B_i^H; \theta\right) + d_i^{NN} ln\pi^{NN}\left(B_i, B_i^L; \theta\right) + d_i^{YN} ln\pi^{YN}\left(B_i, B_i^H; \theta\right) + d_i^{NY} ln\pi^{NY}\left(B_i, B_i^L; \theta\right) \right\}$$

where d_i^{YY}, d_i^{NN},d_i^{YN}, and $d_i{}^{NY}$ are the binary-valued indicator variables and the formulas for the corresponding response probabilities are as mentioned above.

The estimating model is $WTP_i = X_i\beta + \varepsilon_i$, where WTP_i is the WTP of the ith individual. Differing from B_i^L, B_i,, and B_i^H that have observable discrete values, WTP is an unobservable continuous series. Also assumed in our model is that ε is normally distributed with zero mean and $\sigma^2 I$ as the SE, ~$N(0,\sigma^2 I)$. Maximum log-likelihood method is applied to the aforementioned equation for the interval regression where the dependent variable for each observation can be point data, interval data, left-censored data, or right-censored data depending on how respondents answer the two rounds of questions.

2.2. Health-related quality of life

To understand patients' HRQoL and its relationship to WTP and treatments, we employ EQ-5D, Short Form 8 (SF8), and Karnofsky Performance Scale (KPS) in our questionnaire as the quality indicators.

2.2.1. EQ-5D. EQ-5D is a standardized measure of health status developed by the EuroQoL Group that has demonstrated its usefulness in major therapeutic areas (Rabin and de Charro, 2001) as well as in health surveys across various general European populations (Badia *et al*., 1998; Kind *et al*., 1998). It provides a simple, generic measure of HRQoL for clinical and economic appraisal. With its ability to generate a preference-weighted index score, the EQ-5D questionnaire also has been widely used to assess HRQoL when carrying out economic evaluations of new medications during clinical trials (Drummond, 2001). Overall, the responsiveness of the EQ-5D index is equal to the EORTC QLQ C-30 global health-status scale (Krabbe *et al*., 2004). Five dimensions of people's condition are targeted: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has three levels: no problems, some problems, and severe problems. The results of the responses are then translated into an index (EQ-5D Index), ranging from zero death to one perfect health, for further analyses.[1]

Clinically, the EQ-5D questionnaire has been used in studies of patients with many types of cancers (Anderson and Palmer, 1998; Essink-Bot *et al*., 1998; Trippoli *et al*., 2001; Polsky *et al*., 2002; van den Hout *et al*., 2003); however, to the best of our knowledge, it has never been applied to patients with cervical cancer. Taiwan has a relatively high incidence of cervical cancer, and the mortality rate is comparable to those of other countries (Chen *et al*., 2002). The survival rate of cervical cancer patients is increasing because of early diagnosis and timely treatment, and the maintenance of a decent HRQoL following treatment has become the focus of clinical attention. Therefore, the availability of a valid and reliable generic HRQoL survey is useful.

2.2.2. Short Form 8. The SF8 provides an assessment of a community's physical and mental health status. The questionnaire contains the eight items of the SF-8 including general health, physical functioning, role–physical, bodily pain, vitality, social functioning, role–emotional, and mental health. Each item has a five-point or six-point response range. Physical and mental component summary (PCS and MCS) measures were calculated by weighting each SF-8 item using a norm-based scoring method given in the instrument guidelines. PCS is

[1]In some cases, EQ-5D Index can be negative if the quality of life is worse than death. The translation formula can be obtained from EuroQoL Group Monograph series published by Springer.

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a measure of how health may affect physical functioning, whereas MCS measures the effect of health on social and emotional functioning. The general population will have a PCS and MCS score close to 50. Higher scores indicate better health status, whereas lower scores indicate poorer health state. Scores higher or lower than 50 indicate being more or less healthy than the average population.

2.2.3. Karnofsky Performance Status. The KPS was used to assess patient ability to carry out activities of daily living (Karnofsky and Burchenal, 1950). It is rated on a scale of 0–100, in steps of 10, with higher scores representing better functional status. More specifically, a KPS score of 80–100% indicates that the assessed individual is able to carry on normal activity and work. A KPS score of 50–70% indicates that the assessed individual is unable to work but is able to live at home and to care for most of his/her personal needs. A varying degree of assistance is needed with this score range. A KPS score equal to or lower than 40% indicates that the assessed individuals are unable to care for themselves and require the equivalent of institutional or hospital care. The KPS has good predictive validity (Buccheri *et al*., 1996), satisfactory interrater reliability, and sufficient construct and predictive validity (Mor *et al*. 1984).

2.3. Disease stage, treatment, and disease status

2.3.1. Disease stage. In this paper, the disease stage is categorized following the International Federation of Gynecology and Obstetrics system (American Cancer Society, 2011).

Stage I: The cancer has grown into (invaded) the cervix, but it is not growing outside the uterus. The cancer has not spread to nearby lymph nodes (N0) or distant sites (M0).
- Stage Ia: This is the earliest form of stage I. There is a very small amount of cancer, and it can be seen only under a microscope.
  - StageIaI. The cancer is less than 3 mm (about 1/8 inch) deep and less than 7 mm (about 1/4 inch) wide.
  - StageIa2: The cancer is between 3 and 5 mm (about 1/5 inch) deep and less than 7 mm (about 1/4 inch) wide.
- StageIb. This stage includes stage I cancers that can be seen without a microscope as well as cancers that can only be seen with a microscope if they have spread deeper than 5 mm (about 1/5 inch) into the connective tissue of the cervix or are wider than 7 mm. These cancers have not spread to nearby lymph nodes (N0) or distant sites (M0).
  - StageIbI: The cancer can be seen, but it is not larger than 4 cm (about 1 3/5 inches).
  - StageIb2: The cancer can be seen and is larger than 4 cm.

StageII. In this stage, the cancer has grown beyond the cervix and uterus but has not spread to the walls of the pelvis or the lower part of the vagina.
- StageIIa. The cancer has not spread into the tissues next to the cervix (called the parametria). The cancer may have grown into the upper part of the vagina.
  - StageIIaI: The cancer can be seen, but it is not larger than 4 cm (about 1 3/5 inches).
  - StageIIa2: The cancer can be seen and is larger than 4 cm.
  - StageIIb: The cancer has spread into the tissues next to the cervix (the parametria). It has not spread to nearby lymph nodes (N0) or distant sites (M0).

StageIII. The cancer has spread to the lower part of the vagina or the walls of the pelvis. The cancer may be blocking the ureters. It has not spread to nearby lymph nodes (N0) or distant sites (M0).

StageIV. This is the most advanced stage of cervical cancer. The cancer has spread to nearby organs or other parts of the body.
- StageIVa: The cancer has spread to the bladder or rectum, which are organs close to the cervix (T4). It has not spread to nearby lymph nodes (N0) or distant sites (M0).
- StageIVb: The cancer has spread to distant organs beyond the pelvic area, such as the lungs or liver.

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The mortality risks associated with different disease stages when diagnosed differ substantially. Based on the National Cancer Data Base for patients diagnosed between 2000 and 2002, the 5-year survival rates, for Ia, IIa, IIIa, and IVb stage are 93, 63, 35, and 15%, respectively. Thus, dummy variables of disease stage were included as the key independent variables for understanding its impacts on patients' WTP.

2.3.2. Treatments. There are three basic treatment methods for cancer patients: surgery, radiation therapy, and chemotherapy. For a patient's treatment, a single method or the combination of any two or three of them can be used. Theoretically, patients receive different treatments relative to their disease progress—patients in earlier stages are more likely to be treated with surgery alone, whereas in a more severe stage, they are likely to be treated with concurrent chemotherapy and radiation treatment. For example, when the disease stage is less severe than Ib (cancer involves the cervix but has not spread nearby), surgery is recommended with or without radiation. When disease stage moves beyond IIb, usually chemotherapy combined with radiation is the main treatment (Greanebaum Cancer Center, 2009). In practice, however, treatment received by each individual is still highly subject to her idiosyncrasies, including some patients who receive none; hence, there is no simple presumed pattern of treatment for cervical cancer. In addition, to avoid the problem that may arise because of interdependency between independent variables, this study uses a broad classification of binary choice of surgery as one of the treatment variables instead of the narrower classified surgery methods, such as radical trachelectomy, radical hysterectomy, or pelvic exenteration. The narrower the classification, the more disease stage-dependent the treatment becomes. Thus, using broad treatment classifications avoids interdependency with disease severity, which is solely represented by disease stages. As a result, the impact of treatment variables on patients' WTP can be viewed exclusively as the medical efficacy or physical suffering because of treatment itself, not related to disease severity level.

2.3.3. Disease status. After treatment, the patients' results were classified as in remission, persistent, or recurrent. Remission status was given if, after treatment, a patient recovered with no sign of the disease. Recurrent status was given if the cancer had returned in a patient who appeared to be free of cancer after treatment. Persistent status was given if the cancer continued to exist in spite of interference or treatment. We believe that the patients' WTP toward the disease can be substantially influenced by disease results.

2.4. Time dimension

Also included in the empirical model is the time dimension—diagnosed time—number of years since diagnosed. One may suspect that individuals' disease status may move through different categories over time and a measure at one individual point in time does not fully capture the individual's range of experiences. Two individuals who both are in 'remission' at the time of the survey could have had vastly different experiences. Thus, for the model to better explain the variations of patients' WTP, it is important to include time dimension as the control variable. Along with the variable 'disease stages' at the time of diagnosis, the individual's 'range of experiences' should be held under control.

3. IMPLEMENTATION

Our survey was conducted using a specially designed questionnaire that adopted a retrospective, patient-based point of view. The inclusive criteria for the study targeted those who, at the time of our study, were primary case outpatients at least 3 months after they had received therapy. The data collection period was from February 2003 to February 2004. All the patients were referred to the interviewers by their physicians from one of the gynecology clinics at the North Branch (Taipei), Central Branch (Taichung), or South Branch (Kaohsiung) of Veterans General Hospital (VGH). There were no exclusions based on comorbidities. Because the physicians explained the study purpose to the patients before referring them to the interviewers, the response rate of the study was fairly high. Around 603 patients were invited to take part, and 530 of them answered the questions. Three different geographical areas were chosen to hold geographical effect under control. Written

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informed consent was obtained from all participants before conducting the interviews. The patients who did not know their diagnosis were not referred to us by their physicians and consequently were not recruited. The inclusion criteria of our subjects were as follows: (i) outpatients who are diagnosed as cervical cancer patients; (ii) local people who spoke Chinese or Taiwanese; (iii) aged > 18 years; (iv) ability to provide informed consent; and (v) already diagnosed with cervical cancer and undergone treatment at least 3 months previously. Patients with multiple recurrences were excluded from the study because of the complex nature of their medical history and poor prognosis in general (William, 2011; Friedlander and Grogan, 2002). Thus, many of the end-stage patients are excluded to avoid the WTP being upward biased. Ethics approval was received from the ethics review boards of the hospitals.

The survey instrument was developed in four phases. First, the CVM was consulted to determine the general structure of the instrument. Then, three clinical experts reviewed the instrument for content validity. To ascertain the proper amount of patients' WTP, an open-ended question was surveyed to 108 patients, which we used as the basis to determine the first round of WTP bids.[2] The mean and SD of the WTP from this pilot survey were obtained. Starting from the mean (around \$NT48 000), the WTP increased and decreased by one SD (around \$NT12 000) for two levels. Then, for lower value, one-half of SD was used for the additional levels, and for higher value, double the SD for additional levels. A total of 11 groups of bids (levels) were designed. Finally, the instrument was pilot tested with 10 patients. Both the open-ended questions and the pilot test were performed before the formal survey period. The pilot subjects and results are not part of the final 530 participating subjects and their results. The survey instrument consisted of five sections: basic demographic questions, alternative therapeutic methods and costs, patients' clinical information, WTP for a complete remission of the disease, and HRQoL. Demographic data include age, education, income, marital status, religion, employment, time lapsed since diagnosed, and type of primary care giver. For alternative therapeutic method utilization, patients indicate whether they use traditional Chinese herbal medication, acupuncture, and/or special dietary therapy and the costs associated with them. Patients' clinical information, including KPS, disease status, treatment, disease result, and so on, was obtained from patient healthcare providers.

Finally, the WTP is computed by a double-bounded dichotomy method. The monetary values from the questionnaire are denominated in New Taiwan dollars, which are converted to US dollars at a ratio of approximately \$NT32 to \$US1 in 2003 and 2004. The hypothetical out-of-pocket payment questions are asked. To avoid hypothetical bias that may occur when respondents express a WTP higher than what they would actually be willing to pay in a real situation, the interviewers take time to describe the hypothetical scenario in as much detail as possible (cheap talk (Aadland and Caplan, 2006; Ozdemir, 2009)). Specifically, before the WTP questions were brought up, the interviewer explicitly explained the purposes of the study and stated that some hypothetical questions were going to be asked. The respondents do not really have to pay the cost of the medicine. However, to help the patients to ascertain their WTP, the interviewers would ask the respondents to think carefully about the amounts of the bids, compared with some real items they might consume, such as clothes, computers, cars, and real estate. In addition, the interviewers stated that if the respondents did not pay attention to the actual costs, our analysis would be wrong, and we would not obtain a true measure of the value of cervical cancer medicines. Also, the interviewers explained that, although most of the medical bills are paid by the Taiwanese BNHI (patients usually have the copayment around \$US10 ~ 30 depending on the different level of hospitals they use), the patients still suffer from emotional anxiety, physical restraint and pain, job or workday losses, and loss of time because of staying in hospital or outpatient visits, which are not compensated by BNHI.

Thus, the hypothetical scenario states that the patients are asked to pay an amount of money for an imaginary drug that does not exist, and after the subject answers the question, she would not really be asked to pay. Although there is no such 'magic pill' to make the patients go into complete remission without undergoing any treatment, this type of question helps the drug researchers as well as policymakers to understand the underlying

[2]Typically an open-ended survey question in such a setting should be avoided, according to Whittington (2002). However, this pretest was conducted to obtain information on the distribution of people's WTPs. Other questions, such as demographic ones, were not in the questionnaire.

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value of the research on new drugs and the importance of curing or screening the disease. Once respondents are comfortable and clear about the hypothetical setting, the WTP question follows. Specifically, the question states that 'before any treatments you have gone through, when you were diagnosed with cervical cancer, if there had been a pill that you took once a year and then you could be in complete remission of the disease and back to your original health state before you had contracted the disease, would you pay, for example, $NT6000 for this pill?' If the respondent answered yes to the question, then a higher bid with double amount of payment for the same question would be asked again. If the respondent answered no to the question, a lower bid with one-half of the initial bid would be asked.

4. RESULTS

4.1. Patients background

The statistical summary of the survey for the whole sample as well as the breakdown information of the three branches is presented in Table I. Selected data based on availability for comparable populations also are presented in the last column of Table I for comparison. The average age (±SD) of our subjects is 56.21 (±12.01) years, the average years since first diagnosed is 5.19 (±4.13), 67.7% of the subjects are married, and 60% of them received only primary school education. Most of the subjects are surveyed in the central branch of VGH, with 40% from there. Around 57% of the subjects have monthly disposable income less than $NT20 000, 23% of the subjects take special health dietary supplements, and 15% take traditional Chinese herb medicine for alternative treatments. The number of primary physicians used by each subject is 1.28 (±0.97). Because the Taiwan government provides national health insurance to the residents, 99% of the subjects are covered by it. In our surveyed sample, 39% of the subjects purchase additional private general medical insurance, and 30% purchase cancer insurance. Individuals are not eligible to purchase private medical insurance after diagnosis with cancers or most types of chronic diseases.[3] The subjects' disease stages, treatment methods, and treatment results are presented in Table II, and their HRQoL is reported in Table III. Because 91% of the subjects report being in remission after treatment, the average quality of life of our subjects is fairly high: 76% of subjects' EQ5D index is above 0.8 for a 0–1 scale, with 1 meaning perfect health, and average PCS and MCS are 47.74 and 65.99, respectively, with 50 indicating an average health condition for the general population.

4.1.1. Interdependency of disease stages, treatment, and quality of life. To validate the interpretation for our WTP model, we first need to clarify the interdependency between the covariate that might potentially cause problem, such as disease stages, treatment, quality of life, and disease result. Because 91% of our respondents reported in remission at the time of interview, a separate regression is estimated just for those patients in remission. The issue of the interdependency for disease status with other covariates can be compared. To understand the relationship between disease stages and treatment, Table IV shows the breakdown information for the subjects. The first panel shows that the patients who receive surgical treatment are more evenly ranged from the mildest to the most severe disease stage than the other two treatments, and patients with chemotherapy or radiation tend to be distributed, skewed toward more severe stages. Similar outcomes can be confirmed from the second panel of the table. However, patients without any treatment also are distributed, skewed toward more severe stages. As mentioned in the Treatment section, this study uses a broad classification of surgery as one of the treatment variables. The interrelationship between treatment and disease stages can be minimized.

The relationship between different measures of quality of life and the treatments and disease stages are presented in Table V, Panel 1. From the Pearson correlation coefficients, negative relationships are observed, with coefficients ranging from −0.09 to −0.15, that is, more severely ill patients tend to have worse quality of life. However, the relationship is weak. When looking at the breakdown average of the different quality of life measures by disease stages, patients with the disease stages beyond IIIa have the worst quality of life, except MCS,

[3]Thus, additional insurance may affect individual's WTP but may not correlate with her disease stage or treatment.

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Table I. Statistical summary by hospital branches*

Variable	Mean or %	North branch	Central branch	South branch	Population
Observation number	530 (100%)	200 (38%)	214 (40%)	116 (22%)	
Age (years)	56.21 (± 12.01)	58.76 (± 11.28)	53.59 (± 11.93)	56.62 (± 11.60)	37.53[a]
Time since diagnosed (years)	5.19 (± 4.13)	5.93 (± 4.21)	4.78 (± 4.22)	4.67 (± 3.61)	
Married (%)	67.7	63	71	72	74[b]
Employed (%)	75	79	74	72	60.01[c]
Education (%)					
Primary school	60	58	61	64	57.31[d]
Secondary school	18	22	17	15	13.30
High school	16	14	19	14	22.07
College or above	5	7	3	8	7.32
Disposable income ($NT) (%)					20 623.48[e]
< 20 000	57	47	66	59	
20 000 ~ 49 999	36	43	29	36	
50 000 ~ 79 999	5	6	4	4	
80 000 ~ 99 999	0	1	0	0	
> 100 000	2	3	1	1	
Alternative treatment (%)					
Health dietary supplement	23	12	24	40	
Traditional Chinese herb	15	9	20	17	
Acupuncture	3	1	4	3	
Home care by family member	81%	85%	70%	95%	
Waiting time (weeks)	5.33 (± 13.78)	3.67 (± 17.74)	8.89 (± 12.43)	1.70 (± 2.38)	
No. of physicians used	1.28 (± 0.97)	1.16 (± 0.86)	1.75 (± 0.91)	0.63 (± 0.77)	—[f]
Insurance status (%)					
National health insurance	99	100	99	97	99
General medical insurance	39	36	45	34	20
Cancer insurance	30	31	24	15	—

[a]According to the Department of Interior, the official website http://www.ris.gov.tw/version96/population_01_A_03.html
[b]For age 55–59 years old female, http://www.moi.gov.tw/stat/gender.aspx
[c]For age 55–59 years old population, http://statdb.cla.gov.tw/statis/stmain.jsp?sys=210&kind=21&type=1&funid=q02093&rdm=iBeqiukM
[d]For age 55–59 years old female, source: Department of Household Registration Affairs, MOI. http://sowf.moi.gov.tw/stat/year/list.htm
[e]Statistics Abstract, Bureau of Labor Statistics, Executive Yuan, Taiwan.
[f]No reference can be made because primary care physician is not required in Taiwan.
*Data presented as mean ± SD.

and patients with the mildest disease stage (Ia1) have the highest level of quality of life. However, the stages in between do not clearly show the relationship with quality of life measures.

When looking at the breakdown average of different quality of life measures by different treatments as in Panel 2 of the same table, the combination treatments of surgery and radiation consistently show the lowest level of quality of life. The only exception is PCS of SF-8, with the worst case shown on no treatment group. The highest (best) values of quality of life occur at different treatments when measuring using different measures. In sum, no consistent relationships can be concluded between treatments and quality of life.

4.1.2. Validity of the scenario. To analyze how patients understand the meaning of WTP and whether they find this hypothetical scenario compelling, the differences in the respondents' rating of the acceptability of the scenario based on the disease stages and treatment received are examined. The results are presented in Table VI, from which we can see that patients with mildest disease stage have the lowest acceptance rate, 0.41, and the patients with the most severe stage tend to accept this hypothetical scenario with the highest acceptance rate, 0.7; additionally, patients with all three treatments (surgery + radiation + chemotherapy) accept it more than patients receiving only two or one type of treatments. Patients without any treatment are distributed among the more serious disease stage groups (as indicated in Table IV, Panel 2), who also have the highest rating of

[4]When broken down by disease stages, for each disease stage, the percentage of 'yes' response rate also shows a declining trend as initial bids increase for data with Turnbull treatment. However, this trend is less conspicuous for stages beyond IIIa than for the milder stages. The detailed breakdown result is not shown to conserve manuscript space.

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Table II. Treatment methods and disease stages by hospital branches

	Total	North	Central	South
Observation	530	200	214	116
Treatment methods (%)				
Chemotherapy	22	16	31	17
Surgery	82	88	77	83
Radiation	26	23	37	10
Surgery only	52	62	35	58
Radiation only	8	6	11	3
Chemotherapy only	1	1	1	1
Surgery + chemotherapy	19	13	26	16
Surgery + radiation	11	12	14	7
Radiation + chemotherapy	6	4	9	0
Surgery + radiation + chemotherapy	3	3	4	2
No treatment	3	0.5	0	12
Disease stage (%)				
Ia1	9	12	9	3
Ia2	4	5	4	3
Ib1	48	45	44	61
Ib2	13	16	11	11
IIa	9	9	6	17
IIb	11	6	18	6
IIIa	1	2	0	0
IIIb	3	3	4	0
IVa	2	1	3	0
IVb	1	1	1	0
Treatment result (%)				
Remission	91	86	94	93
Persistence	4	4	2	7
Recurrence	5	10	3	0

Table III. Quality of life and disease status

Variable	Mean or % (SD)	North	Central	South
Observation	529	199	214	116
EQ-5D Index	0.87 (0.16)	0.90 (.17)	0.87 (.14)	0.82 (.15)
Index < 0.5	5%	6.03%	2.34%	6.96%
0.5 ~ 0.8	19%	9.55%	23.36%	27.83%
> 0.8	76%	84.42%	74.30%	65.22%
Short Form 8				
Physical function	46.91	8.57	21.46	54.05
Role–physical	47.24	8.64	23.01	53.98
Body pain	53.07	8.15	25.45	60.77
General health	44.42	6.95	22.81	59.45
Vitality	49.72	7.73	28.14	61.83
Social function	50.71	7.44	23.44	55.25
Mental health	51.02	7.84	21.4	56.79
Role–emotional	47.74	7.35	21.66	52.42
Physical Component Scale	47.74	8.72	19.21	59.85
Mental Component Scale	65.99	9.42	31.45	80.18
Karnofsky Performance Scale	91.26 (10.5)	94.08 (12.4)	89.81 (8.3)	88.76 (10.3)
20 ~ 40	0.0%	0.0%	0.47%	0.0%
40 ~ 60	2%	4.1%	0.47%	0.0%
60 ~ 80	3%	1.54%	2.34%	7.22%
80 ~ 100	54%	22.05%	78.04%	67.01%
= 100	41%	72.31%	18.69%	25.77%

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Table IV. Breakdown between treatments and disease stages (number of counts)

Panel 1

Treatment	Chemotherapy (C)		Radiation (R)		Surgery (S)		Total
Stage	No	Yes	No	Yes	No	Yes	
Ia1	45	1	42	4	2	44	46
Ia2	17	3	17	3	1	19	20
Ib1	196	49	213	32	16	229	245
Stage Ib2 ~ IIIa	94	80	98	76	42	132	174
Beyond stage IIIa	29	15	15	29	26	18	44
Total	381	148	385	144	87	442	529

Panel 2

	Treatment								
Stage	S	R	C	S + C	S + R	R + C	S + R + C	No Treatment	Total
Ia1	42	1	0	0	2	1	0	0	46
Ia2	15	1	0	2	1	0	1	0	20
Ib1	162	7	2	43	21	1	3	6	245
Stage Ib2 ~ IIIa	42	22	2	52	28	16	10	2	174
Beyond stage IIIa	5	8	0	2	8	10	3	8	44
Total	266	39	4	99	60	28	17	16	529

acceptance. Thus, the results suggest that individuals who suffer more in general appear to have greater desire for the remission brought by the magic pill, implying the scenario is clear and understood by the patients.

4.1.3. Willingness to pay. The results of WTP for a complete remission of cervical cancer are presented in the left side panel of Table VII, showing that the percentage of 'yes' responses generally declines as the initial bid increases, consistent with the concept of demand theory. However, the response to some of the bids violates the monotonicity assumption for a standard distribution function. Pooling the violating results backward with the previous bids as suggested by Turnbull distribution, the probability mass point estimates are reported in the right panel of Table VII.[4]

To analyze how patients' WTP is determined, the regression analyses are applied using the maximum likelihood method for close-ended double-bounded dichotomous questions. Income was initially collected as ordinal data but treated as continuous variables measured at the midpoint of each interval. Both original unrestricted bid groups and the ones suggested by Turnbull distribution model are estimated as presented in the first and second columns of Table VIII, respectively (both the first and the second bids were adjusted accordingly). For the original unrestricted model, additional regression was performed including only the patients in remission. By doing so, whether the patients with different disease results have fundamental structural differences in the WTP model can be examined. The results are presented in the third column of Table VIII. Comparing the three models, very similar results are observed. In the model of Turnbull adjusted sample, for example, age; high school education; income level; whether the patients are cared for by a family member; MCS; patients' disease stage of Ia2, Ib1, and beyond IIIa; and whether the patients' treatment included surgery, radiation, or none, have statistically significant impacts on the subjects' WTP. Particularly, the subjects with only high school diplomas are willing to pay 0.60% higher than the subjects with only elementary education, and when the subjects' primary caregivers are family members, their WTP is 0.78% less than those cared for by non-family members. Both age and age square are statistically significant at 1% level, indicating that age has polynomial impacts on the WTP. For the subject at 56 years of age (the mean value), her WTP will decrease 0.08% when she is 1-year older. Income variable is in its natural logarithm, so the interpretation of the coefficient is elasticity, that is, one percentage point increase in income level causes the subjects' WTP to increase by 0.66%, holding all other variables constant. The dummy variables for the different branch hospitals do not show significant impacts on WTP, implying that there is no special patient or hospital effects from different branches.

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Table V. Quality of Life by disease stages and treatment

	QoL							
Stage	EQ-5D		KPS		PCS		MCS	
Panel 1: by disease stages								
Ia1	0.93	(0.09)	93.56	(6.79)	48.61	(7.89)	69.24	(5.52)
Ia2	0.83	(0.23)	90.53	(11.77)	47.45	(8.87)	65.48	(9.20)
Ib1	0.87	(0.14)	91.53	(10.30)	48.36	(8.33)	66.15	(9.02)
Stage Ib2 ~ IIIa	0.88	(0.17)	91.12	(10.29)	47.29	(9.20)	65.17	(10.33)
Beyond stage IIIa	0.81	(0.22)	88.65	(15.84)	45.26	(9.60)	65.36	(10.67)
Corr w. stage	−0.15		−0.11		−0.11		−0.09	
Panel 2: by treatment								
S	0.89	(0.14)	93.05	(9.17)	48.05	(8.53)	67.00	(8.01)
R	0.83	(0.17)	89.17	(11.80)	46.23	(9.57)	63.20	(9.84)
C	0.91	(0.10)	92.50	(9.57)	51.24	(9.84)	63.07	(11.88)
S + C	0.89	(0.13)	90.51	(8.73)	48.84	(7.74)	66.23	(9.77)
S + R	0.81	(0.23)	86.61	(15.16)	45.69	(10.73)	62.48	(11.69)
R + C	0.88	(0.14)	92.86	(6.59)	49.57	(7.35)	68.28	(8.79)
S + R + C	0.85	(0.23)	90.00	(17.51)	46.75	(11.09)	67.77	(10.79)
No treatment	0.83	(0.13)	87.50	(12.82)	44.30	(6.40)	63.07	(10.55)
Whole group	0.87	(0.15)	91.32	(10.60)	47.75	(8.72)	66.01	(9.40)

SEs are in parentheses.
KPS, Karnofsky Performance Scale; MCS, mental component summary; PCS, physical component summary; QoL, quality of life.

4.1.4. Simulation of WTP for different target groups. After the regression models were predicted, the first model was applied to simulate each subject's WTP for a complete remission of cervical cancer, and the results are presented in Table IX Because all three models in Table VIII yield comparable results and the third model does not include the disease result variables that are needed to yield more complete estimates for our purpose, the Turnbull model is used for the simulation purpose. The average WTP for the whole sample is $NT40 097.46 ($US1253.04) per year, which increases as income and education level increase. The WTP also increases with EQ-5D index and KPS. Patients with recurrence result tend to have higher WTPs, and the ones with persistent disease symptoms tend to have lowest WTPs for a complete remission from cervical cancer. For disease stage, the mildest ill patients show the lowest amount of WTP. However, the moderately ill patients with stage Ia2 are willing to pay the highest amounts of WTP for a complete remission from the disease. Thus, no systematic pattern for disease stages toward WTP can be concluded. When categorizing the treatment into eight mutually exclusive cases, patients receiving no treatment are willing to pay the highest amount, followed by patients receiving all three treatments, surgery plus chemo, and then surgery plus radiation. Subjects with only chemotherapy are willing to pay the lowest amount. The result indicates that, compared with other groups, patients receiving no treatment may have special, peculiar psychological reactions to conventional Western

Table VI. Willingness-to-pay acceptance rating between different disease stages and treatment

Disease stage	Observation	Acceptance rating	(SD)	Treatment	Observation	Acceptance rating	(SD)
Ia1	46	0.41	0.50	S	266	0.48	0.50
Ia2	20	0.55	0.51	R	39	0.52	0.49
Ib1	245	0.50	0.50	C	4	0.25	0.50
Ib2 ~ IIIa	174	0.47	0.50	S + C	99	0.49	0.50
Beyond IIIa	44	0.70	0.46	S + R	60	0.47	0.50
				R + C	28	0.50	0.51
				S + R + C	17	0.59	0.51
				No treatment	16	0.81	0.40

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Table VII. Willingness to pay for a complete remission of cervical cancer

Unrestricted			Turnbull estimate			
Initial bids($NT)	Total (%)	Count of yes (%)	Initial bids ($NT)	Total (%)	Count of yes (%)	Change of yes (%)
6000	50 (9)	44 (88)	6000	50 (9)	44 (88)	
8400	54 (10)	36 (67)	8400	54 (10)	36 (67)	−21
12 000	57 (11)	31(57)	12 000	110 (21)	63 (57)	−9
18 000	53 (10)	32 (60)				
24 000	50 (9)	19 (38)	24 000	101 (19)	42 (42)	−16
36 000	51 (10)	23 (45)				
48 000	42 (8)	17 (40)	48 000	42 (8)	17 (40)	−2
60 000	46 (9)	15 (33)	60 000	171 (9)	63 (37)	−3
72 000	43 (8)	21 (49)				
96 000	44 (8)	14 (32)				
120 000	38 (7)	13 (34)				
Total	528 (100)	265 (50)	Total	528 (100)	265(50)	
			Mean lower bond willingness to pay by Turnbull estimate = $40 353.84 (± 2767.56)			
		Second bids				
First bids	Yes	No	Total			
Yes	137 (26)	127 (24)	264 (50)			
No	66 (13)	195 (37)	261 (50)			
Total	203 (39)	322 (61)	525 (100)			

medical treatment. They long for a magical drug more than do other groups of patients. An emotional unobserved factor is important in explaining the result.

5. DISCUSSION

This paper discusses patients' WTP for a cervical cancer complete remission and the determinants of the willingness relative to patient disease stage, treatment, HRQoL, and basic demographic characteristics. Our sample was surveyed from the North, Central, and South Branches of VGH of Taiwan. From the demographic background analysis of the subjects, patients in the north are, on average, older than patients in the Center and South Branches, have the lowest rate of marriage and highest rate of employment, and have the least belief in alternative treatment. Samples from the Central Branch have the smallest portion, with family as primary caregivers; the longest waiting time for treatment; and the largest portion to purchase additional general medical insurance. For treatment, Central Branch tends to use more chemotherapy, less surgery, and more radiation than the other two branches. When the treatments are categorized as seven mutually exclusive methods, we can still see that the Central Branch tends to use more radiation, less surgery, and more combination of radiation and chemotherapy, as well as the combination of surgery and chemotherapy. Also in the Central Branch, the subjects have the highest portion of 'in remission' result and lowest portion of persistence. In the three branches, the subjects' disease stages are comparable; however, the North and South Branches more often tend to adopt 'surgery only' treatment with 62, 67, and 35% for the North, South, and Central, respectively. The subjects in the Central Branch seem to have better treatment results than the subjects from the other two branches, implying that surgical treatment with radiation or chemotherapy may be a superior choice to surgery alone. For the difference in HRQoL between hospitals, the central branch has lower averages than those of the North Branch and higher averages than those of the South branch for EQ-5D index and KPS. However, it has the highest scores for almost all measures for SF8. Thus, although the Central Branch has lowest average income, lowest proportion who receive family care, and longest waiting time distribution among the three branches, these features do not seem to cause obvious impacts on individuals' quality of life.

In general, patients with better quality of life tend to have higher WTP toward a complete remission of cervical cancer regardless of whether it is measured by EQ-5D, SF8, or KPS. Especially, MCS has statistically

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Table VIII. Regression results for willingness to pay

	Whole sample		Turnbull modified		Remission only	
Variable	Coefficient	*Z*	Coefficient	*Z*	Coefficient	*Z*
Age	−0.197	−3.04***	−0.194	−3.07***	−0.206	−3.11***
Age[a]	0.002	2.88***	0.002	3.02***	0.002	3.06***
Diagnosed time	−0.004	−0.06	−0.007	−0.11	−0.023	−0.33
Diagnosed time[a]	−0.003	−0.69	−0.003	−0.63	−0.001	−0.15
Marriage	0.084	0.43	0.078	0.40	0.134	0.65
Education						
Middle school	0.246	0.96	0.204	0.80	0.292	1.08
High school	0.641	2.4**	0.602	2.26**	0.654	2.30**
College	0.601	1.46	0.584	1.43	0.795	1.76*
Employed	0.100	0.46	0.115	0.53	0.084	0.36
Income	0.639	4.42***	0.660	4.57***	0.722	4.67***
Dietary therapy	0.236	1.15	0.209	1.02	0.373	1.69*
Herb	0.389	1.55	0.264	1.02	0.242	0.86
Cared by family member	−0.783	−3.48***	−0.782	−3.50***	−0.912	−3.74***
Medical insurance	0.265	1.1	0.262	1.09	0.039	0.15
Cancer insurance	−0.033	−0.12	−0.005	−0.02	0.122	0.43
PCS	−0.002	−0.16	0.000	−0.01	−0.005	−0.38
MCS	0.024	1.97**	0.021	1.76*	0.026	1.95*
Waiting time	0.007	0.67	0.007	0.72	0.003	0.24
No. of doc. used	−0.026	−0.26	−0.008	−0.08	0.012	0.11
Disease status						
Persistence	−0.062	−0.16	−0.023	−0.06		
Recurrence	0.230	0.53	0.190	0.44		
Disease stage						
Stage Ia2	1.108	2.19*	1.083	2.15**	1.083	2.10**
Stage Ib1	0.630	1.87*	0.594	1.77*	0.587	1.71*
Stage Ib2 ~ IIIa	0.322	0.88	0.323	0.89	0.354	0.94
Beyond stage IIIa	0.880	1.68*	0.936	1.79*	0.891	1.53
Treatments						
Chemotherapy	0.056	0.26	0.094	0.44	0.100	0.42
Surgery	0.478	1.73*	0.710	2.10**	0.841	2.21**
Radiation	0.344	1.27	0.459	1.66*	0.582	1.86*
No treatment	1.731	1.78*	1.751	1.82*	1.923	1.91*
Hospital						
VGH_central	0.138	0.59	0.147	0.63	0.164	0.63
VGH_south	−0.088	−0.33	−0.106	−0.40	−0.117	−0.42
Constant	4.379	1.95*	4.214	1.89	3.723	1.55
Observation	397		397		360	

[a]The omitted dummy variables for comparison bases are elementary school, cared by non-family members, remission status, Stage Ia1, and VGH North.
*Statistical significance at 10%; **statistical significance at 5%; ***statistical significance at 1%.

significant effect on WTP, meaning that mental health and positive attitudes toward life are key factors to influence WTP. Another interesting finding of this paper is that disease stage does not show a systematic pattern on the impact of WTP. Individuals who have ever had surgical treatment for cervical cancer tend to have higher WTP than otherwise, regardless of which disease stage they are in, implying that losing all or part of the uterus for a patient creates more psychological or physical trauma than otherwise.

6. LIMITATION

Although having the advantages of being sensitive and comprehensive to preferences of respondents and having a theoretical foundation in welfare economics, CVM also has its drawbacks, including the use of survey questions, strategic behavior, scope validity, and hypothetical bias. Strategic behavior runs a risk of stating a

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Table IX. Simulated willingness to pay for subjects in different target groups

	Observation Number	Computed willingness to pay (NT)	Standard errors
All sample	408	40 097.46	49 787.74
Disposable income			
< 20 000	240	23 929.16	27 877.86
20 000 ~ 49 999	138	57 404.03	60 538.41
50 000 ~ 79 999	18	97 380.71	68 092.52
> 80 000	12	79 860.45	74 803.28
Education			
Primary school	243	20 223.61	19 499.1
Secondary school	71	48 639.94	50 425.89
High school	71	87 567.14	72 837.3
College or above	23	78 026.02	58 376.71
EQ-5D			
Index < 0.5	13	9968.22	4872.103
0.5 ~ 0.8	71	37 534.96	45 269.29
> 0.8	324	41 875.80	51 367.49
KPS			
20 ~ 40	2	23 399.60	8082.19
40 ~ 60	13	39 253.65	46 242.35
60 ~ 80	216	36 591.09	46 636.84
80 ~ 100	169	46 008.11	54 591.84
Result			
Remission	371	39 619.35	49 653.96
Persistence	19	35 215.43	40 312.80
Recurrence	18	54 315.29	60 317.14
Disease stage			
Ia1	33	23 344.04	23 028.87
Ia2	16	78 432.32	83 814.79
Ib1	199	44 009.12	53 681.30
Stage Ib2 ~ IIIa	137	31 681.15	37 641.88
Beyond stage IIIa	23	52 088.16	55 765.37
Treatment			
None	16	80 334.18	60 167.47
Surgery only	211	36 210.51	47 212.05
Radiation only	28	29 245.00	21 371.62
Chemotherapy only	3	18 503.30	19 332.72
Surgery + Chemotherapy	88	49 062.51	56 231.62
Surgery + Radiation	37	45 278.99	52 466.18
Radiation + Chemotherapy	25	28 357.92	32 491.66
Surgery + Chemotherapy + Radiation	12	68 813.08	86 231.06

higher or lower WTP than the actual WTP (Mitchell and Carson, 2005). However, when respondents' answers do not directly influence reimbursement or provision of the commodity, the impact of strategic behavior by respondents is limited. Scope validity means that the answers of CMV questions are not sensitive to the quantity of the commodity under valuation. For example, to avoid the disease for life, one would have to be willing to pay more than to avoid the disease for only 1 year (Carson, 1997; Kahneman *et al*., 1999). In this study, we have emphasized that the complete remission for cervical cancer needs to be purchased every year, which is a reasonable period for reconstituting one's cash flow, and the confusion of scope inconsistency across subjects is eliminated. Hypothetical bias arises when there is doubt whether respondents can answer meaningfully the sometimes very hypothetical questions posed. More specifically, survey respondents may express a WTP that is higher than what they would actually be willing to pay in a real situation. Fortunately, cheap talk that can be used to mitigate hypothetical bias so long as it is incorporated in the original survey instrument (Fischhoff, 1991) was implemented in this study.

Compared with the cervical cancer population in Taiwan, the number of surveyed subjects in our study seems to be small, and the 91% of the remission status for the subjects seems to be high. Potential selection bias may be present. However, the 5-year survival rate for stages Ia is as high as 93% (Greanebaum Cancer

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Center, 2009). The average disease age for our sample is 5.19 years. Given this information, our sample represents a group of patients with cases showing earlier detection. More severe patients have lower 5-year survival rates. Thus, as a snapshot at the time of interviewing, it is reasonable to include fewer subjects with severe disease conditions. In this sense, our sample is not biased and can represent general cervical cancer survivors' statistics. The selected three hospitals in this study are well-established general hospitals that provide services to over a thousand cervical cancer patients each year. Thus, the patients referred by their physicians within this period would be considered a representative sample of the larger population.

7. CONCLUSION

To understand the suffering of patients with cervical cancer, this paper investigates the disease costs using CVM to ascertain patients' WTP for a complete remission of the disease. Using a retrospective format on all possible available cervical cancer patients who returned to hospitals for follow-up outpatient checkups, this study intentionally excluded patients with multiple recurrences because of the complex nature of their medical history and poor prognosis in general. By so doing, patients with severe end-stage disease are excluded, and potential upward bias of WTP can be avoided. In general, the research results fit the general understanding of the relationship between WTP and demographic characteristics, such as patients' age, income, and education level. However, disease stage does not show a systematic pattern toward WTP, although it is directly related to 5-year survival rate. One interesting finding is that individuals with surgery tend to have higher WTP. Traditionally, patients are led to believe that surgery is the simplest and safest way of treating cancer because perceived side effects are relatively low compared with radiation and chemotherapy. Because patients can be treated with surgery ranging from mild to severe conditions, the result implies that losing all or part of the uterus for a patient can be more traumatic psychologically than physically.

The subjects' annual average WTP for a complete remission of the disease is \$NT40 663.46 (or \$US1253.00). With 78 years of life expectancy for women in Taiwan in 2004 and the average age of our study subjects of 56 years, the remaining 22 years of life generates a total WTP calculated as follows.

$$WTP_{Life} = \sum_{n=0}^{22} 1253/(1+\gamma)^n$$

where γ is the discount rate and is assumed to be 3%. Then, the lifetime WTP is calculated to be \$US21 221.96, or around 1.5 times of Taiwanese annual gross domestic product per capita for the same year. Cervical cancer treatment runs about \$US7000–24 000 per woman in the USA (Denver Women's Commission, 2001; Women's Commission, 2001), and the average cost of treatment for the Ib and IIa cancer stage was \$US21 172.98 and \$US49 995.73 for the IIb to IV stage cancers in France (converted to 2004 value) (el M'Rini *et al*., 2001). In Taiwan, total treatment cost for the patients with cervical cancer at early stage is around \$NT23 438. The cost is about doubled for end-stage patients (2004 value). Our research result is consistent with other research findings for patients with earlier stages.

Cervical cancer is considered one of the most preventable and treatable cancers, with the 5-year post-treatment survival rate around 90% for Stage I patients (National Cancer Institute, 2006; American Cancer Society, 2011). This study shows that patients with higher mental morale, better HRQoL, and better disease condition tend to have higher WTP for complete remission. The patients at higher stages, on the other hand, tend to lose interest in fighting the disease. The result implies that early detection is important for patients to maintain a high level of WTP for a complete remission. With the screening rate for cervical cancer in Taiwan remaining low, as high as 48.4% of women aged 20 and older in Taipei City never having had a Pap test in their life (Liao *et al*., 2006), this study intends to generate a WTP figure from the patients to arouse public awareness of the seriousness of the disease. The cost for cervical cancer screening, such as Pap test runs around \$US40 ~ 60, which is significantly lower than the WTP found in this study. With the low compliance rate of Pap test for Taiwanese women, it is crucial for government authorities to be aware of this fact and take measures to change it. More

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active courses of promotion for Pap test and/or cost reimbursement of HPV vaccine for younger female patients are recommended to healthcare authorities in Taiwan.

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