ECONOMIC COSTS OF PODOCONIOSIS IN WOLAITA ZONE, SOUTHERN ETHIOPIA

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LIST OF ABBREVIATIONS

CHA: Community Health Agent

HH: Household

MFTPA: Mossy Foot Treatment and Prevention Association

NGO: Non-Governmental Organization

OR: Odds Ratio

SD: Standard Deviation

SNNPR: Southern Nations, Nationalities and Peoples' Region

SPSS: Statistical Package for Social Sciences

(T)TBA: (Trained) Traditional Birth Attendant

US$: United States' Dollar [Exchange rate: 1 US$=8.6 *Birr*]

WHO: World Health Organization

X^2_{MH}: Mantel-Haenszel Summary Chi-square

ABSTRACT

Podoconiosis is endemic non-filarial elephantiasis mostly affecting barefooted-rural farmers in countries of tropical Africa, Central and South America, North India, Cameroon and Sri Lanka. In Ethiopia the condition is more prevalent than any other African country. In areas of red clay soil the disease is common mainly in the economically active age group. Even so, little attention has been given to it and there have not been any studies on the economic burden of podoconiosis.

The overall objective of this study was to estimate podoconiosis-related direct and productivity costs in Wolaitta zone, SNNPR, Ethiopia.

The study was undertaken in Wolaitta zone, SNNPR, using quantitative matched comparative cross-sectional study complemented by qualitative key informants' interview on 702 study subjects. Cost estimation was based on the societal perspective for cost analysis, the human capital approach to estimate productivity losses and the prevalence-based model as a time frame. Data were entered into EPI-INFO V.6 and exported to SPSS V.11 for matched pair analysis.

The opportunity cost of time lost by patients and care-takers accounted for the major component (72.1%) of patient-side cost. The average patient-side cost was 97.6 *Birr* (US$ 11.35) per patient. The actual out-of-pocket expenses over the three months period form 6% of the overall quarterly expenditure of households

of the studied patients per annum. When projected over one year, the total direct costs amount to 1233.40 *Birr* (US$ 143.42) per patient.

It was also found that most patients did not completely stop work, but spent only 3.56 ± 2.87 hours per day on economic activity compared to 6.52±2.53 hours worked by controls ($p<0.001$). Female patients spent 3.45 hours less on domestic activity compared to their matched controls ($p<0.001$). The total productivity cost comes to 538.86 *Birr* (US$ 62.658) per patient per year. Regression analyses revealed that total absenteeism and total working hours spent on economic activity were significantly influenced by the presence of the disease and by sex. The presence of the disease and household expenditure significantly influenced total absenteeism from domestic work. In addition, the presence of disease, marital status and 'kebele' type significantly determined the number of hours spent on domestic work. Based on the results, some recommendations were forwarded.

1. INTRODUCTION AND STATEMENT OF THE PROBLEM

Podoconiosis (endemic non-filarial elephantiasis) is non-infective, usually crystalline blockage of the limb lymphatics, almost always affecting the lower limbs, especially the feet. It is widely distributed in a number of countries of tropical Africa, Central and South America, North India, Indonesia, Colombia, Ecuador, Brazil and Sri Lanka [1, 2, 3].

It is mostly a disease of agrarian people who work bare foot, particularly on red clay soils of volcanic areas [1, 2]. Studies showed that it is related to the distribution of red clay soil derived from volcanic rocks, particularly basalt. It occurs mostly at high altitude (over 1200 meters), which governs the type of soil produced. The predominance of basalt or basalt-like lava in such areas is thought to be significant. The association between tropical red-clay soil and the occurrence of non-filarial elephantiasis has been tested in East African regions of Kenya, northwestern Tanzania and Ethiopia, and in volcanic areas of Rwanda [4].

In Ethiopia the basalt area covers more than 200,000 Km^2; the fertility of the soil attracts an agricultural population of 20.5 million people [4]. Hence, Ethiopia is one of the countries in which podoconiosis is an important public health problem in endemic areas of red clay soil like Wolaita zone, where the prevalence of the condition is over 5% [3]. Many patients of the zone do not go to government institutions. The Mossy Foot Treatment and Prevention Association (MFTPA) is a local NGO working in Wolaita zone on the prevention and treatment of

podoconiosis. It has been continuously expanding its service since its establishment in May 1998. Many patients in the zone use the services as much of it is available for a nominal fee or for free. It is financially and technically supported by different voluntary funding agencies worldwide. Currently, it is engaged in preventive activities like health education, shoe and sock distribution and training of patients in making 'cost-effective' shoes. It also provides outpatient care at its 10 service delivery sites and surgical operation in Wolaita Hospital.

In a traditional Public Health approach, health problems are usually weighed by measuring their occurrence (incidence and prevalence), seriousness (mortality) and overall weight (costs) [5] . Data on the economic costs of a disease are necessary to give priority to its control [6] and to inform choices in resource allocation by estimating the relative resource consequences of health problems. In general, such studies are concerned with the costs of resources foregone due to the illness and which would be avoided if the illness were absent-'the avoidable costs' [5] . The three main steps employed in costing are identification, measurement and valuation of costs foregone due to an illness [7] . Thus, cost of illness studies can help to improve understanding of the burden of a health problem by policy makers, health managers and the society [5] .

2. REVIEW OF LITERATURE

2.1. Factors in the development of podoconiosis

A possible etiology of podoconiosis was suggested by earlier studies of lymphatic tissues using analytical electron microscopy, in conjunction with various other techniques in Ethiopia and elsewhere. It was postulated that accumulation of inorganic materials of volcanic origin, particularly Silicon and Aluminum, either directly or together with other factors, is responsible for non-filarial elephantiasis of the lower legs [8 -12] .

Earlier observations in the East African countries of Ethiopia, Kenya and north-west Tanzania confirmed that non-filarial elephantiasis occurs on soil originated from volcanic rocks which include basalt at altitudes greater than 1500-2000 meter [13, 4] . Similar observations in tropical Africa showed that four features of the environment are common to all areas of high prevalence: high altitude (>1000 meter) with high rain fall (>1000mm annually); red clays which are very slippery when wet and very adherent if allowed to dry on the skin; the volcanic nature of the parent rock from which the soil developed; and the fact that the volcanism is of alkaline type [14] .

The possibility of a familial factor of bilateral non-filarial elephantiasis of the lower legs was indicated after a study of families for evidence of a hereditary trait in Ethiopia. The data indicated the possible existence of an autosomal recessive trait as a factor in the disease [15] .

2.2. Geographic distribution in the world

Podoconiosis is widely distributed in many areas of the world. Yet, recognition of the worldwide distribution of the disease has been delayed by many factors. Unlike filarial elephantiasis it is not reported in medical statistics; furthermore, patients commonly refrain from seeking treatment in the absence of an effective remedy [16].

It occurs in Africa, Central America, northern South America, Colombia, Ecuador, Brazil, Indonesia, northwest India, and Sri Lanka. It is seen in susceptible families of bare-footed farmers in well-defined fertile volcanic highland zones of these areas, and also in the lowlands irrigated by rivers from these highlands [2,17].

2.3. Distribution in some African countries

Podoconiosis is most prevalent in Africa and especially in the higher altitude regions of eastern, central and western parts of the continent. In Africa the disease is said to be highly prevalent in the highlands of Angola, Mozambique, and Madagascar [2,17]. Using the method of market counts, a total of 26,602 adults were observed in 23 markets for non-filarial elephantiasis of the lower legs in Rwanda and Burundi in Central Africa. Among these, 189 (7.10/1000) elephantiasics were observed. In addition, 264 cases from specially arranged clinics and a further 77 while traveling were observed. Prevalence per thousand adults varied from 0.0 to 20.7. The observations showed that the disease occurs

in bare footed people who work on soil of volcanic origin, under tropical conditions at altitudes around 1500 meters [18].

A study done in the Cameroon highlands, in West Africa, showed that the prevalence of elephantiasis does follow closely the distribution of the red clay area, mainly above 1000 meters altitude. Mineral analysis of the lymph nodes showed that silicon and aluminum were the most prominent elements with significantly higher silicon content relative to aluminum in the elephantiasics compared to the normals. Generally, climatic, geological and soil characteristics were similar to those in east Africa [1]. Another study in Cameroon showed that in elephantiasic areas, clay content is more than twice that of non-endemic areas tested. Although no notable elemental difference between the nodes of elephantiasics and non-elephantiasics was observed, heavy mineral load was clinically noted within greatly enlarged nodes of patients [19].

In the Mount Elgon area of Uganda elephantiasis was observed in all age groups from 10 years and above. The overall prevalence was 4.5%, and the prevalence among individuals aged 20 years and above was 8.2%. Both sexes were equally affected. The low hydrocele to elephantiasis ratio, the absence of filarial infection in human and mosquitoes, the high altitude (1500-2200 meters above sea level) and the volcanic soil type indicated that elephantiasis of the area is most likely due to podoconiosis [20]. A hospital-based study of 30 patients with elephantiasis of the lower limbs in the middle of Tanzania showed that the disease is not of

filarial origin and that non-filarial elephantiasis is present in the Central District of Tanzania [21].

2.4. The context of Ethiopia

The presence of elephantiasis of the lower legs of unknown cause in Ethiopia has been recognized for a number of years [22]. Podoconiosis is more prevalent in Ethiopia than in any other part of Africa and is spread over a larger area [23]. Earlier studies, between 1935 and 1940, of numerous cases of elephantiasis in Shoa, the then central province of Ethiopia, revealed no microfilaria in the peripheral blood taken either by day or by night. Similarly, no microfilariae were detected in 50 cases of elephantiasis examined in Harar province [24].

A report on 19 cases in Addis Ababa observed between 1952 and 1954 and 13 patients in Kenya from 1955 to 1958 showed lymph edema of the lower legs, never extending above the knee. In Ethiopia, the disease had more prevalence in men (15/19) than in women (4/19). No human filaria was present in the regions of origin of the patients and no microfilariae were found in blood, tissue smears, and sections of lymph glands [25].

In 1969 Oomen did market place counts for elephantiasis of the lower legs in 56 places on persons over 15 years of age. It was found that elephantiasis of the legs is common in nearly all places studied. Of the 247,908 persons counted 2.72% (6770) had elephantiasis of one or both legs. In Soddo town 1405 (8.79%) of 15, 963 counts had elephantiasis of the legs, which was the highest

rate found in the country. Yet, no onchocerciasis was found and no microfilariae were reported in a mission hospital in Soddo in more than 30 years, which made the presence of *W. bancrofti* unlikely [24] .

It was also reported that only one man among 298 cases studied stated that he had always worn shoes since the age of 6. Both sexes were equally affected, and in about ⅔ to ¾ of the cases the condition was bilateral. Bilateral affection seemed to be more common in south-west than in central Ethiopia. Age at onset of the disease was between 6 and 55 years. Onset between the ages of 20-24 was most common [24] . The author also reported that elephantiasis of the legs is mainly a disease of the 'Woina Dega', the area between 1000 and 2000meters. Persons of the lowest social class are more often affected, and possibly the condition is more common in rural than in urban populations. Finally, it was stated that onchocerciasis cannot be an important cause of elephantiasis of the legs in Ethiopia [24] .

A rapid survey of non-filarial elephantiasis of the lower legs by school enquiry method in 17 towns in 1972 gave a positive correlation ($r=+0.32$) with the results obtained in the market counts of 90,612 people in the same areas ($p<0.001$) [26]. The other market count of 34, 085 people in Wolamo District (now renamed as Wolaita zone) in 1973 showed that the prevalence is not uniform throughout, but varied from 2.48% to 6.9%. There was also a rapid drop in prevalence as one moved off the red soil area. Immediately outside the district the prevalence fell to

0.79-1.02%. There was significantly more elephantiasis among those not using foot wear [27].

An epidemiological survey involving enquiry of rural health units, schools and markets yielded the number of Ethiopians of age 15-59 with podoconiosis in the rural population as approaching between 200,000 and 350,000. This represents 10-17 per 1000 of the total rural population. The sudden drop in prevalence at the edges of the affected areas was also noted [22].

According to a survey by Mengistu G. et al in 1987 in Ocholo, south-west Ethiopia, 5.43% (146/2,689) had elephantiasis of the lower legs. Of these, 6 (4.11%) had unilateral and the rest 140 (95.89%) had bilateral swelling of the lower legs. The majority of the patients (80.82%) were females and the rest 19.18% were males. The youngest patient was a nine year old girl, and the oldest was an eighty year old male. It was also found that 72.6% of the cases were between the ages of 31 to 60 years. Most (89%) of the patients were engaged in four main jobs: spinning, farming, marketing and weaving. The majority of Ocholo people went bare foot. They claimed that the disease started when they were between 20 and 30 years old. The duration of the health problem ranged between 1 year and 45 years. The authors finally pointed out that environmental factors could be the predisposing factors for the unusually high prevalence of elephantiasis [28].

Later, mineral analysis of soil collected in different places of Ocholo village showed that silicon, aluminum and iron form 75% of the major elements and the content of some of the trace elements (beryllium and zirconium) is significantly greater (double) than soils sampled from neighboring areas where the prevalence of podoconiosis is low. It was thus concluded that year-long exposure of unprotected feet to such elements is responsible for the development of elephantiasis [29] .

In 1992 Kloos et al studied the epidemiology of podoconiosis in the resettlement schemes of Gera and Didessa in Western Ethiopia. Podoconiosis was present in 10 (5.2%) of 194 settlers and in 21 (9.5%) indigenous people. Prevalence was higher in indigenous (9%) people than settler populations (1%) in Didessa but not in Gera (10% and 9.5%). The prevalence was higher in males (8.5%) than females (7.8%) in three of the four study communities. Prevalence rates and degree of debility generally increased with age, reaching the highest levels in the above-60 group. The youngest patients were an 11 year old girl and a 12 year old boy in Didessa. Affected people said that they first noticed symptoms between the ages of 9 and 54 years. Six of the 194 settlers (3%) and 23 of the 222 indigenous people (10%) reported that other members of their households had swollen feet and legs ($p<0.001$). Only one (2.7%) of the 37 persons allegedly wearing shoes regularly but 29 (7.7%) of the 379 individuals not wearing shoes were affected ($p<0.001$) [30] .

The most recent survey on podoconiosis in Ethiopia was conducted in 2001 in Wolaita zone, Southern Ethiopia on 4210 households. The mean zonal weighted prevalence of podoconiosis was 5.46%. The majority (64%) of the cases found were between 16 and 45 years. This is the group most responsible for agricultural and domestic productivity. The male to female ratio of cases was very similar to the sex ratio in the general population [3] .

2.5. Prevention and control

Podoconiosis could be completely prevented if those at risk were to wear shoes [25, 27, 30] . Once the "wooden" stage has developed, the only treatment is surgical. Elevation, elastic stockings, and long leather boots help in the earlier stages. But the main preventive measure is wearing fully protective shoes at all times since childhood [17, 31] . It must be recognized, however, that patients may not be able to afford the regular purchase of shoes. In such cases the use of locally made sandals is recommended [32, 33] . The other means of control as a result of which the disease may regress partly, or totally, include the use of some methods of mechanized agriculture, a change of occupation from agriculture to one involving less contact with the soil and a change of residence to a non-endemic area [16, 23,32, 33] .

Thus recognition of the early symptoms and signs of the disease is important for prevention and control of the condition. Early symptoms include burning sensation in the leg, itching, and knocking of the big toes while walking.

Prodromal signs are splaying of the fore foot, plantar edema, pachydermic (thickened) fore foot, increased skin markings especially at the base of the first toe-cleft, block (rigid) toes and large second toe [2,32, 33] .

2.6. Economics of the disease

The public health and socioeconomic importance of podoconiosis in rural areas is indicated by its debilitating effects, which prevent more severely affected persons from pursuing farming and other activities involving extensive walking. The gross deformity, swelling, repeated ulceration and secondary infection make the swelling so severe that the patients abandon land cultivation and become beggars in big cities and towns. Many affected people are known to have become beggars [22, 30] .

Other researchers have also suggested that endemic elephantiasis is a major health and economic problem in Ethiopia. The disease, although not fatal, causes progressive deformity and disability, and the presence of so many disabled adults in a largely subsistence economy represents a considerable drain on limited resources to provide food and shelter [33] .

For reasons of comparison, some economic cost studies on chronic lymphatic filariasis in parts of India and Ghana are discussed below. One study in Tamil Nadu, South India, showed that treatment costs constituted a large proportion of household income in lower income groups. The mean difference between time spent by patients (4.36 hours/day) and non-patients (4.20 hours/day) in

productive activity was statistically significant ($p<0.01$). Female patients spent 0.31±1.42 hours less on domestic activity compared to their matched controls ($p<0.05$). Regression analysis revealed that chronic disease has a significant effect on work time allocated to economic activity ($p<0.05$), but not on absenteeism from work ($p>0.05$) [34].

In a study involving three districts of the same state it was shown that chronic disease mainly caused partial loss of work. However, on 32% of the total days considered patients did no economic work compared to 27% for controls. The difference was found to be significant ($p<0.05$). The mean (S.D) difference in time allocated to economic activity was 0.74 (4.37) hour per day ($p<0.01$). The mean (S.D) difference in the time spent on domestic activity between the female cases and their matched controls was 0.63 (2.81) hours per day ($p<0.01$) [35].

A different study in Tamil Nadu state investigated the impact of chronic lymphatic filariasis on the productivity of male weavers. Matched analysis revealed that the median difference in the number of hours worked was not statistically different, but that in productivity (meters of cloth produced per hour) was statistically different ($p=0.0001$). Although both groups worked similar number of hours, the productivity of the cases was significantly reduced by an average of 27.4% in comparison with the opposite group [36].

In another study in Orissa, India about three-fourths of the chronic patients have sought treatment for their condition and spent on average an amount of US$ 8.7 per year. The total number of hours spent working per day by patients and controls were 4.94 and 6.06, respectively with a significant difference. The total absenteeism from work was significantly higher among patients than controls. The disease condition, age, sex and family type significantly influenced the total absenteeism and the total number of hours spent on work per day. The chronic patients lost a total of 68 days of work per year, which is equivalent to 19% of the total working time of the year [37].

A more recent study in three urban areas of South India showed that 49% of chronic patients received treatment. The overall (n=200) treatment costs incurred by a chronic patient per visit were US$ 0.35±1.30. Considering only those who paid (n=98), the costs were US$ 0.71±1.79. These costs were considerably higher than in rural areas. Government health centers and private practitioners were important sources of treatment [38].

A study in a rural community in north Ghana showed that chronic patients are less likely to seek treatment particularly for fear of the cost of surgery. About 1.5% of the potential female labor input and over 7% of male labor input was lost due to the disease [39].

2.7. Rationale for doing this study

The existing research on podoconiosis in Ethiopia so far has focused on determining the prevalence of the disease [3,22,24,26,28], its natural history [2,11,32] and possible genetic factors if any [15] .

However, as a chronic life long disease common among societies in the low strata [2], and among the most economically important sector of the population (64% of cases in Wolaita zone were between 16 and 45 years) it may have social and economic consequences like unemployment, financial difficulties and being outcast from the labor market. It also causes considerable morbidity [2, 22] . Yet, health care services in developing countries are oriented to acute medical care [6] and the portion of public health budget allocated for this problem is small [2] .

Economic burden studies on chronic lymphatic filariasis in India [34-38] and Ghana [39] generally showed significant productive time loss and much expenditure on treatment. Despite the gross disfigurement, the evident life long debility and severe morbidity inflicted by podoconiosis on large number of people in Ethiopia, there has been no quantitative study done so far to determine its impact on economic output. Thus, the importance of a study on the economic burden of the disease was recommended by the investigators of the most recent study in Wolaita zone [3] .

This study, using the societal perspective, has been conducted to fill that gap and shed light on the economic cost of podoconiosis, and hence its public health importance, in Wolaita zone, where podoconiosis is known to be highly endemic. The core assumption underlying the study is that this health impairment increases time taken to seek health care, of absenteeism due to sickness, and reduced participation in productive work. As the disease is a chronic one, where productivity loses on a daily basis are inevitable, its economic impact would best be highlighted by estimating productivity differentials between diseased and non-diseased individuals.

3. OBJECTIVES

3.1. General objective:

To estimate podoconiosis-related direct and productivity costs in Wolaitta zone, SNNPR, Ethiopia.

3.2. Specific objectives:

1. To estimate the direct economic cost due to podoconiosis.
2. To compare the average productivity time between podoconiosis patients and non-patients.
3. To estimate the average productivity cost attributed to podoconiosis.

4. METHODOLOGY

4.1. Study area and period

The study was undertaken from October to November 2004 in three randomly selected 'w*oredas'* of Wolaita zone of the Southern Nations Nationalities and Peoples' Region (SNNPR), Ethiopia. Wolaita zone has a total area of 4541 square kilometer in its 7 'w*oredas'.* It is approximately 2000 meters above sea level. The Wolaita population is about 1.5 million. Out of these, 115,569 (7.78%) live in urban areas and the rest 1,370,652 (92.22%) live in rural areas. The average family size is 9 persons. Wolaita is one of the most densely populated areas in the country with an average of 290 people/km^2. The dominant soil geology is basalt and the climate is mainly (75.7%) 'woinadega' (midland 1500-2500 meters) followed by 'dega' (highland > 2500 metres) (13.85%). The majority of the population earn their livelihood from crop production (61.31%) followed by livestock rearing (22.32%). This makes soil contact frequent. The direct and indirect contact with the soil leads to a higher prevalence of non-filarial elephantiasis [(40)] .

This zone is selected because it is known for its endemicity of podoconiosis. According to the elephantiasis survey in 2001 there were at least 81,000 podoconiosis patients in the zone [(3)] . Earlier studies indicated a higher prevalence of the problem in Sodo than elsewhere (up to 69/1000) [(24)] .

4.2. Study design

The study is a matched comparative cross-sectional design using data collected through a quantitative approach supplemented by a qualitative key informants' interview.

4.3. Source and study population

The source population was all podoconiosis patients in Wolaita zone in the economically active age group (15-64 years) [41, 42] . The study population comprised first visit podoconiosis patients in the economically active age group (15-64 years) in the list of the MFTPA register for the period of July - October, 2004.

4.4. Sample size calculation

Sample size was determined using the formula of sample size determination for two population means.

$$n_1 = (1+1/r)\left[\frac{(Z_{\alpha/2} + Z_{\beta})^2\sigma^2}{(\mu_1-\mu_2)^2}\right]$$

where μ= population mean

σ= standard deviation

Assumptions include a confidence level of 95%, power of 80%, patient to non-patient ratio (r) of 1:2, a design effect of 2, and 10 % allowance for non-response, missed cases and out-migration. The results of the study in Orissa, India in 2002 on chronic lymphatic filariasis indicated average hour per day spent on economic activity as being 4.94±3.33 by patients and 6.06± 3.22 by controls [37] .

To maximize our sample size, a common population standard deviation of 3.33 was assumed; thus the sample size came to 702 (234 for the patient group and 468 for the non-patient group).

Eligibility Criteria:

Podoconiosis patients: Those in the economically active age group (15-64 years); registered as MFTPA's first visit patients of podoconiosis during the months of July-October, 2004.

Non-patient study subjects: Those having the same sex, occupation and an age difference of ± 5 years (still within the limits 15-64 years) with the patient; residing in the same 'kebele' as the patient (possibly the immediate neighbor to the right of the patient's house); and without a diagnosis of podoconiosis.

Exclusion Criteria:

People with other reasons for reduced work capacity, including pregnancy, congenital physical disability, blindness and major psychiatric illness.

4.5. Sampling procedure

4.5.1. Quantitative study:

All in all multistage sampling method was used. Among the seven 'woredas' of the zone three were selected using simple random sampling technique. The 'w*oredas'* selected were *Boloso Sore*, *Damot Gale* and *Sodo Zuria*. These 'w*oredas'* were then stratified into urban and rural 'kebeles' and from each

stratum one ‘kebele’ was selected using simple random sampling technique. The calculated sample size was used to recruit podoconiosis patients that reside in the respective ‘kebeles’ and who belong to the MFTPA patient register proportional to the ‘kebele’ population size (see Figure 1). Every patient was then matched with two other eligible non-patients. When more than two eligible non-patients were encountered, the lottery method was used to select only two.

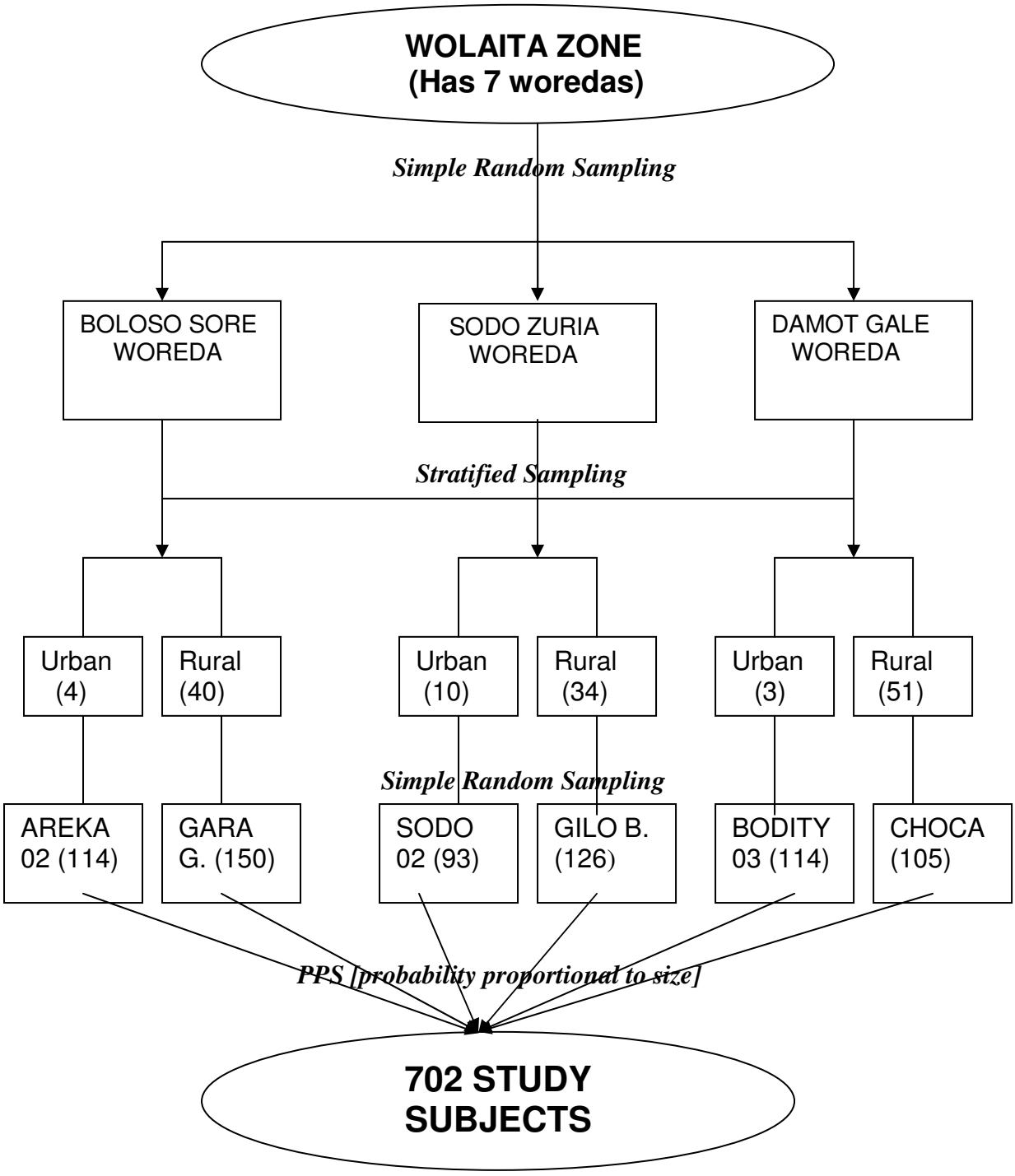
4.5.2. Qualitative study:

The qualitative study involved key informants in two ‘kebeles’ involving individuals who have/had the experience of hired work and their employers. This part aimed to estimate the monetary equivalent of wage works like non-agricultural daily labor, agricultural work and females' housework.

4.6. Principal research instruments

A structured questionnaire was used for the quantitative study. It was prepared in English, translated into Amharic and then translated back into English to check for consistency. The questionnaire documented general socio-demographic variables; socio economic characteristic of households; payments to non-medical items (travel, lodging, food); costs incurred on medical items outside the MFTPA including traditional healers; time spent by patients and care takers for receiving health care; and the activity pattern of all study subjects during the 24 hours of the day preceding the day of interview (Annex I).

Figure 1. Schematic presentation of the sampling procedure used in the study, Wolaita Zone, Ethiopia, 2004.



In addition, an open-ended semi-structured interview guide was used for the qualitative study i.e. key informants' interview. The main issue addressed was payment per hour for the respective worker (Annex II).

Different checklists were also used for administrative record review and for observation of time taken by health workers to help podoconiosis patients. The checklist for administrative record review documented the type, service year, and original purchase price of capital goods in use and current expenditure on recurrent items (Annex III, IV).

4.7. Pre-testing

The structured questionnaire was pre-tested in Hobicha (a rural 'kebele' in Sodo Zuria woreda) and Humbo town kebele 01 (an urban 'kebele' in Humbo woreda) which have similar economic, cultural and socio-demographic characteristics with the 'kebeles' selected for the study. The pretest was done on 36 study subjects, which is about 5% of the total sample size. The questionnaire was then assessed for its clarity, length, and completeness. Some skip patterns were then corrected.

4.8. Operational definition of terms

***'Without a diagnosis of podoconiosis'*:** in this study refers to a person free of prodromal symptoms (itching or burning of the feet); free of early signs of podoconiosis (splayed fore foot, plantar edema, skin thickening, increased skin markings and 'block toes'); and free of gross swelling of legs below knees.

***Direct costs*:** the value of resources expended by the health care system, community and family in addressing the problem directly [7] . In this study direct costs were identified in terms of medical costs (professional time, treatment and overhead); non-medical costs of receiving health care for both patient and accompanying person (travel, lodging, food); and the opportunity cost of time patients and care takers devote for receiving health care (travel, waiting, health education, consultation and treatment and absenteeism from usual activity).

***Productivity costs**:* in this study refer to the value of foregone earnings from domestic and economic activities while working during illness for lesser time as compared to healthy individuals who closely match with them.

4.9. Variables of the study

Independent variable: clinical condition i.e., whether an individual is a podoconiosis patient or non-patient.

Dependent variables: total absenteeism from productive work and total number of productive hours per day.

4.10. Data collection

4.10.1. Quantitative data

For administering the structured questionnaire, eight interviewers were recruited from Wolaita zone. All interviewers had completed secondary school and speak both Amharic and the local language ('Wolaitigna'). Five of them had previous experience of health related data collection. Training was given for three days

(including one day of pretest) on the purpose of the study, confidentiality of information, informed verbal consent and techniques of interview. One supervisor who was a nurse working in Sodo Zuria 'woreda' health office was supervising their work. He was closely monitoring all field work along with the principal investigator. All the questionnaires were revised by the supervisor each night. Any questionnaire with missing or inconsistent data was returned back to the respective data collector for re-interview. In addition, re-visit was done to those individuals who were not available on the first day of interview. Data were collected during the week days from October 19-November 5, 2004.

4.10.2. Qualitative data

To complement the data generated by the house-to-house quantitative study, 8 key informants were interviewed in two kebeles (one urban, one rural). The payment for each job (agricultural work, non-agricultural daily labor and house work) was obtained from an individual who does/did hired work and another individual who hires/d others. Each interview was carried out by the principal investigator. It was tape recorded and field notes were taken.

4.10.3. Administrative data

The principal investigator was responsible for collecting all administrative and financial data from the MFTPA and Wolaita Hospital using different checklists. He also did 3 observations when a nurse was giving inpatient care and 4 observations when trained site workers were giving health education and distribution of treatment supplies to podoconiosis patients at different sites. Time

needed for each activity was thus recorded. Since no operations were done during the period of data collection, the main surgeon was personally communicated about the average time needed for operation of podoconiosis patients.

4.11. Method of cost estimation

4.11.1. Perspective of analysis: the societal perspective, which considers costs to all sectors of the society, was used. Costs incurred by individuals, employers, government and private health care systems, and informal care givers were included.

4.11.2. Estimation method: to estimate productivity costs associated with podoconiosis in terms of productivity time losses, the human capital approach was used.

4.11.3. Time frame: the prevalence-based model, which quantifies economic costs due to illness occurring within a given time period (3 months for direct costs) was used.

4.11.4. Identification, measurement and valuation of costs: 'Avoidable costs' due to podoconiosis were stratified under direct and productivity cost components. Identification and measurement of costs was done based on the principal research instruments mentioned in section 4.6.

Valuation of direct costs depended on record review and patients' recall. Full cost analyses were employed in calculating major overhead costs and incremental cost analyses were used for the rest. The economic cost of buildings was derived from their renting price. For equipment like vehicles, their current replacement cost was computed from their original purchasing price using a discount rate of 10% per year. Time foregone in seeking care and productive time lost was converted into cost based on the daily gross salary for paid work. For non-paid work (like housewives' household chores), the wage rate of someone in paid work that closely matched the unpaid worker was used as a proxy. The latter was complemented by data from key informants' interview.

4.11.5. Adjusting for uncertainty: sensitivity analysis was done in areas of uncertainty like estimation of foregone earnings of health workers by varying their salary for low and high cost case scenarios [7, 43, 44] .

4.12. Data analysis

The variables of the quantitative study were pre-coded and data were computerized using EPI-INFO V.6 and exported to SPSS V.11 for windows for more analysis. Data were then re-grouped into patient-non-patient pairs for matched pair analysis. Errors related to inconsistency of data were checked and corrected during data cleaning. Summary tables and charts were used for describing data. The statistical significance of the difference in socio-demographic characteristics and total absenteeism between patients and non-patients was assessed using Mantel-Haenszel X^2-test for matched pairs in EPI-

INFO V.6. Paired t-test was used for mean difference in productive time between the two groups. Differences in average productive hours among different groups of patients were assessed using student's t-test. The effect of various variables on total absenteeism and productive time was assessed using logistic regression, and multiple regression analyses with forward selection procedure. The qualitative part was transcribed and translated on each day of interview and the main findings were summarized.

4.13. Ethical considerations

Ethical approval of the research proposal was obtained from the ethical review committee of Addis Ababa University, Medical Faculty. A formal letter was written by the Department of Community Health to SNNPR Health Office, Wolaita zone Health Desk, and MFTPA to permit us to undertake the research. The regional and zonal health offices, after consenting, delivered a letter to the zonal administration, and to the selected 'woreda' and 'kebele' administrations. Informed verbal consent was obtained from all study subjects before conducting the actual study. For this purpose a consent form was attached to each questionnaire which explained about the purpose of the study, confidentiality, and the respondent's full right to take part or not to take part in the study. Each observation was also conducted after informed verbal consent was secured.

5. RESULTS

Altogether 702 study subjects (234 podoconiosis patients and 468 non-patients) participated in the quantitative study, with 100% response rate.

5.1. Characteristics of the study subjects

The details of various characteristics of both patients and their matched comparative non-patient subjects are summarized in Table1. The study subjects consisted of 342 (48.7%) males and 360 (51.3%) females. Three hundred eighty one (54.3%) lived in rural kebeles and 321 (45.7%) in urban kebeles. The age range of the study subjects was 16-64 years. The average age (SD) of patients and non-patients was 37.93 (10.73) and 37.40 (10.07) years respectively. The mean (SD) difference in age between the two study groups was only 0.54 (0.82) years which is not statistically significant ($p>0.05$).

In the rural 'kebeles' about half of the study subjects were farmers followed by female housewives (31.5%, 120/381). In the urban 'kebeles', 99 (30.8%) were female housewives followed by 78 (24.3%) farmers. Regarding their educational status, most patients (74.4%) as well as controls (62.4%) were unable to read and write, and the difference between the two groups was significant ($X^2_{MH}=13.88$, $p<0.001$). Very few people were educated beyond grade 12 (0.4%, 2/702). The majority of households of both groups were large family type (family size >4 persons per household); the difference in family type between the two groups was not statistically significant ($X^2_{MH=}1.62$, $p>0.05$). Average monthly

income was estimated by 201 (85.9%) patients (102.98 *Birr*) and 427 (91.2%) non-patients (137.85 *Birr*). The mean (SD) difference in monthly income for 109 patient-non-patient pairs who reported income was 36.14 (102.63) *Birr*. The difference was statistically significant ($p<0.001$).

The mean duration of podoconiosis since the time of onset of swelling of one or both feet or the lower legs among patients was 9.31(5.83) years with a wide range between half a year and 30 years. None of the patients claimed to have always worn fully protective shoes since childhood at the age of six or less.

5.2. Household (Family) economy

Of the 702 household heads interviewed, only 157 (22.4%) were able to report an estimate of the annual income of their family. For this sub-group, the average (SD) annual income of households of patients was 1454 (783) *Birr* and that of non-patients was 1896 (1270) *Birr*. The income ranged from 120 to 6200 *Birr* among all households. The information was thus complemented by data on average annual expenditure for common household items derived from average monthly expenditure of the households. Mean annual e

xpenditure was 1780 (883) *Birr* per household of podoconiosis patients and 2006 (1169) *Birr* for the opposite group. The difference in mean expenditure between the two groups was 227 *Birr* per annum ($p<0.01$).

The main source of income of households in both urban and rural areas was agriculture for both patients and non-patients.

Table1. Socio-demographic characteristics of the study subjects, Wolaita Zone, Ethiopia, 2004.

Characteristics	Patients (n=234)		Non-patients (n=468)	
	Frequency	Percent	Frequency	Percent
Sex				
Male	114	48.7	228	48.7
Female	120	51.3	240	51.3
Age in years				
Mean (SD); Range	37.93 (10.73);16-64		37.40 (10.07); 16-62	
15-24	44	18.8	98	20.9
25-34	39	16.7	73	15.6
35-44	74	31.6	132	28.2
45-54	21	9.0	81	17.3
55-64	56	23.9	84	17.9
Residence 'Kebele' type				
Urban	107	45.7	214	45.7
Rural	127	54.3	254	54.3
Occupation				
Farmer	90	38.5	180	38.5
Housewife	73	31.2	146	31.2
NGO employee	1	0.4	2	0.4
Trader (private)	35	15.0	70	15.0
Daily laborer	35	15.0	70	15.0
Education				
Can't read and write	174	74.4	292	62.4
< Grade 1*	25	10.7	58	12.4
1-4 (1st cycle)	3	1.3	6	1.3
5-8 (2nd cycle)	14	6.0	41	8.8
9-12 (3rd cycle and prep.)	18	7.7	69	14.7
Beyond grade 12	0	0.0	2	0.4
Religion				
Protestant	138	59.0	269	57.5
Orthodox Christian	79	33.8	152	32.5
Muslim	3	1.3	6	1.3
Catholic	14	6.0	41	8.8
Marital Status				
Single	37	15.8	72	15.4
Married	150	64.1	330	70.5
Separated	21	9.0	31	6.6
Widowed	26	11.1	32	6.8
Divorced	0.0	0.0	3	0.6
Family size				
Mean (SD); Range	5.45 (2.48); 1-14		5.51 (2.23); 1-15	
1-4	93	39.7	163	34.8
5 and above	141	60.3	305	65.2
Monthly income (in *Birr*)**				
Mean (SD); Range	102.98 (85.57);0-900		137.85 (106.12);0-800	
0-61	68	33.8	89	20.8
62-150	109	54.2	211	49.4
151-900	24	11.9	127	29.7

**Only those who were able to estimate their monthly income (201 patients and 427 non-patients) are included; category is based on the 25th (low), the middle 50 % (medium) and 75th (highest) percentiles.

For rural residents alone, agriculture was the main source of income for more than 83% of households. The food crop mainly produced by households in rural 'kebeles' was maize. The average (SD) amount produced of any main food crop during the harvest season of the previous year was 2.82 (5.6) *quintals* by patients' households (n=93) and 3.26 (3.03) *quintals* by non-patients' households (n=177). Yet, the mean difference in 73 patient-control pairs who reported the amount of harvest was not statistically significant ($p>0.05$).

To calibrate households with respect to their wealth relative to other households, a composite 'index' of assets was developed based on information assembled from key informants' interview. The majority of key informants reported that a household that possesses its own house, farm land, cattle, cart animals and some plantations is relatively better off in rural areas. In urban areas, one that possesses a radio, a television and its own house is thought of as relatively better off.

The score of assets for urban 'kebeles' was based on possession of radio, television, pipe water, own house and electrification of house. These five indicators (0 or 1) were added to an index from 0 to 5, where 0-1 and 2-5 were interpreted as worse off and better off households, respectively. For rural households, the indicators used were possession of radio, own house, farm land, one or more cattle or beasts of burden, and backyard plantations (coffee, 'chat', pepper and ginger). These nine indicators were added to an index from 0 to 9,

where 0-4 and 5-9 were interpreted as worse off and better off households, respectively♣ (Table 2).

Bivariate analysis showed significantly more 'poor' households in patients than non-patients (OR_{MH}=0.56, 95% CI=0.36-0.94) in urban 'kebeles'. On the other hand, the difference in wealth score detected between patient and non-patient households was not statistically significant in rural 'kebeles' (OR_{MH}=0.79, 95% CI=0.49-1.31).

5.3. Direct costs of treatment for podoconiosis

5.3.1. Medical Costs

5.3.1.1. Patients' expenditures on treatment

Out of the 234 podoconiosis patients, who sought treatment at the MFTPA, 229 (98%) paid for the service. Only 73 (31.2%) had sought treatment at other places and all had incurred expenditure in the three months recall period. This sub-group had sought treatment 134 times during a period of three months. Of these 134 times, 43 (32.09%) were treated by government institutions, 42 (31.34%) by private clinics, and 20 (14.93%) by private pharmacies. A small proportion of visits were made to religious places (4/134), traditional healers (7/134), needle men and CHA/TTBAs (18/134).

♣ Categorized using the median score as a cut-off.

Table 2. Economic condition of households of the study population, Wolaita Zone, Ethiopia, 2004.

Index of Economic Status	Patients' HH		Non-patients' HH	
	No.	%	No.	%
All Households				
Annual household income in *Birr‡**				
Mean (SD); Range	1454(783);400-4500		1895(1270);120-6200	
≤1000	15	27.3	29	28.4
1001-2000	34	61.8	43	42.2
2001-6200	6	10.9	30	29.4
Annual household expenditure in *Birr*‡				
Mean (SD); Range	1780 (883);404-5076		2006(1169);192-11268	
≤1200.00	71	30.3	105	22.4
1201.00-1728.00	50	21.4	126	26.9
1729.00-2394.00	113	48.3	237	50.6
Major source of income to the HH				
Farming	149	63.7	290	62.0
Trade	25	10.7	81	17.3
Handicraft	14	6.0	26	5.6
Daily labor	42	17.9	56	12.0
Employment at institutions	2	0.9	14	3.0
Others	2	0.9	1	0.2
Rural Households				
Main food crop produced by the HH				
'Teff'	8	6.3	21	8.3
Bean	15	11.8	30	11.8
Maize	63	49.6	126	49.6
Barley	3	2.4	4	1.6
Wheat	11	8.7	28	11.0
Other('enset', potato, sweet potato)	21	16.5	33	13.0
Not crop producer	6	4.7	12	4.7
Wealth score out of nine				
Mean (SD); Range	3.88 (1.01);0-7		4.02 (1.14);0-7	
0-4	97	76.4	183	72.0
5-7	30	23.6	71	28.0
Urban households				
Wealth score out of five				
Mean (SD); Range	1.71 (1.02); 0-5		2.19 (1.25); 0-5	
0-1	53	49.5	77	36.0
2-5	54	50.5	137	64.0

* Only for 157 households (55 patient households and 102 non-patient households) in which the household's annual income was estimated. ‡Category is based on the 25th (low income), the middle 50% (medium income) and 75th (high income) percentiles.

The arithmetic mean (SD) of expenditure at the MFTPA for those who paid was 5 (3.74) *Birr*, ranging from a minimum of 2 to a maximum of 15 *Birr*. Mean expenditure incurred by those patients who sought treatment at other places was 40.00 *Birr*. The total payment at all places (MFTPA and others) during a period of three months was 4059.00 *Birr*.

5.3.1.2. Time-cost of health care providers

A total of 230 patients were treated at four sites of the MFTPA by trained site workers. Each site worker works for 8 hours in one of the days of the week (a total of 32 hours per month), with a gross monthly salary of 200.00 *Birr*. Observations showed that on average 7 minutes was needed for distribution of treatment supplies to each patient and 20 minutes for one session of health education. Thus, the average cost of these health care providers' time was 0.73 *Birr* and 2.08 *Birr* each time a patient was treated and a health education session was held, respectively. The value of this time weighted for the total patients treated against the hourly salary of the site workers comes to 168.00 *Birr.* The total cost of health education sessions in which the recruited patients participated (48 sessions in four sites), was 100.00 *Birr.*

Because no operations were performed on podoconiosis patients during the data collection period, observations on the time required for operation were not made. Thus data were based on information elicited from personal communication with the main surgeon in Wolaita Hospital. The staff of the operation theatre is

composed of 18 workers of different category and salary. During an operation for a podoconiosis patient a team of 6 members is involved. Per operation an average of 2.45 hours are spent by the surgeon, his assistant, the anesthetist, and circulator. Two hours are spent by the cleaner and 1hour by the scrubber. The average monetary equivalent of the time spent by the team in operating four of the patients in this study amounted to 69.17 *Birr*. Sensitivity analysis yielded 40.53 *Birr* in low cost scenario and 99.63 *Birr* in high cost scenario (Table 3).

Table 3. Time-cost of the staff of the operation theatre of Wolaita Hospital on operation of podoconiosis patients, Wolaita Zone, Ethiopia, 2004.

Team	**Monthly gross salary in *Birr***			**Cost of time/operation in *Birr***		
Category	**Mean**	**Minimum**	**Maximum**	**Mean**	**Low cost**	**High cost**
Surgeon	2077.50	1145.00	3010.00	31.81	17.54	46.09
Nurse	672.50	426.00	1092.00	10.30	6.52	16.72
Anesthetist	742.80	426.00	1145.00	11.37	6.52	17.53
Scrubber	566.90	325.00	716.00	3.54	2.03	4.48
Circulator	566.90	325.00	716.00	8.68	4.98	10.96
Cleaner	277.80	235.00	308.00	3.47	2.94	3.85
Total cost.....				69.17	40.53	99.63

After operation, an average of 6 weeks time is needed for recovery in the recovery room. One of the operation theatre nurses whose gross monthly salary is 805.00 *Birr* sees these patients for the whole period. It was observed that he spends an average of 15 minutes with each patient in each of the week days. Thus, a total of 30 hours was spent for the four operated patients in 6 weeks time. The monetary equivalent of this time was 151.00 *Birr.*

5.3.1.3. Overhead cost

The overhead cost of the MFTPA was calculated mainly based on the financial and income statement for the 12 months ending June 30, 2004. The local market renting price was used for the buildings (treatment sites and office); the replacement cost was used for the four-wheel drive vehicle and equipment (computer, fax, etc) with a depreciation rate of 10% per year from the original purchasing price (see Table 4). The total patients treated during the 12 months ending June 2004 were 2448 new outpatients, 3636 repeat visits and 32 inpatients. Assuming the cost for a repeat outpatient visit be half and that for a day's stay of an operated patient be five fold of a new outpatient visit, the overhead cost of the MFTPA would be 49.4 *Birr* per new out patient contact and 246.85 *Birr* per bed day. Therefore, the total overhead cost expended for the 234 patients comes to 52,858.00 *Birr.* [If they were to see an optimal of 10 patients per day, rather than 6, the overhead cost would deflate to 29.40 *Birr* per new out patient contact and 147.00 *Birr* per bed day].

Table 4. Overhead cost of the MFTPA for the 12 months ending June 30, 2004, Wolaita Zone, Ethiopia.

Item	**Cost in *Birr***
Capital Items	
Building	8400.00
Vehicles (4-wheel drives)	177000.39*
Equipment (computer, fax, printer etc)	16402.50*
Recurrent Items	
Personnel (excluding salary of site workers)	108599.31
Administrative cost	38501.41
Supplies (medical, shoe making tools etc.)	107592.33
Vehicle operation and maintenance	2815.00
Recurrent training (loom and shoe making training etc)	81867.70
Other running costs	1199.67

* A depreciation rate of 10% per year was used on the original price.
Source: MFTPA, Wolaita Zone, SNNPR, Ethiopia, 2003/04.

For the other health institutions such as Wolaita Hospital where only 1.7% (4/234) of the study subjects were operated, and which were not the major sectors where service was rendered to podoconiosis patients, incremental cost analysis, rather than full cost analysis, was employed. Hence, their overhead costs were not incorporated in the analysis of the current study.

5.3.2. Non-medical costs

These include actual expenditures made on travel, lodging and food for patients and accompanying persons. Most (85.9%) patients went to the MFTPA on foot, resulting in lower expenditure for transport compared to other non-medical costs. The total of all non-medical costs was 2312.00 *Birr* with an overall (n=234) mean expenditure of 9.88 *Birr* per patient per single visit of the MFTPA. The mean (SD) expenditure for those who paid (n=31) was 74.54 (94.6) *Birr* with a wide range of costs from 2.00 to 350.00 *Birr*.

5.3.3. Opportunity cost of patients' and caretakers' time spent

The detail of time spent by patients in seeking treatment during the 3 months recall period is presented in Table 5. All in all, an average of 4.2 work-days[♣] was lost by each patient for travel, waiting, treatment and health education at the MFTPA and absenteeism from usual activity. The cumulative time lost by all patients in this way, thus totals to 930 work-days. A large proportion (95.3%) of this time was due to absenteeism from usual work. Moreover, an average of 12.8 work-hours were lost by each of those patients who went to other places

[♣] It was generally assumed that time lost would otherwise be productive (working time).

(n=73) in seeking relief. This again totaled to 39 work-days. The proportion of patients undergoing paid treatment at places apart from the MFTPA was smaller ($p<0.05$) for those households belonging to the lower income groups [Remark: expenditure was used as a rough estimate of household income]. It was only 15 (21.1%) and 15 (30%) for low (≤ 1200.00 *Birr*) and middle (1201.00-1728.00 *Birr*) income families and 43 (38.1%) for high income (1729.00-2394.00 *Birr*) groups.

Table 5. Time devoted by podoconiosis patients in seeking treatment during the 3 months recall period, Wolaita Zone, Ethiopia, 2004.

Category	**Total time lost**	
	Sum(hours)	**Percent**
In seeking treatment at the MFTPA (n=234) on:		
Travel (to MFTPA and back)	905.4	3.90
Waiting	131.4	0.60
Health education and treatment	44.5	0.20
Absenteeism from usual activity	22308.1	95.30
Total.....	23415.9	100.00
For consultation (n=73) at:		
Religious places	27.5	2.90
Traditional healers	122.9	13.20
Needle men (including TTBA/CHA's)	61.0	6.50
Private pharmacies	85.0	9.10
Private clinics	101.7	10.90
Government institutions	535.5	57.30
Total.....	934.0	100.00

It was also found out that a total of 33 (14.1%) patients were escorted by another individual. Among the escorts, 27 (81.8%) were males and 6 (18.2%) were females. Those who belonged to the productive age group (15-64 years) were 30 (90.9%). The occupation of this group was mainly (63%) farming followed by daily laborers (13.3%). These escorts spent an average of 9.2 work-days (220 hours) in helping the patients during travel, waiting, treatment and consultation, health education and extra home care to the patients. Thus, a total of 275 work-days, which would otherwise be productive, were lost by 30 potentially productive escorts. About half was lost on waiting during treatment and consultation followed in 46.8% by extra home care activities after the patients returned home (Table 6).

Table 6. Time devoted by care takers/people accompanying (n=30) for helping podoconiosis patients during the 3 months period, Wolaita Zone, Ethiopia, 2004.

	Total time lost	
Category	**Sum (hours)**	**Percent**
Travel time	139.00	2.10
Waiting time	6.80	0.10
Treatment of patient	3366.60	50.90
Health education time	4.60	0.07
Extra home care time	3093.25	46.80
Total	6610.25	100.00

To compute the monetary value of this lost time for farmers, laborers and housewives, the local labor market (i.e. their hourly wage) was used as a proxy based on information elicited from key informants.

Most of the key informants agreed that both farmers and non-agricultural daily laborers work for 9-11 hours per day. They also agreed that the daily wage varies with the particular type of job and the particular individual's experience, especially for daily laborers. Little variation of payment was reported in different 'woredas' and between sexes. The most frequently mentioned figures were 6 *Birr* for laborers and 8 *Birr* for farmers and these were taken as proxy for our computation.

The informants said that in rural areas it is not common to hire housemaids because the mother or her daughters do all household activities. But in urban 'kebeles' it was frequently mentioned that an average of 35 Birr is paid monthly for a housemaid who does all activities in a big family for 12 hours per day. For housemaids who eat and live with the family the payment drops almost by half. A few of the informants disagreed with the figure and rather stressed that there is individual variation depending on how close the families of the employee and the employer are in dictating the amount to be paid.

For this study the above mentioned figure was used as a proxy for housewives in both urban and rural 'kebeles'. For employed persons and traders (private business workers), their monthly income was converted into hourly salary assuming a working time of 40 hours/week (8 hours/day for 5 days) and 60 hours/week (10 hours/day for 6 days). The latter was derived from key informants' interview. Thus, the overall opportunity cost of time spent in seeking

treatment at the MFTPA by all patients was 11745.26 *Birr* and at other places by 73 patients was 495.36 *Birr*. Moreover, caretakers lost time with an opportunity cost of 4224.00 *Birr*. The framework employed for this computation is outlined in Table 7 below.

Table 7. A framework used for costing lost time by individuals under different occupation categories, Wolaita Zone, Ethiopia, 2004.

Occupation category	**Number**	**Total time lost (T)**	**Average monthly income**	**Hourly Income**	**Hourly Wage**	**Total opportunity cost**
Farmer	A	Ax Av.hrs*	__	__	F**	TxF
Laborer	B	Bx Av.hrs	__	__	L**	TxL
House wife	C	Cx Av.hrs	__	__	H**	TxH
Trader	D	Dx Av.hrs	R	R/240	__	TxR/240
Employed	E	Ex Av.hrs	N	N/160	__	TxN/160
TOTAL COST.....{(TxF)+ (TxL)+(TxH)+(TxR/240)+(TxN/160)}						

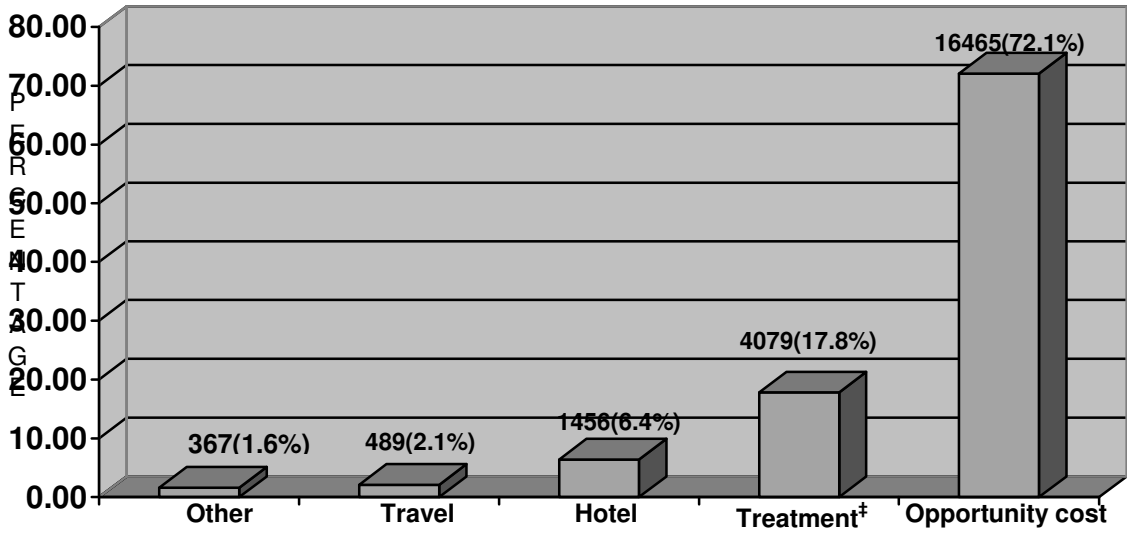
* Average hours lost per individual. ** Derived from qualitative studies

Figure 2 summarizes the relative amount of various components of patient-side costs. Patient-side costs refer to costs incurred by patients, care takers or families in addressing the individual patient's problems. It was found that 72.1% of the total amount was attributed to opportunity cost of time lost followed by expenses of treatment[‡] (17.8%). The expenditures on travel, food and lodging were relatively small.

In summary, the total direct cost of podoconiosis contributed by patient-side costs (18777.00 *Birr*), health care providers' time cost (488.17 *Birr*) and overhead cost (52885.00 *Birr*) comes to 72150.17 *Birr* (US$ 8389.6).

[‡] Treatment expenses are excluded from the total cost to avoid double count since charges are not uniform.

Figure 2. A bar graph showing the percentage distribution of patient-side cost of podoconiosis, Wolaita Zone, Ethiopia, 2004.



5.4. Productivity time of patients and non-patients

Complete absenteeism from economic activity on the day preceding the day of interview was reported by 46 (19.7%) podoconiosis patients and 10 (2.1%) non-patients, and the difference between the two groups was statistically significant (X^2_{MH}=63.53, p<0.001). Total absenteeism from domestic activity was reported by 16 (13.3%) female patients and 8 (3.3%) corresponding female non-patients. The difference between the two groups was statistically significant (X^2_{MH}=13.32, p<0.001). When both sexes were treated separately a highly significant difference was found with p<0.001. Similar trend was also revealed while treating rural residents separately for both economic activity and household chores. The only difference which was not significant was domestic activity of urban females (Table 8).

Table 8. Proportion of patients and non-patients who were totally absent from work, Wolaita Zone, Ethiopia, 2004.

Category	Patients		Non-patients		X^2_{MH}
	Number	Percent	Number	Percent	
Economic activity					
Total	46	19.70	10	2.10	63.53*
Males	7	6.10	1	0.40	08.27*
Females	39	32.50	9	3.80	52.98*
Urban residents	25	23.40	6	2.80	11.39*
Rural residents	21	16.50	4	1.60	25.88*
Domestic activity					
All females	16	13.30	8	3.30	13.32*
Urban residents	7	12.50	6	5.40	02.35***
Rural residents	9	14.10	2	1.60	10.51**

* p< 0.001 ** p<0.01 *** p> 0.05

Bivariate analysis revealed that complete absenteeism from economic activity was significantly higher in patients than non-patients, females compared with males, non-farmers compared with farmers, all others compared with those who were married, those who belong to the lowest income group compared with the highest income group, households with the highest annual expenditure compared with those with medium expenditure and those with the highest wealth score compared with the lowest. When adjusted, only the variables clinical condition and sex remained significantly associated with complete absenteeism from economic activity (Table 9).

By the same token, the odds of complete absenteeism from domestic activity were significantly higher in patients than non-patients and in households with the highest annual expenditure than those with the lowest and medium expenditure.

After controlling for confounders using logistic regression analysis, both variables continued to predict absenteeism from domestic work by females (Table 10).

Table 9. The effect of socio-demographic and economic variables on total absenteeism from economic work, Wolaita Zone, Ethiopia, 2004 (n=702)

Variable	Absenteeism		Crude OR [95% CI]	Adjusted OR [95% CI]
	Yes	No		
Clinical status				
Patient	46	188	11.21[5.54, 22.67]*	20.37 [8.39, 49.50]*
Normal	10	458	1	1
Sex				
Male	8	334	0.16[0.07, 0.33]*	0.07 [0.02, 0.26]*
Female	48	312	1	1
Age in years				
15-24	17	125	1.76[0.78, 4.01]	1.04[0.32, 3.35]
25-34	7	105	0.87[0.32, 2.36]	0.70[0.24, 2.12]
35-44	17	189	1.17[0.52, 2.64]	0.71[0.25, 2.22]
45-54	4	98	0.53[0.22, 2.02]	2.05[0.54, 7.86]
55-64	10	130	1	1
'Kebele' type				
Urban	31	290	1.52[0.88, 2.64]	1.45[0.59, 3.54]
Rural	25	356	1	1
Education				
Read and write	19	217	1.02[0.57, 1.81]	1.76[0.72, 4.33]
Can't read&write	37	429	1	1
Occupation				
Farmer	9	261	0.28[0.14, 0.59]*	1.62[0.45, 5.82]
Others	47	385	1	1
Marital status				
Married	28	452	0.43[0.25, 0.74]*	0.77[0.36, 1.66]
Others	28	194	1	1
Monthly income				
0-61	19	138	1.05[1.01, 2.52]*	1.69[0.71, 4.04]
62-150	11	309	0.25[0.02, 1.74]	1.27[0.49, 3.36]
151-900	19	132	1	1
Family size				
≤4	19	237	0.88[0.50, 1.57]	0.59[0.18, 1.02]
>4	37	409	1	1
HH expenditure				
≤1200.00	16	160	0.96[0.51, 1.80]	0.43[0.18,1.02]
1201.00-1728.00	7	169	0.40[0.17, 0.92]*	0.49[0.17, 1.47]
1729.00-2394.00	33	317	1	1
Wealth score for urban households				
2-5	25	166	3.11[1.25, 7.87]*	0.45[0.16, 1.33]
0-1	6	124	1	1
Wealth score for rural households				
5-7	4	97	0.51[0.17, 1.52]	1.28[0.51, 3.20]
0-4	21	259	1	1

* Statistically significant ($p<0.05$)

Table 10. The effect of socio-demographic and economic variables on total absenteeism from domestic work, Wolaita Zone, Ethiopia, 2004 (n=360 females)

Variable	Absenteeism		Crude OR	Adjusted OR
	Yes	No	[95% CI]	[95% CI]
Clinical status				
Patient	16	104	4.64[1.85, 10.75]*	3.68[1.22, 11.12]*
Normal	8	232	1	1
Age in years				
15-24	6	77	0.61[0.19, 2.00]	0.29[0.05, 1.67]
25-34	4	67	0.47[0.13, 1.75]	0.43[0.08, 2.33]
35-44	6	111	0.42[0.13, 1.38]	0.45[0.10, 2.07]
45-54	2	34	0.46[0.09, 2.42]	0.73[0.10, 5.36]
55-64	6	47	1	1
'Kebele' type				
Urban	13	155	1.38[0.60, 3.17]	1.21[0.33, 4.51]
Rural	11	181	1	1
Education				
Read and write	5	82	0.82[0.30, 2.25]	0.83[0.20, 3.48]
Can't read&write	19	254	1	1
Occupation				
House wife	15	204	1.08[0.46, 2.54]	0.69[0.06, 7.87]
Others	9	132	1	1
Marital status				
Married	9	194	0.44[0.19, 1.03]	0.55[0.18, 1.69]
Others	15	142	1	1
Monthly income				
0-61	10	85	2.12[0.81, 5.57]	2.70[0.81, 8.98]
62-150	2	82	0.44[0.09, 2.12]	0.73[0.13, 4.07]
151-900	8	144	1	1
Family size				
≤4	8	123	0.87[0.36, 2.08]	0.77[0.26, 2.30]
>4	16	213	1	1
HH expenditure				
≤1200.00	4	107	0.31[0.10, 0.94]*	0.18[0.04, 0.76]*
1201.00-1728.00	2	80	0.21[0.05, 0.91]*	0.17[0.02, 1.43]
1729.00-2394.00	18	149	1	1
Wealth score for urban households				
2-5	13	95	0.88[0.82, 0.94]*	1.71[0.48, 6.06]
0-1	0	60	1	1
Wealth score for rural households				
5-7	3	34	1.62[0.41, 6.43]	2.71[0.72, 10.27]
0-4	8	147	1	1

* Statistically significant ($p<0.05$)

Podoconiosis patients spent an average (SD) of 3.56 (2.87) hours per day on economic activity during the day they were visited compared to 6.52 (2.53) hours per day worked by the corresponding non-patients, with a highly significant

difference ($p<0.001$). A similar trend with a highly significant difference was observed when both sexes and urban/rural residence were considered separately. The difference in time spent on domestic activities between female patients and their respective controls was statistically significant too ($p<0.001$) (Table 11). The mean hours lost from economic activity were longer among men than women patients, and among urban than rural residents. Again longer hours of domestic activity were lost by rural than urban females. However, in all these cases the difference was not significant ($p>0.05$). Correlation analysis demonstrated a weak association between the duration of the illness and hours of economic ($r=+0.013$, $p>0.05$) and domestic ($r=+0.025$, $p>0.05$) activity.

Table 11. Number of productive hours and mean difference per day between group of patients and non-patients, Wolaita Zone, Ethiopia, 2004.

Category	Patients Mean (SD)	Non-patients Mean (SD)	Mean difference	Paired-t value*
Economic activity				
Total	3.56 (2.87)	6.52 (2.53)	2.96	-17.49
Males	4.88 (2.92)	8.13 (2.22)	3.25	-12.18
Females	2.30 (2.19)	4.99 (1.74)	2.69	-12.83
Urban residents	3.32 (2.73)	6.44 (2.73)	3.20	-12.52
Rural residents	3.83 (2.98)	6.59 (2.63)	2.75	-12.27
Domestic activity				
All females	3.03 (2.12)	6.48 (2.84)	3.45	-14.03
Urban residents	2.80 (1.75)	5.93 (2.33)	3.13	-9.48
Rural residents	3.22 (2.40)	6.95 (3.17)	3.73	-10.42

* All are statistically significant ($p< 0.001$)

Multiple linear regression was done separately for economic activity and domestic chores to examine the variables that best predict the number of hours worked (Table 12). The number of hours spent on economic work was significantly influenced by whether a person was a patient or not and sex. Similarly, the variables 'kebele' type (urban or rural), marital status (married or not) and clinical condition (patient or normal) affected the number of hours spent on domestic work by females. The coefficient of determination (R^2) of the models indicated that 45.2 % and 9.9% of the variability in the number of hours spent on economic and domestic activity per day are explained by these variables.

Table 12. Multiple regression of variables on the number of hours spent per day on productive activity, Wolaita Zone, Ethiopia, 2004.

Variables	**Beta(B)**	**t-value**	**p-value**	**R^2 (%)**
***Economic activity*:**				
Constant		9.75	0.000	45.2
Clinical condition (0=patient 1=normal)	0.529	8.88	0.000	
Sex (0=male 1=female)	-0.374	-6.29	0.000	
Occupation (0=farmer 1=other)	-0.385	-0.39	0.701	
Annual household Income	-1.853	-1.85	0.066	
***Domestic activity*:**				
Constant		5.680	0.000	9.90
Clinical condition(0=patient 1=normal)	0.260	5.162	0.000	
Marital status (0=married 1=other)	-0.147	-2.918	0.004	
Kebele type (0=urban 1=rural)	0.112	2.224	0.027	

5.5. Productivity cost of podoconiosis

Valuation of productivity cost lay on the assumption that patients would have more or less similar hours of reduced productivity in all working days. For the sake of avoiding double counting and over estimation of costs, female housewives were excluded from the calculation of economic cost and they alone were included in the calculation of costs of domestic activities. The same framework used to calculate opportunity costs was applied here (see Table 7 on page 41). Thus, the daily productivity cost attributed to podoconiosis for the patients turned out to be 345.46 *Birr* (320 *Birr* because of reduced economic activity by all patients and 25.19 *Birr* because of reduced domestic activity by female housewives). Deflating this for an average unemployment rate of 14% by these patients, the productivity cost comes to 297.00 *Birr* (275.20 *Birr* because of reduced economic activity by all patients and 21.80 *Birr* because of reduced domestic activity by female housewives). Of the total cost of podoconiosis over the three months time, the productivity cost amounted to 31,042.80 *Birr* (US$ 3609.62), or about 30%, the remaining 72,150.17 *Birr* (US$ 8389.55) arising from direct costs.

6. DISCUSSION AND CONCLUSIONS

6.1. Discussion

The effects of poor health go far beyond physical pain and suffering, to the extent that learning is compromised, returns to human capital diminished, and productive activities constrained. Pervasive illness of the work force cripples countries from attaining high level of economic development. Strong evidence world wide shows that poor health incurs immense economic costs for individuals, households and society at large [45] .

Although the high prevalence of podoconiosis in Ethiopia has existed for decades and serious debility is associated with it, the disease has not received much attention from policy makers and health planners. The reasons could be that the disease is no threat to life [3, 22, 26], in addition to absence of recent information on the epidemiology and socio-economic impact of the problem. In view of this paucity of information, cost-of-illness studies should be used to increase awareness and lobby for allocation of resources. The present study indicates that podoconiosis imposes a major economic burden to society, government, and other institutions in general.

The average duration of podoconiosis among the study subjects was 9.31(± 5.83) years. Since the disability caused by the disease worsens with age, rising direct and productivity costs have been lost for years since the start of

manifestations. The dominant occupation of the study subjects was farming (38.5%) followed by female housewives (31.21%). This coupled with the relatively poorer economic status of households of patients as reflected in their lower annual income, expenditure, and ownership of some household assets, perpetuates the problem. It opens wide the opportunity for soil contact in the context of poor ability to afford [3, 26] shoes which are believed to be protective [17, 30, 32, 33].

Even though no standard reliable and effective therapy or morbidity care is said to exist, the study showed that 73 (31.2%) patients sought remedies at different places in addition to the MFTPA and all had incurred expenditure. Fewer patients belonging to households of lower income groups undertook paid treatment at these places. Out of the total visits made, most were to government institutions (32.09%) and private clinics (31.34%). This is not going to be just a one time event for these chronic patients. Obviously, treatment seeking and the associated costs are likely to continue time after time as the chronic manifestations are mostly irreversible and the debility worsens with age [30].

Excluding the opportunity cost of time lost, the total out-of-pocket expenses, 6371.00 *Birr* (US$ 740.81), over the three months period formed 6% of the overall quarterly expenditure of households of the studied patients per annum. The unit (average) patient-side cost was 97.6 *Birr* (US$ 11.35). This is roughly equivalent to 12 days' earning of an agricultural laborer or 16 days' earning of a

non-agricultural laborer in the zone. This takes on immense significance especially to the poorer households which are hit hard by the disease.

The opportunity cost of time lost by patients (4.2 work-days per patient at the MFTPA and 12.8 work-hours per patient at other places) and care-takers or accompanying people (9.2 work-days per individual) accounted for the major component (72.1%) of patient-side cost. This will affect the time available for other productive activities that may impact the economy and health of the family.

In addition, health care providers need to sacrifice their time in helping patients especially those with the advanced stage that demands surgery. Time spent for the post operative care of four operated patients, for example, cost 151 *Birr* (US$ 17.6). This was equivalent to 12.5% of the daily work time and hence of the monthly gross salary of the care provider.

Loss of labor or work time constitutes an important component of the total economic cost of a disease [(35)] . The labor loss caused by podoconiosis is very serious as the disease mostly affects the most productive age group [(3)] and its manifestations are mostly irreversible.

In the present study 46 (19.7%) podoconiosis patients, compared to 10 (2.1%) non-patients were totally absent from economic activity. Moreover, 16 (13.3%) female patients, compared to 8 (3.3%) non-patient females were totally absent

from domestic chores [both are statistically significant]. It means about 80% of all patients and 86.7% of female patients were involved in economic and domestic activities, but worked shorter than those free of the condition.

The time lost from economic activities, 2.96 hours per day per patient, is considerably higher than the results for chronic lymphatic filariasis in rural Tamil Nadu (0.89 hours/day) [34], Orissa (1.13 hours/day) [37] and three districts of Tamil Nadu (0.74 hours/day) [35] . Similarly an average of 3.45 hours/day was lost by each female patient from domestic chores, higher than that for the three districts of Tamil Nadu (0.63 hours/day) [35] . The time lost and the cost incurred through it is likely to recur day after day because of the chronic nature of the disease. At a loss of 2.96 hours of economic work per day, each patient loses a total of 166 days of work per year, which is equivalent to 45% of the total productivity work days. This proportion is more than double the results for chronic lymphatic filariasis in India (17% and 19%) [34, 37] .

The study showed that podoconiosis was responsible for more than 368 care-seeking visits to different institutions over 3 months, costing around 308.35 *Birr* (US$ 35.85) per patient. When this is projected to one year it amounts 1233.40 *Birr* (US$ 143.42) per patient. In addition, the total daily productivity cost of 345.46 Birr (US$ 40.169) comes to 538.86 *Birr* (US$ 62.658) per patient per year. As many as 81000 (5.4%) people in the zone are known to be affected, among which 93% (75330) belong to the age group >15 years [3] . Assuming

similar trends, overall, the disease takes direct and productivity costs of 140,497,724 *Birr* (US$ 16,336,945) per year in the zone.

6.2. Conclusion

The present study showed that the segment of the population that is potentially productive is forced to be partially or totally home-bound due to podoconiosis. This inflicts considerable economic burden on patients, their families, the society and all other institutions including the government.

The out-of-pocket expense comes to 6% of the overall household expenditure. A total of 1244 work-days with an opportunity cost of 16,465 Birr (US$ 1915) were devoted by potentially productive patients and their care takers in seeking relief at different institutions. The opportunity cost of time lost accounted for the major component (72.1%) of patient-side cost. One-fifth of the patients were not totally involved in any productive work. In addition, productive hours from both economic and domestic activities were reduced almost by half. The chronic nature of podoconiosis makes such productivity losses inevitable. All in all the disease takes yearly cost of 140,497,724 *Birr* (US$ 16,336,945) per year in Wolaita zone.

Thus, the high prevalence of the disease coupled with its immense direct and productivity costs imply that podoconiosis is a health problem of public health and economic importance demanding attention from health planners and policy makers.

6.3. Strengths and limitations of the study

6.3.1. Strengths:

- The societal perspective of cost estimation was used which enabled many of the core cost components to be grasped in the study.
- A qualitative study was employed to complement data that were not gathered by the quantitative part of the study.
- Matching and multivariate analysis were used together to control the possible confounding effect of covariates.

6.3.2. Limitations:

- Resource limitations made us base our study on patients registered at the MFTPA. Thus we have already excluded severe cases or others who couldn't access the clinic for several reasons. This might bias our cost estimates.
- Because of time constraints only a single 24-hour activity pattern datum was collected. This fails to address seasonal fluctuations in work pattern in a predominantly agricultural community like the one we studied.
- Since our study was not carried out over a year, the previous year's statistics was used to calculate the overhead cost of the MFTPA. That may not actually be the same as the current year's statistics.
- This study didn't quantify the effect of the disease on a worker's marginal product (out put) while he/she is physically on the job.

6.4. Recommendations

♦ To minimize the economic burden of the problem, priority should be given to the prevention of the onset of manifestations among non-sufferers.

♦ Expansion of outreach sites should be facilitated to improve access to health institutions and hence to decrease the opportunity cost of time spent in seeking care.

♦ Efforts should be made in making more resources available for the control of this debilitating disease by enhancing the contribution of the international community and linking that to the existing programs of the MFTPA in the locality.

♦ There is a need for health planners and managers in the zone to revise the poor concern accorded to this health problem such as the low priority given to surgery of podoconiosis in government hospitals.

♦ The cost-effectiveness of prevention and control strategies and coping strategies, like shifting to less demanding activities, adopted by chronic patients should be researched.

♦ Disability-adjusted-life-years (DALYs) lost need to be calculated to further estimate and compare the burden of the disease and emphasize its public health importance which helps to reasonably allocate resources for the problem by the government.

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ANNEXES

ANNEX I. A structured questionnaire on the economic burden of podoconiosis in Wolaita zone, Ethiopia, 2004 (English and Amharic versions).

INTRODUCTION

My name is _____. I am working with the research team of Addis Ababa University. Here in Wolaita zone we are interviewing people to estimate the economic burden of podoconiosis. We believe that this study would help to bring about practical changes on the problems related to the disease. We would like to assure you that your name will not be mentioned in this form and the information that you give us will be kept confidential. You have full right to refuse to take part or to interrupt the interview at any time. But the information that you give us would be quite useful for the study. The interview will roughly take one hour.

Are you willing to participate in the interview of this study?

1. Yes
2. No

Signature of the interviewer which shows that the respondent has consented to take part in the study _____

Interviewer's: Code_____ Name _____ Signature: _____

Date of interview: ____ (day)/___ (month)/1997 E.C.

Supervisor's: Name_____ Signature: _____

Checked on: ____ (day)/___ (month)/1997 E.C.

PART I. SOCIO-DEMOGRAPHIC

S.No.	Questions	Possible answers	Skip to	Code
101	Sex of the respondent	1. Male 2. Female		
102	Where is your residence?	'Woreda'_____ 'Kebele'_____		
103	What is your age (in years)?	1. ____ 99.No data		
104	What is your current occupation?	1. Farmer 2. House wife 3. Government employee 4. NGO employee 5. Trader (Private business) 6. Student 7. Daily laborer 8. Unemployed 9. Other (specify): _____		
105	Are you able to read and write (in any language)?	1.Yes 2. No →	107	
106	If yes, which level of education did you complete?	1. Below grade 1 2. Grade 1-12(specify): ____ 3. Education after grade12: 12+_		
107	What is your religion?	1. Protestant 2. Orthodox Christian 3. Muslim 4. Catholic 5. Others (specify)_____		
108	What is your ethnicity?	1. Wolaitta 6. Oromo 2. Gamo 7. Tigre 3. Sidama 8. Other 4. Gurage (specify):___ 5. Amhara 98. Unknown 99. Refused to answer		
109	What is your current marital status?	1. Single (Never married) 2. Married 3. Widowed 4. Separated 5. Divorced		
110	What is the family size of your household?	1. ___ 99. No data		
111	What is your average monthly income (in *Birr*)?	1. _____ 98. I don't know 99. Refused to answer		

PART II. DIRECT EXPENDITURE BY PATIENTS (ONLY FOR PATIENTS)

201	How long have you had this condition since the onset of foot/leg swelling (in years)?	1._____ 99. Refused to answer		
202	Have you always been wearing fully protective shoes since childhood (age 6 years)?	1. Yes 2. No		
203	What means of transport did you use when you go to the MFTPA treatment site on ___ [mention the date!]	1. On foot 2. On back of an animal (mule, donkey etc.) 3. By cart 4. By car 5. Other (specify): _____		
204	How much did you pay in fees to the MFTPA in getting care?	1._____*Birr*. 98.I don't know		
205	How long did you spend on travel (home to treatment site and back)?	1._____ (min/hr/day) 98. I don't know		
206	How long did you wait to get treatment after you arrived at the site?	1._____ (min/hr/day) 98. I don't know		
207	How long did you spend on consultation and treatment?	1._____ (min/hr/day) 98. I don't know		
208	How long did you spend on health education at the site?	1._____ (min/hr/day) 98. I don't know		
209	How long were you absent from your usual activity after you returned home?	1._____ (min/hr/day) 98. I don't know		
210	Did any one accompany you to the health institution?	1.Yes 2. No →	216	
211	What is his/her sex?	1. Male 2. Female		
212	What is his/her age (in years)?	1. ___ [If not 15-64] → 98. I don't know 99. Refused to answer	216	
213	What was his/her occupation at that time?	1.Farmer 2.House wife 3.Government employee 4.NGO /private organization employee 5.Trader(Private business) 6.Student 7.Daily laborer 8.Unemployed 9.Other(specify):_____ 98. I don't know 99. Refused to answer		

214	If the answer to Q.212 is 3, 4 or 5, how much did he/she earn per month (in *Birr*)?	1._____ 98. I don't know 99. Refused to answer		
215	How long did the accompanying person spend to help you?	1.On travel:_____ (min/hr/day) 2.On waiting:____ (min/hr/day) 3.On consultation:_____ (min/hr/day) 4.On health education:__(min/hr/day) 5.Extra home care:____ (min/hr/day)		
216	How much was paid (in *Birr*) while visiting the treatment site (for you and your accompanying person)?	1.For transportation:_____ 2.For food and lodging:_____ 3.Other costs:_____		
217	Did you go to any other place in seeking relief for this health problem during the past three months?	1.Yes 2. No →	Part III	
218	If yes, where? (more than one answer is possible)	1.Religious places including holy water 2.Traditional healer 3.CHA,TBA or TTBA 4.Needle men 5.Private pharmacies 6.Private clinics 7.Goverment health institutions 8.Other(specify):_____		
219	How long did you spend there?	1st___(min/hr/day) at___ 2nd___(min/hr/day) at___ 3rd___ (min/hr/day) at___ 4th___ (min/hr/day) at___ 5th___ (min/hr/day) at___		
220	Did you have to pay for that?	1.Yes 2. No →	Part III	
221	If yes, how much?	_____*Birr* at _____ _____*Birr* at_____ _____*Birr* at_____ _____*Birr* at_____ _____*Birr* at _____		

PART III. DAILY ACTIVITY PATTERN (For patients and non-patients)

What were the activities that you performed yesterday? (Please state in chronological order from 6.00 A.M. yesterday to 6.00 A.M. today).

Timings	Activity	Total duration

Total hours of domestic activity (for females):_____
Total hours of economic activity: _____

PART IV. GENERAL HOUSEHOLD ECONOMIC STATUS

[To be responded by the head of the household]

401	What is the average annual income of the household (in *Birr*)?	1._____ 98. I don't know 99. Refused to answer		
402	What is the main source of income for the family?	1.Farming 2.Trade 3.Production of handicrafts 4.Daily labor 5.Monthly income from employment → 6.Other (Specify):_____		
403	What is the main food crop produced by the household (select only one)?	1.Teff 2.Bean 3.Maise 4.Barley 5.Wheat 6. Other legumes 7. Other (Specify):_____ 8. HH is not crop producer	405	
404	How many quintals of this crop were produced in the previous harvest season?	1._____ 98. I don't know 99. Refused to answer		
405	Do you have the following cultivation /plantation in your farm or backyard garden?	1.Coffee 1.Yes 2.No 2.'Chat' 1.Yes 2.No 3.Pepper 1.Yes 2.No 4. Ginger 1.Yes 2.No 5. Cabbage 1.Yes 2.No		
406	Do the family/ household own the following?	1.Piped water 1.Yes 2.No 2.Electricity 1.Yes 2.No 3.Radio 1.Yes 2.No 4.TV 1.Yes 2.No 5.Own home 1.Yes 2.No 6.Own land 1.Yes 2.No 7.Cattle 1.Yes (#__) 2.No 8.Beasts of burden 1.Yes 2.No		
407	What is the average household expenditure in the last month for the items listed (in *Birr*)?	1. Food items___ 10. Milling__ 2. Electricity___ 11. 'Edir'___ 3. Water____ 12. 'Ekub'___ 4. Education____ 13. Savings__ 5. Clothing____ 14. Utencils__ 6. Transport___ 15. Health___ 7. Telephone___ 16. Tax___ 8. House rent___ 17. Others__ 9. Kerosene____		

በወላይታ ዞን የዝሆኔን የእግር በሽታ የኢኮኖሚ ገጽታ በተመለከተ የቀረበ ቃለ መጠይቅ

[Amharic Version]

መግቢያ

እኔ ስሜ_____ ይባላል ። የምሰራው ከአዲስ አበባ ዩኒቨርሲቲ የጥናት ቡድን ጋር ነው። እዚህ ወላይታ ዞን ውስጥ የዝሆኔን የእግር በሽታ ኢኮኖሚያዊ ገጽታ በተመለከተ ለምናደርገው ጥናት ሰዎችን ቃለ መጠይቅ እያደረግን ነን። ይህ ጥናትም በበሽታው ላይ ያተኮረ ተግባራዊ ለውጥ ለማምጣት ከፍተኛ አስተዋጽኦ እንደሚያበረክት እናምናለን። በዚህ ቅጽ ላይ ስምዎ አይገለጽም። የሚሰጡን መረጃም ሚስጥራዊነቱ የተጠበቀ ይሆናል። ቃለ መጠይቁንም በፈለጉ ሰአት ማቋረጥ ይችላሉ።ነገር ግን እርስዎ የሚሰጡን መረጃ ለጥናታችን ከፍተኛ አስተዋጽኦ እንደሚያበረክትልን ልንገልጽልዎ እንወዳለን።ቃለ መጠይቁ አንድ ሰአት ያህል ይፈጃል።

በቃለ መጠይቁ ለመሳተፍ ፈቃደኛ ነዎት? 1.አዎን

2.አይደለሁም

ተጠያቂው የቃል ስምምነቱን ማድረጉን የሚያሳይ የቃለ መጠይቁ አቅራቢ ፊርማ_____

የቃለ መጠይቁ አቅራቢ፡ ኮድ_____

ስም_____

ፊርማ_____

ቃለ መጠይቁ የቀረበበት ቀን:____/____/1997 ዓ.ም.

(ቀን) / (ወር)

የተቆጣጣሪው ፡ስም_____

ፊርማ_____

ያረጋገጠበት ቀን_____/_____/1997 ዓ.ም.

(ቀን) / (ወር)

ተ.ቁ	ጥያቄዎች	አማራጭ ምላሾች	ወደ ተ.ቁ	ኮድ
		ክፍል 1፡ ማህበራዊና ስነህዝባዊ		
101	የተጠያቂው ጾታ	1. ወንድ 2. ሴት		—
102	እርስዎ የሚኖሩበት ቦታ የት ነው?	ወረዳ፡_____ ቀበሌ፡_____		
103	ዕድሜዎ ስንት አመት ነው?	1._____ 99. መረጃ የለም		—
104	በአሁኑ ወቅት ስራዎ ምንድነው?	1.ገበሬ 6.ተማሪ 2.የቤት እመቤት 7.የጉልበት ሠራተኛ 3.የመንግስት ሠራተኛ 8.ሥራ የለኝም 4.መንግስታዊ ያልሆነ ድርጅት ሠራተኛ 9.ሌላ (ይገለፅ)____ 5.ነጋዴ (የግል ሥራ)		—
105	ማንበብና መጻፍ ይችላሉ(በማንኛውም ቋንቋ)?	1. አዎን 2. አልችልም ⟶	**ወደ ክፍል 2**	—
106	ያጠናቀቁት የትምህርት ደረጃ ስንት ነው?	1. ከአንደኛ ክፍል በታች(መሠረተ ትምህርት) 2. ከ1-12 (ይገለጽ)_____ 3. ከ12ኛ ክፍል በላይ (12+_____)		—
107	የየትኛው እምነት ተከታይ ነዎት?	1. ፕሮቲስታንት 2. ኦርቶዶክስ ክርስቲያን 3. ሙስሊም 4. ካቶሊክ 5. ሌላ (ይገለጽ)_____		—
108	የየትኛው ብሄረሰብ አባል ነዎት?	1. ወላይታ 6. ኦሮሞ 2. ጋሞ 7. ትግሬ 3. ሲዳማ 8. ሌላ(ይገለጽ)_____ 4. ጉራጌ 98. አላውቅም 5. አማራ 99. መረጃ የለም		—
109	በአሁኑ ወቅት የጋብቻዎ ሁኔታ እንዴት ነው?	1. ያላገባ(ች) 2. ያገባ(ች)ና ከትዳር ጓደኛው(ዋ) ጋር አብሮ(ራ) የሚ(ምት)ኖር 3. ያገባ(ች)ና ከትዳር ጓደኛው(ዋ) ጋር አብሮ(ራ) የማይ(ት)ኖር 4. የትዳር ጓደኛው(ዋ) የሞተብ(ባ)ት 5. በህጋዊ መንገድ የፈታ(ች)		—
110	እርስዎን ጨምሮ የቤተሰብዎ ብዛት ስንት ነው?	1._____ 99.መረጃ የለም		—
111	አማካይ ወርሀዊ ገቢዎ ስንት ብር ነው?	1._____ 98. አላውቅም 99.መረጃ የለም		—

ክፍል 2፡ በህመም ወቅት የወጣ ወጪ (ለበሽተኞች ብቻ)				
201	ይህ በሽታ ለምን ያህል ጊዜ ቆየብዎ(እግርዎ ካበጠ በኋላ)?	1._____ (ወራት/አመታት) 99. መረጃ የለም		—
202	ከልጅነትዎ (ከ6 አመትዎ ጀምሮ) ያለማቋረጥ ሽፍን ጫማ ያደርጉ ነበር?	1.አዎን 2.አይደለም		
203	ባለፉት ሦስት ወራት ወደ ዝሆኔ በሽታ ህክምናና መከላከያ ማህበር በምን ሄዱ? **(ጊዜው ይጠቀስ)**	1. በእግር 2. በጋማ ከብት 3. በጋሪ 4. በመኪና 5. ሌላ(ይገለጽ)_____		—
204	በወቅቱ ለዝሆኔ በሽታ የህክምናና መከላከያ ማህበር ለእርስዎ ህክምና በጠቅላላው ስንት ብር ተከፈለ?	1._____ 98.አላውቅም		—
205	ከቤት እስከ ህክምናው ቦታ ላደረጉት **የደርሶ መልስ** ጉዞ ምን ያህል ጊዜ ፈጅ?	1._____ (ደቂቃ/ሰአት/ቀን) 98.አላውቅም		—
206	ህክምናው ቦታ ከደረሱ በኋላ ተራ ለመጠበቅ ምን ያህል ጊዜ ቆዩ?	1._____(ደቂቃ/ሰአት/ቀን) 98.አላውቅም		—
207	ለምርመራና ለህክምና ምን ያህል ጊዜ ቆዩ?	1._____(ደቂቃ/ሰአት/ቀን) 98.አላውቅም		—
208	የጤና ትምህርት ለመከታተል ምን ያህል ጊዜ ቆዩ?	1._____(ደቂቃ/ሰአት/ቀን) 98.አላውቅም		—
209	ወደ ቤትዎ ከተመለሱ በኋላ የተለመደውን ሥራዎን ለምን ያህል ጊዜ አቋረጡ?	1._____ (ደቂቃ/ሰአት/ቀን) 98.አላውቅም		—
210	ወደ ሕክምናው ቦታ እርስዎን ለመርዳት አብሮት የሄደ(ች) ሰው ነበረ(ች)?	1. አዎን 2. የለም →	**ወደ 216**	—
211	የአጃቢዎ ጾታ	1. ወንድ 2. ሴት		—
212	እድሜው(ዋ) ስንት አመት ነው?	1._____**(ከ15-64 ዓመት ካልሆነ)** → 98.አላውቅም 99.መረጃ የለም	**ወደ 216**	—
213	በዚያ ወቅት ስራው(ዋ) ምን ነበረ?	1.ገበሬ 6.ተማሪ 2.የቤት እመቤት 7.የጉልበት ሠራተኛ 3.የመንግስት ሠራተኛ 8.ሥራ የለዉም 4.መንግስታዊ ያልሆነ 9.ሌላ (ይገለፅ)__ ድርጅት ሠራተኛ 98.አላውቅም 5.ነጋዴ(የግልሥራ) 99.መረጃ የለም		—

214	ከላይ ላለው ጥያቄ ምላሹ 3፣4፣5 ከሆነ የወር ገቢው(ዋ) ስንት ብር ነበረ?	1._____ 98.አላውቅም 99.መረጃ የለም		_
215	አጃቢ ሥ እርስዎን ለመርዳት ምን ያህል ጊዜ ቆየ(ች)?	1.በጉዞ ላይ_____ (ደቂቃ/ሰአት/ቀን) 2.ተራ ለመጠበቅ_____ (ደቂቃ/ሰአት/ቀን) 3.በህክምና ላይ_____ (ደቂቃ/ሰአት/ቀን) 4.ለጤና ትምህርት_____(ደቂቃ/ሰአት/ቀን) 5.ለተጨማሪ የቤት ውስጥ እንክብካቤ_____(ደቂቃ/ሰአት/ቀን)		
216	ወደ ህክምናው ቦታ ሲሄዱ ለእርስዎና ለአጃቢ ሥ ስንት ብር ተከፈለ?	1. ለትራንስፖርት_____ 2. ለምግብና መጠለያ_____ 3. ሌላ ክፍያ_____		
217	ለዚህ የጤና ችግርዎ ማስታገሻ (ህክምና) ለማግኘት ባለፉት 3 ወራት ውስጥ ወደ ሌላ ቦታ ሄደው ነበር?	1.አዎን 2.አልሄድኩም →	ወደ ክፍል 3	_
218	ይህ የሄዱበት ቦታ የት ነበር ? (ከአንድ በላይ መልስ ይቻላል)	1.የእምነት ቦታዎች (ጸበልን ይጨምራል) 2.የባህል ሃኪም 3.የጤና ተጠሪ/የልምድ አዋላጅ 4.የመንደር መርፌ ወጊ 5.መድሃኒት መሸጫ ቤት 6.የግል ሃኪም ቤት 7.የመንግስት የጤና ተቋም 8.ሌላ(ይገለጽ)_____		_ _ _ _ _ _ _
219	እዚያ የሄዱበት ቦታ ምን ያህል ጊዜ ቆዩ?	1ኛ_____(ደቂቃ/ሰአት/ቀን) ቦታ__ 2ኛ_____(ደቂቃ/ሰአት/ቀን) ቦታ__ 3ኛ_____ (ደቂቃ/ሰአት/ቀን) ቦታ__ 4ኛ_____ (ደቂቃ/ሰአት/ቀን) ቦታ__ 5ኛ_____ (ደቂቃ/ሰአት/ቀን) ቦታ__		
220	ላገኙት የጤና አገልግሎት መክፈል ነበረብዎት?	1.አዎን 2.አይደለም →	ወደ ክፍል 3	_
221	በአጠቃላይ ምን ያህል ብር ተከፈለ?	_____ብር ___ ቦታ _____ብር ___ ቦታ _____ብር ___ ቦታ _____ብር ___ ቦታ _____ብር ___ ቦታ		

ክፍል3. የዕለት ተዕለት የሥራ ሁኔታ

ጊዜ	የስራው ዝርዝር	ድምር

ክፍል 4. ጠቅላላ የቤተሰቡ ኢኮኖሚያዊ ሁኔታ (በቤተሰቡ ሃላፊ የሚመለስ)

401	**የቤተሰቡ አማካይ አመታዊ ገቢ ስንት ብር ነው?**	**1._____** **98.አላውቅም** **99.መረጃ የለም**		**_**
402	**ለቤተሰቡ ዋንኛ የገቢ ምንጭ ምንድነው?**	**1.ግብርና 4.የቀን (የጉልበት)ሥራ** **2.ንግድ 5.የወር ገቢ (ቅጥር ሥራ)** **3.የዕደጥበብ 6.ሌላ(ይጠቀስ)_____ ሥራዎች**		**_**
403	**በቤተሰቡ የሚመረት ዋንኛ የምግብ ሰብል ምንድነው? (አንድ ብቻ ይመረጥ)**	**1.ጤፍ 5.ስንዴ** **2.ባቄላ 6.የጥራጥሬ እህሎች** **3.በቆሎ 7.ሌላ (ይጠቀስ)_____** **4.ገብስ 8.ሰብል አያመርትም⟶**	**ወደ 405**	**_**
404	**የባለፈው አመት የዚህ ሰብል ምርት ስንት ኩንታል ነበር?**	**1._____** **98.አላውቅም** **99.መረጃ የለም**		**_**
405	**በእርሻም ወይም በጓሮም የሚከተሉት ተክሎች አሉ?**	**1.ቡና 1.አዎን 2.የለም** **2.ጫት 1.አዎን 2.የለም** **3.በርበሬ 1.አዎን 2.የለም** **4.ዝንጅብል 1.አዎን 2.የለም** **5.ጎመን 1.አዎን 2.የለም**		**_** **_** **_** **_** **_**
406	**ቤተሰቡ ከዚህ በታች የተዘረዘሩት ነገሮች አሉት?**	**1.የቧንቧ ውሃ 1.አዎን 2.የለም** **2.ኤሌክትሪክ 1.አዎን 2.የለም** **3.ሬድዮ 1.አዎን 2.የለም** **4.ቴሌቪዥን 1.አዎን 2.የለም** **5.የግል ቤት 1.አዎን 2.የለም** **6.የግል መሬት 1.አዎን 2.የለም** **7.የቀንድ ከብቶች1.አዎን(#_)2.የለም** **8.የጋማ ከብቶች 1.አዎን(#_)2.የለም**		**_** **_** **_** **_** **_** **_** **_**
407	**ከዚህ በታች ለተዘረዘሩት ፍጆታዎች የባለፈው ወር የቤተሰቡ አማካይ ወርሀዊ ወጪ ስንት ብር ነበር?**	**1.ለምግብ_____ 10.ለወፍጮ___** **2.ለኤሌክትሪክ___11.ለዕድር_____** **3.ለውሃ_____ 12.ለዕቁብ_____** **4.ለትምህርት_____13.ለቁጠባ_____** **5.ለልብስ_____ 14.ለማብሰያ ዕቃ_** **6.ለትራንስፖርት__15.ለጤና_____** **7.ለስልክ_____ 16.ለግብር ___** **8.ለቤት ኪራይ__ 17.ሌላ ወጪ_** **9.ለናፍጣ(ጋዝ)_____**		

ANNEX II. Guiding questions for key informants' interview, Wolaita Zone, Ethiopia, 2004.

1. Location: 'Woreda' _____/ 'Kebele'_____
2. Name of the interviewer:_____

General information: Questions 1-4 deal with the following activities: daily laborer, agriculturalist and housemaid.

1. Do/did you currently/in the past work as or hire any one of the above?
2. How long does such a worker in your 'kebele' do per day for others?
3. How much does he or she earn per day or per month for his or her wage labor?
4. Is there any variation of payment by age or sex?
5. How is a household in your kebele labeled as better off or worse off in terms of wealth?

ANNEX III**.** Check list for observation of time taken by health institution workers to help podoconiosis patients, Wolaita Zone, Ethiopia, 2004

1. Name of the health institution: _____
2. Location: 'Woreda'_____/ 'Kebele'_____
3. Type of activity: Operation/Health education/Postoperative care/ Out patient treatment
4. Date of observation: _____
5. Name of observer: _____

Health worker	**Monthly gross salary**	**Time/case (Per session for health education)**	**Unit cost (Per case or per session)**
Specialist(surgeon)			
General practitioner			
Nurse(senior)			
Nurse(junior)			
Anesthetist			
Scrubber			
Cleaner			
Trained site worker			

ANNEX IV. Check list for administrative record review, Wolaita Zone, Ethiopia, 2004.

1. Name of the health institution:_____
2. Location: 'Woreda'_____/ 'Kebele'_____
3. Name of review taker:_____

Capital item category	**Type**	**Service year**	**Original price**	**Replacement cost**
Building				
Vehicles				
Equipment($100 or more unit cost)				
Others				
Recurrent item category		**Type**		**Current expenditure**
Administrative cost(personnel)				
Supplies				
Vehicle operation and maintenance				
Building operation and maintenance				
Training(recurrent)				
Other running costs				