Published by Oxford University Press in association with The London School of Hygiene and Tropical Medicine *Health Policy and Planning* 2009;**24**:129–139

doi:10.1093/heapol/czn052

Paying for hospital-based care of Kala-azar in Nepal: assessing catastrophic, impoverishment and economic consequences

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Accepted 11 July 2008

Households obtaining health care services in developing countries incur substantial costs, despite services generally being provided free of charge by public health institutions. This constitutes an economic burden on low-income households, and contributes to deepening their level of poverty. In addition to the economic burden of obtaining health care, the method of financing these payments has implications for the distribution of household assets. This effect on resource-poor households is amplified since they have decreased access to health insurance. Recent literature, however, ignores the importance of the method of financing health care payments. This paper looks at the case of Nepal and highlights the impact on households of paying for hospital-based care of Kala-azar (KA) by analysing the catastrophic, impoverishment and economic consequences of their coping strategies. The paper utilizes micro-data on a random selection of 50% of the KA-affected households of Siraha and Saptari districts of Nepal. The empirical results suggest that direct costs of hospital-based treatment of KA are catastrophic since they consume 17% of annual household income. This expenditure causes more than 20% of KA-affected households to fall below the poverty line, with the remaining households being pushed into the category of marginal poor; the poverty gap ratio is more than 90%. Further, KA incidence can have prolonged and severe economic consequences for the household economy due to the mechanisms of informal sector financing to which households resort. A heavy burden of loan repayments can lead households on a downward spiral that eventually becomes a poverty trap. In other words, the method of financing health care payments is an important ingredient in understanding the economic burden of disease.

Keywords Kala-azar, health care payment, loan repayment, catastrophic, poverty, economic consequences, Nepal

KEY MESSAGES

- The estimated direct cost of Kala-azar (KA) in Nepal is 17% of average household income, which is high in comparison with other tropical diseases such as tuberculosis and malaria (at <10%).
- The study found that over 20% of non-poor households fall into poverty due to out-of-pocket (OOP) expenditure on hospital-based KA care.
- The method of financing used for OOP payments (such as high-interest loans from the informal finance sector) can have a more severe impact among resource-poor households than the actual OOP payments themselves, leading households into a poverty spiral that is hard to climb out of.

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Introduction

In recent literature, there has been considerable discussion of factors that influence the utilization of health care and their impact on the household economy. For example, Xu *et al*. (2006: 866) point to the possibility of increasing the utilization of health care by either reducing or even abolishing user fees in public health facilities. Ensor and Cropper (2004: 69) and Gertler and Van der Gaag (1990: 19) suggest that the indirect costs of obtaining health services (such as travel cost, opportunity costs of time) have a significant impact on health care utilization. The cost of obtaining services and the implications of the method of financing out-of-pocket (OOP) payments are important in understanding the effect on household income generation, consumption and economic welfare (Russell 2004: 147; Van Damme *et al*. 2004: 273).

In literature on the economic consequences of disease on the household economy, a popular approach has been to focus on income and financial burden (Attanayake *et al*. 2000: 535; WHO 2000: 35–36; McIntyre *et al*. 2006: 858). These studies have dedicated substantial effort to analysing the catastrophic and impoverishment impact on households (Xu *et al*. 2003: 111; Van Doorslaer *et al*. 2005: 3), however they have ignored the effect of mechanisms used to cope with health care payments (Van Damme *et al*. 2004: 274). The mechanism of financing OOP payments (especially in developing countries) plays an important role in the economic impact experienced by households. This is because households in developing countries commonly finance unexpected expenses by borrowing, usually through informal sources of financing (Van Damme *et al*. 2004: 275; Meheus *et al*. 2006: 1720; Sharma *et al*. 2006: 760). The method of financing has implications for a household's assets and the process of impoverishment (Russell 2004: 151–2; Alvar *et al*. 2006: 552–6).

This paper aims to demonstrate the importance of financing for treatment of a tropical disease episode by examining the incidence of Kala-azar (KA; visceral leishmaniasis), a tropical disease caused by the bite of an infected sandfly, which if not treated has fatal consequences in over 80% of cases (Ahluwalia *et al*. 2003: 624). KA is categorized as one of the most neglected diseases in the world (Yamy and Torreele 2002: 176–7; Ahluwalia *et al*. 2003: 624–8). It is most prevalent in the Indian subcontinent, affecting 100 000 people per year, with 147 million people at risk (WHO/SEARO 2005). The KA situation in Nepal is described in Box 1.

Despite the disease burden, economic analyses on KA are scarce, with most focusing on malaria, such as Asenso-Okyere and Dzator (1997: 659–667) in Ghana and Konradsen *et al*. (1997: 127–30) in Sri Lanka. Only six economic studies on KA were found from an extensive search of the literature in the South Asia region. These include a study in India (Meheus *et al*. 2006), two studies in Bangladesh (Ahluwalia *et al*. 2003; Sharma *et al*. 2006) and three studies in Nepal (Sharma *et al*. 2004; Adhikari and Maskay 2005; Rijal *et al*. 2006). However, these studies have their limitations. For example, the studies in India (Meheus *et al*. 2006) and Bangladesh (Ahluwalia *et al*. 2003) are largely confined to the estimation of average cost of treatment, with no further analysis on economic consequences of the disease. Meheus *et al*. (2006) focused on the societal cost of KA case management. Similarly, Sharma *et al*. (2006), Rijal *et al*. (2006) and Adhikari and Maskay (2005) estimated the cost (direct and indirect) and analysed the consequences of KA, but with no explicit estimation of the impoverishment and catastrophic impact of OOP payments on households. Further, Sharma *et al*. (2004) considered the socio-economic aspects of KA with a focus on the distribution of costs and income, but with no empirical analysis.

Box 1 Kala-azar in Nepal

In Nepal, KA is presently confined to the 12 south-eastern districts bordering Bihar State in India. These identified KA districts share a similar climate and geography, and have a population of approximately 6 million, a figure which suggests that one-quarter of the nation's citizens are at risk (Bista *et al*. 2004). With the seasonality of KA, incidence remains high from May to September, and declines by the end of the year (Bista *et al*. 2004: 94). The Government of Nepal has continued to implement KA control programmes, both curative as well as preventive, for almost the last three decades. The government has recently included KA control in the first priority programme of the health sector (NPC 2003), with targets to: reduce KA incidence to less than 10 cases per million population; reduce KA cases by 10% per annum; reduce mortality due to KA; and to strengthen rapid identification and management of KA patients. Presently, KA is diagnosed in Nepal using the K39 antigen strip test (K39 antigen) or Direct Agglutination Test (DAT) (Cheesbrough 1998: 273). K39 antigens are generally used to diagnose KA in public hospitals; DAT, which is also used for further diagnosis, is not available in all public hospitals. The major drug for treatment—sodium antimony gluconate—is available only in public hospitals, although supplementary drugs for KA treatment can be found in private drug stores and private hospitals. Diagnosis and treatment services and major drugs are provided free of charge in public hospitals. However, people have to rely on private facilities in some circumstances, such as when laboratory technicians are absent or there is a shortage of drugs in public hospitals.

This paper contributes to the aforementioned literature with discussion of the economic burden on households of hospital-based care for KA, utilizing recently developed methods of catastrophic and impoverishment impact assessment, along with consequences of loan and interest repayment. Specifically, the paper answers two questions from a health care financing perspective: (1) what is the impact of OOP payments on the household economy; and (2) what are the consequences of the method of OOP financing on the future household economy? The analysis aims to assess the catastrophic and impoverishing impact and economic consequences of KA on the affected households using primary data collected from two of the 12 KA-affected districts in Nepal.[1]

We next discuss the methods used, before presenting the findings and an analysis of the catastrophic, impoverishment

and economic consequences. This is followed by a discussion section, and finally, some concluding observations.

Study methods

Sampling methodology and data collection

The study utilized both probability and non-probability sampling methods. The study purposively selected Siraha district due to its having the highest recorded KA case fatality rate (CFR: 1.30%) (MOH 2002). Saptari district was selected as it is adjoining to Siraha. The total population of KA patients in both districts was taken from the official records of patients admitted during the period April to November 2003 in three public hospitals (Siraha hospital, Lahan hospital and Sagrmatha hospital), which are the only public health institutions in these areas that treat KA. The field survey took place during February 2004 with a recall period of a minimum of 3 months to a maximum of 10 months. Similar studies by Murti *et al*. (2003: 17), Su *et al*. (2006: 22), Rijal *et al*. (2006) and Sharma *et al*. (2006) used recall periods of 6 months, 5 months and 3 years.

The total population of KA patients in both districts was 144. This total of KA patients was clustered into five groups based on their place of residence. We took a 50% random selection of this population, which resulted in 72 KA patients who resided in either Siraha or Saptari districts. This sample size is sufficient to represent the population of KA patients since it exceeds by more than three-fold the minimum requirement, which is 23 patients only.[2]

We identified households from KA patient records. During interview, pre-tested and pre-designed questionnaires were administered to those individuals responsible for household expenditures, taken to be the household head. If they were not available, we turned to the KA patients themselves, then to caretakers, in that order. As no household was found to have more than a single KA patient during the study period, each KA patient represented a household. Hence, the household is also the unit of analysis in this study, referring to a unit of persons living together and sharing the same kitchen at the time of survey.

The survey questionnaire captured standard socio-economic characteristics of both the individual KA patients and the KA households, along with the different costs borne by the households in the course of KA treatment *vis à vis* costs of hospital-based medical care, travel costs, food costs, opportunity costs, among others. The information on costs of KA treatment was verified through both cross-checking among household members involved in KA treatment and through examination of financial documents, as far as possible. Regarding the opportunity costs of the household, the workdays lost (which comprised the total hospitalized days, bed rest at home during symptomatic periods, and recovery time) were multiplied by the prevailing market wage rates for conversion into monetary terms. This method is similar to that used in studies such as Asenso-Okyere and Dzator (1997), Onwujekwe *et al*. (2000) and Mock *et al*. (2003).

Information on the total incomes of households was produced through incorporation of the data collected with a one-year income cycle from January to December 2003.[3] Household income included food grains and other goods produced for self-consumption valued at the prevailing market price. At times during the interview process, it was difficult to capture all sources of income of rural households using the structured questionnaire. The process of interviews, therefore, was not limited to the questionnaire; they became more detailed discussions about agriculture, harvesting, livestock, work during the downtime of agricultural work, individual occupations of household members, and other possible sources of income, in order to obtain a more accurate account of household income. Along with this information, the sufficiency of household income in meeting household consumption was also ascertained to facilitate cross-checking of household income data. This method is similar to that administered by Attanayake *et al*. (2000) in Sri Lanka.

Measurement of economic burden and consequences

We used three different measures to evaluate the economic burden and consequences of health care payments:

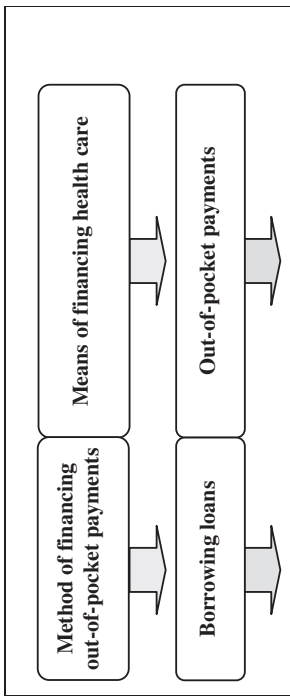
1. Catastrophic payments caused by a KA episode—this is reflected in the share of total household income spent on treatment in excess of some given thresholds;
2. The impoverishing impact of OOP payments—this quantifies the difference between the poverty incidence before and the poverty incidence after deducting the health care payments from individual income; and
3. The economic consequences of the method used to finance OOP payments—an assessment of possible poverty dynamics in terms of the intensity and severity of poverty after deducting the loan repayment from individual income in successive years.

These three concepts are illustrated in the conceptual framework detailed in Figure 1.

Measuring catastrophic payment

A catastrophic payment is a health care payment that constitutes a significant share of household resources, which either diverts consumption from basic goods or requires the household to resort to using savings, selling assets, borrowing, etc. (Wagstaff and Van Doorslaer 2003; Xu *et al*. 2003: 111; Van Doorslaer *et al*. 2005: 13–19). There are various methods found in the literature to quantify catastrophic payments. Russell (2004) suggests that an OOP payment greater than 10% of total household consumption is catastrophic, while Xu *et al*. (2003) define total OOP expenditure equalling or exceeding 40% of non-subsistence household expenditure as catastrophic. The widely accepted method for measuring the incidence and intensity of catastrophic payments is the methodology of Xu *et al*. (2006: 21–27), Van Doorslaer *et al*. (2005: 13–19) and Wagstaff and Van Doorslaer (2003: 923–24), who use a threshold range from 5 to 25% of household income.[4] We adopted this methodology for quantifying catastrophic payments for KA-related hospital-care.

While the incidence and intensity indices provide information on the prevalence and magnitude of catastrophic payments, these estimations do not provide the income-related distribution of the headcount and the gap of catastrophic payments. The concentration indices used in the paper were computed as



Economic Impact	Measurement Tools	Indicators	Interpretation of the Effects
Catastrophic payment	Percentage of health payment out of income or consumption with some threshold	Incidence and intensity; and concentration indices	Reduced consumption due to high OOP payments and loss of economic welfare; distribution of catastrophic payment among poor and rich
Impoverishment	Difference between pre health-payment income poverty and post health-payment income poverty	FGT poverty index (headcount, poverty gap and severity of poverty)	Poverty situation in the society (non-poor people become poor and poor push in marginal poor); hidden poverty
Economic consequences	Differences between pre loan-repayment income poverty and post loan-repayment income poverty in successive years	FGT poverty index (headcount, poverty gap and severity of poverty)	Poverty spiral to the household economy (poverty getting deeper and deeper in successive years) and changing portfolio of household assets

Figure 1 Analytical conceptual framework

proposed by Van Doorslaer *et al*. (2005: 13–19) and Wagstaff and Van Doorslaer (2003: 923–24). The concentration indices for incidence and intensity of catastrophic payments provide information on who—either the better-off or the poor—spend the larger fraction of their income on health care. Thus, a positive (negative) value of concentration index indicates a greater tendency for the better off (the poor) to exceed the payments' threshold.

However, in some cases this index does not give a policy relevant picture. For example, a negative concentration index suggests that the catastrophic impact is more prevalent and intense among the worse-off. In this case, catastrophic impact based on the distribution of payment may be higher than the level of catastrophic impact. This problem is overcome by constructing the complement of the associated concentration index (or, $1-C_E$) (Wagstaff and Van Doorslaer 2003: 924–5). That is, a rank-weighted index that reflects both the level and the distribution of payments is obtained by multiplying the catastrophic headcount or intensity by the constructed weight [or, rank-weighted index = headcount or intensity index*$(1-C_E)$]. The rank-weighted catastrophic index gives a more policy relevant picture than the unweighted catastrophic index.

The paper estimates catastrophic payment using four different numerators: medical costs; the sum of medical and travel costs; total financial payment (direct cost); and total resource cost (both financial payment and opportunity cost). These different measurements have different policy implications. For example, the index of catastrophic payment for medical costs indicates the role of the risk protection mechanism that reflects both the fees and prices paid to providers. The catastrophic payment index for transportation costs suggests the spatial distribution of or access to health facilities. The catastrophic payment indices for total direct cost and total resource cost suggest the total opportunity cost of forgone consumption and the consequences for the household economy, respectively.

Measuring impoverishment impact

The impoverishment impact of a health care payment is measured in terms of poverty incidence and intensity. Poverty incidence (or headcount index) quantifies the percentage of population pushed below the poverty line as a result of the health care payment, while the intensity of poverty measures the depth of poverty. The difference between the pre-payment and post-payment income poverty gives an estimate of the impact of health care payments on poverty incidence and intensity (Van Doorslaer *et al*. 2005: 13–19). The estimate of pre-payment income poverty is based on per capita income before deducting health care costs, while for post-payment income poverty, health care costs have been deducted.

Various methods are found in the literature to estimate income poverty. Among them, the Foster, Greer and Thorbecke (FGT) poverty estimation method is the most popular (Chaubey 1995: 33). The equation for calculating the FGT index[5] is:

$$\text{Poverty index} = \frac{1}{N}\sum_{i=1}^{n}\left[\frac{P_L - Y_{Pi}}{P_L}\right]^{\lambda}$$

where, P_L = the poverty-line income, and Y_{Pi} = below poverty-line income. Values for $\lambda = 0$, 1 and 2, and give the headcount index, normalized deficit (poverty gap) ratio and severity of poverty, respectively. The index is sensitive to changes in income when $\lambda > 0$, and to the transfer to income when $\lambda > 1$. The poverty gap expresses the gap between a pre-determined poverty-line income and the actual income of people below the poverty line. The poverty gap ratio is measured by the ratio

of poverty gap to the poverty line income. The square of the poverty gap measures the severity of poverty.

We employed the FGT method to estimate both pre-payment and post-payment poverty by using the income at the national absolute poverty line. The national absolute poverty line income for the survey period, 2003, was 6716 Nepalese Rupees (NRs), an estimate obtained by adjusting for inflation from a per capita annual income of NRs 4404 at 1996 constant prices, set by the National Planning Commission of Nepal in 1996 (NPC 1997).

Measuring economic consequences

Resource-poor households finance expenditure related to treatment of KA either by selling productive assets or by borrowing from the formal and informal financial markets (Sharma *et al*. 2006). The latter financing strategy is very risky given households' income situation, since non-payment of loans can trigger a vicious circle of impoverishment and further indebtedness (Russell 2004: 148; Van Damme *et al*. 2004: 274), a poverty spiral. The poverty spiral is the propagation of the intensity and severity of poverty in successive years, generated by loans with interest repayment (LIR). The procedures and methods to estimate the intensity and severity of poverty are similar for OOP payments and LIR. However, the data coverage and the policy implications are different. The estimation of the impoverishment impact of OOP payments covers all KA households who have received services from public hospitals, but the analysis does not consider how households finance the OOP payments. In other words, the poverty spiral is a dynamic concept, while the impoverishment and catastrophic impact of OOP payments is static and relates to a point in time.

A better estimation of the magnitude of the poverty spiral thus requires a follow-up study to assess the timing of repayment and income dynamics. However, it is possible to estimate the poverty spiral due to LIR through the use of cross-sectional data. In an attempt to make such an estimation, we have assumed a repayment period of up to 5 years and a constant income stream during that period. The assumption of a 5-year pay-back period is based on the general trend from analysing economic activities in Nepal, the 5-year development plan of Nepal, for instance. Thus, the poverty spiral based on deducted annual income is estimated for successive years up to the fifth year period.

Estimation of the impact of loan repayments for 5 years is important in showing policymakers the gravity of the impact on the household economy. The results provide information for designing appropriate strategies to combat this, such as introducing demand-side financing policy or community-based health insurance, or eliminating KA; and for understanding the role that access to capital plays in poverty incidence.

Results

Descriptive results

Among the 72 KA patients identified for the field survey, 11 were unavailable for interview; it was felt that these missed KA patients were not atypical and thus did not introduce a significant bias into the results. Also, 15% (11/72) missed interviews is consistent with previous KA studies in Nepal, such as the USAID Environmental Health Project (2001).

Of the 61 KA households, the average annual household income and per capita income are NRs 40 547 and 6302,[6] respectively, which are quite high compared with the median incomes (NRs 34 130 and 4542, respectively). The main sources of household income are agriculture, followed by manual labour, service, repair works and business.

The average total cost of an episode of KA treatment is NRs 7076, which is 17.5% of average household income (Table 1). The average total economic cost for the household (i.e. cost of treatment plus the opportunity cost of workdays lost) is NRs 17 986, which is 44.4% of average household income. Regarding the distribution of the total direct cost by major expenditure category, medical costs constitute the largest share at 66.5%, followed by food, travel and other costs, at 22.6%, 8.9% and 1.9%, respectively. 'Other costs' include expenditures other than those categorized above, such as small offerings to hospital staff at the time of discharge, payments to middlemen for hospital access etc.

The abovementioned costs can be categorized into demand-side and supply-side costs. Demand-side costs are direct non-medical costs and indirect costs (i.e. productivity lost and time costs). These comprise travel costs, food costs and other costs as well as opportunity costs, and constitute 73.83% of the total economic burden, which is 33% of household income. The supply-side costs are the direct medical costs, which constitute 12% of household income. It should be noted that 49 (80.33%) households took on loans to pay for treatment, with the loan amount being around 16% of their household income (Table 1).

Income distribution among KA households by per capita quintile reveals that the highest quintile enjoy 44% of the total income while the lowest quintile survive on 6% (Table 2). This indicates a high extent of income inequality among

Table 1 Summary statistics of the health care costs of Kala-azar, Siraha and Saptari districts, Nepal (Nepalese Rupees)

Measurements	Annual household income	Annual per capita income	Total direct cost	Total indirect cost	Total demand-side cost	Total supply-side cost	Total borrowing for health care	Total economic burden
Mean (standard deviation)	40 547 (28 594)	6157 (4705)	7076 (7350)	10 910 (9728)	13 279 (10 699)	4707 (5590)	6462 (7976)	17 986 (13 676)
Median	34 130	5000	4805	7800	10 690	3110	4000	15 052
Ratio with average household income	–	–	17.45%	26.91%	32.75%	11.61%	15.94%	44.36%

Table 2 Distribution of health care costs for Kala-azar, Siraha and Saptari districts, Nepal

Quintile	Annual per capita income (%)	Total direct cost (%)	Total indirect cost (%)	Total demand-side cost (%)	Total supply-side cost (%)	Total borrowing for health care (%)	Total economic cost (%)	Economic burden (ratio of direct cost and per capita income) (%)
First quintile	5.84	26.38	14.39	15.11	30.37	36.48	19.10	51.22
Second quintile	10.90	18.10	27.94	25.32	20.54	18.68	24.07	21.62
Third quintile	17.21	15.20	20.86	20.04	14.69	12.19	18.64	11.30
Fourth quintile	22.47	15.96	20.76	19.73	16.44	15.29	18.87	8.50
Fifth quintile	43.58	24.36	16.05	19.80	17.96	17.36	19.32	7.36
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 3 Catastrophic incidence: headcount index

	Threshold (% of household income spent)			
	5%	10%	15%	25%
Medical costs: catastrophic payment				
Headcount index (H_c)	75.41%	49.18%	31.15%	9.84%
Correlation with distribution of household rank	−0.0456	−0.0547	−0.0347	−0.0320
Concentration index (C_i)	−0.1210	−0.2222	−0.2228	−0.6500
Rank weighted headcount index (RWH_i)	84.54%	60.11%	38.09%	16.23%
Medical and travel costs: catastrophic payment				
Headcount index (H_c)	81.97%	60.66%	40.98%	14.75%
Correlation with distribution of household rank	−0.0424	−0.0577	−0.0322	−0.0410
Concentration index (C_i)	−0.1033	−0.1901	−0.1573	−0.5556
Rank weighted headcount index (RWH_i)	90.44%	72.19%	47.43%	22.95%
Direct costs: catastrophic payment				
Headcount index (H_c)	91.80%	70.49%	54.10%	24.59%
Correlation with distribution of household rank	−0.0238	−0.0574	−0.0440	−0.0257
Concentration index (C_i)	−0.0518	−0.1628	−0.1626	−0.2089
Rank weighted headcount index (RWH_i)	96.56%	81.97%	62.90%	29.73%
Total costs (direct and indirect costs): catastrophic payment				
Headcount index (H_c)	93.44%	85.25%	68.85%	52.46%
Correlation with distribution of household rank	0.0008	−0.0142	−0.0462	−0.0582
Concentration index (C_i)	0.0018	−0.0333	−0.1341	−0.2219
Rank weighted headcount index (RWH_i)	93.28%	88.09%	78.09%	64.10%

KA households. In contrast, the highest share of the total supply-side cost of treatment, which is 30%, is borne by the lowest income quintile, while the highest income quintile bears only 18%. The economic burden, which is the ratio of direct cost to per capita income, demonstrates the regressive nature of payments for hospital care.

Catastrophic impact

Table 3 reveals that the headcount index declined with the increase in the threshold. Seventy-five per cent of households spent at least 5% of their income on KA treatment (medical cost); 31% spent at least 15% of their income. The headcount index for total resource costs (direct and indirect costs) suggests that approximately 93% of households spent more than 5% of their total income, and 69% spent at least 15% of their income. Headcount indices of catastrophic payments increase with the inclusion of additional cost components such as travel and food, among others, though medical costs are the major contributing factor. All the concentration indices for the costs of KA are negative, except for total resource costs at the 5% threshold, indicating that the poor are more likely to suffer from catastrophic payments.

Similar to incidence of catastrophic payments, the health payment gap is highest at the lowest threshold, 5% (Table 4). The health payment gap declines when the threshold increases. The concentration index was negative for all given threshold levels, indicating that the poor contribute more, proportionately, for health care payments. Thus, in all cases,

Table 4 Catastrophic intensity: poverty gap index

	Threshold (% of household income spent)			
	5%	10%	15%	25%
Medical costs: catastrophic payment				
Gap index (G_i)	14.66%	11.38%	9.32%	7.56%
Correlation with distribution of household rank	−0.0377	−0.0351	−0.0330	−0.0300
Concentration index (C_i)	−0.5138	−0.6164	−0.7076	−0.7925
Rank weighted gap index (RWG_i)	22.19%	18.40%	15.92%	13.55%
Medical and travel costs: catastrophic payment				
Gap index (G_i)	16.46%	12.99%	10.59%	8.15%
Correlation with distribution of household rank	−0.0398	−0.0372	−0.0349	−0.0320
Concentration index (C_i)	−0.4837	−0.5718	−0.6586	−0.7861
Rank weighted gap index (RWG_i)	24.43%	20.43%	17.56%	14.56%
Direct costs: catastrophic payment				
Gap index (G_i)	21.86%	17.95%	14.89%	11.18%
Correlation with distribution of household rank	−0.0460	−0.0439	−0.0411	−0.0380
Concentration index (C_i)	−0.4211	−0.4890	−0.5514	−0.6789
Rank weighted gap index (RWG_i)	31.07%	26.72%	23.11%	18.78%
Total costs (direct and indirect costs): catastrophic payment				
Gap index (G_i)	34.92%	30.53%	26.85%	20.79%
Correlation with distribution of household rank	−0.0451	−0.0444	−0.0422	−0.0368
Concentration index (C_i)	−0.2581	−0.2906	−0.3146	−0.3543
Rank weighted gap index (RWG_i)	43.93%	39.40%	35.30%	28.16%

Table 5 Average pre-payment income and post-payment income, Siraha and Saptari districts, Nepal (in Nepalese Rupees)

Variables	Mean	Std. Err.	95% Conf. Interval	
Pre-payment income	6157.3990	602.4078	4952.4040	7362.3940
Post-payment (medical cost) income	1450.2190	966.8051	−483.6790	3384.1170
Post-payment (medical and travel costs) income	818.6289	975.2161	−1132.0900	2769.3520
Post-payment (total direct costs) income	−918.8300	1068.9830	−3057.1100	1219.4530

the catastrophic intensity based on distribution of income is higher than the unweighted catastrophic intensity.

Impoverishment impact

The results suggest that the average pre-payment per capita income is NRs 6157, while average post-payment per capita income after deducting 1) medical costs, 2) medical and travel costs, and 3) total direct costs is NRs 1450, NRs 819 and NRs −918.83, respectively (Table 5). The total direct cost amount is less than per capita income, resulting in a negative post-payment income, i.e. payments are financed from past savings, through sales of household assets or by loans. The absorption of per capita income varied from 10 to 227% during KA treatment, leaving households with either scanty resources for living or a heavy repayment burden.

According to the results, 67% of the KA households are poor. The post-payment incidence of medical costs, medical and travel costs and total direct costs is 87%, 89% and 93%, respectively, with a consequent poverty impact of 20%, 21% and 26%, respectively (Table 6). The results suggest that OOP payments are greater than current income. The post-payment income, thus, can be negative, and the poverty gap and severity of poverty can be greater than 100%.

Economic consequences

The results suggest that more than 80% of households have taken on loans to pay for KA costs. Eighty-five per cent of all borrowing households are poor. Ninety-four per cent of the poor households depend on moneylenders for loans, with interest rates ranging from 30% to 120% per annum—these rates are generally 3–12 times greater than those of the formal financial market. The study estimated how borrowing households may fall into a vicious circle of poverty due to the burden of loan repayments—the poverty spiral (Table 7). The population below the poverty line remains the same in the successive years, while the poverty gap ratio increases steadily. The poverty gap ratio is 142% in the first year. If households are not able to pay back the loan amount, this ratio rises to 184% in the second year. The severity of poverty increases considerably over the years, from 560% in the first year to 3094% in the fifth year.

Table 6 Poverty impact of out-of-pocket payments for Kala-azar, Siraha and Saptari districts, Nepal

	Estimate (%)	Std. Err.	95% Conf. Interval		Poverty impact (%)
Pre-payment poverty index					
Headcount ratio	67.21	0.0606	0.5509	0.7934	–
Poverty gap ratio	30.18	0.0355	0.2307	0.3729	–
Severity of poverty	16.69	0.0250	0.1168	0.2169	–
Poverty post-payment of total medical costs					
Headcount ratio	86.89	0.0436	0.7817	0.9560	–
Poverty gap ratio	89.10	0.1234	0.6441	1.1378	–
Severity of poverty	170.78	0.6851	0.3373	3.0782	–
Poverty post-payment of total medical costs and travel costs					
Headcount ratio	88.52	0.0411	0.8029	0.9676	–
Poverty gap ratio	97.18	0.1265	0.7187	1.2249	–
Severity of poverty	190.50	0.7022	0.5003	3.3097	–
Poverty post-payment of total direct costs					
Headcount ratio	93.44	0.0320	0.8705	0.9983	–
Poverty gap ratio	120.21	0.1471	0.9080	1.4963	–
Severity of poverty	274.26	0.9440	0.8544	4.6308	–
Poverty impact of total medical costs					
Headcount ratio	–	–	–	–	19.67
Poverty gap ratio	–	–	–	–	58.92
Severity of poverty	–	–	–	–	154.09
Poverty impact of total medical costs and travel costs					
Headcount ratio	–	–	–	–	21.31
Poverty gap ratio	–	–	–	–	67.00
Severity of poverty	–	–	–	–	173.82
Poverty impact of total direct costs					
Headcount ratio	–	–	–	–	26.23
Poverty gap ratio	–	–	–	–	90.04
Severity of poverty	–	–	–	–	257.57

Note: The increase in incidence and intensity (from different payments criteria) of the poverty between pre-payment and post-payment income (poverty impact) demonstrates that those previously non-poor people were moved to poor and poor people pushed into marginal poor.

Poorer households are most likely to fall into the vicious circle of poverty through the poverty spiral.

Table 7 Projection of poverty spiral

Years	Poverty index	Headcount index	Poverty gap ratio	Severity of poverty
Survey year	Existing poverty	67.21%	30.18%	16.69%
First year	Poverty after loan repayment	88.52%	141.94%	560.53%
Second year	Poverty after loan repayment	88.52%	183.98%	999.73%
Third year	Poverty after loan repayment	88.52%	226.02%	1568.45%
Fourth year	Poverty after loan repayment	88.52%	268.06%	2266.70%
Fifth year	Poverty after loan repayment	88.52%	310.10%	3094.47%

Discussion

Prior to discussing the above results, we must highlight the study limitations. First, the recall period was somewhat long and could have affected the accuracy of the cost and income data. Secondly, the poverty spiral was estimated without conducting a follow-up study; this makes the measurement of household income and poverty spiral indicative only. Thirdly, the structured questionnaires for data collection do not always capture all types of cost associated with illness. For example, travel cost and time loss of caretakers, relatives and others are difficult to capture through a questionnaire, and it is difficult to value the opportunity cost of time lost by homemakers and the economically inactive population. Lastly, the study is of KA households that accessed the formal health system; thus there is a possibility of underestimation of the magnitudes in the analysis.

The evidence from the sample survey demonstrates that medical costs are the largest contributor to the total direct cost of KA care, which is similar to findings in Bangladesh (Sharma *et al*. 2006) and India (Meheus *et al*. 2006). These costs can be categorized further for analytical purposes. Supply costs (the amount that has to be paid by the consumer for treatment) constitute 26% of the total resource cost of hospital-based care and take up 12% of average annual household income. These costs indicate that KA patients are still paying a large proportion of their incomes for treatment even though diagnosis and the main drugs for KA are provided free at public hospitals. The associated costs of treatment, costs incurred before diagnosis of KA, costs arising from unusual situations in public hospitals (such as the absence of a laboratory technician, shortages of IV sets, saline solution bottles, etc.), are factors raising medical costs.

The results demonstrate that economic access to health care services is an important issue in the physical access to health care services in Nepal. The catastrophic impact of medical costs of KA remains high, and it is the poor who are most likely to suffer from such catastrophic payments. Catastrophic indices of direct costs and total resource costs suggest that KA households divert regular consumption resources to health care expenditure. The unexpected expenses of KA treatment affect the present welfare and future wellbeing of household members through reduced consumption, reduced investment in education, nutrition, etc. Catastrophic payments may also impose behavioural changes, leading to a shift in treatment seeking from the formal to the informal health sector. Thus, the existing government provision of free care for KA is not sufficient to protect poor KA-affected households.

The empirical results indicate that household payments for KA treatment are dis-proportionately catastrophic for the poor. In spite of exemptions for the poor for KA treatment in hospital, the direct costs of treatment are still regressive, implying a greater burden on poor families than on those

better off. The poor lack information about the provision of cost exemptions, and there is no mechanism in the health system to identify those who are poor and qualify for exemptions.

The study shows that different estimates of catastrophic payment will result depending on how cost is measured. We used various cost components, such as total direct cost, total medical and travel cost, and medical cost, to shed light on which cost is responsible for catastrophic payment. Estimations of catastrophic payments found in the literature (Wagstaff and Van Doorslaer 2003; Xu *et al*. 2003) are based on medical costs. Because of this, such estimations tend to underestimate the magnitude of catastrophic payment. Using these different components, the study has shown that the magnitude of underestimation and distribution of such payments would be in the order of 15–22% if medical costs alone were used.

The results of the impoverishment impact analysis suggest that non-poor households are pushed into poverty because they incur a higher proportion of OOP payments for hospital-based KA care. This has a much greater impact on the poverty gap ratio and the severity of poverty than on poverty incidence. Hospital-based care for KA acts as a source of poverty deepening under these payment criteria. The results demonstrate that 20–26% of the non-poor fall into poverty due to hospital-based KA care, which is more than 10 times higher than the estimate for outpatient care in Nepal (Van Doorslaer *et al*. 2006).

In other words, the magnitude and the distribution of OOP payments appear to be the root cause of the present and future impoverishing consequences of KA (Alvar *et al*. 2006). To reduce OOP payments resulting from an incidence of KA, there are two alternatives: heavy public investment in curative services to improve access to information and treatment, or development of risk protection mechanisms through health insurance, particularly community health insurance schemes. These complementary mechanisms can protect households from the catastrophic and impoverishing impacts of KA. KA is a preventable disease, which was virtually eliminated as a consequence of malaria eradication activities launched during the 1950s. It re-emerged in 1980 in Nepal after the termination of the malaria eradication programme (Bista and Pokhrel 2003). Simultaneous implementation of curative and preventive programmes can eliminate KA (WHO/SEARO 2005; Alvar *et al*. 2006; Bhattacharya *et al*. 2006), which would save both households and public hospitals from unwanted costs. Thus, the eradication of KA is the most effective route to reducing the impoverishing and catastrophic impact that it creates.

Conclusions

This paper assesses the impact of health care payments incurred by households for an episode of KA; the magnitude and distribution of health costs in terms of catastrophic and impoverishment impact, and the economic consequences of coping mechanisms. The key findings of the paper are:

- The estimated direct cost of KA is 17% of average household income. This is high in comparison with under 10% of household income for other tropical diseases, such as tuberculosis and malaria (Onwujekwe *et al*. 2000; Russell 2004).
- The results suggest that the existing provision of KA care in Nepal has an impoverishing impact on households, which translates to 20–26% of non-poor people falling into poverty and both a higher poverty gap ratio and severity of poverty.
- The sampled KA households have borrowed loans totalling about 16% of their annual incomes. This suggests that loans are used mainly to finance the direct cost of KA treatment, with the poor borrowing more than those better off. Thus, both the amount of OOP payments for a KA episode and the method of financing used have a significant impact on the household economy.

The paper explores how Nepalese health policy fails to provide financial protection. The aforementioned empirical results, and other studies such as Alvar *et al*. (2006) and Sharma *et al*. (2006), suggest that KA is not only a disease of the poor but also a source of poverty itself. An episode of KA requiring hospital-based treatment imposes an economic burden on the household economy. Coping mechanisms such as loans have a more severe impact among resource-poor households than the actual OOP payments they incur. Under the burden of loan repayments, a KA-affected household can easily fall into a poverty trap, escape from which is unlikely with effort at the household level alone. In other words, the method of financing health care payments is an important ingredient in understanding the economic burden of the disease.

The issue of catastrophic and impoverishing health spending in Nepal should be a policy priority. Through our findings, we aim to draw policymakers' attention to this hidden aspect of poverty propagation and intensification, which is currently underestimated in Nepalese poverty analysis documents. This evidence will aid policy design, particularly in terms of protecting poor households from the financial risks of high OOP payments.

Acknowledgements

This investigation received financial support from the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Disease (TDR). This paper derives from a research study entitled 'Access to information, prevention and therapy of Kala-azar and its economic impact on the Households of Nepal'. Dr Nephil Matanig Maskay was Principle Investigator and Mr Shiva Raj Adhikari and Mr Bishnu Prasad Sharma worked as Health Economist and Social Scientist, respectively, in this research study. We would like to thank Owen O'Donnell, Ke Xu, Audie and Kathy Blevins, Kevin D Frick, Jason R Andrews, Devi Prasai and three anonymous reviewers for providing valuable comments on an earlier draft, with the errors being the sole responsibility of the authors. The views expressed are those of the authors and do not necessarily reflect the view of the Nepal Health Economic Association, Chulalongkorn University, Thailand, Tribhuvan University, Nepal, or any other author-affiliated institutions.

Endnotes

[1] The primary data were collected for a research study entitled 'Access to information, prevention and therapy of Kala-azar and its

economic impact on the Households of Nepal', funded by UNDP/World Bank/WHO Special Programme funds for Research and Training in Tropical Disease (TDR) (no. A30238).

[2] To get this figure, the estimated sample size is obtained by employing formula $N = Z^2(PQ)/e^2$ (Mahajan 1997: 93). Where Z = z value (1.96), P = prevalence rate (1.5%, Bista *et al*. 2004) (KA is a fatal disease so it is assumed that incidence rate is equal to prevalence rate), Q = 1−P and e = error (5% level, suppose), then the required sample size (N) = 23 KA households.

[3] This was similar to that used by the USAID Environmental Health Project (2001) for KA.

[4] The detailed methods of computation used in this paper are from the various technical notes provided on the World Bank website: http://www.worldbank.org/poverty/impact/health.

[5] STATA syntax 'sepov' is used to estimate the poverty index.

[6] The average buying exchange rate in 2002/2003 was 77.49 NRs = 1US$ (Nepal Rastra Bank 2007).

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