Gender differences in health expenditure of rural cancer patients: Evidence from a public tertiary care facility in India[*]

Akansha Batra[@]

Indrani Gupta[#]

Abhiroop Mukhopadhyay[&]

[*] We wish to thank Planning and Policy Research Unit, Indian Statistical Institute and the Institute of Economic Growth for funding this study. We wish to thank Soumitra Dash, Devmani Upadhyaya and Shalini Rudra for research assistance. We wish to acknowledge the late Professor Sanghamitra Das who thought it important to study the plight of cancer patients in Odisha. The usual disclaimers apply.

[@] Economics and Planning Unit, Indian Statistical Institute (Delhi), 7 SJS Sansanwal Marg, New Delhi 110016.

[#] Institute of Economic Growth, University of Delhi, New Delhi, indrani@iegindia.org

[&] Economics and Planning Unit, Indian Statistical Institute (Delhi), 7 SJS Sansanwal Marg, New Delhi, abhiroop@isid.ac.in

Gender differences in health expenditure of rural cancer patients: Evidence from a public tertiary care facility in India

Abstract

This paper investigates if there are gender differences in health expenditures and treatment seeking behavior among cancer patients and finds that the results are consistent with gender discrimination. Using a longitudinal survey on rural patients suffering from cancer in a public tertiary health center in Odisha, a poor state of India, the study finds that expenditures on female patients are significantly lesser than those on males. Even after controlling for other covariates, in particular the type of cancer, demographic and socio-economic variables, seventy three percent of the difference persists. Our paper attributes it to gender discrimination. Moreover, the biggest reason for the difference in expenditure is attributed to differences in treatment seeking and medical expenditures before coming to the tertiary center. These results are corroborated using a nationally representative survey on health for the whole country.

KEYWORDS: Cancer, Gender Discrimination, Health Iniquities, Non Communicable Disease

1. INTRODUCTION:

Health is a basic human right that is guaranteed in several human rights treaties. However, health inequities abound, especially, in developing countries, with high levels of poverty. Research shows that there is substantial variation in the population in terms of health status, health investments undertaken, access and utilization of healthcare services (Purohit and Siddiqui, 1994; Joe et. al., 2008; Nikiema et. al., 2008; Baeten et. al., 2013). The literature around the social determinants of health stresses the social gradient in health, and explains how psychological and social influences affect physical health and longevity (Wilkinson and Marmot, 2003). One such factor is gender-based discrimination that can fetter the attainment of health goals (such as those laid out as a part of the Millennium Development Goals). Analogous to other inequities, gender discrimination manifests itself in both lower health investments as well as worse health status of women relative to men. A number of researchers have looked into gender differences in health (see for example, the Special Issue of Social Science and Medicine edited by Hunt and Annandale, 1999). More recent work on differential exposure and differential vulnerability closely fit into the literature around the social determinants of health (Denton, et. al. 2003).

Most research on gender discrimination focuses on children and shows preferential treatment is given to boys, especially when resources are scarce (Behrman, 1988; Asfaw et. al., 2007, 2008). A comprehensive overview of the issues can be gleaned from a variety of sources (Sekher and Hatti, 2004). There is also evidence of gender discrimination in immunization and nutrition among children (Pande, 2003; Mishra et. al., 2004; Borooah, 2004; Jayachandran and Pande, 2012). More recent research (Anderson and Ray 2009, 2012) has shown that females face the risk of excess mortality in comparison to males at each stage of their lives, with the possibility that poor treatment and care at home may be an important factor for such excess mortality.

With its deeply patriarchal society, the Indian context is especially relevant to study the effect of discrimination in health. However, in India, the gender differences in treatment-seeking behavior within households are relatively less discussed and analyzed. While Pandey et. al., (2002) finds gender discrimination in treatment in rural West Bengal for treatment of diseases like diarrhea;, Gantara and Hirve (1994) finds a male bias in health care utilization for under-fives in a rural community in Western India. Gosoniu et. al., (2008) finds a greater delay in diagnosis for tuberculosis for females. These differences in the treatment seeking behavior often result in worse outcomes for poor females (Sen et. al., 2007), especially in rural areas (Rajeshwari, 1996).

This paper explores whether there are gender differences in health expenditures and treatment seeking behavior among adults. This has been studied in the context of cancer, a disease which is generally perceived as life threatening, reducing bias in the results that may emanate from differing perceptions about the seriousness of the malaise. Moreover, given the higher incidence of Non-Communicable diseases (NCDs) among adults (Anderson and Ray 2009), the evidence on health seeking behavior for cancer treatment adds to the growing literature on the determinants of treatment-seeking behavior in the context of NCDs.

Gender inequality is analyzed using a longitudinal survey of cancer patients residing in rural parts of the Indian state Odisha. In particular, the aim is to understand the presence and magnitude of differences in health expenditure between males and females and the likely determinants of such differences in a multivariate framework.

The study contributes to three disparate strands of literature. First, it contributes to the growing evidence of gender inequity in health-seeking behavior of patients. Further, given the disproportionate cases of cancer among the elderly, it provides evidence on whether differences in health expenditure exists among the aged. Given that the study takes into account number of control variables, we contend that any residual difference is reflective of gender discrimination.

Second, the study adds to the literature on the impact of cancer on households. There is an increasing evidence globally and in India that the incidence of cancer is showing an alarming rise. Cancer is the leading cause of adult deaths worldwide, and in India, 6 percent of all reported deaths are due to cancer (Dikshit et. al., 2012). The International Agency for Research on Cancer, in their ongoing Million Death Study (MDS), reports that, in India, around 635,000 people died from cancer in 2008[1]. The estimated rates of cancer mortality for men and women in rural India are 95.6 and 96.6 per 100,000 respectively (Dikshit et. al., 2012). Approximately one million newly diagnosed cancer patients are seen in India each year[2] and there are very few estimates of cost to patients. The Global Economic Cost of Cancer report (American Cancer Society, 2011) estimates that cancer has the greatest economic impact from pre-mature death and disability of all causes worldwide. An earlier study (Mohanti et. al., 2011) found that the cost of cancer treatment in a public hospital in Delhi was about Rs. 14,597(PPP $5838). The focus on a relatively poor state of India- Odisha, brings out the possible economic hardships faced by patients suffering from an expensive disease like cancer.

The third contribution of this paper is to add to the growing evidence around NCDs and their effect on households in India. The Global Burden of Diseases, Injuries, and Risk Factors Study (2010) indicates that, overall, the three risk factors that account for the most disease burden in India are dietary risks, household air pollution from solid fuels and tobacco smoking. These factors are largely responsible for chronic diseases. Moreover, NCDs are rising in India and communicable, maternal, neonatal and nutritional causes of disability-adjusted life years (DALY) are declining, consistent with global trends. These two points together justify studying cancer as a case of a chronic disease.

---

[1]MDS is a study conducted by the Centre for Global Health Research, (http://www.cghr.org) to study premature mortality in the world. It includes the study of the cause of death; of uncertified cause as well using verbal autopsy.

[2] This is based on cancer incidence data (2006-08) and actual growth rates (2001-2011) observed in India. Source: Indiastathttp://www.indiastat.com/health/16/diseases/77/cancer/17811/stats.aspx

The economic burden of a chronic disease begins with the occurrence of the symptoms of the disease, as a considerable amount is spent on the diagnostic tests and symptomatic care. Moreover, long treatment duration and expensive healthcare services add to the socioeconomic impact. While there is considerable literature around the economic impact of diseases like HIV/AIDS, there is comparatively little evidence on economic hardships households undergo from NCDs like cancer.

Section 2 and 3 provides details on the data set and methodology respectively. Section 4 reports the main results of our analysis. In section 5, to show that our results may be more general, we present additional evidence on possible gender disparity from a brief analysis of cross-sectional data collected by the National Sample Survey (NSS) in 2004. Subsequently, the limitations of the sample and potential limitations of this analysis are discussed in section 6. Section 7 presents the conclusions and policy implications of the study.

2. Data

The data used in the study are based on a primary longitudinal survey of 204 cancer patients residing in rural Odisha, one of the poorest states in India; in 2004-05, 37.58 percent of rural residents had a per capita monthly consumption below the poverty line Rs. 407(PPP $ 162). The survey including the baseline was conducted at a public tertiary hospital in the city of Cuttack over 5 months in 2007.

The baseline survey was done at the hospital and information was collected from them on their treatment and expenditures at the hospital. Cancer staging is usually recorded from 0 to 4, with higher stages reflecting severity. We choose patients with stage 3 and above as advanced cancer patients. In the case of patients at advanced stage of cancer, questions were asked to accompanying caregivers. Terminal stage cancer patients, seeking palliative care, were excluded from our survey on humanitarian grounds. The expenditures include money spent on various medical items like drugs and diagnostics, as well as on non-medical expenditure items related to treatment (transport, food and lodging of the patient and those accompanying caregivers from the household). Further, detailed information was obtained on the treatment and expenditures (medical as well as non-medical) before coming to the hospital. Also, detailed household demographic and asset information were recorded for each patient, both current as well as for the period before symptoms of cancer were first observed. A subsequent survey on patients was done after one year at the household residence. Forty-seven patients (23.5 percent) died before our second survey and information was collected from the household for the period they were alive after the baseline survey. Thus, there is no attrition in the sample.

Information on expenditures, analogous to those collected for other reference periods, were collected for the last one-year since baseline.

Table 1 summarizes the characteristics of the sample. Women account for 71 percent of the sample, and the average age of patients is around 49. The study covers patients from the ages of 10 to 80. However, most of the sampled patients are above 15 (only 3 patients are below 15 years). The sample covers patients, with most of the common cancers seen in India. Given both sexes report equal incidence rates (as reported by MDS), this suggests a selection bias in sampling at the public tertiary center. However, in so far as richer men prefer to go to private tertiary centers, any evidence of discrimination in expenditure in favor of men is an underestimate.

For the sake of presentation, cancers are classified into three kinds: those specific to females (*female cancer*: breast cancer and cervical cancer; 97 patients), those specific to males (*male cancer*: penile cancer; 4 patients) and those cancers, which occur in both men and women (*common cancer*: head and neck, brain, bone, urinary, gastro-intestinal, liver and lungs; 101 patients). Around 53 percent of males suffer from head and neck cancer whereas around 50 percent of females suffer from cervical cancer. The focus on all cancers instead of common cancers is to highlight the difference in the costs of cancers across gender. Gender discrimination can only be examined within common cancers and our methods allow us to do that.

The average education among the patients is relatively high. Around 25 percent of patients have at least secondary schooling, though the proportion of males with this education level (44 percent) is higher than females (18 percent). The proportion of men in the richest quartile is 26 percent; whereas the proportion of females is 21 percent. These quartiles are based on a recall of assets owned by the household before the first symptom/diagnosis of cancer. Within the Odisha sample, a wealth index is created, which is based on assets owned by the households before first diagnosis. Using principal component analysis, an asset index was calculated, based on which households were put in wealth quintiles. The male and female patients come from similar households; the average education of the household head is 7-8 years in both cases. Moreover, 28 percent women patients report that the household had taken some loan before the first symptom of cancer. While this is slightly lower for males (27 percent), the difference is not statistically significant. Thus, the households that men and women patients come from are very similar in terms of economic characteristics.

The patients also belong to households that are demographically similar. The household sizes across gender are similar (6-7 members per household). While 73 percent of males come from a joint family, 68 percent of females come from such families[3].

Given the relative scarcity of tertiary centers in rural Odisha, people come from far away places to seek treatment. The average distance of a cancer patient from his place of residence is 58 kms. Females come from slightly further off (60 kms) relative to males (52 kms).

Crucial to the analysis of expenditure is to account for the fact that some of the expenditures may be subsidized by the government. Moreover, governments also provide insurance to their employees and their family members. Indeed, 34 percent of the households of male patients come from households that have

[3] Joint family is defined as a household that has more members than just the patient, his/her spouse and his/her children.

some member in the family working in the government. While this is lower at 27 percent for females, the difference is not statistically significant.

A tertiary cancer center is usually not the first point of contact for ailing individuals in rural areas. Usually the first diagnosis or initial provisional diagnosis is done outside the hospital, though it is always re-confirmed at the tertiary center. This can potentially create a problem if the patients reach the tertiary hospitals only at an advanced stage. However, the mean duration from first diagnosis to being registered at the cancer center is less than half a year and the median duration is even lower at 83 days[4]. The difference between males and females in terms of duration is insignificant. While this does not rule out selection (that many women do not reach the cancer center at all), their inclusion would only strengthen the argument about discrimination.

3. Empirical Model and Estimation Technique

In this section, a model is specified to investigate if there are gender differences in cancer expenditures, after controlling for other covariates. The model separates out the gender difference in expenditures owing to the kind of cancers that are specific to females from gender discrimination for cancers that occur in both male and female patients.

To formalize the model, suppose t_0 is the date on which a patient i registers at the tertiary centre. At some point in the past, the patient had the first symptom

[4]The patients reach the tertiary center at various stages of cancer (Appendix Table 1A). Almost 42 percent of the sample reaches the hospital in Stages 0 and 1, which is consistent with the low median duration. Females reach the hospital at a relatively higher stage than males.

of cancer. In this analysis, the month of the first symptom at $t_0 - \tau_i$ is taken as the reference point from when the expenditures for cancer are undertaken. To minimize imperfect recall, the analysis has already been restricted to patients whose date of symptom or initial diagnosis is within the last 5 years. According to this timeline, cumulative expenditures are a function of duration τ_i. While outside the *center* expenditure is clearly a function of *duration,* for all subsequent expenditures (*at the center* and *post survey*), *duration* can be interpreted as an imperfect measure of the delay in treatment.

The expenditures on the patient may depend on the kind of cancers. We include *Female Cancers* and *Male cancers* as explanatory variables (with cancers not specific to females as the omitted group).[5] The other explanatory variables for expenditures pertain to individual, household as well as geographic characteristics. At the individual level, age and education are controlled for. Since the model includes male and female cancers as regressors, the dummy variable for gender (*Female*) captures the gender differential among cancers that occur to both men and women (the reference category). Hence, the variable *Female* is the measure of gender discrimination in our model.

At the household level, the initial asset wealth of the household (before the first symptom: *rich*) and the outstanding debt before the first symptom (*Debt*) are included in the specification as independent variables. These measure the

[5] The classification is largely for the ease of presentation. The results in this paper are equally true for a sub sample of the three main cancers: head and neck, breast and cervix, where no such classification is done. The observations on the other cancers are too few so as to yield any robust results on their own.

amount of money that can be potentially spent on healthcare when the illness first manifests. The other controls are the demographic characteristics like household size, average education of the household head, whether the patient belongs to a joint family and whether anyone in the patient's family works in the government sector. We cannot control for social groups, as data was not collected for this variable. However, various wealth measures control for the economic affluence of the households.

Further, to control for household's geographic access to the tertiary hospital *distance* (distance to tertiary center) is included as a regressor.

The following equation is estimated:

$$EXP_i^{cum} = \alpha + \beta Female_i + \gamma\ Female\ Cancer_i + \delta\ Male\ Cancer_i + \theta' Z_i + \varepsilon_i$$

where EXP_i^{cum} is the cumulative expenditure and Z is a vector of all the other individual, household and geographic characteristics.

In the data, cumulative expenditure is skewed (2.23 compared to 0). Hence an OLS regression with EXP_i^{cum} is not recommended (Manninga and Mullahy, 2001). In the presence of heteroskedasticity and where variances of the log scale residuals are less than 1, Generalized Linear Models (GLM) are recommended. Hence a GLM is estimated, with the appropriate tests for choice of functional forms of the link function and the distribution form. Clustered standard errors are reported in the tables where the sample size is large enough.

A model is estimated as well with total cumulative medical expenditure M_i^{cum}as a dependent variable, since around 64 percent of total costs comprise medical costs

A large part of the difference between expenditure on males and females is because of the medical expenditures *outside the center*. Hence, an additional exercise is conducted wherein the joint decision of seeking no treatment for cancer as well as the expenditure on medical treatment outside the center are considered as dependent variables. The hypothesis is that controlling for other covariates, females have both lower medical expenditure before reaching the tertiary center as well as a lower probability of being treated. To estimate this bivariate model, a Seemingly Unrelated Regression (SUR) model is estimated. We use the square root of the medical expenditure outside the center$\sqrt{(M^{Outside})}$ to reduce the skewness of data as well as to retain values of zeros in our dataset. The second dependent variable is $Treat$, which takes the value 1 if there has been any cancer treatment outside the center and zero otherwise.

4. Results:

To begin with, let us classify expenditures in two ways: those incurred before registering at the tertiary center, and those incurred post the baseline survey, which includes the cost of treatment at the tertiary center.

As Table 2 shows, the mean cumulative expenditure including medical as well as non-medical expenditures over the period of our survey is Rs. 93,010(PPP

$37,204). The mean cumulative expenditure in female patients is lower at Rs. 83,626(PPP $33,450) as compared to Rs. 116,073 (PPP $46,429) spent on male patients. Thus, the difference of cumulative expenditure between male and female patients is Rs. 32,446(PPP $12,978) and statistically significant. More than 70 percent of this difference comes from the difference in the cumulative medical expenditure. Classifying expenditures based on where they were made indicates that 85 percent of it comes from expenditures incurred before coming to the center.

While the focus of this analysis is gender differences in expenditures, it is important to understand how the other covariates affect cumulative expenditures (Table 3, column 1) as well as cumulative medical expenditures (Table 3, column 2).

As expected, duration has a significant positive impact on both dependent variables. If a patient reaches a tertiary center a month later (relative to it's mean value of 171 days), the cumulative expenditure is higher by around Rs. 1217 (Rs.40.59 X 30 days) (PPP $486). This is largely driven by the increase in the cumulative medical expenditure of around Rs. 1045 (Rs. 34.84 X 30)(PPP $418). These calculations have important implications for the impact of outreach of cancer centers. While distance is conventionally used to measure outreach, these results show that it is an insignificant (though positive) predictor of the cumulative expenditure. Surprisingly, it negatively affects cumulative medical expenditures, which may be due to the low availability and accessibility of health facilities in remote places.[6] These results are not driven by selection. If one expects those coming from remote places to be at more advanced stage, then medical expenditures should be higher not lower. A bivariate regression of the probability of a patient being in an advance stage of cancer on distance yields an insignificant coefficient and confirms this.

The results also indicate that educated individuals have higher cumulative total as well as medical expenditures, and the rich as well as the less indebted spend more. Among other results, household size positively and significantly impacts medical expenditures, but not total expenditure.

The main empirical question is whether discrimination drives the differences in expenditure between males and females. Results show that if a patient is female, the mean cumulative expenditure is less by Rs. 23,698 (PPP $9479). Therefore, 73 percent of the overall difference in cumulative expenditures (Rs. 32,446 (PPP $12978)) is explained by gender difference in expenditures among patients suffering from *common cancers*. Moreover, the results indicate that expenditures on cancers that afflict only females are not significantly different from expenditures on *common cancers*. In a similar vein, the gender difference in cumulative medical expenditure is Rs.14,578 (PPP $ 5831), which is around 64 percent of the total difference in cumulative medical expenditure. This reflects

[6] It is also possible that health care is cheaper in remote places. We do not take into account the price of health care.

that the cumulative medical expenditure on females, taking into account other covariates, is 20 percent lower than males.

This gender difference can be interpreted as discrimination since we have controlled for all other possible covariates and the comparison is within the reference group: that is similar cancers. Additional evidence of discrimination is discussed in the next section.

Next, Table 4 presents results of a joint estimation of medical expenditures and the probability of treatment outside the center, with the square root of medical expenditures as the dependent variable. Controlling for other covariates, the expenditure on female patients is significantly less than that for males. Moreover, the expenditures on female cancers are lesser than that spent on cancers that can also affect men. As pointed out above, the actual cost of treating cancer can vary depending on types of cancer. However, as the column (2) shows, the probability of being treated for cancer, before coming to the tertiary center, is lesser for females by 0.2 as compared to males, even for similar cancers. This evidence with respect to common cancers before coming to the tertiary center, suggests that there is gender discrimination in cancer treatment and expenditures, and that this takes place largely before coming to the public tertiary center. It is pertinent to point out here that this analysis provides a lower bound on the discrimination since we study patients at a public hospital. In the case of private tertiary centers, which are more expensive, the discrimination might be even larger.

One may still be concerned that the health status of men relative to women drives our results. In particular, if women in our sample were healthier than men, then it is likely that less money would be spent on them. Objective information on the severity of the disease, at the time of first symptom, is not possible to get using retrospective questioning. The first credible staging information is available at the tertiary center. These additional results are presented in Table 5. In column (1), we investigate if women are more likely to be at less advanced stages of cancer than men. Due to imperfect record keeping at the tertiary center, staging information is available for only 158 patients in the sample. Controlling for all other covariates (same as above), results show that, among common cancers, there is no significant gender difference in the probability of being an advanced cancer patient. Hence, for common cancers, this implies that it is not the better health of women, relative to men, that drives the gender differences. Alternatively column (2) reports ordered probit results with KPS (Karnofsky Performance Status), which is an index from 0 to 100, with higher values indicating better health and is an indicator of functional health recorded by doctors at the time of first registration. The results show no difference in KPS between males and females for common cancers*;* in fact, the results seem to indicate that the females are unhealthier. It may be argued that if women were in a more advanced stage at the time of first detection, then households may find it optimal not to invest in them. However, if women were in a more advanced stage at the time of first detection, it is likely that they are much worse off than men when they arrive at the tertiary center. However, as we show, the proportion of advanced cancer patients, among common cancers, does not differ across gender. Moreover, as a robustness check, we carry out regressions controlling for the KPS score and a dummy reflecting that a patient is in an Advanced Stage and find the coefficient on *female* is still significant. Hence, even comparing between males and females, who seem equally unhealthy, more money was spent on males than females.

Do the gender differences among common cancers vary by different demographic and economic characteristics? An interaction terms of the form: *female * characteristic*, is introduced in the empirical model for total cumulative expenditures to explore this issue. As before, this is estimated by GLM and marginal effects are reported.

The results indicate that gender differences in expenditure increases with age (Figure 1). While the difference between males and females is around Rs .16,185 (PPP $6474) at the age of 40, the difference, at the median age (almost 50), is Rs. 20,232 (PPP $8092). This seems to indicate that discrimination worsens with age. Households are more likely to invest in woman's health if she is in the reproductive age group, when she also takes care of other young children. While the results indicate that households discriminate less when a woman is younger, it is important to recall that cancer is a disease that affects people at older ages. Hence, while consistent with the idea that discrimination is less for the reproductive age group, it is also plausible that older men have control over their lifetime savings while older women do not. Further, results in a regression where the female dummy is interacted with the variable joint family, indicate that cumulative total expenditure on females is Rs 19,634 (PPP $ 7842) lesser than males when they are from joint families (statistically significant at 10%). The difference is insignificant for nuclear families. Recall that this is over and above the effect of household size. The impact of joint structure of a family has been found to play a significant role in explaining sex differences in survival and health outcomes in rural India, among girls and boys (Jain, 2014) and is consistent with the fact that joint families are largely patriarchal with women having limited bargaining power.

The results also indicate that more education can offset gender disparities to a significant extent as the magnitude of the coefficient on education is almost as large as than on gender. Further, the results (available on request) indicate that gender difference is relatively more in credit-constrained poorer households. This could be borne out of favoring income-generating male members compared to females.

5. Results from a Nationally Representative Survey

To validate these small-sample results, data from the 60th round (on utilization of medical facilities) of the nationally representative National Sample Survey (NSS) for 2004 are used. The analysis uses data for rural India: in particular, the individual level information on ailments and health expenditures pertaining to hospitalizations. It is important to emphasize that the two exercises are slightly different. While the analysis of cancer considers the stream of expenditures for the disease from first symptom till one year after registering at the tertiary center, the NSS survey covers the hospital expenses spent on particular spells of ailment for which the patient was hospitalized in the last one year. Thus the expenditure on the same ailment before arriving at the hospital is not registered, if the spell is longer than one year. Also, this analysis is now not just restricted to public hospital but also includes those who go to private hospitals.

As before, expenditures are modeled as a function of individual characteristics (age, gender, education, occupational status and marital status), household characteristics (household size, religion, caste and land ownership) as well as types of diseases (those that affect only females, those that affect only males as well as those that affect both sexes). We consider more variables here since there is greater heterogeneity in the all India data. On the other hand, we do not have an index for assets in the survey and thus use land ownership as a proxy for wealth. Geographic heterogeneity is controlled for by including district fixed effects. The models are estimated using GLM and standard errors and are clustered by village identifiers.

Results in Table 6, show that controlling for other covariates, the expenditure on medical treatment on female patients, for common diseases is Rs.1074 (PPP $429) lesser as compared to men. Hence, gender differences in expenditure exist even at the all India level and for other disease groups. This is explored further by interacting the female dummy with communicable and non-communicable disease groups. Results indicate that the gender differences in expenditure on NCDs is larger (at Rs.1395; PPP $558) than the gender differences among CDs (Rs 928; PPP $371). These may be partly driven by the average expenditure on NCDs which is Rs.9333 (PPP $3733) as compared to Rs. 4605 (PPP $1842) for CDS. Thus expenditures for female patients are around 13 to 20 percent lower than for male patients.

6. Limitations

The paper is based on sample drawn from a tertiary care hospital; to that extent, there would be some concerns about selection of patients who visit such facilities. While we have attempted to minimize such biases by sampling at a public sector hospital, which provides inexpensive care to mostly poor households, some concerns may still remain as they do in any study based on facility level data.

Since the results are based on a small sample from one hospital in one state of India, external validity would also remain a natural concern. While results using the NSS point to similar gender differences, the specific magnitudes should be interpreted with caution.

Also, while the results are consistent with gender discrimination, it does not analyze the source of discrimination. This is outside the scope of this study, given the nature of our sample. For example, almost 85 percent of female patients report that they only did domestic work before they had their first symptom of cancer. Hence it is not possible to estimate if occupation and income earned before cancer set in matters for discrimination.

7. Conclusion

NCDs are increasingly becoming a major part of the total disease burden in India. While Cardiovascular Diseases (CVDs) and diabetes have received considerable focus in the recent past, relatively less is known and researched on the impact of cancer in households, especially from a gender perspective.

This paper fills this gap and attempts to test the hypothesis that women are at a disadvantage in the treatment of cancer, emanating from social – rather than – biological factors. The analysis indicates that gender discrimination accounts for 73 percent of the gender difference in cumulative total expenditure and 64 percent of the difference is on account of gender discrimination in cumulative medical expenditure. Most of the differences come from expenditures before coming to the tertiary center. Women are also 20 percentage points less likely to get treatment for cancer before coming to the tertiary center. The analysis also finds that gender discrimination is higher among the elderly, among the poor and among those who live in joint families.

The Odisha sample-based results are backed up by results from the NSS which indicates gender difference for communicable as well as non communicable diseases.

While the gender difference is cumulative expenditures on cancer is found to be around 20 percent, the gender difference in expenditure, using the NSS is between 13 to 20 percent. To compare this to other countries, in urban China, using a survey on health utilization of 69,993 patients, Song and Bian (2014) find that the total medical expenses for men were nearly 40% more than that for women.

What are the policy implications of this? To begin with, all kinds of discrimination should concern us, irrespective of the disease. The fact that in a rapidly spreading disease, there is discrimination in treatment is worrying because it is likely to increase inequalities in health outcomes between the genders, and also impose a higher economic impact from untreated or less-treated cancers by way of healthy life years lost. The repercussion of not treating or not optimally treating any cancer is serious as it is a fatal disease. Besides imposing economic burden of lives lost in the economy and deepening inequities, it is also likely to have serious implications for households with children, with many cancer-struck households facing the loss of female members, many of whom would be married with children. The loss of a primary caregiver for small or growing children would have inter-generational implications for the welfare of such individuals.

Intra-household discrimination is hard to tackle from outside. Values and norms are difficult to change with policies. Nevertheless, increasing awareness about cancers and making information available on early diagnosis as well as treatment may help in reducing this somewhat. Messages need to be women-centric and services women-friendly. Also, education of women could potentially reduce gender disparity to a significant extent. Finally, making cancer treatment available and accessible at public hospitals where the costs are relatively much lower might bring down the incidence of discrimination considerably.

References

Anderson, S., and Ray, D. (2009). Missing Women: Age and Disease. *Review of Economic Studies* , 77(4), 1262-1300.

Anderson, S., and Ray, D. (2012). The age distribution of missing women in India. *Economic and Political Weekly*, 47 (47-48), 87-94.

Asfaw, A., Klasen, S., and Francesca, L. (2007). Intra-household Gender Disparities in Children's Medical care before death in India. *IZA Discussion paper* 2586. Retrieved from http://ftp.iza.org/dp2586.pdf

Asfaw, A., Klasen, S., and Lammana, F. (2008). Intra-household health care financing strategy and gender gap: empirical evidence from India. *America Institute for Econ. Research (IAI) Discussion Paper No. 177, Ibero-America Institute for Economic Research.*

Baeten, S., Ourti T.V., andDoorslaer E. (2013). Rising inequalities in Income and Health in China: Who is left Behind? *Journal of Health Economics*, 32(6), 1214-1229.

Behrman, J. R. (1988). Intra-household allocation of nutrients in rural India: Are boys favored more? Do parents exhibit inequality aversion? *Oxford Economic Papers*, 40(1), 32-54.

Borooah, V. (2004). Gender Bias among children in India in their diet and immunisation against disease. *Social Science and Medicine*, 58(9), 1719-1731.

Denton, M., Prus, S., and Walters, V. (2004). Gender differences in Health: a Canadian study of the psychosocial, structural and behavioural determinants of health. *Social Science and Medicine*, 58(12), 2585-2600.

Dikshit, R., Gupta, P. C., Ramasundarahettige, C., Gajalakshmi, V., Aleksandrowicz, L., Badwe, R., Kumar, R., Roy, S., Suraweera, W., Bray, F., Mallath, M., Singh, P.K., Sinha , D.N., Shet, A.S., Gelband, S., Jha, P.,(2012). Cancer mortality in India: a nationally representative survey. *Lancet*, 379(9828), 1807-1816.

Gantara, B., and Hirve, S. (1994). Male Bias in health care utilization for under-fives in a rural community in western India. *Bulltein of the World Health Organisation*, 72(1), 101-104.

Gosoniu, G. D., Ganapathy, S., Kemp, J., Auer, C., Somma, D., Karim, F., Weiss, M.G. (2008). Gender and socio-cultural determinants of delay to diagnosis of TB in Bangladesh, India and Malawi. *International Journal of Tuberculosis and Lung Disease*, 12(7), 848-855.

Jain, T. (2014). Where there is a will: Fertility behavior and sex bias in large families. *Journal of Human Resources* 49(2), 393-423.

Jayachandran, S., and Pande, R. (2012).Why Do Mothers Breastfeed Girls Less than Boys? Evidence and Implicationsfor Child Health in India.*The Quarterly Journal of Economics*, 126(3), 1485-1538.

Joe, W., Mishra, U.S., and Navaneetham, K.(2008). Health Inequality in India: Evidence from NFHS 3.*Economic and Political Weekly*, 43(31), 41-47.

Manning, W. G., and Mullahy, J. (2001). Estimating log models: to transform or not to transform? *Journal of Health Economics*, 20(4), 461-494.

Mayer, P. (1999). India's falling sex ratios. *Population and Development Review* ,25(2), 323-343.

Mishra, V., Roy, T., and Retherford, R. (2004). Sex Differentials in childhood feeding, healthcare and nutritional status in India. *Population and Development Review*, 30(2),269-295.

Mohanti, B., Mukhopadhyay, A., Das, S., Sharma, K., and Dash, S. (2011). The Economic Burden of Cancer. *Economicand Political Weekly*,46(43),112-117.

Nikiema, B., Haddad, S.,and Potvin, L. (2008). Women Bargaining to Seek Healthcare: Norms, Domestic Practices, and Implications in Rural Burkina Faso. *World Development*, 36(4), 608-624.

Pande, R. (2003). Selective gender differences in childhood nutrition and immunization in rural India: the role of siblings. *Demography*, 40(3), 395-418.

Pandey, A., Sengupta, P.G., Mondal, S. K., Gupta, D. N., Manna, B., Ghosh, S., Sur, D., Bhattacharya, S.K. (2002). Gender differences in health care seeking during common illnesses in a rural community of West Bengal, India. *Journal of Health, Population and Nutrition*, 20(4), 306-311.

Purohit, B.C., and Siddiqui, T.A. (1994). Utilisation of Health Services in India. *Economic and Political Weekly*, 29(18), 1071-1080.

Rajeshwari. (1996). Gender Bias in utilization of health care facilities in rural Haryana. *Economic and Political Weekly*, 31(8),489-494.

Rose, E. (1999). Consumption smoothing and excess female mortality in rural India. *Review of Economics and Statistics* ,81(1), 41-49.

Sen, G., Iyer, A., and George, A. (2007). Systematic Hierarchies and Systematic failure: Gender and Health Iniquities in Koppal District. *Economic and Political Weekly*,42(8), 682-690.

Sekher, T.V., and Hatti, N. (2004). Lives at Risk: Declining Child Sex Ratios in India. *Lund Papers in Economic History*, 93.

Song, Y., and Bian, Y. (2014). Gender differences in the use of health care in China: cross-sectional analysis, *International Journal for Equity in Health* 13 (8)

Wilkinson , R.G., and Marmot, M. (2003). Social determinants of health: the solid facts. Geneva: *World Health Organisation*.

Table1: Summary Statistics

Summary statistics		*Male*	*Female*	*Total*
Gender		29%	71%	
Cancer sites:				
Female cancers	Breast		17%	13%
	Cervix		50%	35%
Male Cancers	Penile	7%		2%
Common Cancers	Head neck	53%	23%	31%
	Others	40%	10%	19%
Age		50.7	48.9	49.5
Education greater than secondary education		44%	18%	25%
Duration (days)		182	167	171
Joint family		73%	68%	69%
Education of head (years)		7	8	7
Household size		7	6	7
Loan before diagnosis		27%	28%	28%
Richest quartile		26%	21%	23%
Family member in govt.		34%	27%	29%
Distance from patient's district railway station to the tertiary centre		52Kms	60Kms	58Kms

Table 2: Health care expenditures differences by gender

Expenses (Rupees)	*Male*	*Female*	*Total*	*Difference*
Cumulative total expenses	116073	83626	93010	32447**
Cumulative medical expenses	75243	52530	59099	22713**
Total expenses outside centre	49976	22514	30456	27462**
Medical expenses outside centre	33388	16322	21258	17066**
Total expenses post survey	66097	61112	62553	4985
Medical expenses post survey	41855	36208	37841	5647

Authors Calculations (** $p < 0.05$)

Table 3: Marginal effects from expenditure models (GLM): Cumulative Expenses

VARIABLES	(1) Total	(2) Medical
Female	-23,698***	-14,578***
	(8,056.29)	(5,386.88)
Female cancers	8,299	6,752
	(10,268.93)	(7,230.87)
Male cancers	3,092	11,134
	(20,809.11)	(17,458.78)
Age	-20.73	-146.2
	(275.60)	(155.51)
Education Greater than secondary education	26,048	20,142*
	(16,026.71)	(10,626.11)
Duration	40.59***	34.84***
	(11.62)	(10.70)
Joint family	-5,420	-7,653
	(8,721.53)	(5,885.03)
Education of Head	1,073*	547.5
	(616.12)	(427.16)
Household Size	2,374	2,011
	(2,079.82)	(1,227.81)
Loan	-19,836***	-10,726*
	(7,660.45)	(6,088.93)
Rich	31,129***	23,259***
	(10,837.95)	(6,531.05)
Family member in the Govt.	5,252	-4,353
	(9,432.28)	(6,089.08)
Distance	35.44	-140.7*
	(107.90)	(80.09)
Link	Log	Log
Family	Gamma	Gamma
Observations	204	204

Note: Standard errors in parentheses clustered at the district level
**** p<0.01, ** p<0.05, * p<0.1*

Table 4: Marginal effects from expenditure models (SUR): Outside the Centre medical expenses

VARIABLES	(1) Square root of medical expenses	(2) Treatment
Female	-26.91*	-0.196**
	(14.77)	(0.09)
Female_cancers	-13.80	0.007
	(12.99)	(0.08)
Male_cancers	-78.31**	-0.128
	(38.70)	(0.24)
Age	-0.713*	-0.009***
	(0.41)	(0.00)
Education Greater than secondary education	36.82**	0.151
	(15.57)	(0.10)
Duration	0.072***	8.49e-05
	(0.02)	(0.00)
Joint family	-4.784	-0.023
	(13.15)	(0.08)
Education of Head	0.489	0.0014
	(1.26)	(0.01)
Household Size	1.722	0.018
	(2.12)	(0.01)
Loan	-7.362	0.046
	(11.54)	(0.07)
Rich	36.10***	0.216**
	(13.73)	(0.09)
Family member in Govt.	-8.312	-0.040
	(13.51)	(0.09)
Distance	-0.0641	0.0007
	(0.11)	(0.00)
Constant	149.7***	0.845***
	(25.06)	(0.16)
Observations	204	204
R-squared	0.215	0.174

Note: Standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Table 5: Estimates from Probit models of Advanced stage and KPS

VARIABLES	(1) Advanced Stage	(2) KPS
Female	0.091	-0.451
	(0.116)	(0.274)
Female cancers	0.158*	0.509**
	(0.0915)	(0.241)
Observations	158	195

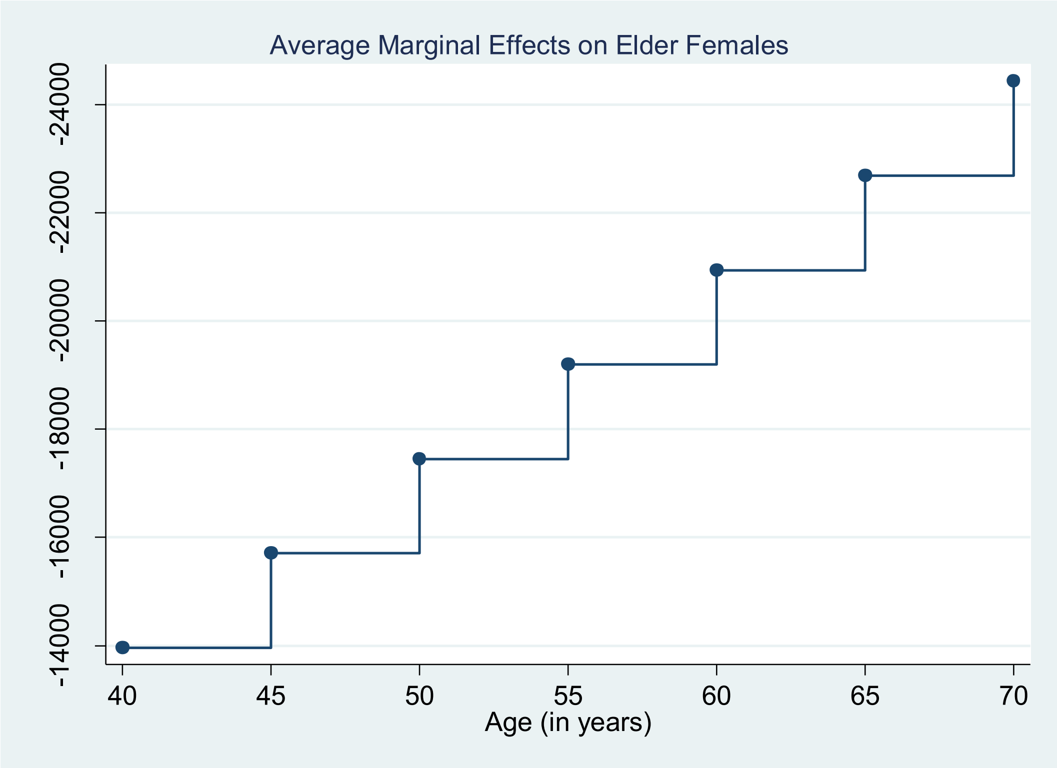
Note: Robust Standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*
Controls included.

Table 6: Marginal effects on Inpatient Medical Expenses (GLM) (National Sample Survey Data)

VARIABLES	(1) Marginal Effects
Female	-1,074***
	(224.0)
Female diseases	5,399***
	(333.8)
Male diseases	4,477***
	(990.0)
Age	23.13**
	(9.873)
Currently Married	1,106***
	(385.6)
Separated	-1,406**
	(618.7)
Education Greater than secondary education	4,600***
	(603.5)
Not working	906.4***
	(191.6)
Household size	174.4***
	(37.28)
Land hectare >=1	1,752***
	(245.0)
Islam	-1,424***
	(393.1)
Others	-333.2
	(377.7)
OBC	1,665***
	(225.2)
General	2,358***
	(229.6)
Observations	18,471

Note: Standard errors in parentheses clustered at the district level
*** *p<0.01,* ** *p<0.05,* * *p<0.1*

Figure1: Age-wise marginal effects of females on cumulative expenditures



Appendix:

Table 1A: Staging of cancer patients

Cancer stage	*Male*	*Female*	*Total*
Stage 0	50%	24%	31%
Stage I	9%	11%	11%
Stage II	16%	28%	25%
Stage III	5%	29%	23%
Stage IV	9%	4%	5%
Post operative	11%	4%	5%