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EPIDEMIOLOGY | RESEARCH ARTICLE

Financial toxicity in Indonesian cancer patients & survivors: How it affects risk attitude

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Abstract: This paper investigates financial toxicity of patients with cancer and survivors in Indonesia and how this condition affects their risk attitude. Financial toxicity is the harmful financial burden caused by cancer treatment. Data were collected using questionnaires. We adopted Comprehensive Score for Financial Toxicity (COST) measure and Domain-Specific-Risk-Taking (DOSPERT) scale to measure our variables. Our analysis shows that financial toxicity is experienced by the respondents (n = 194). We also find that risk attitude is not only influenced by financial toxicity, but also by age, number of dependent children, cancer stage, religious disaffiliation, and the use of health insurance.

Subjects: Behavioral Sciences; Economics; Finance

Keywords: financial toxicity; risk attitude; cancer; financial distress; behavioral finance

1. Introduction

Cancer is one of the leading causes of death in the world. Worldwide cancer cases are projected to increase by 50% until 2030 (American Cancer Society, 2015). In Indonesia, cancer accounted for 30% of mortality in 2014 (WHO, 2014).

ABOUT THE AUTHORS

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PUBLIC INTEREST STATEMENT

Cancer is the world's second leading cause of death and its treatment is costly. This article discusses **financial toxicity**; the financial burden caused by cancer treatment. We find that Indonesian patients with cancer and survivors suffer from **financial toxicity**. This condition triggers a change in their risk preference, turning them into risk-taking individuals. Other factors also influence this change in attitude: higher cancer stage and atheism cause patients to be more risk-taking. Whereas older patients, patients with more dependent children, and those with insurance tend to be more risk-averse under their condition of financial distress. As a result, we advocate for (i) a better communication between patient and physician regarding the costs and affordability of cancer care, and (ii) society-wide education about the importance of accomplishing financial security and leading healthy lifestyle. As always, prevention is better than cure.

Patients diagnosed with cancer, who receive timely treatment, may prolong their survivorship. However, ASEAN Costs in Oncology study (2014) discovered that 12 months after the diagnosis, 29% of the patients had died and 48% experienced financial catastrophe. Despite the introduction of Mandatory Health Insurance Scheme[1] (*Jaminan Kesehatan Nasional* or JKN) in 2014, the costs of cancer treatment in Indonesia remain high, and this circumstance may lead to financial toxicity.

Financial toxicity is a term used to describe the harmful financial burden faced by patients receiving cancer treatment (Zafar, 2016). This condition may be severer in those who are uninsured, although Zafar et al. (2013) found that health insurance does not eliminate financial distress among patients with cancer. These patients would still have to cover out-of-pocket expenses, possibly by spending life savings and altering lifestyle. For example, Souza et al. (2014) gave evidence that insured patients with cancer had to reduce leisure activities, withdraw savings, and sell assets.

The purpose of this study is to assess whether financial toxicity is embedded among Indonesian patients with cancer, and how this condition affects their risk attitude. Comprehending this may help healthcare professionals in serving patients, because risk attitude may explain the patients' preferences for treatments. To the best of our knowledge, a research of this nature has not been conducted in our country. The term "financial toxicity" itself is relatively novel; it was introduced in 2009 (Souza, Yap, Ratain, & Daugherty, 2015) to describe the economic impact of modern oncology drugs. Previous studies on financial toxicity have been conducted by medical specialists, whereas we would like to further contribute to the literature by offering a different perspective: behavioral economics.

2. Literature review

2.1. Prospect theory
Prospect theory was introduced by Kahneman & Tversky in 1979 and modified in 1992. This theory is a model of decision-making under risk, i.e. how people evaluate risk. According to this theory, people are risk-averse for gains and risk-seeking in losses (Tversky & Kahneman, 1992).

There are three different attitudes toward risk: risk-averse, risk-neutral, and risk-loving. Risk-averse people avoid taking risks, whereas risk-lovers are the opposite. This attitude can be illustrated with a gambling scenario.

You are given two options:

   Option A: You are guaranteed a $5 winning pot.
   Option B: A coin toss would decide whether you win (heads) $10 or (tails) $0

A risk-averse person would rather accept a certain payment (certainty equivalent) of less than $5 than gamble with a 50% chance of no winning at all. A risk-neutral person would be indifferent to both alternatives, i.e. guaranteed and unguaranteed outcome. Whereas a risk-lover would accept the bet, even when the guaranteed winning may be more than $5.

Previous research findings have indicated that patients with cancer tend to show risk aversion. Stiggelbout et al. (1994) found that patients who had received chemotherapy were more risk averse, and McNeil et al. (as cited in Chapman & Sonnenberg, 2003) discovered strong risk aversion in seriously ill patients.

However, if we adhere to prospect theory, then patients or survivors facing great loss would take on risk in decision-making, especially if they perceive high probability of benefit. Financial toxicity is

the personal financial distress experienced by patients with cancer undergoing treatments. By this definition, then financial toxicity can be regarded as a condition of economic loss. Therefore, we hypothesize the following:

H_{a1}: Should financial toxicity exist, it would result in an increased risk-taking attitude among patients.

3. Methodology

3.1. Ordinary least squares
The impact of financial toxicity on risk attitude can be estimated by using Ordinary Least Squares (OLS) technique. Consider the following equation:

$$riskatt_i = \beta_0 + \beta_1 fintox_i + u_i \tag{3.1}$$

where *$riskatt_i$* represents the risk attitude of patient *i* (measured as in index from 1 to 5, with 5 being the most risk-seeking), *$fintox_i$* represents the average financial toxicity of a patient *i* (measured as an index from 1 to 5, with 5 being the most toxic) and *u_i* represents other unobserved variables that can affect the dependent variable. If an increase in financial toxicity causes a person to be more risk-seeking, then we expect β_1 to be positive in Equation (3.1). Therefore, we can use the estimated parameters to observe the relationship between financial toxicity and risk attitude.

However, it is also possible that risk attitude is also affected by variables other than *$fintox_i$* . For example, a person's age may have a correlation with his/her financial toxicity, as older (60 years old or above) people are more financially secure. a priori, older patients may have a lower risk attitude index as they are more content with their situation and consider doing risky actions less beneficial. If these arguments are true, then we can determine that age has a negative correlation with financial toxicity and risk attitude. The negative correlation between age and risk attitude means that age is included in the error term of Equation (3.1). If financial toxicity and age are correlated, then financial toxicity is correlated with the error term in Equation (3.1). If so, then financial toxicity is an endogenous regressor in Equation (3.1), which causes the estimated parameter $\widehat{\beta_1}$ to be biased and inconsistent in Equation (3.1), therefore inferences in Equation (3.1) will be invalid.

Thus, we should include other variables that can affect the dependent variables in our model. We consider the following equation:

$$riskatt_i = \beta_0 + \beta_1 fintox_i + \boldsymbol{X}\beta + u_i \tag{3.4}$$

where *X* represents a matrix of regressors other than financial toxicity.

3.2. Data description
We collected 201 rows of data from October until December 2017. However, seven were removed due to incompleteness. Afterwards, the data set containing 194 responses were cleaned before they were analyzed.

(a) Risk attitude

In measuring risk attitude, we adopted Blaise & Weber's Domain-Specific Risk-Taking scale (DOSPERT). It is a psychometric scale that assesses risk-taking behavior. (Blais & Weber, 2006). This scale has been used and proven useful in behavioral finance studies, e.g. to measure the risk attitude of private investors (Markiewicz & Weber, 2013).

DOSPERT is divided into three components. The first one is measuring the likelihood of engaging in risky activities. Respondents would rate with an index of 1 to 5 (5 being most likely to perform risky actions) the following 30 activities:

(1) *admits that your tastes are different compared to others;*

(2) *go camping in forests;*

(3) *gamble a day-worth of income on horse racing;*

(4) *invest 10% of your yearly income on a diversified investment with moderate growth;*

(5) *consume a large amount of alcohol in a social gathering;*

(6) *reduce the amount of taxes to be paid;*

(7) *disagree with authorities regarding important issues;*

(8) *risk a day-worth of income for gambling activities (such as poker);*

(9) *have an affair with a married person;*

(10) *claim another person's work as your own;*

(11) *go skiing in a course that is beyond your abilities;*

(12) *invest 5% of your yearly income on high-risk stocks;*

(13) *go rafting in deep water;*

(14) *gamble a day-worth of income on sports events;*

(15) *have sex without protection;*

(16) *spread around your friend's secrets;*

(17) *drive a car without using a seat belt;*

(18) *invest 10% of your yearly income on a startup company;*

(19) *take a skydiving class;*

(20) *drive a motorcycle without using a helmet;*

(21) *choose a career out of passion instead of financial security;*

(22) *voice an unpopular opinion in a business meeting;*

(23) *tan without using a sunblock lotion;*

(24) *do bungee-jumping from a high bridge;*

(25) *drive a small airplane;*

(26) *walk home alone at night in an unsafe area;*

(27) *move to a city far away from your family;*

(28) *get a new career in your 30s;*

(29) *leave your child alone at home while working;*

(30) *keep a wallet you found lying on the street with 2 million rupiahs (around $200) inside.*

The second component is risk perception. It evaluates the respondents' perceptions of the risk magnitude. Respondents would again rate the risk level of the same 30-item activities (from previous component) with an index of 1 to 5, with 5 being most risky.

The third and final component is expected benefit, as a contrast to risk perception. Respondents would rate whether they deem the 30-item activities beneficial by using an index of 1 to 5, with 5 being most beneficial.

Based on the values we obtained, we would take the average value to get an index that represents the risk taking, risk perception, and expected benefit indices of each respondent, and then calculate the risk attitude index based on those three components.

(b) Financial Toxicity

Our main regressor, financial toxicity, is a variable that measures the financial burden faced by patients undergoing cancer treatment. To measure financial toxicity, we adopted the Comprehensive Score for Financial Toxicity Patient (COST) survey, as developed by Souza et al. (2014). Its validity and reliability have been proven in measuring financial toxicity (Souza J., et al., 2017).

The respondents were asked to rate each of the 11 statements with an index of 1 to 5, with 5 representing complete agreement to the statement. The 11 statements are as follows:

(1) *I know I have enough savings, pensions and assets to cover my medical bills.*
(2) *My expense for medical bills is larger than I anticipated.*
(3) *I am worried for my future financial problems caused by my medical bills.*
(4) *I feel helpless regarding my medical expenses.*
(5) *I am frustrated because I can no longer as much as I used to.*
(6) *I am satisfied with my current financial situation.*
(7) *I can cover my monthly expenses.*
(8) *I am financially stressed.*
(9) *I am worried about keeping my job and income.*
(10) *My current disease and medication are reducing my satisfaction level with my financial situation.*
(11) *I feel in control of my financial situation.*

For statements 1, 6, 7 and 11, we reversed the obtained data so that the score 5 represents the most toxic situation. We would then calculate the average of these values to get an index that represents a person's financial toxicity. The closer the value to the number five means the severer the financial toxicity is.

We also obtained several other variables from the respondents, such as age (measured in years), gender, education, income, race, religion, number of children under the age of 21, cancer type, cancer stage (degree of seriousness), and insurance situation. These variables can be used to estimate the *ceteris paribus* relationship between financial toxicity and our dependent variable.

4. Findings & discussion

4.1. Exploratory data analysis and simple regression

Data were obtained from responses of 194 patients and survivors with cancer. These data represent several variables, such as risk attitude, risk perception, expected benefit, and financial toxicity (refer Figure 1).

Table 1 shows a reasonable maximum and minimum values of each variable. This is due to the data cleaning procedure that was conducted. The mean values of risk attitude, risk perception, benefit perception, and financial toxicity are 2.3155, 3.5414. 1.3684, and 3.2498, respectively. We can see that the average age of our respondents is 46. Most of them have one or two children under the age of 21, and they earn 5 until 10 million Rupiah per month (US$375–US$755). Approximately 3.09% of the patients are atheists, 60.31% of them use JKN (Indonesia's mandatory health insurance), and 60.83% of them are women. Most of them have finished high school, and only 26.80% of them listed bachelor's degree as their highest education level. The frequency distribution of our respondents can be found in the appendix section (see Table A1).
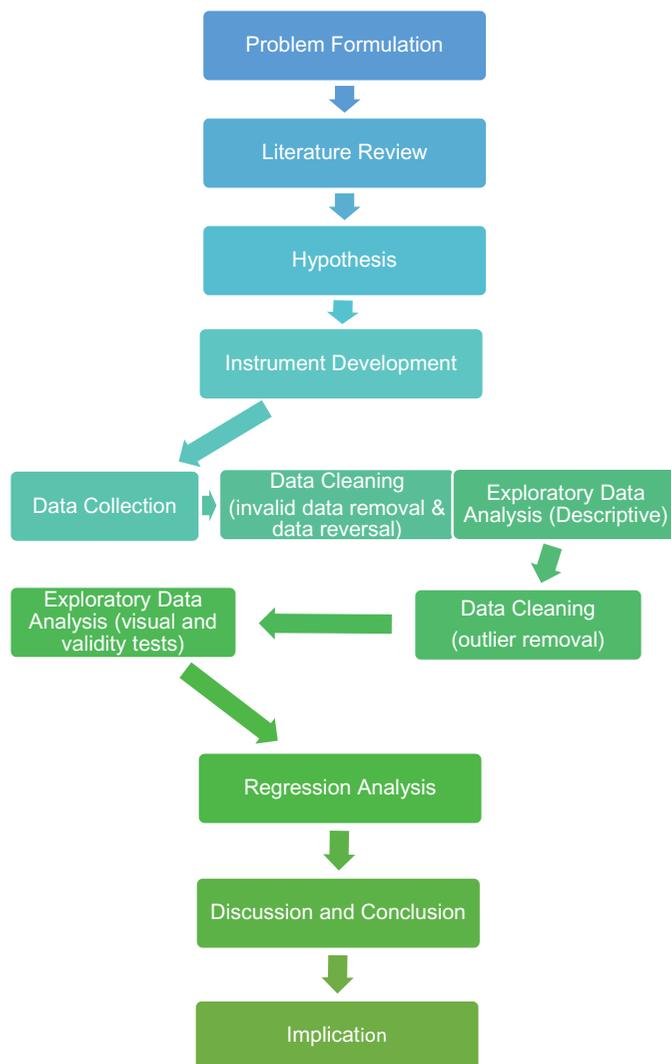
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Figure 1. Research framework.

Table 1. Descriptive statistics								
	Risk Taking	**Riah Perception**	**Expected Benefit**	**Financial Toxicity**	**Age**	**Atheist**	**JKN**	**CH21**
Mean	2.315461	3.541413	1.368428	3.249792	46.10309	0.030928	0.603093	1.561856
Median	2.250000	3.600000	1.300000	3.318182	48.00000	0.000000	1.000000	1.000000
Maximum	4.000000	4.900000	2.800000	4.818182	92.00000	1.000000	1.000000	6.000000
Minimum	1.000000	1.000000	1.000000	1.363636	1.000000	0.000000	0.000000	0.000000
Std. Dev.	0.643405	0.688310	0.306984	0.635346	17.55287	0.173570	0.490522	0.965084
Skewness	0.410717	−0.432292	1.264574	−0.067703	−0.193508	5.418971	−0.421426	1.800789
Kurtosis	3.006791	3.703852	5.226282	2.630618	2.549545	30.36525	1.177600	6.609585
Observations	194	194	194	194	194	194	194	194

In order to determine the risk attitude of the patients, we measured it based on the risk-taking, risk perception, and expected benefit indices, obtained with the DOSPERT scale. Consider the following equation

$$risktaking_i = \beta_0 + \beta_1 riskperc_i + \beta_2 expbenefit_i + u_i \tag{4.1}$$

Table 1. (Continued).

	Genderdum	Income	Stadium	High School	Diploma	Bachelor	Master
Mean	0.608247	2.082474	2.907216	0.412371	0.123711	0.268041	0.046392
Median	1.000000	2.000000	3.000000	0.000000	0.000000	0.000000	0.000000
Maximum	1.000000	6.000000	5.000000	1.000000	1.000000	1.000000	1.000000
Minimum	0.000000	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000
Std. Dev.	0.489405	1.112064	1.479269	0.493535	0.330104	0.444085	0.210876
Skewness	−0.443508	0.924808	0.140759	0.356026	2.285719	1.047362	4.313259
Kurtosis	1.196699	3.369573	1.621419	1.126754	6.224510	2.096966	19.60420
Observations	194	194	194	194	194	194	194

Table 2. OLS estimate of risk taking on risk perception and expected benefit

Estimation	Model (4.1)—Risk Taking
Constant	1.2602
	(5.1235)***
Risk Perception	−0.2306
	(−5.0409)***
Expected Benefit	1.3681
	(13.3355)***
F Statistics	133.7783***
R^2	0.5835
AIC	1.1059
Observations	194

*** = significant at 1%

where $risktaking_i$ represents the risk-taking index of patient i (measured as an index from 1 to 5), $riskperc_i$ represents the risk-perception index of patient i (measured as an index from 1 to 5), $expbenefit_i$ represents the expected-benefit index of patient i (measured as an index from 1 to 5) and u_i represents any other unobserved variables that can affect risk-taking index. We estimate Equation (4.1) using OLS, and Table 2 shows the estimated parameters and their t-statistics.

We can see from Table 2 that all regressors are significant at 1% level of significance. Based on these estimated parameters, we calculate risk attitude based on the estimated value of the risk-taking index obtained from model (4.1).

$$riskattitude_i = \widehat{risktaking}_i = 1.2602 - 0.2306 \times riskperc_i + 1.3681 \times expbenefit_i$$

Thus, we calculate the risk attitude index for each of our observations shown in table 3. The descriptive statistics and distribution are shown in the following table:

As for the general relationship between financial toxicity and risk attitude, the following scatter plot displays the relationship between the two variables:

Figure 2 shows that there seems to be a positive relationship between financial toxicity and risk attitude, which shows that a patient with a high financial toxicity index tends to possess a high risk attitude index. We would also estimate Equation (3.1) using OLS to determine the significance of the relationship between the two variables. The following output was generated:

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Table 3. Risk attitude descriptive statistics

	Risk Attitude
Mean	2.315461
Median	2.284689
Maximum	4.003445
Minimum	1.498074
Std. Dev.	0.491469
Skewness	0.679376
Kurtosis	3.298942
Observations	194

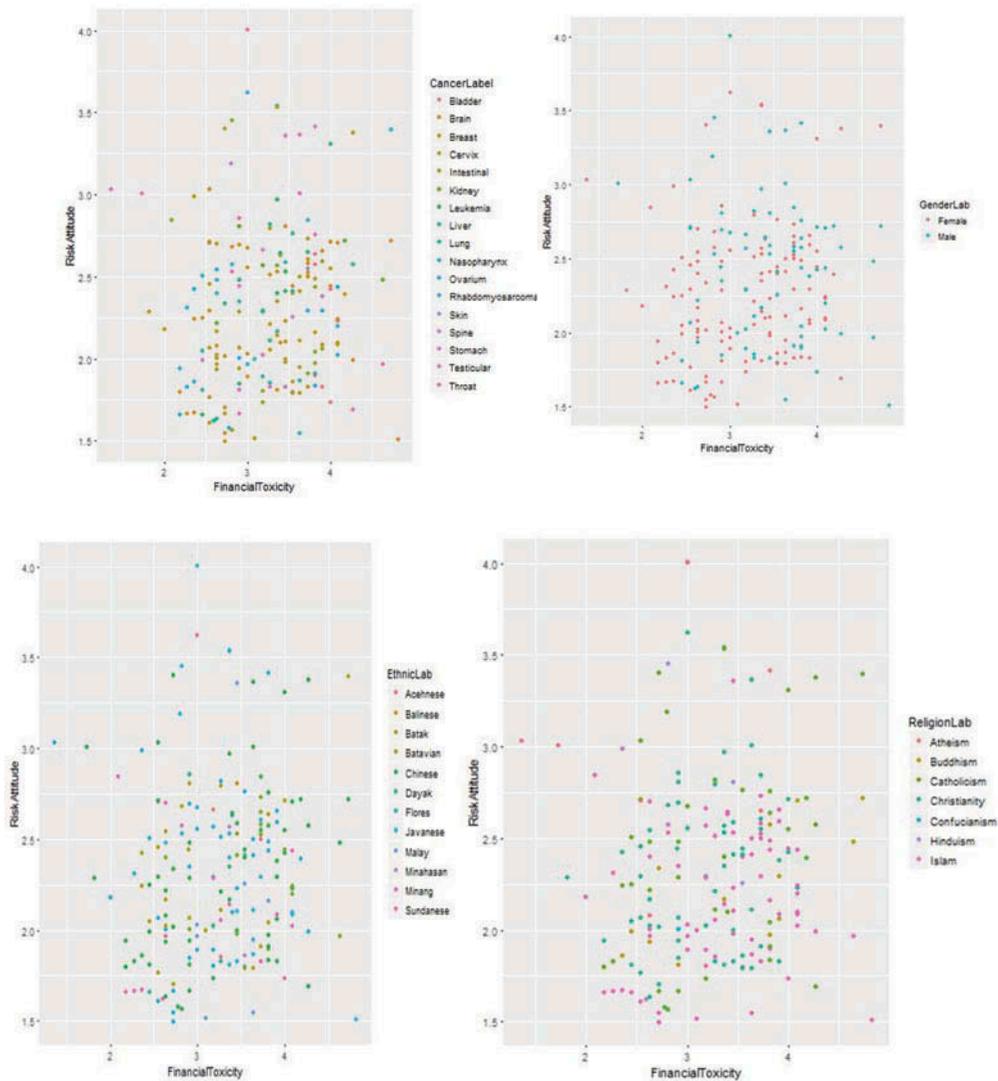**Figure 2. Financial toxicity vs risk attitude.**
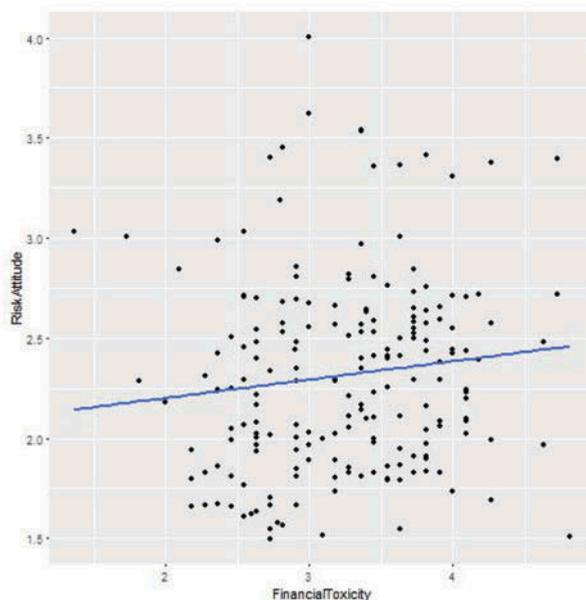
The results from Table 4 confirms that there is a significant, positive correlation between financial toxicity and risk attitude at 10% level of significance. However, this does not represent the *ceteris paribus* effect. There is a possibility that the estimated parameter in model (3.1) is biased and inconsistent. As a result, we must include other variables that may affect a person's risk attitude and financial toxicity in the model.

Table 4. Simple regression of risk attitude on financial toxicity

Estimation	Model 3.1—Risk Attitude
Constant	2.0169
	(10.9892)***
Financial	0.0919
Toxicity	(1.6576)*
F Statistics	2.7477*
R^2	0.0141
AIC	1.4184
Observations	194

* = significant at 10%, *** = significant at 1%

Figure 3. Scatter plots based on religion, ethnic, gender and cancer type.

The following scatter plots show the relationship between financial toxicity and risk attitude based on several categorical variables.

There is no obvious pattern that we can establish from the scatter plots in Figure 3 that show group differences in the relationship between financial toxicity and risk attitude. However, we can see that atheists tend to have higher risk attitude indices.

4.2. Impact of financial toxicity on risk attitude

As discussed in the previous section, the parameters in Equation (3.1) are likely to be biased and inconsistent, because it is unlikely that financial toxicity is the only variable that can significantly affect risk attitude. Therefore, we included several other variables that can affect our dependent variables. Consider the following equation:

$$
\begin{aligned}
riskatt_i = \beta_0 &+ \beta_1 fintox_i + \beta_2 age_i + \beta_3 children21_i + \beta_4 income_i + \beta_5 cancerstage_i \\
&+ \beta_6 atheist_i + \beta_7 female_i + \beta_8 highschool_i + \beta_9 diploma_i + \beta_{10} bachelor_i \\
&+ \beta_{11} master_i + \beta_{12} bpjs_i + u_i
\end{aligned}
\tag{4.2}
$$

where $riskatt_i$ represents the risk attitude of patient i (measured as an index), $fintox_i$ represents the financial toxicity of patient i (measured as an index), age_i represents the age of patient i (measured in years), $children21_i$ represents the number of children under 21 years old for patient i (measured in number of children), $income_i$ represents the monthly income of patient i (measured as a grouped, ordered categorical variable), $cancerstage_i$ represents the cancer stage of patient i (measured as an index), $atheist_i$ takes the value of 1 if patient i is an atheist, 0 otherwise; $female_i$ takes the value of 1 if patient i is female, 0 otherwise; $highschool_i$ takes the value of 1 if the highest education obtained by patient i is a high school diploma, 0 otherwise; $diploma_i$ takes the value of 1 if the highest education obtained by patient i is a college diploma, 0 otherwise; $bachelor_i$ takes the value of 1 if the highest education obtained by patient i is a bachelor degree, 0 otherwise; $master_i$ takes the value of 1 if the highest education obtained by patient i is a master's degree, 0 otherwise; jkn_i takes the value of 1 if patient i gets aid from Indonesia's mandatory health insurance JKN, 0

Table 5. OLS estimate of risk attitude on financial toxicity and other variables	
Estimation	**Model (4.2)—Risk Attitude**
Constant	2.1575
	(8.1136)***
Financial Toxicity	0.1117
	(1.9235)*
Age	−0.0036
	(−1.8191)*
Children under 21	−0.0899
	(−2.5331)**
Income	−0.0000000009
	(−0.3841)
Cancer Stage	0.0386
	(1.6851)*
Atheist	0.6268
	(3.1660)***
Female	−0.0477
	(−0.6520)
High School	0.1022
	(1.0026)
Diploma	0.0675
	(0.5251)
Bachelor	0.0965
	(0.8877)
Master	0.1205
	(0.6534)
JKN	−0.1207
	(−1.7266)*
F Statistics	3.4664***
R^2	0.1869
Jarque-Bera Statistics	4.1407
White Obs*R^2	80.9834
AIC	1.3391
Observations	194

* = significant at 10%, ** = significant at 5%, *** = significant at 1%

otherwise; and u_i represents any other unobserved variables that can affect risk attitude. We estimate Equation (4.2) using OLS and the results are summarized in Table 5.

Prior to generating the regression results, we found no proof of heteroskedasticity in model (4.2). We also checked the parameters' Variance Inflation Factors and found no traces of multicollinearity in the model. Additionally, the residual distribution in model (4.2) was found to be normal.

Based on the regression output of model (4.2), we can see that financial toxicity has a significant positive impact on risk attitude at 10% level of significance. This means that the more toxic a person's financial situation is, the more risk-seeking the person becomes, *ceteris paribus*. Whereas an increase in number of offspring by 1 child is expected to decrease risk attitude by 0.0899 index points, which shows that patients who have more dependent children tend to be more risk-averse, holding all other variables constant. Furthermore, atheists are significantly more risk-seeking than their religious counterparts, as their risk attitude index is on average higher by 0.6268 index points, *ceteris paribus*.

Age is also found to be a significant variable, which shows that older people tend to be more risk-averse than the younger ones. Moreover, patients' cancer stage is also proven to be a significant variable, which interestingly shows that the severer the stage of their cancer is, the more risk-seeking they become. Finally, patients who received aid from JKN (Indonesia's mandatory health insurance) are more likely to be risk-averse.

The variables gender, education, and income were found to be insignificant regressors of risk attitude. Therefore, we removed them from the model to reduce variances in the model:

$$riskatt_i = \beta_0 + \beta_1 fintox_i + \beta_2 age_i + \beta_3 children21_i + \beta_4 cancerstage_i + \beta_5 atheist_i + \beta_6 bpjs_i \\ + u_i \tag{4.3}$$

Table 6. OLS estimate of risk attitude on financial toxicity and other variables (without gender, education and income)	
Estimation	**Model (4.3)—Risk Attitude (with White standard errors)**
Constant	2.1897
	(9.8562)***
Financial Toxicity	0.1189
	(2.2666)**
Age	−0.0042
	(−1.9954)**
Children under 21	−0.0866
	(−2.8329)***
Cancer Stage	0.0424
	(1.8692)*
Atheist	0.6449
	(2.3478)**
JKN	−0.1255
	(−1.7987)*
F Statistics	6.8128***
R^2	0.1794
Jarque-Bera Statistics	3.6856
White Obs*R^2	47.9697***
AIC	1.2865
Observations	194

Table 6 displays the estimated parameters and their t-statistics after removing the insignificant variables.

Since there is heteroskedasticity in model (4.3), we employed the White heteroskedasticity-consistent standard errors so that we would be able to collect valid inferences from the model. After removing the insignificant variables, the Akaike Info Criterion (AIC) value has decreased, and financial toxicity is now significant at 5% level of significance. This shows that an increase in financial toxicity index by 1 point is expected to increase risk attitude index, on average, by 0.1189 points, *ceteris paribus*. Thus, we can conclude the more toxic a patient's financial situation is, the more risk-seeking the patient tends to become.

5. Conclusion

In summary, we find that risk attitude is affected by financial toxicity, age, number of dependent children, stage of cancer, religious disaffiliation, and the use of health insurance.

(1) Financial toxicity

Our statistical analysis accepts our proposed hypothesis. We can conclude that financial toxicity causes people to be more risk-taking. This finding supports the theory of Prospect. Financial toxicity is a condition of loss; and prospect theory states that those facing great loss would be more likely to take on risk in decision-making. This contrasts with the findings of Stiggelbout et al. (1994) and McNeil et al. (as cited in Chapman & Sonnenberg, 2003), whom both found strong risk aversion. Note that these studies were conducted in a different time and country.

The positive aspect of this finding is that cancer survivors are willing to take on more risks; this can be translated to courageousness in undergoing treatments should cancer relapses or recurrences occur.

(2) Variables showing positive effect on risk attitude:
    (a) Cancer stage
        Higher cancer stage would result in a more risk-taking behavior. This further supports the effect of financial toxicity on risk attitude. The worse condition the patient is in, the braver he/she is in taking risks. Patients with higher cancer stages are predicted to have lower survivorship; this realization could catalyze risk-taking.

    (b) Religious disaffiliation
        Atheists suffering from financial toxicity show a more risk-tolerant attitude. Our finding here is consistent with Leon and Pfeifer (2017), who found that religious people are less willing to take risks in general, compared to non-religious people. This shows that the coping behavior of atheists are different than their religious counterparts. Horning, Davis, Stirrat, and Cornwell (2011) gave evidence that atheists showed lower presence of meaning in life. It can be argued that they are less afraid to take risks because they value life less. Being an atheist in Indonesia itself is a brave stance, especially when we consider the rising religious intolerance in the nation as expressed by Hamayotsu (2013) and shown by the prison sentence of former Jakarta governor Basuki Tjahaja Purnama in 2017 for the criminal act of blasphemy. Our descriptive statistics only shows that 3.09% of the respondents are atheists; a minority group.

(3) Variables showing negative effect on risk attitude; causing patients to be more risk-averse:
    (a) Age
        We find that older patients are more risk-averse. This corresponds to many previous empirical studies that show risk-taking tendencies reduce with age, such as Rolison, Hanoch, Wood, and Liu (2014). Older folks are faced with important financial and medical decisions. Suffering cancer means a person is under a certain high level of uncertainty in

survivorship. Therefore, it can be the case that they evaluate their options more pru-
dently. With this being an economic research, it would be compelling to approach this
finding from a cognitive medicine or neuroscience perspective.

(b) Number of children

Patients with greater number of dependent children tend to be risk-averse. They are more
careful in decision-making because the decision, particularly when related to cancer
treatment, would affect the children directly. For instance, saving fund: should it be
allocated for further cancer treatment or the children's future?

(c) Insurance usage

The effect shown here is consistent with the motivation to purchase insurance premium
in the first place. An insurance enables an individual to receive financial protection and in
the case of JKN, certain cancers are covered by this health insurance; including pre-
existing conditions.

6. Implication

Every disease treatment has both physical and financial side effects. There should always be a
proper physician-patient communication regarding the costs and affordability of cancer care. If
patients are concerned with paying for treatment, then other parties (such as social workers,
financial advisors, and pharmacists) should be involved to inform patients about the most afford-
able care.

Further studies can focus on designing programs or schemes aimed at neutralizing financial
toxicity, i.e. achieving greater savings in healthcare spending. Finally, the society has to be
educated about the importance of (i) accomplishing financial security and (ii) leading a healthy
lifestyle. As always, prevention is better than cure.

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Note
1. As managed by the *Badan Penyelenggara Jaminan
Sosial Kesehatan* or commonly known as BPJS (Social
Security Administrator for Health). Indonesians tend to
use the term "BPJS" when they refer to the insurance
scheme.

References
American Cancer Society. (2015). *Global cancer facts &
figures* (3rd ed.). Atlanta: American Cancer Society.
Blais, A., & Weber, E. (2006). A domain-specific risk-taking
(DOSPERT) scale for adult populations. *Judgment and
Decision Making, 1*, 33–47.
Chapman, G., & Sonnenberg, F. (2003). *Decision making in
health care: theory, psychology, and applications*.
Cambridge University Press, Cambridge, United
Kingdom.
Hamayotsu, K. (2013). The limits of civil society in demo-
cratic Indonesia: Media freedom and religious intol-
eranc. *Journal of Contemporary Asia, 43*(4), 658–677.
doi:10.1080/00472336.2013.780471
Horning, S., Davis, H., Stirrat, M., & Cornwell, R. (2011).
Atheist, agnostic, and religious older adults on
well-being and coping behaviors. *Journal of Aging
Studies, 25*(2), 177–188. doi:10.1016/j.
jaging.2010.08.022
Leon, A., & Pfeifer, C. (2017). Religious activity, risk-taking
preferences and financial behaviour: Empirical evi-
dence from German survey data. *Journal of
Behavioral and Experimental Economics, 69*, 99–107.
doi:10.1016/j.socec.2017.05.005
Markiewicz, L., & Weber, E. U. (2013). DOSPERT's gambling
risk-taking propensity scale predicts excessive stock
trading. *Journal of Behavioral Finance, 14*(1), 65–78.
doi:10.1080/15427560.2013.762000
Rolison, J., Hanoch, Y., Wood, S., & Liu, P. (2014). Risk-
taking differences across the adult life span: A
question of age and domain. *The Journal of
Gerontology: Series B, 69*(6), 870–880. doi:10.1093/
geronb/gbt081
Souza, J., Yap, B., Ratain, M., & Daugherty, C. (2015). User
beware: We need more science and less art when
measuring financial toxicity in oncology. *Journal of
Clinical Oncology, 33*(12), 1414–1415. doi:10.1200/
JCO.2014.59.4986

Souza, J., Yap, B., Wroblewski, K., Blinder, V., Araujo, F., Hlubocky, F., … Cella, D. (2017). Measuring financial toxicity as a clinical relevant patient-reported outcome: The validation of the comprehensive score for financial toxicity (COST). *Cancer, 123*(3), 476–484. doi:10.1002/cncr.30369

Souza, J., Yap, B. H., Wroblewski, K., Ratain, M., Cella, D., & Daugherty, C. (2014). The development of a financial toxicity patient-reported outcome in cancer: The COST measure. *Cancer, 120*, 3245–3253. doi:10.1002/cncr.28814

Stiggelbout, A., Kiebert, G., Kievit, J., Leer, J., Stoter, G., & De Haes, J. (1994). Utility assessment in cancer patients: adjustment of time tradeoff scores for the utility of life years and comparison with standard gamble scores. *Med Decis Making, 14*, 82–90. doi:10.1177/0272989X9401400110

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty, 5*(4), 297–323. doi:10.1007/BF00122574

World Health Organization. (2014). *Noncommunicable diseases country profiles*. Geneva: Author.

Zafar, S. (2016). Financial toxicity of cancer care: It's time to intervene. *Journal of the National Cancer Institute, 108*, 5.

Zafar, S., Peppercorn, J., Schrag, D., Taylor, D., Goetzinger, A. Z., & Abernathy, A. (2013). The financial toxicity of cancer treatment: A pilot study assessing out-of-pocket expenses and the insured cancer patient's experience. *The Oncologist, 18*, 381–390. doi:10.1634/theoncologist.2012-0279

Appendix

Table A1. Frequency table		
Number of Respondents		**194**
Gender		
	Female	118
	Male	76
Age Group		
	18–24	25
	25–34	23
	35–44	16
	45–54	61
	55–64	38
	65 or above	24
	Below 18	7
Ethnic Group		
	Acehnese	1
	Balinese	1
	Batak	23
	Batavian	14
	Dayak	6
	Flores	1
	Javanese	56
	Minahasan	2
	Malay	7
	Minang	8
	Sundanese	13
	Chinese	62
Highest Education		
	Elementary	16
	Junior High School	13
	Senior High School	80
	Diploma	24
	Bachelor Degree	52
	Master's Degree	9
(Monthly) Income Group		
	Less than Rp5,000,000	74
	Rp5,000,000–10,000,000	59
	Rp10.000.001–20.000.000	40
	Rp20,000,001–50,000,000	14
	Rp50,000,001–Rp100,000,000	6
	Greater than Rp100,000,000	1

(*Continued*)

TableA1. (Continued)		
Number of Respondents		**194**
Number of Children under 21 years old		
	0	1
	1	131
	2	25
	3	30
	4	5
	6	2
Religion		
	Atheism	6
	Buddhism	15
	Catholicism	38
	Christianity	58
	Hinduism	4
	Islam	72
	Confucianism	1
Cancer Type		
	Bladder	3
	Brain	10
	Breast	61
	Cervix	14
	Intestinal	13
	Kidney	6
	Leukemia	5
	Liver	14
	Lung	17
	Nasopharynx	2
	Ovarium	18
	Rhabdomyosarcoma	1
	Skin	1
	Spine	5
	Stomach	10
	Testicular	11
	Throat	3
Cancer Stage (Stadium)		
	1	45
	2	43
	3	34
	4	29
	5	43
JKN-registered (Universal health coverage in Indonesia)		
	No	77
	Yes	117

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