



PERGAMON

Accident Analysis and Prevention 35 (2003) 81–90

ACCIDENT
ANALYSIS
&
PREVENTION

www.elsevier.com/locate/aap

Economic consequences of injury and resulting family coping strategies in Ghana

Charles N. Mock^{a,b,*}, Stephen Gloyd^b, Samuel Adjei^a, Frederick Acheampong^a, Oscar Gish^b

^a Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

^b Harborview Medical Center, Harborview Injury Prevention and Research Center, University of Washington, Box 359960, 325 Ninth Avenue, Seattle, WA 98104, USA

Received 14 May 2001; received in revised form 27 September 2001; accepted 2 October 2001

Abstract

The toll of human suffering from illness and injury is usually measured by mortality and disability rates. Economic consequences, such as treatment costs and lost productivity, are often considered as well. Lately, increasing attention has been paid to the economic effects of illness on a household level. In this study, we sought to assess the economic consequences of injuries in Ghana by looking at the effects on households and the coping mechanisms these households employed. Using cluster sampling and household interviews, we surveyed 21,105 persons living in 431 urban and rural sites. We sought information on any injury that occurred to a household member during the prior year and that resulted in one or more days of disability time.

A total of 1609 injuries were reported for the prior year. Treatment costs and disability days were higher in the urban area than in the rural. Coping strategies were different between the two areas. Rural households were more likely to utilize intra-family labor reallocation (90%) than were urban households (75%). Rural households were also more likely to borrow money (24%) than were urban (19%). Households in both areas were equally likely to sell belongings, although the nature of the belongings sold were different. Although injuries in the urban area had more severe primary effects (treatment cost and disability time), the ultimate effect on rural households appeared more severe. A greater percentage of rural households (28%) reported a decline in food consumption than did urban households (19%). These findings result in several policy implications, including measures that could be used to assist family coping strategies and measures directed toward injuries themselves.

© 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Health economics; Injury; Cost of illness; Developing country; Coping; Household

1. Introduction

The burden of illness is usually assessed by mortality and disability rates (The World Bank, 1993; Murray and Lopez, 1996). Increased attention is now being focused on economic costs of illness. These include costs of treatment and costs of lost productive time on the part of the ill persons and those who care for them. Such costs are usually considered at a macro-economic level (Lee and Mills, 1985). However, several authors have pointed out the importance of looking at the household, in terms of the effect of the cost of illness and in terms of household coping strategies to deal with both time and financial costs (Jayawardene, 1993; Mills, 1994; Sauerborn et al., 1996a,b).

Such factors have been looked at both for medical problems in general and especially for the cost of illness due to malaria (Jayawardene, 1993; Mills, 1994; Asenso-Okyere

and Dzator, 1997; Attanayake et al., 2000). Scarce attention has been paid to the cost of injury. However, injury is a significant health problem in most less developed countries. Moreover, rates are anticipated to rise, primarily due to increased use of motorized transport (Smith and Barss, 1991; Zwi, 1993; Murray and Lopez, 1996).

A few studies have looked at the economic effects of injury. In large part such studies have looked at health service utilization as a proxy for associated costs (Mock et al., 1995; Zwi, 1993). Several studies have looked at actual costs of hospitalization for injuries (Zwi, 1993). A Malaysian study estimated costs of injuries nationwide based on per capita GDP and loss of life expectancy for fatalities (Arokiasamy and Krishnan, 1994).

One population based study stands out in its thoroughness. The costs of all illness in rural Brazil was looked at by deCodes et al. (1988). Direct costs of medical treatment were calculated from both health service sources and out of pocket payments by patients and their families. Indirect morbidity costs were calculated using days lost from work

* Corresponding author. Tel.: +1-206-521-1520; fax: +1-206-521-1562.
E-mail address: cmock@u.washington.edu (C.N. Mock).

multiplied by usual wages. They found that a large component of the cost of illness was due to indirect costs. In the United States, the ratio of indirect costs to the direct costs of medical treatment is estimated at 2.5–1 (Rice et al., 1989), but deCodes et al. found a ratio of 7–1 in their study. Injuries accounted for 25% of all costs, primarily because of its high cost of indirect morbidity (deCodes et al., 1988).

There have been almost no studies to assess the effects of injury on the household level, nor to address household coping strategies for dealing with these economic costs. The purpose of this current study was to perform such an assessment in Ghana. We sought to look at the monetary costs of treatment and of lost wages. We also sought to investigate the broader effects on the involved families and the coping strategies they employed. By so doing, we hoped to provide information that would help with development of policies to assist existing household coping strategies and ameliorate the economic impact of injury or illness on the involved families.

2. Methods

The urban area studied was the Kumasi Metropolitan Area in the Ashanti Region. This city, with a population of 650,000, is the second largest city in Ghana and the economic center of the northern two-thirds of the country. The rural area studied included all or portions of four contiguous districts of the Brong-Ahafo Region: Berekum, Jaman, Wenchi, and Dormaa. The rural study area comprised 7500 km² with a population of 425,000.

In Kumasi, the primary economic activities involve commerce, small scale trading, and a variety of small industries. In rural Brong-Ahafo, the majority of the population are employed in non-mechanized farming.

Data on injuries occurring in the study areas were obtained by an epidemiologic survey using household visits and interviews. The study methods have been presented in detail in prior publications (Mock et al., 1997, 1999a,b,c,d) and are briefly reviewed herein. Those selected to be interviewed were chosen using a two stage cluster sampling scheme (Lemeshow and Robinson, 1985; Bennett et al., 1991).

In the first stage of the sampling process in Kumasi, the individual enumeration areas (EAs), employed by the Ghana Statistical Service for the 1984 census, were listed by their populations. Individual EAs varied in population from 500 to 5000. Similarly, in the rural areas, the individual villages and towns were listed by their population. Populations varied from single individuals in isolated homesteads to towns with 20,000 persons. A subset of the EAs in the city and the villages/towns in the rural area were randomly selected for sampling with probability proportional to their population size (Lemeshow and Robinson, 1985; Bennett et al., 1991).

In the second stage of the sampling process, each selected EA and village/town was visited. A random location within each site was chosen and the nearest household to this

location was then selected. Household members were interviewed regarding any injuries that occurred to themselves or other household members during the preceding year. Information was obtained on any injury during the preceding year which resulted in one or more days of lost activity, including fatalities, occurring to persons who had been living in that household during the prior year. The study definition of injury included blunt injury, penetrating injury, and burns. It did not include poisoning or asphyxiation.

For those for whom there were no such injuries, demographic denominator information on the household was obtained. For those to whom an injury had occurred, a six-page questionnaire was verbally administered in the vernacular language (Ashanti Twi). This questionnaire concerned the injury sustained, the mechanism of injury, treatment obtained, cost of treatment, economic consequences of the injury to the individual and his/her family, and length of disability. Information was obtained from either the injured persons themselves or from their relatives if the injured person were absent or under age 18 year.

Field workers surveyed a minimum of 30 persons for the denominator at each site. In more sparsely populated areas, adjacent homesteads and hamlets were visited in addition to the selected site, as necessary to accrue a sufficient number of persons for that site. A total of 10% of sites were randomly chosen and revisited by the principal investigator (CNM) to confirm the findings of the field workers.

The *primary economic effects* of the injury included treatment costs for the injured persons. This consisted of out of pocket payments for all forms of treatment, including traditional practitioners, outpatient clinics, and inpatient and outpatient services at hospitals. It also included payments for supplies and medications, whether prescribed by a medical practitioner or purchased for self medication. Primary economic effects also included the time that the injured person lost from his/her usual activity (disability time). When this activity was wage labor, the percentage of persons who lost wage income was also estimated.

Coping strategies that were specifically asked about included intra-family labor reallocation, borrowing money, and pawning or selling belongings.

Secondary economic effects evaluated included decline in family income, decline in food production (rural only), and decline in family food consumption.

In addition to the above specific questions, injured persons and their families were also given the opportunity to discuss, in their own words, how the injury had affected their family and how they had dealt with the financial stress. The interviewers recorded verbatim or paraphrased and summarized these comments. Responses varied from one sentence to several paragraphs.

The socio-economic level of the urban respondents was categorized into high, medium, or low, based on housing type (Boapeah and Tipple, 1983). In rural areas, villages were ranked by degree of remoteness based on the transportation access of the village: 1 (most access): paved road; 2: major

unpaved road; 3: secondary unpaved road, indicating at least one motorized vehicle per day; 4: tertiary unpaved road, indicating motorized transportation less than daily or footpath access only.

Economic data have been converted from the local currency (cedis) and expressed as US dollars. Statistical analysis was performed using the χ^2 -test for categorical data and the unpaired Student's *t*-test and analysis of variance (ANOVA) for continuous data (Altman, 1991; Dean et al., 1995). The study was approved by the Ministry of Health of Ghana.

3. Results

3.1. Denominator surveyed

Data were obtained on 11,663 individuals in 263 separate sites in Kumasi and on 9442 individuals in 168 separate sites in the rural area.

In the urban area, 656 individuals (5.6% of those surveyed) reported 681 injuries that resulted in one or more days of loss of normal activity during the preceding year. In the rural area, 886 persons (9.4% of those surveyed) reported a total of 928 injuries. Among the reported injuries, there were 13 fatalities, including 8 in the urban area and 5 in the rural. For those persons who reported more than one injury in the preceding year, the economic effects of each are reported separately.

3.2. Primary effects

The mean out of pocket expenditure for treatment in the urban area was US\$ 31 ± 105 (S.D.) per injury. This was considerably lower in the rural area at US\$ 11 ± 58 ($P < 0.001$ versus urban).

For the nonfatally injured, the mean disability time in the urban area was 31.4 ± 51.1 day. This was slightly lower in the rural area at 26.4 ± 46.3 day ($P = 0.04$).

A total of 43% of the urban injured and 59% of the rural injured were reported to have been working for cash reimbursement (including farming) prior to the injury. A total of 39% of the urban injured and 32% of the rural injured were reported to be students prior to their injury. The remainder of the injured were housewives, unemployed adults, or children not attending school.

Among those who had been working prior to a nonfatal injury, the mean disability times reported were 43.3 ± 61.6 day for the urban group and 32.6 ± 53.5 day for the rural group ($P = 0.01$). The percentage of these disability days that consisted of actual lost work was not evaluated. However, among those who had been working prior to their injury, 72% of urban and 73% of rural injured reported lost income.

Among those who had been students prior to their injury, the mean disability times reported were 18.8 ± 26.3 day for the urban group and 15.5 ± 23.3 day for the rural group ($P = 0.1$). The percentage of these disability days that consisted of actual missed school was not evaluated.

3.3. Coping strategies

The most frequently reported coping strategy was intra-family labor reallocation. In both urban and rural locations, the great majority of injured persons reported at least one family member who took time off from their usual activity to assist the injured person or to perform the injured person's household, farm, or other activities (Table 1). The percentage of families reporting such labor reallocation was higher in the rural area (90%) than in the urban (75%, $P < 0.001$).

The days of lost activity on the part of these persons was approximately the same in both locations (Table 1). Furthermore, about one-third of such persons in each location reported loss of income as a result of the labor reallocation. In addition, about 5% of those who took time off from their usual activities were students who reported missing school as a result.

For urban and rural areas combined, 1524 specific individuals were reported to have taken time off from their usual activity to assist the injured person or to perform the injured person's usual tasks (553 urban and 971 rural). The category of relative who was reported most frequently was the mother (40%), followed by siblings (17%) and children (14%). The relatives who reallocated their labor were overwhelming female (81%) in both locations.

The overall economic effects of the injuries on the involved families are summarized in Table 2. As indicated above, the most frequently reported coping strategy was intra-family labor reallocation. The next most frequently reported coping strategy was borrowing money, which was utilized more frequently in the rural area (24% versus 19%).

Table 1
Effect of injury on individual relatives of injured persons

	Urban (<i>n</i> = 681)	Rural (<i>n</i> = 928)
At least one family member took time off from usual activity to help	504 (75%)	829 (90%)*
Loss of income to at least one such person	180 (36%)	320 (39%)
Days of lost work for above person (mean, S.D.)	26 (42)	22 (36)
Students missing school	24 (4%)	48 (5%)
School days missed, for students missing school (mean, S.D.)	33 (36)	10 (7)*

* $P < 0.001$.

Table 2
Economic effects on families of injured persons in Ghana: urban versus rural

	Urban (<i>n</i> = 681)	Rural (<i>n</i> = 928)	Significance
Primary effects			
Disability time (days: mean, S.D.) ^a	31.4 (51.1)	26.4 (46.3)	0.04
Money spent on treatment (US\$: mean, S.D.)	31 (105)	11 (58)	<0.001
Coping strategies			
Intra-family labor reallocation ^b	75%	90%	< 0.001
Borrow money ^b	19%	24%	0.02
Borrow amount (US\$: mean, S.D.)	66 (98)	22 (43)	<0.001
Still in debt ^b	9%	11%	N.S. ^c
Pawned, but did not sell belongings ^b	0.7%	1.3%	N.S.
Sold, but did not pawn belongings ^b	2.8%	2.5%	N.S.
Both pawned and sold belongings ^b	0.7%	0.8%	N.S.
Value of items sold (US\$: mean, S.D.)	165 (142)	35 (45)	<0.001
Secondary effects			
Family income decline ^b	40%	42%	N.S.
Family food consumption decline ^b	19%	28%	<0.001
Food production decline, rural only ^b		33%	

^a Excluding fatalities.

^b Percentage of answering yes.

^c Not significant: N.S.

The amount borrowed was significantly higher in the urban area however. About half of those who borrowed money were still in debt at the time of the interview, a mean of 4.3 ± 3.7 month after the injury.

The third most frequent strategy was selling of belongings, which was undertaken by about 3% of involved families in both locations. The value of the items sold was significantly higher in the urban area (Table 2). In addition, 1–2% of involved families indicated that they had pawned belongings as collateral for loans.

A total of 67 specific items (26 urban, 41 rural) were reported to have been sold or pawned. In the urban area, the most frequently sold/pawned items were clothing (38% of items) and televisions (23%). There were also two instances each (8%) of families selling a cocoa farm or the rights to a house for lease. Finally, there were one instance each (5%) of selling/pawning of: automobile parts, jewelry, shoes, typewriter, machinery, and miscellaneous trading items.

In the rural area, the most frequently sold/pawned item was food (61% of items). This was predominantly maize (39% of all rural items) and secondarily all other types of crops (22%). In only one instance was livestock (a goat) sold. There were also six instances (15%) of families selling/pawning cocoa farms (13%) or oil palm farms (2%). Other items sold/pawned in the rural area included: bicycles (7%), sewing machines (7%), clothing (5%), and miscellaneous trading items (2%).

3.4. Secondary effects

The net or secondary effects of the injuries are also shown in Table 2. The family income was reported to decline in almost half of urban and rural households. Food

production reportedly declined in one-third of rural households. Finally, 18% of urban families and 41% of rural ones reported a decline in food consumption. Although treatment costs and disability days were higher in the urban area, a higher proportion of rural families reported a decline in food consumption.

3.5. Factors influencing the economic effects

The primary factor influencing the economic effect of the injury was the injury's severity, as assessed by the length of the disability period. Injuries were classified as minor if they resulted in less than 30 day of disability and as severe if they resulted in 30 or more day of disability or were fatal. The effects of these two categories of injuries are indicated in Table 3. Disability time was different, as this was used in the definition of the categories. All other economic indicators were more pronounced in the more severe group, including treatment costs, labor reallocation, borrowing money, selling belongings, family income, and food consumption. All of the differences between minor and severely injured persisted when urban and rural groups were analyzed separately.

The influence of age of the injured person is indicated in Table 4. The disability period became progressively longer with increasing age. Almost all of the economic effects of the injury were more pronounced with increasing age, except labor reallocation. The differences between the various age groups remained for most categories when urban and rural groups were analyzed separately.

There were 724 injured females and 885 injured males in the study. There were no significant differences between the genders for any of the economic indicators in either urban or rural location.

Table 3
Economic effects on families of injured persons in Ghana: minor versus severe injuries

	Minor (<i>n</i> = 1151)	Severe (<i>n</i> = 458) ^a	Significance
Primary effects			
Disability time (days: mean, S.D.) ^b	8.8 (6.2)	77.7 (68.6)	<0.001
Money spent on treatment (US\$: mean, S.D.)	6 (13)	55 (150)	<0.001
Coping strategies			
Intra-family labor reallocation ^c	79%	93%	<0.001
Borrow money ^c	14%	41%	<0.001
Borrow amount (US\$: mean, S.D.)	13 (15)	59 (91)	<0.001
Still in debt ^c	39%	53%	0.015
Pawned, but did not sell, belongings ^c	0.3%	2.8%	<0.001
Sold, but did not pawn, belongings ^c	1.1%	6.3%	<0.001
Both pawned and sold belongings ^c	0.3%	1.7%	0.006
Value of items sold (US\$: mean, S.D.)	54 (111)	109 (121)	0.03
Secondary effects			
Family income decline ^c	32%	64%	<0.001
Family food consumption decline ^c	18%	41%	<0.001
Food production decline, rural only ^c	26%	54%	<0.001

^a Severe indicates disability time ≥ 30 days or fatality.

^b Excluding fatalities.

^c Percentage of answering yes.

The urban group was categorized into socio-economic levels based on housing type: low (35% of sample), medium (42%), and high (23%). There were only modest differences in the economic effects of injury on the different levels. Mean disability times and treatment costs were not significantly different, nor were the percentages of families engaging in labor reallocation or borrowing money. Poorer families were more likely to still be in debt at the time of the interview: low (11%) versus medium (7%) versus high (4%, $P = 0.03$). Households in the high socio-economic level were less likely to sell or pawn possessions (2.0%) than were households in the low and medium levels (5.9%;

$P = 0.05$). There were no significant differences between the groups for percentage of families reporting income or food consumption decline.

The rural group was categorized by degree of remoteness based on transportation access: paved road (28% of sample), major unpaved road (26%), secondary unpaved road (27%), and tertiary unpaved road (19%). The differences among the rural groups were more notable than for the urban. The economic effects reported by households in communities on all types of unpaved roads tended to be similar to each other and to be different than those on paved roads. Treatment costs were slightly higher for those living

Table 4
Economic effects on families of injured persons in Ghana, by age of injured person

	<15 year (<i>n</i> = 563)	15–59 year (<i>n</i> = 904)	>60 year (<i>n</i> = 142)	Significance
Primary effect				
Disability time (days: mean, S.D.) ^a	18.1 (32.9)	32.8 (52.5)	42.1 (63.1)	<0.001
Money spent on treatment (US\$: mean, S.D.)	11 (36)	21 (91)	39 (129)	0.007
Coping strategy				
Intra-family labor reallocation ^b	86%	82%	79%	0.06
Borrow money ^b	14%	25%	29%	<0.001
Borrow amount (US\$: mean, S.D.)	24 (43)	50 (158)	49 (84)	0.02
Still in debt ^b	34%	48%	58%	0.03
Pawned, but did not sell belongings ^b	0.4%	1.2%	2.8%	0.03
Sold, but did not pawn belongings ^b	1.6%	3.3%	2.1%	0.12
Both pawned and sold belongings ^b	0.2%	1.1%	0.7%	0.13
Value of items sold (US\$: mean, S.D.)	55 (74)	93 (116)	160 (210)	N.S. ^c
Secondary effects				
Family income decline ^b	26%	49%	50%	<0.001
Family food consumption decline ^b	14%	29%	38%	<0.001
Food production decline, rural only ^b	17%	40%	45%	<0.001

^a Excluding fatalities.

^b Percentage of answering yes.

^c Not significant: N.S.

on paved roads (mean US\$ 16 ± 99) compared with those on unpaved roads (US\$ 9 ± 32; $P = 0.09$). Intra-family labor reallocation was more likely to be used by those living on unpaved roads (92%) compared with those on paved roads (83%; $P < 0.001$). There were no significant differences in the tendency to borrow money or to pawn or sell belongings. However, when items were sold, they were of more value in the households on the paved roads (mean US\$ 71 ± 69) than in those on unpaved roads (US\$ 18 ± 12; $P = 0.01$). There were no significant differences between the groups for percentage of families reporting income or food consumption decline.

3.6. Qualitative descriptions

Respondents were given the opportunity to explain in their own words how the injury had affected their family and how they had dealt with the financial stress. The interviewers recorded verbatim or paraphrased and summarized these comments. Responses varied from one sentence to several paragraphs. In some cases, these descriptions served to reinforce the answers provided to the quantitative and close-ended questions. In other cases, these descriptions demonstrated economic and social effects that had not been measured otherwise.

3.6.1. Examples of statements that reinforced information provided by quantitative data

Use of existing savings was a frequent means of paying for treatment. In some cases such savings had been intended for other uses and their use for treatment represented a form of lost opportunity; “I used the money I had been saving to purchase a machine for work.” A frequent theme was: “We had to spend our trading capital on treatment.”

One of the most frequently commented upon effects was the opportunity costs of labor reallocation:

An aunt had to stop farming to look after him.

Both he and his mother lost money from missed trading.

A brother who stayed with him at the bonesetters (e.g. traditional healer) lost a year of school.

The company clinic treated me for free, but my mother lost time from paid work to care for me.

The terms of borrowing money were discussed by some. Several indicated difficulty getting credit: “I had difficulty even getting a loan for treatment.” The study asked about pawns and collateral for loans. However, sometimes these were not possessions: “The money lender gave us land to weed to cover the loan.”

The items sold or pawned were usually given in the open-ended comments section. In many instances the family members expressed an understanding that the selling of their possessions represented a loss of their asset base and their buffer against future hardship; “We sold the maize we were saving in case of famine.”

Numerous quotes from the rural area reflected the effect upon agricultural output:

Our cocoa farm was left unattended and went to bush.

We could not make the usual size of the farm.

The farm was at the seedling stage, and got destroyed due to inability to work it.

3.6.2. Examples of statements that demonstrated economic and social effects that had not been otherwise measured

“We had to hire a laborer for the farm.” Several people indicated hiring labor rather than or in addition to intra-family labor reallocation. The study did not directly measure such economic costs, but included them in the category of decrease in family income.

Several people indicated they had been helped by acts of charity by non-family members: “The church has been helping to care for me.” “I was given food by the other tenants, as I lived alone.” However, several times such charity had to be requested, with resultant social stigma and evident emotional distress: “I had to beg for food.”

In addition to loans, other forms of credit were utilized: “Treatment at the clinic was given on credit.” “His boss, the chief watchman, is paying the bills. We are uncertain of the amount of the debt.”

Even if the intra-family labor reallocation did not result in direct financial loss, it was evident that such shifts in labor might have resulted in loss of attention to other important duties, such as housework, and may have depleted the physical reserve of family members:

Others had to work much more in the house and on the farm.

My wife had to work extra hard to feed the rest of the family.

Children had to walk to school instead of using a vehicle.

Likewise, some wage earners in the formal sector did not lose wages, but their productivity and job security were affected. “I continued to receive pay as a teacher, but my students were affected.” “My son took time off work to care for me and as a result nearly was fired.”

Many brought up the potential long-term effect of the injuries. This was particularly notable as regarded children’s education. The mean days of lost school time have been noted above. However, not recorded in these numbers are those who completely dropped out. “My daughter withdrew from school to help.” Likewise, loss of financial security continued to make long-term education difficult: “Our children’s education is now difficult.”

Long-term employment security was also effected. An injured taxi driver stated: “The car owner did not give me my job back after the accident.” Another injured man stated: “I am now able to work, but I have lost my job because of the injury.” Several reiterated this theme. A few also indicated

the injury had resulted in lost opportunity for advancement: “I missed an important police enlistment opportunity.”

Several persons also indicated economic effects that were real but that were difficult to assess. “Her mother closed the store earlier than usual to care for her.” “Shoes are made in large numbers and sold later. Hence, the effects were not well defined.”

4. Discussion

The purpose of this study was to assess the economic effects of injury at the household level in Ghana. Before discussing the results and drawing conclusions from the data, the limitations of the study methodology must be addressed.

First, the study relied on self-report by respondents. There was no way to independently validate answer veracity. This is less likely to be a problem for mechanism of injury and health care utilization. However, it is more likely to be a problem for the more subjective data such as disability time and economic consequences.

Second, the socio-economic status of households was approximated using housing type in the urban area and degree of geographic remoteness in the rural area. These categorizations have been previously shown to correlate well with health service utilization patterns (Mock et al., 1997). However, they are very rough indicators of socio-economic status, which may explain why only limited differences in economic effect were detected among the groups.

Third, approximately 0.5–1 h was taken for each interview with an injured person or their relatives. Hence, interviews were less lengthy and most likely less in-depth than some other studies on this topic (Jayawardene, 1993; Mills, 1994; Sauerborn et al., 1996a,b; Attanayake et al., 2000). However, the fact that this study was performed with a population based survey allowed us to look at the entire spectrum of economic costs, from minor to catastrophic. The large number of subjects (1609) who were randomly selected allows quantitative analysis of economic coping strategies on a population-wide basis. Moreover, the study was able to look at a large group of severely injured (458), for whom a greater amount of detail on coping strategies was forthcoming.

Despite these limitations, the data presented do allow us to draw some inferences about the economic effects of injury and the resulting family coping strategies. In terms of primary effects, the study has shown the high potential cost of disability time. Even considering labor at the Ghanaian minimum wage equivalent to US\$ 1 per day, the disability time incurred by the injured persons alone would be considered of higher economic value than the money spent on treatment, especially in rural areas. The economic costs of missed opportunity by persons who took time off to care for the injured persons (Table 1) were of almost equal magnitude. In Brazil, deCodes et al. also found that the indirect costs of lost productivity were substantially larger than

the direct costs of medical treatment (deCodes et al., 1988). Likewise, Asenso-Okyere and Dzator, in looking at malaria in Ghana, showed that the opportunity costs to caretakers accounted for the major opportunity costs, as the majority of the ill persons were children (Asenso-Okyere and Dzator, 1997).

In terms of coping strategies, the study identified the primary strategies used by families of injured persons in Ghana to be intra-family labor reallocation, the use of loans, and the sale of assets. In a similar study, Sauerborn et al. (1996a,b) looked at the economic costs of illness and resulting household coping strategies in Burkina Faso. They identified strategies for coping with time costs: intra-household labor substitution; change in capital-labor mix; hiring labor; and free labor. They also identified strategies for financial costs: mobilizing savings; asset sales; loans; income diversification; wage labor; free care; and gifts. The coping strategies uncovered in the current study are similar to most of the strategies categorized by Sauerborn et al. In both studies the main coping strategies for time costs were intra-household labor substitution. Also in both studies, mobilization of savings was the primary means of meeting financial costs. Most households were able to meet the financial cost of treatment and disability time without borrowing money or selling belongings.

When savings were exhausted in the Burkina Faso study, the next most common means of meeting the financial costs were asset sales (Sauerborn et al., 1996a,b). In Ghana, however, loans were more commonly used. Loans were used at least 5 times more commonly than selling of belongings (Table 2). This was true even for severe injuries (Table 3).

When assets were sold or used as collateral for loans in Ghana, the most commonly used items in the rural area were foodstuffs, primarily maize. In the urban area, the most commonly used items were clothing and televisions. In Sauerborn's study the assets most commonly sold or used as collateral for loans were livestock. The difference in asset mobilization between the current study and Sauerborn's most likely represents the difference in the predominant economic activities in the study areas (Sauerborn et al., 1996a,b).

Similar issues have been addressed for household coping strategies in the face of economic hardships and famine (Cutler, 1986; Corbett, 1988; Gibbons and Garfield, 1999). In a review of famine coping strategies, Corbett reported a sequence of strategies. The first phase involved development of alternative sources of income which did not cut into productive capabilities. This included sales of nonproductive assets, such as clothing, jewelry and small livestock. The second stage included sales of key productive assets, such as oxen used in plowing fields or other large livestock. The third phase consisted of destitution and approaching starvation, when the subsistence base of the household was severely depleted (Corbett, 1988). In the rural area in the current study, far more persons sold food items and a variety

of other non-productive possessions, and very few sold productive assets such as farmland. In the urban area, only rare persons sold items that could be considered productive assets.

Despite the various coping mechanisms utilized, a significant percentage of families in the current study reported deleterious secondary effects, including decreased food production and consumption. Sauerborn et al. also showed that most families reported a decrease in agricultural productivity in the Burkina Faso study (Sauerborn et al., 1996a,b). Likewise, Over et al., in reviewing the evidence of several studies on related topics, found that substitute labor usually did not fully compensate for the missing labor of the ill person (Over et al., 1992).

The coping strategies discussed in the current and related papers (Over et al., 1992; Jayawardene, 1993; Mills, 1994; Sauerborn et al., 1996a,b; Asenso-Okyere and Dzator, 1997) are obviously necessary to meet the challenges of treatment costs and the loss of labor of the injured or ill person. However coping strategies incur their own costs. Jayawardene and Over et al. reported a high rate of indebtedness after major illnesses in the family (Over et al., 1992; Jayawardene, 1993). In the current study, almost half of those who had borrowed money were still in debt at the time of the interview. The loss of the asset base for those who depleted savings or sold belongings would be anticipated to leave them more vulnerable to future economic insults (Sauerborn et al., 1996a,b). This was well brought out by the respondent in the current study who stated "We sold the maize we were saving in case of famine."

One might also anticipate a negative effect of the shift of activities (Over et al., 1992). In the current study, the loss of wages for at least one-third of those who took time off to care for the injured person is straightforward. However, the net effect of the loss of labor of housewives, unemployed adults, or children is less straightforward. Whether or not officially employed, these persons contribute to the health and well-being of the household by numerous chores including fetching of water and firewood, cleaning, food preparation, and child rearing. The long-term effect of the decrease in the availability of these activities to the household is difficult to gauge, but potentially serious. For example, in a study in the Gambia, Chambers found that a decrease in time spent on household chores by women was associated with an increased infant mortality rate (Chambers, 1982; Over et al., 1992).

The effect upon the education of children who took time off from school either to care for ill or injured persons or to make up for their lost labor must also be considered. Prior studies have not suggested this to be a major problem (Over et al., 1992; Mills, 1994). However, the current study suggests otherwise. A total of 5% of both urban and rural households reported that students missed school as a result of labor reallocation. Moreover the anecdotal reports in this paper indicate that several students had to completely withdraw from school to meet the economic needs of the

household. In addition, a fair number of apprentices in trades lost time from their vocational training.

The gender of the injured person had minimal effect on the economic outcome of the injury. However, the vast majority of persons who took time off from their usual activities to care for injured persons or to contribute to their usual activities were women. This is likely to have significant implications in a location such as Africa, where a substantial amount of food production is done by women (Green, 1990).

Prior studies looking at coping strategies, either for illness or famine, have focussed almost exclusively on rural areas (Cutler, 1986; Corbett, 1988; Jayawardene, 1993; Mills, 1994; Sauerborn et al., 1996a,b; Asenso-Okyere and Dzator, 1997). Despite generally higher urban living standards, 19% of urban families in the current study reported a decline in food consumption. Although the items sold or pawned were different, the overall pattern of coping strategies in the two areas were fairly similar.

In the current study, we used a schema of primary effects and coping strategies, with the ultimate or secondary effect on the household being assessed by food production and consumption. Obviously, these have further effects on the potential for morbidity and mortality of household members. However, the decrease in food consumption may also be a coping strategy as well as an ultimate effect. In her review of famine coping strategies, Corbett reported that food rationing occurred in the early stages, usually before sale of productive assets (Corbett, 1988).

The economic costs of the illness and the resulting family coping strategies have several policy implications. Sauerborn et al. discussed several policy changes which would help to reduce the economic impact of illness on involved families (Sauerborn et al., 1996a,b). These include: increasing asset buffers; income diversification; use of rural credit; schemes to help finance health care, such as pre-payment; increasing geographic availability of health care to decrease time costs; and identification of high-risk households. In the current study, borrowing was the major financial coping mechanism aside from use of household savings. It is difficult to know to what extent some families' coping strategies were limited by lack of available credit or lack of sufficient collateral to obtain credit. Several respondents did indicate difficulty obtaining credit in the open-ended questions. Hence, Sauerborn et al.'s strategies of use of rural credit and schemes to help finance health care stand out as potential means to lessen the economic impact of illness in the study area.

Another policy implication has been brought out by Pryer (1989). He showed a strong relationship between the health of breadwinners and the nutritional status of children. In his study, 40% of severely malnourished children in a Bangladeshi slum were from households in which a breadwinner had been incapacitated by illness or injury. He concluded that non-governmental organizations and international agencies that target child health needed to reorient

their health programs to cover all household members (Pryer, 1989). The current study provides corroborating evidence for Pryer's position, given the significant percentage of families of injured persons that reported a decline in household food consumption.

5. Conclusions

This study identified the primary economic coping strategies used by families of injured persons in Ghana to be intra-family labor reallocation, the use of loans, and the sale of assets. The economic effects of illness in general probably would be fairly similar in the study area. Hence, the study sheds further light on family coping mechanisms in the study area, which are somewhat different from those reported elsewhere in the world (Mills, 1994; Sauerborn et al., 1996a,b).

Finally, this study draws attention to injuries as a health problem. Although it does not show the relative cost of different illnesses in comparison to injury, it nonetheless shows that injury has a definite, widespread and potentially severe economic cost to families of injured persons. This study thus adds further evidence to the need to develop strategies for injury control, including both prevention and cost effective treatment, in the context of less developed countries.

Acknowledgements

This study was funded by a grant from the American Association for the Surgery of Trauma. The authors thank: Mr. nii-Odei of the Ghana Statistical Service for preparation of maps for the survey work; Dr. Samuel Forjuoh, Dr. Thomas Koepsell, Dr. Ronald Maier, and Dr. Frederick Rivara, for their advice on study design; Mr. A. Yeboah for his assistance with translation of the questionnaire; and Mr. Francis Arthur for his assistance with transportation and logistics for the rural field work. We also thank the District Directors of Health Services and/or Primary Health Care Coordinators for their help with the conduct of the field work in each of the rural districts: Dr. A. Ofosu (Berekum), Mr. F. Amponsah (Jaman), Dr. K. Yeboah-Antwi (Wenchi), and Dr. K. Antwi-Agyei (Dormaa).

References

- Altman, D.G., 1991. *Practical Statistics for Medical Research*. Chapman & Hall, London.
- Arokiasamy, J.T., Krishnan, R., 1994. Some epidemiological aspects and economic costs of injuries in Malaysia. *Asia Pac. J. Public Hlth.* 7, 16–20.
- Asenso-Okyere, W.K., Dzator, J.A., 1997. Household cost of seeking malaria care: a retrospective study of two districts in Ghana. *Soc. Sci. Med.* 45, 659–667.
- Attanayake, N., Fox-Rushby, J., Mills, A., 2000. Household costs of malaria morbidity: a study in Matale district, Sri Lanka. *Trop. Med. Int. Hlth.* 5, 595–606.
- Bennett, S., Woods, T., Liyanage, W.M., Smith, D.L., 1991. A simplified general method for cluster-sample surveys of health in developing countries. *World Hlth Stat. Q* 44, 98–106.
- Boapeah, S.N., Tipple, A.G., 1983. Estimating housing stock in a third world city: a method used in Kumasi. *Third World Planning Rev.* 5, 177–188.
- Chambers, R., 1982. Health, agriculture, and rural poverty: why season matters. *J. Dev. Stud.* 18, 217–238.
- Corbett, J., 1988. Famine and household coping strategies. *World Dev.* 16, 1099–1112.
- Cutler, P., 1986. The response to drought of Beja famine refugees in Sudan. *Disasters* 10, 181–188.
- Dean, A.G., Dean, J.A., Coulombier, D., Brendel, K., Smith, D., Burton, A.H., et al. 1995. *Epi Info, Version 6: a word processing, database, and statistics program for public health on IBM-compatible microcomputers*. Centers for Disease Control, Atlanta.
- deCodes, J., Baker, T.D., Schuman, D., 1988. The hidden costs of illness in developing countries. *Res. Human Capital Dev.* 5, 127–145.
- Gibbons, E., Garfield, R., 1999. The impact of economic sanctions on health and human rights in Haiti, 1991–1994. *Am. J. Public Hlth.* 89, 1499–1504.
- Green, R.H., 1990. The human dimension as a test of and a means towards Africa's economic recovery and development. *The Human Dimension of Africa's Persistent Economic Crisis*. Hans Zell Publishers, London, pp. 1–8.
- Jayawardene, R., 1993. Illness perception: social cost and coping-strategies of malaria cases. *Soc. Sci. Med.* 37, 1169–1176.
- Lee, K., Mills, A., 1985. *The Economics of Health in Developing Countries*. Oxford University Press, Oxford.
- Lemeshow, S., Robinson, D., 1985. Surveys to measure programme coverage and impact: a review of the methodology used by the expanded programme on immunization. *World Hlth. Stat. Q* 38, 65–75.
- Mills, A., 1994. The economic consequences of malaria for households: a case-study in Nepal. *Hlth. Pol.* 29, 209–227.
- Mock, C.N., Adzotor, K., Conklin, E., Denno, D., Rivara, F., 1995. Admissions for injury at a rural hospital in Ghana: prospects for prevention. *Am. J. Pub. Health* 85, 927–931.
- Mock, C., Maier, R.V., nii-Amon-Kotei, D., 1997. Low utilization of formal medical services by injured persons in a developing nation. *J. Trauma* 42, 504–513.
- Mock, C., Acheampong, F., Adjei, S., Koepsell, T., 1999a. The effect of recall on estimation of incidence rates for injury in Ghana. *Int. J. Epidemiol.* 28, 750–755.
- Mock, C., Amegashie, J., Darteh, K., 1999b. Role of commercial drivers in motor vehicle related injuries in Ghana. *Inj. Prev.* 5, 268–271.
- Mock, C.N., Abantanga, F., Cummings, P., Koepsell, T.D., 1999c. Incidence and outcome of injury in Ghana: results of a community-based survey. *Bull. WHO* 77, 955–964.
- Mock, C.N., Forjuoh, S., Rivara, F., 1999d. Epidemiology of transport-related injuries in Ghana. *Accid. Anal. Prev.* 31, 359–370.
- Murray, C.J., Lopez, A., 1996. *The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries and Risk Factors in 1990 and Projected to 2020*, Vol. 1. Harvard University Press, Cambridge.
- Over, M., Ellis, R.P., Huber, J.H., Solon, O., 1992. *The consequences of adult ill-health. The Health of Adults in the Developing World*. Oxford University Press, New York, pp. 161–207.
- Pryer, J., 1989. When breadwinners fall ill: preliminary findings from a case study in Bangladesh. *Institute Dev. Stud. Bull.* 20, 49–57.
- Rice, D.P., MacKenzie, E.J., Associates, 1989. *Cost of Injury in the United States: A Report to Congress*. Institute for Health and Aging,

- University of California and Injury Prevention Center, The Johns Hopkins University, San Francisco.
- Sauerborn, R., Adams, A., Hien, M., 1996a. Household strategies to cope with the economic costs of illness. *Soc. Sci. Med.* 43, 291–301.
- Sauerborn, R., Nougara, A., Hien, M., Diesfeld, H.J., 1996b. Seasonal variations of household costs of illness in Burkina Faso. *Soc. Sci. Med.* 43, 281–290.
- Smith, G.S., Barss, P., 1991. Unintentional injuries in developing countries: the epidemiology of a neglected problem. *Epidemiol. Rev.* 13, 228–266.
- The World Bank, 1993. *World Development Report 1993: Investing in Health*. Oxford University Press, New York.
- Zwi, A., 1993. The public health burden of injury in developing countries. *Trop. Diseases Bull.* 90, R5–R45.