

A Case- Control comparison of mental burden across and within different types of cancers in Nepal

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Himalayan Policy Research Conference
Annual Conference on South Asia, October 2017

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Motivation

- Cancer diagnosis is a life-changing phenomenon leading to a considerable amount of psychological and emotional stress
- Disruptions in their life through physical challenges and through social isolation
- Studies have tried to quantify the levels of depression among cancer patient

[Linden et al. 2012, Hinz et al. 2010, vantSpijker, Trijsburg, and Duivenvoorden 1997]

- Levels of burden varies across studies due to differences in age, stage, cancer sites, and socio-economic dimensions

[Groenvold et al. 1999, Crawford et al. 2001, Chen et al. 2009, Vodermaier, Linden, and Siu 2009, Vodermaier et al. 2011]

Motivation

- Distress of cancer patients studied in light of general population

[Groenvold et al. 1999, Hadi, Asadollahi, and Talei 2009, Hinz et al. 2010]

- Risk of psychiatric distress was nearly twice as higher in cancer population than general population

[Hinz et al.,2010]

Patients diagnosed with cancer are ten times more likely to emotional distress

[Desplenter et al. 2012]

- On the contrary, cancer and control cases do not necessarily differ in their levels of anxiety but vary over cancer types and gender

[Groenvold et al. (1999) and Hadi, Asadollahi, Talei (2009), Linden et al. (2009)]

Objectives

- To compare and measure the extent of mental burden faced by cancer and control patients

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- To examine the differential impact of gender and cancer sites across different categories of patients

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- Cancer patients experience mental burden as high as 2.69 times more than the control groups
- Burden increases under lack of familial support and increased medical expenditure during the treatment period
- In addition to gender effects: Cervical patients face significantly higher burden compared to other female cancer, male cancer patients, and control patients respectively
- Higher burden of cervical cancer patients may be related to family level distress

Data & Variables

- Primary survey on five hospitals of Nepal
Bir, Bhaktapur Cancer, B.P Koirala Memorial, Army, Dhulikhel
- Survey span: December 2015-March 2016
- Total cancer patients (n=600) Total control patients (n=200)
- Control patients: (a) Chronic conditions (b) No history of cancer (c) > 18 years (d) Hospitalized for > 3 days & done > 2 diagnostic tests

Dependent variables

- Different measures of burden ensure robustness

- (a) Mental Burden- Disease 1

- Worried about finance; Family distress ; Awkward appearances ;
Lose hope against illness ; Unable to take personal care;

- (b) Mental Burden- Disease 2: Additional variables

- Little pleasure ; Down/depressed ; Feeling like hurting

- (c) Mental Burden- Disease 3: Additional variables

- Heart pounding fast ; Vomiting ; Chest pain

- (d) Self- Assessed

- Content with QOL; General life is good

Independent variables

■ Independent variable [Covariates]

(a) Social Support post diagnosis

Interpersonal relationships: trust, sharing private worries;

(b) Lifestyles and Habits

Alcohol, Smoke, Indoor pollution, exercise, eating, screening

(c) Economic Expenses

Total treatment expenses in last 30 days

(d) Socio-Economic Indicators

Income, education, age, occupation, ethnicity, marital status,
genetic

Empirical Methodology: Propensity Score Matching

- Non-randomized experiments: Direct comparisons can be misleading
- Baseline characteristics of treated and untreated groups differ systematically
- Propensity Score matching techniques (PSM)- Balance in the distribution of covariates among treatment and control groups
- After we account for the differences, we can estimate the effect of treatment on outcome

PSM: Different methods

- (a) Matching methods
Nearest neighbor, Radius matching, Stratification, Kernel matching;
- (b) Weighting estimators
Regression adjustment (RA), IPW, IPWRA, AIPW;
- Both the methods have their specific merits and demerits
- Multivalued treatment only estimated through weighting
- Matching with and without replacement

- Binary treatment: Cancer Vs Control
- Multivalued treatment: Different categories of cancer patients and control patients

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$$\frac{\ln[\Pr(T_i = M|X_i)]}{1 - \ln[\Pr(T_i = M|X_i)]} = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \dots + u_n$$

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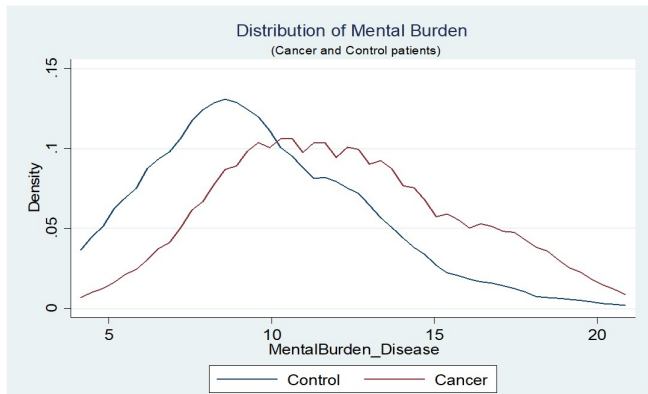
$$\frac{\ln[\Pr(T_i = M|X_i)]}{1 - \ln[\Pr(T_i = M|X_i)]} = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \dots + u_n$$

- Multinomial logistic regression for multivalued treatments
- Treatment effects

$$ATT : \tau = (E(Y_{1i} - Y_{0i})|T_i = 1)$$

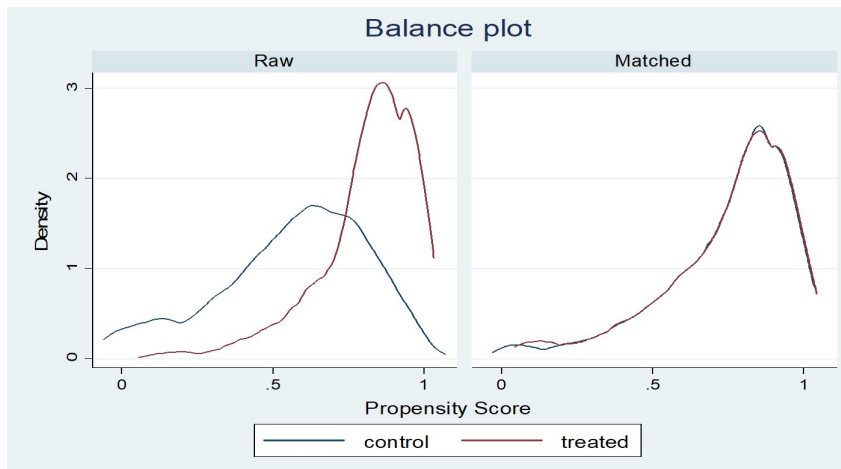
$$ATE: E(Y_{1i}|T_i = 1) - E(Y_{0i}|T_i = 0)$$

Descriptive Statistics



- The Mean and Median of the two distributions are different

Descriptive Statistics



- Panel A: Before Matching ; Panel B: Post Matching on covariates

Descriptive Statistics

Serial No.	Name of the hospitals	Cancer patients	Control patients
1	Bhaktapur Cancer Hospital	184	0
2	Bir Hospital	118	105
3	Dhulikhel Hospital	61	65
4	Birendra Army Hospital	22	28
5	B.P Koirala Memorial Hospital	207	0
Total		592	198

- Number of patients sampled from each of the hospitals

Empirical Results

Binary Treatment effects by measures of burden

Dependent variables						
Matching estimators	Cancer	Controls	ATT	Bootstrapped Std. Err	t statistics	
Mental Burden Disease-1						
Nearest Neighbor matching	591	134	1.99***	0.35	5.72	
Radius Method	549	185	2.19***	0.31	6.96	
Kernel Matching Method	591	189	2.08***	0.30	6.99	
Stratification Method	591	189	1.88***	0.31	5.96	
Mental Burden Disease-2						
Nearest Neighbor matching	591	134	2.29***	0.44	5.22	
Radius Method	549	185	2.69***	0.42	6.39	
Kernel Matching Method	591	189	2.54***	0.42	6.04	
Stratification Method	591	189	2.34***	0.37	6.29	
Mental Burden Disease-3						
Nearest Neighbor matching	591	134	2.03***	0.52	3.87	
Radius Method	549	185	2.29***	0.52	4.36	
Kernel Matching Method	591	189	2.13***	0.52	4.09	
Stratification Method	586	189	2.03***	0.43	4.76	
Self-Assessed Health						
Nearest Neighbor matching	591	134	-1.08***	0.25	-4.34	
Radius Method	549	185	-0.95***	0.18	-5.29	
Kernel Matching Method	591	189	-0.96***	0.17	-5.58	
Stratification Method	591	189	-1.13***	0.15	-7.23	

Binary Treatment: With and without replacement

	MentalBurden Disease1		MentalBurden Disease2		MentalBurden Disease 3		Self Rated Health	
	W/O	With	W/O	With	W/O	With	W/O	With
<i>Treatment indicator</i>	1.268*** (4.04)	1.537*** (8.42)	1.840*** (4.19)	1.783*** (7.19)	1.406*** (2.72)	1.766*** (6.11)	-1.061*** (-5.55)	-1.017*** (-9.74)
Social Support								
<i>Moderate support</i>	1.032*** (3.09)	1.126*** (5.69)	1.463*** (3.13)	1.934*** (7.19)	1.772*** (3.22)	2.381*** (7.60)	-0.344* (-1.69)	-0.0192 (-0.17)
<i>Low Support</i>	1.723*** (3.10)	1.791*** (5.61)	3.030*** (3.89)	2.918*** (6.73)	4.039*** (4.41)	3.914*** (7.74)	-0.588* (-1.74)	-0.379** (-2.08)
Economic Expenses								
<i>Low(Expenses)</i>	0.214*** (3.57)	0.241*** (5.67)	0.278*** (3.32)	0.301*** (5.21)	0.264*** (2.67)	0.199*** (2.96)	-0.106*** (-2.90)	-0.0871*** (-3.59)
Life Styles / Habits	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	396	1182	396	1182	396	1182	396	1182

Summary: Binary treatment models

- Cancer is associated with a maximum of 2.69 times higher mental burden and poorer self rating of health
- Robustness measures using four weighting strategies: 1.63 to 1.98 units higher burden for cancer patients [Table not shown here]
- Higher economic burden and extent of social isolation increases mental burden
- Results of PSM matching, weighting estimators, and with or without replacement models similar.

Multivalued Treatment: Different categories of patients

Outcome variable	RA		IPW		IPWRA		AIPW
	ATE	ATET	ATE	ATET	ATE	ATET	ATE
Mental Burden Disease-1							
Cervical cancer [Base]							
All Females	-1.01**	-1.50***	-1.26**	-1.56***	-1.05***	-1.69***	-0.93*
All Males	-1.05**	-1.86**	-1.50**	-1.64***	-1.40***	-2.19***	-1.11**
Control	-2.67***	-3.31***	-3.18***	-3.30***	-2.72***	-3.05***	-2.50***
Mental Burden Disease-2							
All Females	-0.95	-1.56***	-1.32**	-1.66**	-0.93	-1.83***	-0.80
All Males	-1.19*	-2.29***	-1.90***	-1.91**	-1.62***	-2.63***	-1.29*
Control	-2.97***	-3.62***	-3.84***	-3.73***	-3.04***	-3.31***	-2.74***
Mental Burden Disease-3							
All Females	-0.23	-0.99	-0.62	-0.96	-0.06	-1.21**	-0.03
All Males	-0.64	-1.92***	-1.30*	-1.44*	-0.90	-2.34***	-0.66
Control	-2.05***	-2.87***	-2.83***	-2.89***	-1.85***	-2.41***	-1.70**
Self-Assessed Health							
All Females	-0.25	-0.18	0.04	-0.009	-0.26	-0.07	-0.19
All Males	-0.11	-0.43	0.04	-0.30	-0.17	-0.44*	-0.09
Control	0.95***	0.70**	1.29***	1.03***	1.01***	0.83***	1.06***
POM-1	12.70	13.61	13.29	13.63	12.97	13.80	12.73
POM-2	18.82	19.97	19.78	20.01	19.16	20.23	18.88
POM-3	22.59	23.84	23.52	23.8	22.71	24.06	22.54
POM-4	3.94	4.12	3.7	3.95	3.93	4	3.89

Causes for higher burden: Item analysis

Items / MentalBurdenDisease1	Cervicalcancers	Other cancers	Cohen's <i>d</i>
<i>WorriedFinance</i>	3.3	2.95	-0.35
<i>FamilyDistress</i>	3.25	2.76	-0.47
<i>AwkwardAppearances</i>	2.2	2	-0.17
<i>Lose hope against illness</i>	2.3	1.97	-0.29
<i>Unable to Personal care</i>	2.37	2.22	-0.12
<i>Little interest in things</i>	2.37	2.24	-0.11
<i>Depressed</i>	2.47	2.19	-0.28
<i>Feeling like hurting self</i>	1.78	1.74	-0.04
<i>Heart pounding fast</i>	1.3	1.43	0.18
<i>Vomiting</i>	1.33	1.47	0.18
<i>Chest pain</i>	1.37	1.56	0.22
<i>Content with QOL</i>	1.97	1.98	0.01
<i>General life is good</i>	1.97	1.94	-0.03

Summary: Multivalued treatment models

- Covariate balance are ensured through inverse probability weighted regressions
- ATT/ ATE across different estimators and measures of burden are higher for cervical cancer patients compared to other categories of patients
- No significant change in the self rating of health across cancer types
- Item level analysis shows that the effect is highest for family level distress

Discussion: Literature on cervical cancer

- Domestic violence increases the likelihood of STI leading to cervical cancer (Coker et al. 2009, Ramaswamy et al. 2011, John et al. 2004, Loxton et al. 2006, Modesitt et al. 2006)
- Cervical cancer leads to physiological changes giving rise to familial dysfunction making women more prone to violence (Basen-Engquist et al. 2003)
- Treatment side effects: Radiation & Hysterectomy (Frumovitz et al. 2005; de Groot et al. 2005)

Conclusion

Policy Recommendations

- Counseling should be a part of the hospital treatment procedure to the cancer patients
- Female patients especially cervical cancer patients should be given special attention because they appear to be the most vulnerable group of patients
- Health authorities should make concerted efforts to hold discussions with both the husband and wife explaining them about the common side effects of cervical cancer so that familial dissent can be avoided

Conclusion

Limitations

- Due to lack of longitudinal data, we couldn't examine the late-term effects of cancer survivor
- We could not explore the different channels that explain the relatively higher mental burden of a cervical cancer patient due to lack of information

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Future directions: 2nd phase (December 2018)

- Using clinical scales of depression, we will measure depression more accurately among the patients
- An entire module on domestic relationship is introduced to explain mental burden among cervical cancer patients

THANK YOU!

