

Discussion Papers

in

Development Economics and Innovation Studies

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Patient's Family Perspective: A Case Study of Punjab**

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Discussion Paper No. 5

October 2013

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and Innovation Studies (CDEIS)
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Abstract

International evidence is indicative of the fact that agriculture revolution has generated the much needed food security and at the same time it has raised alarming signs for the ecology also. Punjab, being the granary state of India, has been the leader of the Green Revolution. Punjab is the leading state in terms consumption of chemical fertilizers and pesticides per hectare. The health ailments, alarmingly on the rise, are being getting closely identified with indiscriminate chemical use in agriculture. The emergence of cancer cases evenly across the cotton cultivation areas of Malwa region of Punjab have been well documented, in the past, by news reports and research studies. *This study examines the economic and financial consequences for the households suffering from the deadly disease called cancer. Study is based on census survey of four villages conducted during the period of December 2012 to February 2013 in Muktsar district of Malwa region. Findings of the study help us to quantify the amount of insurance support that can bring the family out of perpetual distress.*

Keywords: Health ailments, cancer, consumption of chemicals, financial and economic consequences, green revolution, Punjab.

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Introduction

International evidence is indicative of the fact that agriculture revolution has generated the much needed food security to the nation(s), and at the same time, it has raised alarming signs for the ecology also. Worldwide, the ground water quantity and quality has been the first victim of this agricultural revolution; the next are the human health and the existence of species (Singh, 2011). The indiscriminate use of agro-chemicals (fertilizers, insecticides/pesticides, etc.) in the agriculture has created serious health and environmental problems in so many developing countries. From the ecological perspective, heavy and indiscriminate use of agro-chemicals has contaminated the surface and ground water, damaged fisheries, destroyed freshwater eco-systems, and entered our food chain in a subtle way that the very existence of mankind is facing an extreme danger. Punjab, being the granary of India, has been the leader of the Green Revolution in India. High growth of agricultural output in Punjab has led to falling water table and groundwater overdraft has become a serious problem in the state. Punjab is the leading state in terms of consumption of chemical fertilizers and insecticides/pesticides per hectare. The health ailments, alarmingly on the rise, are being getting closely identified with indiscriminate use of agro-chemicals in agriculture.

Further, emerging cancer cases evenly across the cotton belt of Malwa region of Punjab have been well-documented by the newspaper reports and research studies. Heavy presence of Persistent Organic Pollutant (POP), Nitrate, Phosphate and Uranium in the region has been debated to be the cause of it. Indeed, it is true that a single cancer case in the family derails the economy for several generations in that family. It leads to sharp cut in the essential expenditures, distress sale of assets, and indebtedness. In addition to economic consequences, it has many social consequences for the family too. In this context, the main objective of present study is to analyze the economic and financial consequences of cancer from patient's family perspective. Findings of study will also help to quantify the state support or insurance coverage that can bring the cancer victim's family out of perpetual distress. Further, the outcomes of study will be used to formulate bigger policy support to cover the entire Malwa cotton belt.

Review of Theory and Empirics

Most of the existing studies on cancer have been conducted by the medical professionals; a very few social scientists especially the economists have been involved in this field of research. Most of the international research in developed countries is related to incidence of cancer, morbidity and mortality, prevalence rates and cost comparisons (Parkin,

2001; Shibuya, et al., 2002; Polsky, et al., 2003; Chang et al., 2004; Brown et al., 2006; Ferlay et al., 2010).

Cancer is not a single disease; it is a generic term that refers to more than one hundred distinct type of cancers, and each one is defined by its anatomic site and microscopic features (Barnum and Greenberg, 1993). It is defined as an uncontrollable growth of abnormal cells within the human body. A spate of environmental factors contributes towards the development of cancer, apart from the genetics and dietary factors (Singh, 2008). Many studies have examined the relationship between cancer and environmental factors, particularly in the local context. Carcinogens vary between geographical locations, since their prevalence often depends on local practices. Still this understanding, the interplay of local environmental factors and fatal diseases like the cancer is far from any consensus. The countries like India are expected to see an increase in deaths due to the cancer. World Health Organization (WHO) estimates that the proportion of deaths from the cancers in India will rise from 8 percent in 2005 to 11.9 percent in 2030.

In India, a few studies have been conducted on the economic aspects of cancer from the patients' perspective. Our country lacks nation-wide cancer registry of such a high incidence disease. Study by Dikshit et al. (2012) added that tobacco and cervix related cancers are on the rise and such cancers need early detection to reduce the treatment burden, particularly in the rural areas. Thakur et al. (2008) estimated higher incidence of cancer cases in cotton belt of Punjab - a Green Revolution state. This study also identifies multiple factors like indiscriminate use of pesticides, tobacco and alcohol that caused cancer. Even, rising urbanization, industrial pollution, undesirable life-styles, poverty abundance syndrome, social stress and strains; which in turn has contributed to rising incidence of non-communicable diseases (NCDs) like the cancer, heart diseases, diabetes, hypertension, arthritis, mental disorders, respiratory disease and accidents (Reddy, et al., 2011). As per one estimate, cancer accounts for one out of eight deaths annually in the world (Mathers and Loncar, 2006). Among all these, cancer is not a consequence of affluent lifestyle; it occurs most often in the poorer countries (Boyle and Levin, 2008; Parkin et al., 2001). Further, the rising cancer incidence has been due to the aging population also (Bumgarner, 1992). Some studies show that it is also associated with substance abuse.

A study done by Dikshit et al. (2012) revealed that, in India, the most common cancer among the men are of oral cavity, stomach, esophagus, and lungs compared to the most common cancers of cervix, breast and ovaries across women. Cancer causes premature loss of life and thereby the national economic loss. In India, next to cardio-vascular diseases, that

count 52 percent of NCDs associated mortality and 29 percent of mortality statistics, the cancer comes next; as 25 lakh people are suffering from it. About 8 lakh cases are added every year in India and the cancer deaths are likely to rise from 7.30 lakh currently to 15 lakh by year 2030 (Mohan et al., 2011). It means the incidence of cancer is on the rise in India.

An ideal health care system of a region should have three characteristics: easy access; low cost treatment; and quality aspect of service. Under the new policy regime, Indian health system, where out-of-pocket expenses dominate, is highly regressive in nature and iniquitous in practice (Duggal, 2007). It is characterised by 'imperfect information' and 'imperfect competition'. Incorrect information with the patient about this disease, treatment cost and outcomes become a major cause of drain on financial resources of patient and their families (Lanky, 1983). Cancer patient's families have to do a costly borrowing or sell off their capital assets and cut down their important family or social expenses. Due to the unmanageable treatment cost, the patients are forced to postpone treatment, or do get sub-standard treatment or leave the treatment in between.

There is also a dearth of studies relating to public/private cost and financing of cancer treatment. This set of problems are further compounded by the low penetration of health insurance in India. In rural areas, cancer is taken as a stigma. Therefore, socio-economic analysis of the cancer affected individuals and their families are the need of time. Present study is targeted to analyze the economic and financial consequences of cancer from patient's family perspective in Punjab, a province of northern India.

Methodology and Coverage

The reference period of the study is 2012. Keeping in view the main objectives of the study, Muktsar district of Punjab state has been selected for primary survey. Against World Health Organization's point of reference, 80 cancer affected persons amongst one lakh population, the incidence of cancer is the highest in Muktsar district (136.3 per lakh). Further, four villages, namely, Kotbhai, Bhalaina, Doda and Channu have been selected. These villages are well spread across the length and breadth of Muktsar district (see map). Kotbhai has been reported to be high cancer deaths village (Singh, 2008). Bhaliana and Doda have very high nitrate content in water (Green Peace, India). Channu has a poor water quality with presence of chemical constituents (like EC, F, As, Fe) more than the permissible limit. The sample of the study fairly represents all types of ecologically affected villages. Since, we have been interested in identifying the cost and financial aspect of cancer from patient's perspective, the starting point has been the identification of cancer afflicted families for collection of the data. Our fieldwork covers the living cancer patients and those cancer

victims who died in the last eleven years. First house listing of each village and interaction with chemists, political and social activists helped us in identifying the cancer patients' families. A structured interview-cum-schedule has been used for data collection that covers demographic, social and economic aspects relating to the disease. Descriptive statistics and Likart scaling technique for analysis of data has been used. Secondary sources of data are also used to supplement and strengthen the present analysis.

Intensive Agriculture and Earlier Empirical Evidence on Cancer

While the success of Green Revolution in Punjab has been well documented and accepted; but its consequences have recently been come under a considerable global scrutiny. Issues like the environmental degradation (Conway et al., 1991), separatist violence in Punjab (Corsi, 2006), increasing class disparities, agrarian tensions arising out of wealthier farmers being favoured by the markets, rural-urban migration, loss of biodiversity (Shiva 1991), petering out of productivity (Byerlee, 2006), water issues like water logging, water overuse, and changes in soil salinity (Gupta and Abrol, 2000) have been raised. The Punjab state is now suffering from the adverse consequences of Green Revolution as well. Fears are being expressed that 'what happens in Punjab today could happen to the rest of the country tomorrow (Philipose, 1998).

In Punjab, wheat-paddy crop rotation has become a dominant cropping pattern along with wheat-cotton cycle in the South-Western Punjab. The rising crop intensity from 140 percent in 1970-71 to 190 percent in 2010-11 indicates the adoption of intensive agricultural practices that led to rising trend of consuming chemical fertilizers, pesticides/weedicides and other chemicals. In fact, the state has been a chemical centered agriculture system. Further, Punjab's agriculture sector has undergone significant structural changes since the advent of Green Revolution in the mid-1960s. The traditional agriculture has progressively given way to the modern and commercial agriculture. The production of wheat and rice has increased many-fold since the mid-1960s. Apart from high yielding varieties of wheat and rice, many other factors like consolidations of land holdings, expansion of irrigation facilities, higher use of agro-chemicals (fertilizers, insecticides/pesticides, etc.), farm mechanization, power and road infrastructure, easy access to inputs and market support mechanism for output have facilitated this process (Chadha, 1986). To meet the ever-growing demand for food of other Indian states, food grains production has been increased by intensive use of farm inputs like water, fertilizer, insecticides/pesticides, etc. *However, adoption of this strategy has raised many development related problems on economic, social and environmental fronts.* The effects of intensive chemical based agriculture are visible on human health. The adverse

effects of intensive chemical based agriculture on human health are now clearly visible like the emergence of many fatal diseases like cancer and other NCDs has been found in the specific clusters.

In Punjab, the news about cancer deaths first emerged in late 1990s when the media had reported high cancer mortality in a few select villages. Village Gyana and Jajjal in Bathinda district hogged the limelight for being “cancer stricken” villages (Pandherc, 1999). The state government was initially in a denial mode and even stated that ‘there have been no cancer deaths in Punjab’ in response to a parliamentary question (Punjab, 2003). The denial mode did not last long, and a spate of reports and publications increased the focus on cancer mortality in Punjab. The state’s own agency, the Punjab Pollution Control Board commissioned the Post Graduate Institute of Medical Education and Research (PGI), Chandigarh to study the cancer issue. The study report (PPCB, 2005) revealed that the prevalence of confirmed cancer cases was 103 per lakh people in Talwandi Sabo block and 71 per lakh at Chamkaur Sahib block of Punjab. An epidemiological study (Thakur et al., 2008) on cancer cases reported that cancer deaths in Talwandi Sabo block were greater than those in Chamkaur Sahib ‘probably due to more use of pesticides, tobacco and alcohol’. A few other studies showed that in the drinking water, presence of heavy metals such as As, Cd, Cr, Se, and Hg was generally higher, and residue of pesticides such as heptachlor, ethion and chloropyrifos were also higher in the samples of drinking water, vegetables and human blood in the villages of Talwandi Sabo as compared to villages of Chamkaur Sahib.

Another report by Centre for Science and Environment (CSE, 2005) entitled, “Analysis of Pesticide Residues in Blood Samples from Villages in Punjab”, concluded that out of 28 pesticides analyzed, 15 were detected in blood samples as well. The Atlas of Cancer in India (ICMR, 2006) has also reported a spurt in cancer deaths in Punjab, with incidence in the Muktsar district growing from 30 cases in 2001 to 191 in 2002, while it rose from 19 cases to 144 in the Faridkot district during the same time period. These reports, coupled with media scrutiny and increasing public awareness have now forced the state government to announce a series of steps to augment health facilities to tackle the scourge of cancer. Punjab Government had also estimated 7738 cancer cases in 2009 in the whole Punjab; of which 32.29 percent cancer cases were in five districts: Muktsar, Bhatinda, Barnala, Mansa and Faridkot (GOP, 2010).

Present Status of Cancer in Punjab

The government survey report (released by Health Minister Madan Mohan Mittal on 28.1.2013) of a statewide cancer awareness and symptom-based early detection campaign

showed that 33,318 cancer deaths have occurred during the last five years, out of which 14,682 were in the Malwa region alone. The survey data reveal that there are 84,453 persons who have cancer-like symptoms in the state. The survey covered almost 98 per cent of the state's population and it has found that the incidence of cancer is higher than national and international average. When compared to WHO's point of reference — 80 affected persons among a population of one lakh — Punjab's survey discovered that 90 persons in a population of one lakh were suffering from the cancer. While 215 people per lakh have died of cancer, another 318 per lakh are suspected of suffering from the disease. Region-wise, Malwa tops the list (107.1 per lakh), followed by Doaba (88.1 per lakh) and Majha (64.7 per lakh). In Malwa, district-wise incidence of cancer was the highest in Muktsar (136.3 per lakh). Among Doaba districts, the incidence of cancer was highest in Kapurthala (99.1 per lakh) (*The Indian Express*, 2013).

Description of the Study Area

Our primary survey covered four villages of district Muktsar. Muktsar district lies in the South-Western part of Punjab and lies between North Latitude $29^{\circ} 54' 20''$ & $30^{\circ} 40' 20''$ and East Longitude $74^{\circ} 15'$, $74^{\circ} 19'$ and falls in Survey of India Toposheet No.44J & 44K and covers an area of 2630 km² which constitutes 5.19 percent area of Punjab (Central Ground Water Board, 2007). The district is divided into three Tehsil sub-divisions, two sub-Tehsils and four development blocks, namely Kotbhai, Lambi, Malout and Muktsar for the purpose of administrative control. The district shares its boundary with Faridkot district in the North and North-East, in North-West and Eastern side with Ferozpur district. On the East, it is bounded by Bathinda district of Punjab, on the South by Hanumangarh district of Rajasthan and Sirsa district of Haryana state. Physiographically, the area has no river and is covered extensively by the canal network of Sirhind feeder canal to meet the irrigation and drinking water needs of the people. The area is flat and plain and slopes from NE to SW. The climate of district is dry with sub-humid having grass land type of vegetation. The district receives an annual rainfall of 380 mm in 22 rainy days. About 79 percent of the annual rainfall occurs during the monsoon period and 21 percent occurs during non-monsoon period. The district forms part of Satlej sub-basin and main Indus basin. The district has mostly sierozem type of soil and partly desert soil in its South-Western parts. The synoptic view of the district is presented in Box 1. Box highlights that district is cotton belt characterized by deteriorating water quality.

Box 1: District Muktsar (Fact Sheet)

Geographical Area	2630 Sq. Km.
No. of Panchayats/Villages	235
Population (as per 2011 Census)	7, 77,493
Land Use (Sq. Km.)	
a) Forest Area	20
b) Net Area Sown	2260
c) Cultivable Area	2210
Area under Principal Crops (Sq. Km.)	Cotton (1170); Rice (770); and Wheat (2000)
Irrigation by different sources (Area)	
a) Tube Wells	160
b) Canals	2080
c) Other Sources	-
Net Irrigated Area	2240
Gross Irrigated Area	4416
Ground Water Quality	
a) Presence of chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	Lambi (3510 us/cm); Giddarbaha (3149 us/cm); and Kabarwala (5.36)
b) Type of Water: Ca-Mg-HCO ₃ & Na mixed anions	
c) Major Ground Water Problem: Salinity and Water Logging	

The broad parameterization of the sampled households is as follows. Out of 136 cancer cases covered by the study, 103 were dead and 33 are live patients. Caste-wise distribution of the cancer affected households is characterized by almost equal percentage of Jat and non-Jat families. Occupation-wise distribution shows that 45.59 percent of the cancer victims have been engaged in agriculture related operations; 39 percent of them in household work and the rest in other occupations. Out of total sampled cancer victims, 55.88 percent had a direct exposure to pesticides during their lifetime. Only 2.21 percent of cancer cases have insurance cover; and that too only life insurance and not the health insurance. Average length of the cancer ailment has been 1.9 years in the study region. Average expenditure per patient has been Rs. 2.75 lakh, of which about 60 percent has been on hospital admission and the rest on day care treatment. To meet this expenditure, 11.76 per cent of the cancer cases depended on their own savings; more than 60 percent of cancer victims were depended on the loans from commission agents or landlords at highly unfavorable terms and conditions.

Out of 136 cancer cases, 65 (47.79 percent) were males and 71 (52.21 percent) are females. In two villages, namely, Bhalliana and Kot Bhai, the proportion of females suffering from cancer was 59.38 percent and 56.67 percent respectively. In villages Doda and Channo, the proportion of males was slightly higher; it was 53.49 percent and 51.61 percent respectively.

Box 2: Broad Parameterization of Sampled Cancer Cases

Number of cases		
a) Dead		103 (75.74 percent)
b) Live		33 (24.26 percent)
c) Total Number		136
Caste-wise Distribution		
a) Jat		66 (48.53 percent)
b) Non-Jat		70 (51.47 percent)
Occupation		
a) Agriculture Related		62 (45.59 percent)
b) Household Work		54 (39.71 percent)
c) Other		20 (14.70 percent)
Exposure to Pesticides		
a) Direct		73 (55.88 percent)
b) Indirect		63 (46.32 percent)
Insurance Cover Status		
a) Insured		3 (2.21 percent)
b) Not Insured		133 (97.79 percent)
Average Ailment Length		1.9 Years
Average per Patient Cost (Rs.)		2.75 Lakh
Source of Finance:		
a) Commission Agent		45 (33.09 percent)
b) Relatives		26 (19.12 percent)
c) Landlord		38 (27.94 percent)
d) Own Savings		16 (11.76 percent)
e) Other		11 (8.09 percent)

Table 1: Sex-wise Distribution of Cancer Cases in Muktsar District

Name of Village	Male		Female		Persons	
	Number	Percent	Number	Percent	Number	Percent
Doda	23	53.49	20	46.51	43	100
Channu	16	51.61	15	48.39	31	100
Bhaliana	13	40.63	19	59.38	32	100
Kot Bhai	13	43.33	17	56.67	30	100
Total	65	47.79	71	52.21	136	100

Source: Primary Survey.

To measure the incidence of cancer at the micro level, number of cases per thousand of population is the best approximation. In the present study area, overall cancer cases per thousand populations come to be 3.88 (Table 2); it is 5.96 per thousand in the case of village Channu and 4.78 per thousand in village Bhaliana. In villages of high cancer incidence, the female cancer incidence is also high; it is 6.02 per thousand in village Channu and 5.93 per thousand in village Bhaliana. Gender-wise distribution of cancer cases per thousand of population is indicative of the fact that it is 4.26 per thousand for female as against 3.53 per thousand in case of male population. This implies, female are more prone to cancer in the region as compared to male population.

Table 2: Number of Cancer Cases per Thousand of Population in the Study Area

Village	Male	Female	Persons
Doda	3.80	3.65	3.73
Channu	5.91	6.02	5.96
Bhaliana	3.72	5.93	4.78
Kot Bhai	2.12	3.10	2.58
Total	3.53	4.26	3.88

Source: Primary Survey.

Cancer, as reported by many studies, has grown very fast in Punjab in the recent years. To assess the time profile of cancer growth in the region, temporal distribution of the cancer cases and cancer deaths is the best way out. Temporal distribution of cancer cases and deaths in the study region is presented in Table 3. Year-wise distribution of cancer detection is not evenly distribution in the last decade. Fifty percent of the cancer cases were detected during 2002-2006 and the rest of fifty percent cancer cases afterwards. For the last few years, the proportion of cancer cases detected has slightly gone down. On the other hand, out of 103 deceased number of cases studied, about fifty percent of the deaths have occurred in the last four years. Rest of the fifty percent is spread over seven years; and in the first three years of study frame, there have been just 10.67 percent of the total deaths. Hence, the temporal analysis of cancer cases is indicative of the fact that more than 50 percent of the cancer ailment cases detected in the first half of last decade have been crucial in taking the death toll of last few years to such an alarming level.

Table 3: Time Profile of Cancer Cases and Deaths in Study Region

Year of Detection/Death	No. of Cancer Cases		No. of Cancer Deaths	
	Number	Percent	Number	Percent
2002	15	11.03	3	2.91
2003	17	12.50	4	3.88
2004	12	8.82	4	3.88
2005	15	11.03	11	10.68
2006	12	8.82	10	9.71
2007	8	5.88	8	7.77
2008	15	11.03	11	10.68
2009	15	11.03	7	6.80
2010	10	7.35	15	14.56
2011	9	6.62	16	15.53
2012	8	5.88	14	13.59
Total	136	100.00	103	100.00

Source: Primary Survey.

It is a commonly held view that exposure to the pesticides has a direct bearing on occurrence of cancer. Quite often, in the pesticide belt, the people can be classified on the basis of exposure into: directly and indirectly exposed. Direct exposure is where an

individual has been actively associated with the handling, storage and use of the pesticides. On the other hand, indirect exposure related victims are passive victims of pesticide use. Out of total cancer cases in the study area (Table 4), 53.68 percent belonged to direct exposure category and the rest (46.32 percent) fell in indirect exposure category. High proportion of brain (100 percent), blood (63.16 percent), liver (60.38), throat (64.71 percent) and other (60.00 percent) types of cancer cases are prevalent in the ‘direct exposure to pesticides’ category. It shows that all brain related cancer cases belonged to the individuals directly exposed to pesticides. On the other hand, most of the female patients with the breast, uterus and food-pipe related cancers belonged to the ‘indirect exposure’ category. This shows that direct exposure to pesticide handling, storage and use leads to a specific type of cancer like that of brain, blood, liver and throat.

Fig 1: Time Graph of Number of Cancer Deaths in Study Region

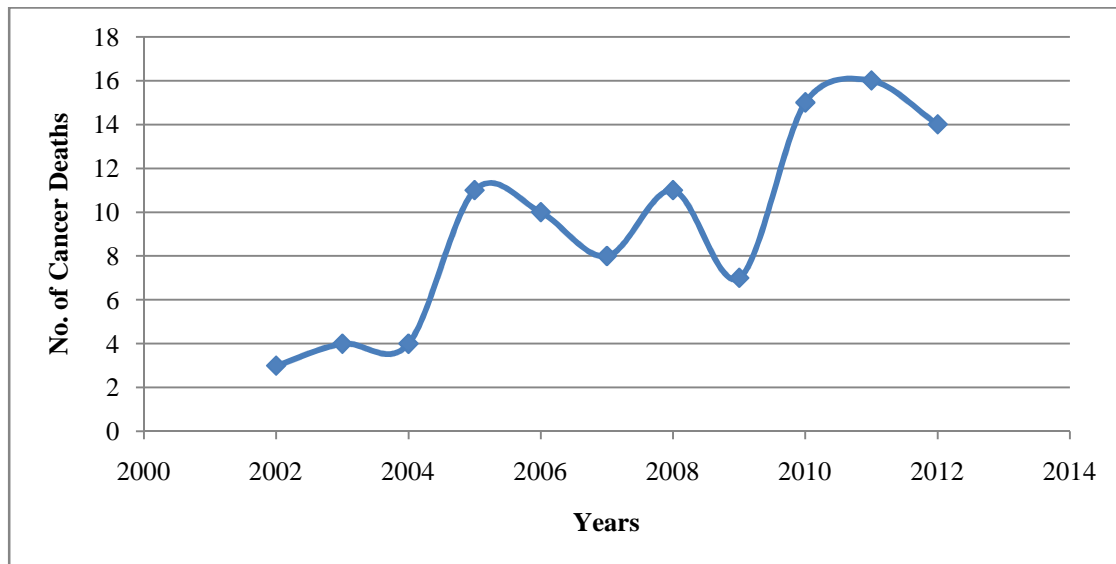


Table 4: Cancer Site-wise and Type of Exposure-wise Analysis of Cancer Cases

Cancer Site	Direct Exposure to Pesticides		Indirect Exposure to Pesticides		Total Number of Cases
	Number	Percent	Number	Percent	
Blood	12	63.16	7	36.84	19
Breast	7	28.00	18	72.00	25
Liver	32	60.38	21	39.62	53
Throat	11	64.71	6	35.29	17
Uterus	2	28.57	5	71.43	7
Food Pipe	2	33.33	4	66.67	6
Brain	4	100.00	0	0.00	4
Other	3	60.00	2	40.00	5
Total	73	53.68	63	46.32	136

Source: Primary Survey.

Village-wise and cancer-site wise distribution of cases in the study region is presented in Table 5 and Figure 2. In the study area, the cancer of liver is the most dominant component; it constitutes 38.97 percent of cases. It is followed by the breast cancer (18.38 percent) and blood cancer (13.97 percent). Spatial distribution of cancer cases at disaggregation of four studied villages shows some glaring results. In village Doda (44.19 percent) and Channu (51.61 percent), liver cancer cases have the larger proportion. Village-wise analysis of cancer cases shows that in villages Doda Bhaliana and Channu, the top most cancer is the liver, followed by breast and blood cancer. In village Kot Bhai, it is liver cancer, followed by breast and throat cancer. In village Channu, the liver cancer alone constitutes 51.61 percent of the total cases. Some of the cancers are region specific, for example, food pipe cancer is prevalent in Bhaliana and Doda; brain cancer is prevalent in village Doda only. Half of the throat cancer cases are in village Kot Bhai only. Different types of cancer occurrence have a spatial specificity.

Table 5: Village-wise and Cancer Site-wise Distribution of Cancer Cases

Cancer Site	Village				Total
	Doda	Bhaliana	Kot Bhai	Channu	
Blood	6 (13.95)	6 (18.75)	2 (6.67)	5 (16.13)	19 (13.97)
Breast	6 (13.95)	6 (18.75)	9 (30.00)	4 (12.90)	25 (18.38)
Liver	19 (44.19)	8 (25.00)	10 (33.33)	16 (51.61)	53 (38.97)
Throat	4 (9.30)	2 (6.25)	8 (26.67)	3 (9.68)	17 (12.50)
Uterus	1 (2.33)	3 (9.38)	0 (0.00)	3 (9.68)	7 (5.15)
Food Pipe	1 (2.33)	5 (15.63)	0 (0.00)	0 (0.00)	6 (4.41)
Brain	4 (9.30)	0 (0.00)	0 (0.00)	0 (0.00)	4 (2.94)
Other	2 (4.65)	2 (6.25)	1 (3.33)	0 (0.00)	5 (3.68)
Total	43 (100.00)	32 (100.00)	30 (100.00)	31 (100.00)	136 (100.00)

Source: Primary Survey.

Besides bearing pain and social costs, financial burden of cancer diseases is measured by the economic costs which include all resources required/used to provide/get a service and the value of foregone opportunities. Theoretically, economic cost of cancer care and control includes wide range of costs: expenditures on seeking cancer care services; costs associated with time and effort spent by the patients and their families; and cost of lost productivity due to cancer related disability or earlier death. Cancer cost is a function of income level, social status, and cultural factors. A typical cancer cost cycle consisting of screening, diagnosis,

staging, therapy and follow up costs approximately Rs. 2.5 lakh to 3.5 lakh in India. In our study area, the average cost per patient (Table 6) on the diagnosis, admission, treatment and follow up comes out to be Rs 2.75 lakh. There are spatial variations in this average cost. It is Rs. 3.33 lakh in village Doda; Rs. 2.42 lakh in Bhaliana; Rs. 2.77 lakh in Kot Bhai and Rs. 2.26 lakh in village Channu.

Fig 2: Cancer Site-wises Distribution of Cancer Cases in Study Villages

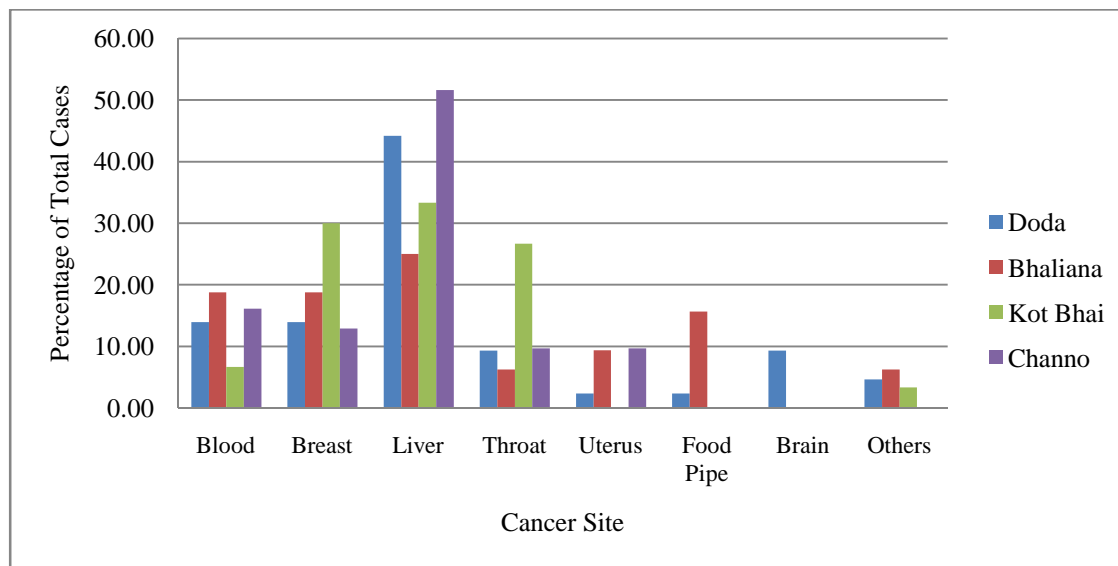


Table 6: Average Cost of Cancer Treatment in Different Study Villages

Village/Area	Doda	Bhaliana	Kot Bhai	Channu	Total Sample
Expenditure per Person (Rs. Lakh)	3.33	2.42	2.77	2.26	2.75

Source: Primary Survey.

These spatial variations in average cost are a function of type of cancer, length of ailment and paying capacity or income status of the patient. Cancer site-wise and average ailment length-wise distribution of average cost is presented in Table 7. For total sample, the average cost of cancer treatment is Rs. 2.75 lakh and average ailment length is 1.9 years. Average cost of cancer treatment is more than Rs. 3.93 lakh for brain cancer; it is Rs. 3.25 lakh for food pipe cancer. It is nearly Rs. 3 lakh for blood and breast cancer. It is as low as Rs. 1.79 lakh for cancer of uterus and Rs. 2.00 lakh for other type of cancers. Average ailment length is also different for different type of cancers. It is just 1.1 year for brain, and 3.5 years for food pipe cancer. Karl Pearson's correlation coefficient between average ailment length and average cost of cancer treatment is positive and statistically significant at 1 percent level of significance. It shows that the average cost of cancer treatment is a function of length of ailment.

Table 7: Cancer Site-wise Analysis of Average Ailment Length and Average Cost of Cancer Treatment

Cancer Site	Average Ailment Length (Years)	Average Cost of Cancer Treatment (Rs. Lakh)
Blood	2.1	3.03
Breast	2.5	3.11
Liver	1.5	2.67
Throat	1.9	2.31
Uterus	1.7	1.79
Food Pipe	3.5	3.25
Brain	1.1	3.93
Other	2.9	2.00
Total	1.9	2.75
Correlation between length of ailment and cost of treatment: $r = 0.230$ (d.f.=134), Significant at $p=0.01$		

Source: Primary Survey.

Per patient cost of Rs 2.75 lakh during mean ailment period of 1.9 years is not a small amount, keeping in view the average level of income and living standards of the study region. Due to meager in-hand savings, to meet this unplanned eventuality, the cancer victim families have to depend on outside sources of finance (Table 8). For meeting the treatment cost, on an average, each cancer suffering family has to arrange a finance of Rs. 2.48 lakh. There is no major difference between the finance arranged for male and female patients. At aggregate level, commission agents and own savings are a source of finance to the tune of more than Rs. 3.00 lakh. Further, quantum of finance (Rs. 3.00 lakh) from the commission agents is the same irrespective of the gender. Average amount of finance from relatives is Rs 2.32 lakh for male and 1.69 lakh for female. On the other hand, average amount of finance from landlord is Rs 1.48 lakh for male and 2.08 lakh for female. Different sources of finance are not evenly available with respect to the gender. For cancer suffer families, support of commission agent finance is available irrespective of gender. On the other hand average financial support from relatives is higher for male than female patients; the landlord's financial support is more for the female patient than the male.

Table 8: Source of Finance Per Patient (Rs. lakh)

Source of Finance	Amount of Finance per Cancer Patient (Rs. Lakh)		
	Male	Female	Persons
Commission Agents	3.03	2.98	3.01
Relatives	2.32	1.69	2.03
Landlords	1.48	2.08	1.73
Own Savings	2.90	3.34	3.26
Others	3.20	3.33	2.88
Total	2.37	2.59	2.48

Source: Primary Survey.

Further, disaggregate analysis of the sources of finance (Table 9) is indicative of the fact that commission agents meet the needs of 33.09 percent and landlords meet the needs of 27.94 percent of the cancer affecting families. Thus, about 61 percent of the families depend on the commission agents and landlords for their financial requirement for the cancer treatment. Income based disaggregation of source of finance depicts that the landlords are the significant source of finance for low income group, and the commission agents are the significant source of finance for the middle and high income groups. Relatives, as a source of finance for cancer treatment, is found in the lower and middle income group respectively; it is insignificant in the case of high income group. So, the sources of finance are not evenly available to all the families suffering from cancer disease.

Table 9: Source of Finance by Income Group

Income Group	Comm. Agenst		Relatives		Landlords		Own Savings		Others	
	N	%	N	%	N	%	N	%	N	%
Low	1	2.86	12	34.29	20	57.14	-	-	2	5.71
Medium	26	40.00	13	20.00	16	24.62	7	10.77	3	4.62
High	18	50.00	1	2.78	2	5.56	9	25.00	6	16.67
Total	45	33.09	26	19.12	38	27.94	16	11.76	11	8.09

Source: Primary Survey

It is a proven fact in health economics that the average cost of an ailment is a function of income level of a family. Table 10 presents average annual family income in relation to average cost of cancer treatment in the study area. As already mentioned, for the total sample, the average cost of cancer treatment is Rs. 2.75 lakh. The average annual family income of sampled households is Rs. 2.30 lakh. For low income group, average income is Rs. 0.36 lakh compared to average cost of treatment Rs. 1.61 lakh. For middle income group, average income is Rs. 1.29 lakh against average treatment cost of Rs. 2.71 lakh; and for high income group, average income is equal to Rs. 6.01 lakh) and average cost is Rs. 2.75 lakh. The correlation between family income and average cost of treatment is positive and statistically significant at 1 percent level. Thus the cost of treatment is a function of the paying capacity of the family. For low income group, the cost of cancer treatment is equivalent to four and a half years income; for middle income group, it is 2 years' income and for the high income group, it is just a two-third of one year's income. So, the worst hit by cancer is the low and the middle income group patients respectively.

Table 10: Relationship between Average Income and Average Cost across Cancer Families

Income Level	Income (Rs. lakh)	Average Annual Family Income (Rs. Lakh)	Average Cost of Cancer Treatment (Rs. Lakh)	Gap of Treatment Cost and Family Members (Rs. Lakh)
Low	Up to 0.4	0.36	1.61	-1.15
Medium	0.4 to 3.0	1.29	2.71	-1.42
High	Above 3.0	6.01	3.92	+2.09
Total	-	2.30	2.75	-0.45

Correlation Between Income and Expenditure: $r = 0.330$ (d.f. =134), Significant at $p=0.01$

Source: Primary Survey.

To meet the financial cost and repay the financial debt, the households suffering from cancer have to cut down their essential expenditures; that in turn affect their quality of life and capacity to earn income. Quality of life is affected, if one has to sacrifice one/more of the essential components of quality of life: food, clothing, housing, education, health and social ceremonies. For each aspect of quality of life, a five-point Likert scale method has been used to arrive at the weighted average score (WAS) using -2, -1, 0, 1 and 2 as the weights. The rank based on WAS giving the directly useful magnitude of the effect. An important finding which emerges from the analysis based upon quality of life shows that the cancer suffering households cut expenditure on the basic needs. On the total sample level, due to cancer, in terms of expenditure cut, the food is affected at the first, followed by the health, and clothing, respectively (Table 11). For low income group, the order of effect is in terms of reduced expenditure is the food, education and clothing. For middle income group, it is in the order of food, clothing and health. For high income group, it is the health, education and social ceremonies in order of importance. For meeting the cost of cancer treatment, lower income group and middle income group cut down their expenditure on even the food; what to talk about health and education. Even, in the case of higher income group, the health becomes the first victim. In general, the basic ingredients of human capital, the food, education and health have been seriously hit in the cancer victim families. To save these families and their functionalities, an economic package not only for treatment, but also for the food, education and family health is suggested.

Table 11: Effect on Quality of Life by Expenditure Cut due to Cancer Treatment

Expenditure Cut on	Income-wise Weighted Average Score (WAS) and Ranks							
	Low		Medium		High		Total	
	WAS	Rank	WAS	Rank	WAS	Rank	WAS	Rank
Food	1.31	1	1.11	1	0.19	6	0.92	1
Clothing	1.23	3	1.06	2	0.26	4	0.89	3
Housing	1.03	5	0.82	5	0.25	5	0.73	5
Education	1.26	2	0.89	4	0.47	2	0.88	4
Health	1.11	4	0.91	3	0.69	1	0.90	2
Social Ceremonies	0.69	6	0.55	6	0.42	3	0.55	6

Source: Primary Survey.

In addition to the expenditure-cut, various other parameters of quality of life are also affected at large due to the heavy cost of cancer treatment (Table 12). At aggregate level, high cancer cost has led to financial stress, followed by low human resource utility and high anxiety. In the lower income group, the heavy ailment cost has led to decline in child and elderly care. In the middle income group, it leads to low human resource utility, followed by decline in child and elderly care. In high income group, it leads to low human resource utility and the depression. Thus, in addition to financial stress, first victim of heavy cancer cost is earning capability of the family followed by decreased care of children and elderly.

Table 12: Effect on Quality of Life due to Cancer

Ailment Lead to	Income Bracket Weighted Average Score (WAS) and Ranks							
	Low		Medium		High		All	
Depression/Anxiety	1.20	4	1.18	3	1.00	3	1.14	3
Decreased HR Utility	1.17	5	1.26	2	0.93	4	1.15	2
Counseling	0.34	8	0.41	7	0.22	7	0.34	8
Social Alienation	0.40	7	0.58	6	0.39	6	0.49	6
Decreased Child Care	1.37	2	1.03	5	0.92	5	1.09	4
Decreased Elderly Care	1.26	3	1.04	4	1.01	2	1.08	5
Relatives Distanced	0.49	6	0.40	8	0.19	8	0.37	7
Financial Stress	1.60	1	1.60	1	1.28	1	1.51	1
Shift to Cheap Treatment	-1.11	9	-0.78	9	-0.92	9	-0.90	9
Left Treatment in Between	-1.14	10	-0.82	10	-0.97	10	-0.94	10

Source: Primary Survey.

Table 13: District-wise Cases of Cancer Assistance under Mukh Mantri Punjab Cancer Raahat Kosh (as on 31.12.2012)

Sr. No.	District	Number of Applications	Number of Cases Sanctioned	Total Amount (Rs.)	Amount per Case
1	Amritsar	593	593	72602137	122,432
2	Barnala	194	194	18597349	95,863
3	Bathinda	509	509	53102176	104,326
4	Fatehgarh Sahib	90	90	10175650	113,063
5	Faridkot	266	266	27436654	103,145
6	Ferozepur	443	443	42006828	94,824
7	Gurdaspur	509	509	66589706	130,825
8	Hoshiarpur	237	237	22946942	96,823
9	Jalandhar	395	395	52301590	132,409
10	Kapurthala	145	145	17107604	117,983
11	Ludhiana	622	622	61504134	98,881
12	Mansa	232	232	22107940	95,293
13	Moga	288	288	28971501	100,595
14	Muktsar	265	265	27211448	102,685
15	Patiala	290	290	32203301	111,046
16	Pathankot	6	6	772600	128,767
17	Roopnagar	56	56	4047860	72,283
18	SBS Nagar	89	89	8638092	97,057
19	SAS Nagar (Mohali)	54	54	6136800	113,644
20	Sangrur	412	412	41364042	100,398
21	Tarn Taran	332	332	33560809	101,087
	Total	6027	6027	649385163	107,746

Source: Punjab Government Website.

Further, at the disaggregate level; the analysis revealed that 47 percent of the families, after starting costly treatment of the cancer patients, shifted to a cheaper treatment. Similarly, 45 percent of cancer families left the treatment in between and took the patient to their home in a state of hopelessness. Most such cases belonged to the low and middle income groups. This is precisely because of the reason that except the high income group, the gap between the cost of treatment and the averaging annual income of the household is very high. In the case of low income groups, fund raising capacity as compared to the cancer treatment cost is low. Thus, the cancer suffering households are unable to receive quality treatment.

State Policy Initiatives

There have been various state initiatives for the prevention, diagnosis and treatment of cancer disease in Punjab (Box 3). But still, most of the initiatives are yet at design level and their implementation needs a big push in terms of resources and awareness of the masses. The status report of cancer assistance under Mukh Mantri Punjab Cancer Raahat Kosh (Table 13) is indicative of the fact that during the reference period, only 6027 cancer patients have availed of this assistance which is a too low figure, if one compares with the actual number of live cancer patients in the state. The average amount that was sanctioned for a cancer patient comes to be only Rs. 1.07 lakh; in Roopnagar district, it is merely Rs. 0.72 lakh.

The process for taking state assistance, termed as tedious and time consuming, is as follows: (a) submission of application with residence proof, cancer test report and estimates of treatment cost from the hospital; (b) approval from the Govt. Medical College and Hospital Level Committee (Amritsar, Faridkot, GMCH Chandigarh, PGIMER Chandigarh); and (c) a final sanction from the government, Chief Minister of Punjab. Existing rules regarding delivering grants to afflicting cancer patients are quite loose and create hurdles in reaching grants to the patients. Therefore, most of the applicants seeking grants face rejection. In some cases, delay in sanction of assistance is more than six months. As per the respondents, government relief of 1.5 lakh comes after a long chain of formalities, while the treatment cannot wait for a long time. As per the state government's guidelines, a patient will be given money for the treatment after the date of sanction and not during the time period of treatment during which the case was sent for approval. Instead of sanctioning money for treatment, it should provide free hospital admission and medicines to the cancer patients. Further, free education should be given to the living children where the bread winner becomes victim of cancer (ill or dead).

Box 3: State Initiative for Prevention, Diagnosis and Treatment in Punjab

Cancer Prevention

1. Testing of heavy metals in drinking water has been started in the State Public Health Lab.
2. State Government has started installing Reverse Osmosis Systems (RO) in various villages of districts.
3. Health education activities are undertaken to make people aware about the causes, signs/symptoms and prevention of cancer.
4. Steps have been undertaken to control excessive use of pesticides/insecticides.

Diagnosis of Cancer

1. Mammography units have been established at Civil Hospital, Bathinda, Patiala, Jalandhar and Hoshiarpur.
2. Punjab Government had signed a MoU with the NGO 'Roko Cancer Trust' to spread cancer awareness.
3. Cancer Registry has been started:
 - a) Population Based Cancer Registry (PBCR): it has been started and it is collecting data of cancer patients and located at Govt. Medical College, Patiala.
 - b) Hospital Based Cancer Registry (HBCR): It has been started at the PGI, Chandigarh & is collecting the cancer data.

Free/Cheap Treatment of Cancer

1. Financial assistance under State Illness Fund through Punjab Nirogi Society is provided to cancer patients along with other life threatening diseases belonging to BPL families.
2. Mukh Mantri Punjab Cancer Raahat Kosh Society – Under this scheme, 50.00 crores has been made available by the Govt. of Punjab for treatment of all cancer patients except the Govt. employees and those having health insurance cover. An amount of up to 1.50 lakhs is made available for treatment of every cancer patient.
3. School children suffering from cancer are provided free treatment by Health Deptt.
4. Brachytherapy is a type of radiation therapy in which radiation source is used in a focused manner/beam to treat localized cancer. Brachytherapy machine has been installed at Government Medical College & Hospital, Patiala.
5. Radiotherapy machine & Cobalt Unit has been started at Sri Guru Gobind Singh Medical College, Faridkot.
6. Cobalt Source for the treatment of cancer patients has been installed at Sri Guru Ram Das Institute of Medical Sciences & Research Centre, Amritsar.
7. Regional Cancer Centre at the PGI has been connected to all district hospitals of Punjab via Tele-Medicine facility.
8. Free travel facility in Punjab Roadways & PRTC Buses is provided to the cancer patients for availing treatment.
9. State government has executed an agreement with Max Health Care to set up Super Specialty Hospital for Cancer & Trauma Care in the premises of Civil Hospital SAS Nagar (Mohali) and setting up of Super Specialty Cancer & Cardiac Hospital in the premises of Civil Hospital, Bathinda. These hospitals are now fully functional.
10. National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular diseases & Stroke (NPCDCS) has also taken care of cancers.
11. Cancer Hospital at Bhatinda is being set up with an investment of Rs.60 Crore by BFUHS, Tenders floated for construction.

Source: Government of Punjab (2013), accessed on March 2013.

Summary and Conclusions:

The major findings that emerged from the analysis are as follows:

Punjab, the leader of the green revolution since the mid-1960s, is now suffering from the adverse consequences of it as well. The health ailments, alarmingly on the rise, are being getting closely identified with indiscriminate use of agro-chemical in agriculture; and the cancer is one of them.

Recent government survey report on cancer in Punjab (released on 28.01.2013), covering 98 percent of population, showed that 33,318 cancer deaths have occurred during the last five years, out of which 14,682 were in the Malwa region alone. The survey data also reveals that there are 84,453 persons in the state who have cancer-like symptoms – an alarming situation.

Against WHO's estimates—80 cancer affected persons per one lakh population — Punjab's survey reported 90 persons per one lakh population were suffering from cancer. On the basis of cancer incidence region-wise, Malwa (107.1 per lakh) tops the list, followed by Doaba (88.1 per lakh) and Majha (64.7 per lakh). In Malwa, district-wise incidence of cancer was the highest in Muktsar (136.3 per lakh).

This study covers four villages of Muktsar district: Doda, Bhalaina, Kotbhai, and Channu and collected data from 136 cancer cases, of which 103 were dead and 33 are live patients. Occupation-wise distribution shows that 45.59 percent cancer victims were engaged in agriculture related operations; 39.71 percent in household work and the rest in other occupations. Further, 55.88 percent of sampled cancer victims had a direct exposure to pesticides during their lifetime. Only 2.21 percent of the total cancer cases had only life insurance cover and not the health insurance.

Average length of the cancer ailment has been 1.9 years in the study region. And, average cost per patient on diagnosis, admission, treatment and follow up comes out to be Rs 2.75 lakh. There are spatial variations in this average cost. Average cost of cancer treatment is a function of length of ailment. Gender-wise distribution of cancer cases indicates that the females (4.26 per thousand) are more prone to cancer in the region as compared to males (3.53 per thousand). Temporal analysis of cancer cases is indicative of the fact that more than 50 percent of the cancer ailment cases detected in the first-half of last decade.

Direct exposure to pesticide handling, storage and use leads to a specific type of cancer like that of brain, blood, liver and throat across sampled villages.

Income based disaggregation of source of finance depicts that commission agents emerge as the most significant source of finance for low income group and landlords for the

middle and high income groups. Relatives, as a source of finance for cancer treatment, are found in the lower and middle income group in order of importance; it is insignificant in the case of high income group. For cancer victim families, support of commission agents to finance treatment cost is available irrespective of gender. On the other hand, average financial support from relatives is higher for male than that of female patients; the landlord's financial support is more for the female patients than the males.

Cost of treatment is a function of the paying capacity of the family. For low income group, cost of cancer treatment is equivalent to four and a half years income; for the middle income group, it is 2 years income and for the high income group, it is just a two-third of one year's income. So, the worst hit by cancer is the low and the middle income group in order. In general, basic ingredients of human capital - food, education and health - have seriously been hit across the cancer victim families. This calls for an economic package not only for treatment, but also for the food and family health.

Lastly, at disaggregate level; the database revealed that 47 percent of the families, after taking costly treatment shifted to a cheaper treatment. Similarly, 45 percent of the families left the treatment in between and took their patient to home in a state of hopelessness. Most of such cases belonged to the low and middle income group.

Policy Implications

The size and scale of cancer problem analyzed above calls for developing a viable state supported system. It is a high time to develop a system that combines public and private efforts, not only to finance cancer treatment but also to bring the families out of perpetual distress in the long run. In this regard, following are the broad policy implications that emerges from the study:

- For prevention of cancer, first and the foremost step that needs to be taken is to regulate the intensive and uncontrolled use of deadly agro-chemicals (fertilizers, insecticides/pesticides, etc.). If need be, some of such agro-chemicals may be banned.
- Masses need to be educated regarding the storage, handling and use of fertilizers and chemicals. This should include first aid in the case of accidents caused due to mishandling of such chemicals.
- Early detection is essential to reduce the burden of treatment costs. Create awareness among people to identify causes and signs for early detection of cancer.
- Ensure safe drinking water to the masses in the region in order to ensure the prevention of cancer to some extent.

- Diagnostic facilities at affordable cost should be provided, at least, one government hospital in each district and that too at block level.
- Cancer treatment facilities need to be strengthened in the public hospitals.
- Procedure to avail cancer related economic assistance from the state needs to be simplified. It is thus suggested that direct payment may be made to the patient through banks.
- Expenditure incurred by cancer suffering households varies by the type of cancer and length of the treatment. It is, therefore, suggested that the state government's financial assistance should be variable or flexible as per the level of income, type of cancer and expected length of the treatment.
- Cancer related state assistance needs to be extended to cover even dead cases, so that the family can support the food, education and health care needs of living family members.

To sum up, different types of cancer in the region are being identified in particular geographical clusters. Against the average cost of cancer treatment of Rs. 2.75 lakh, average family income at aggregate level is just Rs. 2.30 lakh. And, average length of cancer ailment is 1.9 years. In the absence of health insurance system and meager own savings, cancer victim families have to depend on outside sources of finance. Huge treatment cost borne by the cancer victims' families reduces their expenditure on food items, care of children and elderly. State government support to cancer victims is insufficient, untimely and involves procedures cumbersome. There is high time to design a financial support system for the cancer victim families that covers not only cancer treatment but also their basic needs, capabilities and functionalities by providing additional financial assistance for looking after the food, health and educational needs of distressed families.

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