CREDIT RESEARCH PAPER

No. 99/13

THE RELATIVE PREVALENCE OF DISEASES IN A POPULATION OF ILL PERSONS

Evidence from Benin

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November 1999

Codes JEL:I12 (Health Production; Morbidity), O15 (Human Resources).

This research, which is a revised version of a CSAE discussion paper, has been initiated under the auspices of the Programme PARADI at the Université Laval (Canada) and has been continued at the University of Oxford (UK) thanks to a TMR grant from the European Union. It has benefited from useful comments from participants at a seminar at Oxford University, W. Morrison and D. Whynes, and from a previous joint work with G. Lacroix. Of course responsibility for errors remains mine. I am grateful to the CREDESA for providing me with the data.

Abstract:

Little is known about the correlates of symptoms among ill persons. However, surveys of symptoms among ill persons hold much information that should be of interest for health care management. We propose a new technique based on the consideration of competing scores of symptoms to explain their relative prevalence among ill persons.

Using data from Benin, we estimate multinomial logit models of relative prevalence of four categories of symptoms, for four age classes of ill persons. Age and gender of the ill person, marital status, household composition, health equipment and noxious consumption influence the relative prevalence of symptoms. Moreover, living standards and economic activities also play important roles showing that the pattern of symptoms of poor and agricultural ill persons is different from that of the rich or of the non-peasants.

Three types of outcomes for management of health care can be extracted from the estimation results. First, since very little is known about the socio-demographic and economic variables affecting the structure of symptoms among ill persons, any new descriptive series of correlates is welcome. Second, such estimation results, in association with specific studies of causal relationships can be used to assist health care management directed towards specific symptoms or specific groups. Third, the estimation may reveal variables that might be used as instruments for a health intervention.

Résumé

La connaissance des caractéristiques associées avec les symptomes de malades est limitée. Cependant, beaucoup d'information est disponible dans les enquêtes de symptomes de malades qui est intéressante pour la gestion des soins de santé. Nous proposons une nouvelle méthode fondée sur la considération de scores de symptomes concurrents qui expliquent leur relative prévalence parmi les malades.

A partir de données du Bénin nous estimons des modèles logit multinomiaux de prévalence relative de quatre catégories de symptomes, pour quatre classes d'age de malades. L'age et le sexe du malade, la composition du ménage, l'équipement sanitaire et les consommations nuisibles influencent la prévalence relative des symptomes. En outre, le niveau de vie et les activités économiques jouent également des roles importants montrant que la composition des symptomes des malades pauvres ou agriculteurs est différente de celles des riches ou des non paysans.

Trois types de résultats peuvent être tiré des estimations pour la gestion des soins de santé. D'abord, puisque très peu est connu en ce qui concernent les variables socio-démographiques et économiques affectant la structure de symptomes parmi des malades, toute nouvelle série descriptive de corrélats est bienvenue. Ensuite, les résultats d'estimation, en association avec des études spécifiques de relations causales peuvent être utilisé pour assister les interventions sanitaires dirigées vers des symptomes ou des groupes spécifiques. Enfin, les estimations peuvent révéler des variables qui pourraient être utilisé pour une intervention sanitaire.

1. Introduction

Illnesses and diseases hamper welfare improvement and economic growth in developing countries. They augment the burden devoted to health problems in public or private expenses. They force governments and households to mobilise ressources that could have been allocated to other welfare or productive uses (Feldstein (1995), Asenso-Okyere and Dzata (1997)). They also diminish labour productivity because ill persons are less productive and less efficient (Audibert and Etard (1998), Strauss and Thomas (1999), Croppensted and Muller (2000)) than people in good health. Finally, they threaten the future productivity of the country because of their negative impacts on educational investment in children. Distinct diseases have different consequences, although in LDCs only general symptoms or diagnostics are often observed. These symptoms constitutes therefore the basis of feasible policies. Identifying high risk demographic or economic groups for general symptoms and separating the relative risks of prevalence of symptoms for these groups, can help to enhance the allocation of health public funds.

Despite this concern, few micro-econometric studies are devoted to the study of a detailed set of symptoms in developing countries. Behrman and Deolalikar (1988), Strauss and Thomas (1995, 1998), who survey the economic literature about health problems in LDCs, and Sickles and Taubman (1997) for all countries, show that most studies deal with general indicators of individual health. However, medical practitioners are confronted with a set of endemic illnesses with different characteristics. Since health policies in LDCs are often directed to specific types of illnesses through specific health programs, distinguishing the prevalence of different diseases is a major concern in practice. Sometimes, it is not possible to cure the disease, but it is possible to alleviate the symptoms. Then, information about symptoms is interesting in itself and not only as proxy for subjacent diseases.

Present knowledge of factors influencing specific diseases is limited. The epidemiology literature (Salvato (1982), Mausner and Kramer (1985), Lilienfeld and Stolley (1994), Souhami and Moxham (1994)) and the economic literature (Behrman and Deolalikar (1988), Strauss and Thomas (1995, 1998), Zweifel and Breyer (1997)) consider biological, genetic and environmental factors as well as economic and demographic characteristics. The studies of interactions between determinants of the prevalence of different illnesses are still in an exploratory step, especially when specific symptoms are considered. Moreover, authors generally study one given disease without accounting for other health problems, whereas populations of ill persons in LDCs are often affected by multiple health problems (Drasar, Tomkins and Feachem (1981)). Unfortunately, the available data sets do not generally include all the necessary information, notably the genetic factors. Then, researchers are constrained to work under strong assumptions of missing variables.

Most medical data in LDCs is based on samples of ill persons rather than individual samples representative of the total population[1]. Despite the selectivity problem that they involve, there is a great interest to elucidate, using these ill persons samples, which factors favour each type of symptom since these populations are natural targets of health policies. Indeed, hospital, health centres and dispensaries are mostly visited by ill persons[2].

In developing countries, ill persons often suffer from several diseases and injuries (parasitises, malaria, wounds, etc) at the same time. However, clinical symptoms are difficult to observe for all diseases and only the main symptom is generally recorded during health surveys. In Africa, health programs are often directed against a few major diseases (malaria, bilharzias, AIDS, tuberculosis, etc) that are first identified by general symptoms, such as for example fever for malaria. Indeed, considering the high prevalence of malaria in some areas, it may be more efficient and cheaper not to check it specifically by using blood examinations that require medical

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1 Besides, most sources of morbidity statistics only provide information on special population groups (Lilienfeld and Stolley (1994)).

2 This means that, in this approach, data sets are analysed conditionally to the assumption that selectivity effects can be neglected.

equipment, before undertaking treatment. This is especially the case for remote rural areas far away from health facilities. In this situation, the identification of factors correlated to the prevalence of a particular symptom is interesting.

The concept of general health status is complex and ambiguous, whereas symptoms are easier to define and to observe. Let us mention a few examples of analysts studying clinical symptoms for a specific disease. From a sample of young children in Columbia, Heller and Drake (1979) estimate probabilities of incidence of diarrhoea, and of a general disease. Using a panel sample of very young children in the Philippines, the Cebu Study Team (1992) simultaneously estimate both probabilities of incidence of diarrhoea and of respiratory fever, and a weight growth curve. Rampey, Longini, Haber and Monto (1992) estimate a discrete-time model for the per-time-unit distribution of infectious disease cases in a sample of U.S. households in Michigan, linking the probability of becoming infected by rhinovirus to the member's age and the family size. Using a U.S. sample of men from San Francisco, Geoffard and Philipson (1995) estimate a hazard model for acquisition of HIV sero-positivity, showing the importance of socio-demographic variables like race, but also of behaviour as suggested by the influence of the number of sexual partners. In all cases, the complete spectrum of symptoms and their relative prevalence are not considered. Note that knowledge of prevalence rates may be more appropriate for the implementation of new health interventions in LDCs, than that of incidence rates at a given date. Indeed, in a context where little health infrastructure is available, the health interventions to initiate are first directed towards the stock of existing ill persons rather than towards new cases during a specific period.

The set of correlates to include in prevalence equations is subject to debate. Epidemiologic models link host factors, environment factors and disease agent[3] (Salvato (1982), Mausner and Senauer (1985), Lilienfeld and Stolley (1994)). Host factors affect susceptibility to disease while environment factors influence exposure, and sometimes indirectly influence susceptibility as well. For a specific disease, epidemiologists (Salvato (1982)) distinguish three types of explanation: the origin, the transmission mode and the susceptibility of the host.

The aim of this paper is to propose a new modelling technique based on the consideration of several competing health problems so as to exploit the information available in surveys of

[3] The latter is unobserved in our data.

symptoms among ill persons. We investigate the correlates of the relative prevalence of disease symptoms among ill persons in Benin. We present our model in section 2. In section 3, we describe the data, and we discuss estimates of multinomial logit models of the relative prevalence of symptoms. Finally, we conclude in section 4.

2. The Model

We propose an approach based on the assumption that every observed symptom is characterised by its “latent potentiality” (or score) due to the environmental factors and the host characteristics associated with these explanations. Indeed, as suggested Mausner and Bahn (1985), or Lilienfeld and Stolley (1994), the development of a specific illness must account for successive stages: susceptibility; presymptomatic phase; clinical disease; and perhaps disability or death. During the subclinical stages, no symptom can be observed. Thus, symptom scores characterise the level of development of diseases. The score of the i^{th} disease (S_i) is an indicator of its latent severity and describes the "spectrum of the disease"[4]. The first part of this spectrum (susceptibility or presymptomatic level) corresponds to unobserved events occurring in the human organism from the time of exposure. Although unapparent, these events associated with early infection are important because they play a role in the transmission of infectious agents. When the disease is actually observed, the score corresponds to the level of clinical symptoms. We assume that the declared symptom corresponds to the highest score[5] obtained among the set of symptoms.

The system of equations (1) describes the scores of symptoms ($S_1, \ldots, S_q$).

(1) $$S_{ih} = X_{ih}' b + e_{ih} = X_h' b_i + e_{ih}$$

$i = 1, \ldots, q$ index of symptoms,

[4] MIMIC-models (van de Ven and van der Gaag (1982) , van de Ven and Hooijmans (1991)) treat the general health status itself as a latent variable.

[5] Similar “hidden diseases” occur for mortality statistics established in terms of “cause of deaths”. Traditionally a single cause of death has been recorded for routine statistical tabulations. It has been criticised as not providing a complete representation of events (Krueger (1966)), and since 1978 multiple cause-of-death data is available for all recorded deaths in the USA.

h = 1, ... , N   index of ill persons.

where X_{ih} is the vector of independent variables; b (or b_i) are vectors of parameters; ε_{ih} are errors terms accounting for unobserved heterogeneity of ill persons and households, unobserved attributes of environment and symptoms, and measurement errors.

System (1) is used as a set of latent equations of a discrete variable model. As only differences in scores are useful in determining the observed symptom, we do not consider in these equations the explanatory variables that are not specific to the considered symptoms since they disappear with the comparison of scores. The effects of correlates are described as interaction effects of the considered variable with a dummy variable of the concerned symptom[6]. To enable identification, we drop the constant associated with the alternative "Others".

The observed symptom for ill person h corresponds to index j such that $S_{jh} > S_{ih}$ for all i $\neq$j. The probability of observed prevalence of symptom j is probability Pr($S_{jh} > S_{ih}$, for i $\neq$ j). Only the differenced model, $S_{ih}(.) - S_{i1}(.)$, can be identified where S_{i1} is the score function of a reference alternative, here the symptom category “Others”.

We assume that the ε_{ih} follow independently identical Gumbel distribution[7]. Then, the probability of prevalence of symptom j is that of a multinomial logit model (see for example Maddala (1983), Jones (1998))[8].

$$(2) \quad P_j = \frac{\exp(X_h ' b_j)}{\sum_{i=1}^{q} \exp(X_h ' b_i)}$$

The likelihood function is then:

$$(3) \quad L = \prod_h \prod_j [P_j(.)]^{d_{jh}}$$

[6] The introduction of dummies of symptoms is consistent with the hypothesis that the effect of any host or environment variable is specific to the symptom since it corresponds to specific biological processes.

[7] Various logistic models and different estimation methods have been used in health studies for the incidence of a specific disease (Becker (1979), Prentice and Pyke (1979), Whittemore (1995), Breslaw and Holubkov (1997), Zhao et al. (1998)). We use in this paper a simple multivariate generalisation estimated by likelihood maximisation.

[8] When longitudinal data with multiple spells is available, models of competing risks inspired from duration models would be appropriate (Lin (1997), Omori (1998)). This is not the case with cross-section data such that the one we dispose of.

where δ_{jh} = 1 when ill person h has symptom j, else 0. The maximum likelihood estimator can easily be calculated by optimising the log-likelihood which is globally concave. This specification is chosen because of its simplicity and the small amount of information that is required for its estimation[9]. Only relative probabilities can be identified in this model. Alternatively, one can obtain the identification of the probabilities described in eq. (2) by fixing to zero the vector of coefficient of one alternative. In our application, this reference alternative is defined by the "Other Symptoms".

Our approach is original on several grounds. First, we focus on the population of ill persons that is the relevant target of health intervention, and the type of population that is likely to be encountered at treatment sites (hospital, community health center). Second, we do not model the incidence of diseases but rather their relative prevalence, which is consistent with the fact that we observe a sample of ill persons. Third, we consider competing symptoms instead of isolated diseases. Indeed, for populations affected by multiple health problems, concentrating the heed on an unique disease may give a misleading picture of a complex situation.

We include in X, available variables that describe mostly the host factors. These variables are socio-demographic characteristics of the ill person and of the household; variables related to economic status or behaviour likely to influence health status; and health equipment. Unfortunately, the environment factors are unobserved. We control for their influence by including dummy variables for seven districts.

3. Data Description and Econometric Results

3.1. The data

3.1.1. The country

[9] However, it has also unattractive features, especially the property of independence from irrelevant alternatives that implies that the ratios P_j/P_k for two symptoms j and k, does not depend on the values of parameters nor of attributes associated with other symptoms. Moreover, no correlations between error terms ε_{ih} has been allowed. We tried to estimate Multinomial Probit Models to eliminate these limitations, but the discriminating information that is present in the data was unsufficient to reach significant estimates. Under this strong constraint of information, we choose to restrict the analysis to the results of the multinomial logit model.

Benin is a small rural country in western Africa with a population of 4.74 millions in 1991, with 48 percent under 15 years old[10]. Per capita GNP is US $ 340 which makes Bénin one of the poorest country in the World. Agriculture is the cornerstone of Benin's economy and contributes 37 percent of the country's GNP. Moreover, three-fourths of the active population is employed in the agricultural sector. The education level of the population is very low with around four-fifth of adult people illiterate.

Health status is also dramatically low. Average life expectancy at birth is estimated at 50 years. Children experience a heavy mortality toll with perinatal mortality rate equal to 6.9 percent and juvenile mortality rate equal to 17. This high mortality is partly due to morbidity, especially from numerous endemic diseases such as malaria, parasitises and tuberculosis. Malnutrition is also widespread with 35 percent prevalence of malnutrition amongst children under five years old, whereas 10 percent of children show weight insufficiency at birth.

Despite the extent of poverty in the country, efforts have been made to improve the population's health. 67 percent of children are vaccinated with their third dose of DCT and 34 percent of deliveries benefit from an health assistance. But households spend on average only 5 percent of their final consumption expenditure on health, whereas 37 percent goes to food consumption. Moreover, only 4.3 percent of the GNP is devoted to health expenses with 41.8 percent of these expenses being funded by international assistance. The knowledge of factors associated with the main type of diseases may help to enhance the efficiency of the too scarce resources allocated to health.

3.1.2. The ill person sample

The data is taken from a random health survey conducted by the government of Bénin covering the district of Ouidah, which has about 70 000 inhabitants, in the South-East of Cotonou, from May to September 1992. This district is composed of nine communes where 2591 households were visited, corresponding to 11502 individuals. 880 individuals reported having

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10 The following statistics are also given for 1991.

suffered an illness at the period of the collection[11]. Due to missing values, 786 observations of ill persons are used in the estimation[12]. The household sample is representative of the district of Ouidah. The household members who reported an illness or a disease two weeks prior to the interview have been asked about their health and their socio-demographic and economic characteristics at the individual/household level. The interviews were conducted by doctors and medical staff from the Community Health Centre in Pahou. The health knowledge of these enumerators suggests that the measurement of health status is more precise than usual[13]. The basis of enquiries is a mixture of self-report and medical examination. Diagnostic rather than disease has been recorded to avoid misreporting from individuals who self-treated.

We do not dispose of the data for the whole sample of households but only for the sample of ill persons in households with illness. However, we know that the whole sample of households is characterised by a smaller average household size (4.40 members and a lower average education level (64.7 percent of uneducated people to be compared with 36.5 percent for the ill persons). Finally, the proportion of females is similar in the two samples (52.5 percent for the whole set of households, 55.73 for the ill persons). These differences between ill person households and non ill households illustrate the selectivity associated with the constitution of the ill person population. However, because our concern in this paper is the study of competing illnesses for ill persons, and not the incidence of illness in general, we do not incorporate this selectivity mechanism in the model, which would be anyhow impossible to identify from the available information.

We divide our sample of ill persons in four age classes so as to account for the specificity of health processes for different stages in life-cycle (Mausner and Kramer (1985)). Indeed, age is related to the occurrence of infectious diseases and to their severity, and chronic diseases tend to increase with age. 171 ill persons are babies (under four years old); 132 are young children

[11] The CREDESA health centre supervised the collection.

[12] Bolduc, Lacroix, Muller (1996) present a detailed description of this data, especially concerning treatments.

[13] Cox and Cohen (1985) discuss the importance of observation problems in health surveys.

(between 4 and 10); 71 are adolescents (between 11 and 18); and 412 are adults (over 18). Table 1 shows the mean and standard deviation of the main variables by age class of the ill persons.

Let us consider first the whole sample of ill persons. The average age of ill persons is about 27. The average household size is of 5.08 members. Amongst them around two-fifth (38 percent) are ill. Most of these members are children (4.25 by household) and the average age of ill persons is 27.3 years. Only one-fourth of ill persons are educated with an average education level of 0.44 years (including children too young to be educated). Thirty-six percent of households are headed by a female head. The average age of the household head is 44.4 years.

About 40 percent of ill persons live in a peasant household but only 7 percent of households are totally dependent on agricultural activity. On average 5.39 active persons from the family assist in household activities, mostly for agricultural work. Twenty-seven percent of households in which lives the ill person, are corn producers. A majority of ill persons use kerosene for lighting (83 percent), thus avoiding the noxious effects of smoke from firewood, although only 39 percent are equiped with septic tank, showing a general susceptibility to contagion through excrements.

Declared total expenses amount to 10475 FCFA [14] on average, which corresponds to average per capita expenses of 3166 FCFA. Only 1614 FCFA have been spent on health expenses in those households where at least one member is ill. This amount is to compare with the level of average tobacco expenses (73 FCFA) and the level of average alcohol expenses (444 FCFA)[15] that are believed to be noxious to health status.

Communes 1, 6 and 8 have been combined together because their individual sample size was not sufficient for statistical analysis. The location of the commune in the urban community of Ouidah (43 percent of the sample), or the average distance to modern health centres are controlled by dummy variables.

We examine now the characteristics of ill persons in specific age classes. The demographic and economic characteristics of households do not vary very much with the age class of the ill

[14] FCFA=CFA Francs. 1 FCFA is equal to US $ 0.00346 in 1992 (IMF - International Financial Statistics)

[15] There are probably substantial measurement errors attached to declarations of expenses by households since they are collected through retrospective interviews. However, we consider the observed variables as positively correlated with the true levels.

person[16]. Naturally, age and education level are increasing in the age class. Half of ill persons are female for age group 0-3 years (babies) or 4-10 years (children), and respectively 58 and 60 percent for age group 11-18 (adolescents) and 19+ (adults). Some symptoms are more frequent for specific age classes: cough, diarrhoea, skin diseases for babies; fever for children; fever, wounds, abdominal pains for adolescents; abdominal pains, fatigue, articular pains, cardio-vascular illnesses for adults.

3.1.3. The symptoms

The average duration of illness is 10.85 days, although since this variable has been truncated to 15 days for the longest duration, the mean underestimates the actual mean duration. Illnesses and diseases are recorded in terms of symptoms, which are classified in to 33 categories. Table 2 shows the frequency of occurrence for every symptom. Most of the usual health problems are observed. Only three symptoms show a sufficient number of observations for econometric analysis: "Fever", "Cough" and "Wounds". They represent 61 percent of observations and we focus on their relative prevalence. We group all the other symptoms in a residual category "Others".

The diseases are classified on the basis of symptomatology rather than on etiology which would have necessitated the knowledge of the specific agent of each illness[17]. Surprisingly diarrhoea, dysentery, malnutrition and other diseases related to diet do not seem to have been correctly recorded, probably because the survey methodology was better adapted to the study of illnesses than to nutrition problems. A nutritional survey based on anthropometric measures would have been useful for the knowledge of nutritional status.

"Fever" accounts for almost half of the symptom declarations. Fever (without cough) may often be attributed to malaria that is frequent in this area[18]. The symptom "Cough" is more

[16] The classes of ill persons correspond to different but not disjoint sub-populations of households since members of several classes may belong to the same household.

[17] As recall Mausner and Kramer (1985), classification of diseases on the basis of symptomatology was the traditional approach in Europe for a long time since enough etiologic information was available. This approach is still useful for Africa where little detailed data is available.

[18] Malaria is responsible for the greatest number of death in the World, especially for children. It is transmitted by bites of certain species of infected anopheles, and the germs are becoming increasingly resistant to usual treatments.

difficult to attribute to specific diseases. It may be resulting from dengue, influenza, tuberculosis, infantile illnesses, etc. "Wounds" may also have various origins related to working activities, to presence where violent behaviour is happening, to engaging in hazardous activities.

Demographic variables are often considered as correlated with morbidity. Gender is believed to be influential and if death rates are higher for males than for females, morbidity rates are generally higher for females. The family size is associated with complex effects since it may be related to living standards (in LDCs rich households have sometimes more children) or to poverty since in large families many persons have to share limited resources. Moreover, the existence of large families helps contagion, although adults may have better health experience and awareness since they had opportunities to practice on children.

In fact, the characteristics of the ill person, and of the household she/he belongs to, vary with the recorded symptom. Table 3 shows these characteristics for the four categories of symptoms. Age, as we have shown above, gender and education of ill persons are linked to the recorded symptoms. Cough and Fever affect relatively less frequently the household head, while Wounds affect rarely the spouse of the head. The average duration of illness is shorter for fever and cough than for wounds and other diseases.

The characteristics of households in which each type of symptoms occurs are also of interest. Wounds are more common in household with larger size, larger number of children or larger number of active persons. On average, Fever is more often associated with a greater land area and with male heads. Cough is more frequently associated with landlords, bachelor head or older heads, absence of septic tank, small land area and production of corn. Although the total expenses and the per capita expenses do not vary much with the symptom, health expenses (lower for Cough), alcohol expenses (higher for Wounds), tobacco expenses (higher for Fever and Wounds) are much more related with observed symptoms. All these associations suggest the possibility of discrimination between the relative prevalence of different symptoms. In the next section, we present estimates of a multinomial logit model describing this discrimination. This enables us to account for the multivariate interaction of correlates, which is impossible with simple descriptive statistics that may provide a misleading picture of effects of variables of interest on the prevalence of symptoms.

Gomes (1993) stresses that few reliable data on malaria morbidity exist, particularly in Sub-Saharan Africa. The ill health burden and the economic burden due to malaria is a major source of poverty (Bonilla and Rodriguez (1993)).

3.2 Econometric Results

Table 4 shows the multinomial logit estimates. The interpretation of parameters is in terms of relative effects of the considered variable on the score of the considered symptom relatively to the score of the reference set of symptoms. Therefore, a positive parameter indicates a positive effect on the relative prevalence of the considered symptom (Fever, Cough, Wounds) with respect to the prevalence of symptom “Others”[19]. Dummies for communes have been included to account for health environment of variable quality[20], although the corresponding coefficients are not shown in the table.

Many econometric studies deal with the incidence of general illness, or with the incidence of a specific disease or symptom in a particular population. We present results of *relative* prevalence of symptoms in a population of ill persons[21].

The age of the ill person is the main demographic variable, consistently with the medicine, epidemiological and health economics literatures, in which health processes are considered strongly dependent on age groups (Souhami and Moxham (1994)). Age should as well affects the composition of diseases in a population of ill persons. For example, the risk of infantile and other illnesses is often strongly decreasing with the growth of children (see the case of Rhinovirus infectious diseases in Rampey et al. (1992); diarrhoea and illness of children in Heller and Drake (1979); diarrhoea and respiratory diseases of infants in Cebu Study Team (1992)). The differences in estimates for each age class and for the global sample supports the use of age classes for the study of relative prevalence of symptoms. Furthermore, the effects of age is significant inside each

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19 Clearly, the exact causality mechanisms explaining these effects is generally unknown. In many cases, the interpretation of estimated effects should be in terms of descriptive association rather than precise causality.

[20] notably as in Thompson et al. (1997) in Mozambique, for the proximity of breeding sites of mosquitoes or other parasites.

21 This make the comparison with past published results delicate. Indeed, the comparison would be straightforward in the case of a fixed structure of the population of ill persons, a fixed probability of “Other symptoms” in this population, a steady-state situation enabling us to assimilate incidence and prevalence with constant duration of disease, and no influence of diseases on one another. Thus, part of the differences between our results and, say, binary probit estimates of the incidence of a particular symptom, would be explained by the above distinctions in the estimated model and in the considered population. Other differences in results would stem from the fact that different sets of correlates may be used. However, it is interesting to verify that factors present in studies of absolute incidence of morbidity in the literature are also influential in our relative prevalence approach.

age class at least for one symptom, suggesting that age classes of smaller width would be appropriate, although this is not possible with our sample size.

Significant effects of age inside age classes show that when they grow older. Babies are more affected by fever and cough, which may be related to the high occurrence of infantile diseases as soon as babies cease to benefit from the immunity provided by the mother's milk. Young children suffer relatively more from wounds, perhaps because of a greater autonomy of movement at older ages. Adolescents suffer relatively less from cough and adults relatively less from fever.

The effect of gender is less strong. However, as expected from absolute incidence studies (Mausner and Kramer (1985)), females are associated with a lower relative prevalence of wounds that males. In particular, wounds are significantly less relatively frequent among female adolescents than among male adolescents. The effects of the education of the ill person is not significant and has been omitted as well as other minor insignificant variables. No information about parent's education is available.

In absolute incidence studies, the marital status has been found associated with health status. Sickles and Taubman (1997) show that marriage has a positive effect on life-tables. Using Kenyan data, Gage (1997) shows that children of married mothers have a lower probability of polio dropout and of acute malnutrition. Mausner and Kramer (1985) insist that marital status is associated with lower level of mortality for both sexes. Several explanations have been proposed for the influence of the marital status of the health person on her/his health status. Single persons lead often a more dissolute lifestyle. Marriage brings positive interactions between spouses (caring and companionship), although also stress and anxiety. Surviving widows or widowers experience acute grief provoking health problems and premature death. Finally, marriage is in itself a selection mechanism likely to often exclude persons with chronic illness. For adults in our sample, the spouse of the head is a woman. These wives experience relatively less frequently Fever and Wounds. Ill persons in households with single heads have relatively less often Cough. The signs of the coefficient of the two variables describing marital status show that ill persons with symptom in the category "Others" are relatively more frequent for the head's spouse or in households with single head. Anyhow, the marital status is not neutral for the relative prevalence of symptoms of ill persons.

It is well known that crowding people indoors reinforces the occurrence of respiratory diseases (Sutton (1981)). This implies that, at constant dwelling area, large size households should have a higher incidence of these diseases and the same is true for most infectious illnesses. This is clearly not the only influence channel of household composition since large household size is often correlated in LDCs with high income or socio-economic status, but also with considerable economic burden. In that case, high income might induce both large household and large dwelling, and the effect of household size may not be interpretable in terms of density. Moreover, subtle health management decisions may incorporate the birth order, the number of children or the masculinity ratio of household, directing care and resources allotted to infants and young children (Mausner and Kramer (1985), Strauss and Thomas (1995)). The number or the proportion of active members is an indicator of the capacity of the household to meet its members needs both financially and in terms of caring time. We find here that a large household size lowers the relative frequency of fever among adolescents. Moreover, the number of active persons negatively influences the relative frequency of fever for children and adults, and of cough for children. The structure of disease prevalence of ill persons is clearly dependent on the composition of the household they belong to.

Household's income or assets, as in Heller and Drake (1979), Appleton (1995), Gage (1997), Smith (1998), are strongly correlated with absolute incidence of general or specific illnesses, the richer households being uniformly in better health for all symptoms. Here, it is noticeable that several economic variables do not affect systematically the relative prevalence of symptoms in our sample. This is not as surprising as it may seem. Indeed, it is not obvious a priori if the relative frequency of one of the three main symptoms with respect to the set of residual symptoms should be higher or lower for rich households. What show the results is that the symptoms of the poor are not always those of the rich. High income level, approximated by per capita expenses, is associated with a lower relative frequency of fever among adults and a higher relative frequency of cough among children. When the household head is the landlord of his house - which is another indicator of wealth - the relative frequency of wounds is lower for adults, and the relative frequency of fever is lower for adolescents. A possible explanation of these changes in the structure of diseases, related to an increase in socio-economic status, is the consequence of investments in housing and comfort, which may considerably improve the insulation of the house from mosquitoes and parasites. Thompson et al. (1997) have shown in particular that the sole expedient of closing the eaves of houses in Mozambique significantly reduces the malaria risk. Richer households and landlords are more likely to undertake this type of housing investment. Thus, changes in household living standards may influence the pattern of symptoms of ill persons.

The occupation of the ill person (and also of household members) is known as an important determinant of health status (Mausner and Kramer (1985), Sickles and Taubman (1997), Cavelaars et al. (1998)). Andersson and Bergstrom (1997) found that agricultural women in Central African Republic are associated with lower birth weight of children. In our data, economic activities as well affect the relative prevalence of symptoms. Babies, children and adults in pure agricultural household have relatively less frequently fever and cough, and children and adolescents relatively more frequently wounds. The higher prevalence of wounds is consistent with the frequent occurrence of accident related to agricultural work. Adults and children in corn producer households have relatively less frequently fever, and children have relatively less frequently cough. This may be related to the fact that these peasant households do not use irrigation systematically and live generally on dryer land than the average, more suitable to cultivation of corn. Thus, they avoid contamination by parasites present or associated with water, such as mosquitoes transmitting the germ of malaria, plasmodium falciparum. By contrast, this health hazard touches other professions such as the fishermen. The low occurrence of fever and cough for peasants may also be related to their lower household density, which diminishes contagion risks.

Health equipment is as well influential. Behrman and Deolalikar (1988) insist on the improvement of health status linked to higher quality or better availability of water. Use of latrines and septic tanks is generally associated with better health of household members (Cebu study team (1992), Appleton (1995)). Smoke exposure has also been found positively associated with febrile respiratory infections (Cebu study team (1992)). Here, the presence of a septic tank in the household is associated with relatively less frequent fevers among babies and adults, coughs among babies and wounds among adults. The occurrence of fever and cough may be low in that case owing to reduced exposure to contaminated faeces that would transmit infections. Using kerosene for lighting is related to relatively less frequent fevers and coughs for babies and children, which is consistent with avoiding the noxious effect of firewood use on the air quality in the house.

Habits have been frequently invoked as explanations of morbidity problems (Sickles and Taubman (1997)). Alcoholism is known to increase motor vehicle accidents and liver diseases. Smoking is associated with higher absolute incidence of lung cancer and stroke. In our sample, these consumptions that are noxious for health are as well related to the relative prevalence of specific symptoms. Large alcohol expenses are associated with lower relative frequency of fever among adolescents, perhaps because liver diseases are included in category "Others". Large tobacco expenses are linked with greater relative frequency of wounds among adults, which might be associated with a sometimes more dissolute life of smokers.

Under the usual precaution that more thorough studies would be necessary before implementing health policies, estimation results could help to assist health care management directed towards specific symptoms or specific groups. Since the relative prevalence of the studied symptoms is very dependent on the age of the ill person, a special attention should be attached to the design of policies in terms of age classes. There are several ways to use the table of estimates. Conditionally on the acceptance of causal relationships that should be confirmed by further studies, it exhibits influential variables that can be considered as policy instruments for each couple (symptom, group). It shows which populations and which symptoms can be touched for each of these instruments. The instruments can also be used merely to improve prevention through screening and early intervention in a population of ill persons. Note that some health care interventions are naturally directed towards specific age groups (children at school, infants during mother's visits at health centres, adults at work). The estimation results can be used to determine for each specific age group, which symptom to treat in priority, and therefore which equipment, material and health personnel to mobilise. Then, the practical organisation of health care delivery could take advantage of the knowledge of the multivariate statistical association that appear in the estimates.

Finally, using the estimation results, the observation of predominating symptoms in a population of ill persons indicates some likely characteristics of this population. Some characteristics may suggest special types of interventions. Others can be modified to influence the occurrence of symptoms.

Let us consider a few examples. The results show that one does not expect that wounds will be an important problem, then health expenses in this direction can be moderate for this type of population. Low occurrence of fever and cough are simultaneously associated with the presence of septic tanks and kerosene lighting. Incentive to install such equipment can be raised by providing financial subsidies or technical advice to households.

In the case of poor adults, the estimates tend to indicate a relatively higher prevalence of fever and wounds. Then, the health interventions could be more directed towards these health problems than for an average population of ill persons. This may imply in particular enhancing the capacity of local health centres to fight malaria in areas where these economic features have been detected. This can be achieved by constitution of floroquine stocks, drainage to destroy mosquitoes breeding sites, insulation of houses.

Among ill persons living in agricultural households, cough is relatively less frequent, while wounds are relatively more common than for average ill persons. Then, the equipment of local health centres can be adjusted, for example by constitution of plasters stocks and disinfectant stocks, and purchase of small surgery equipment.

In a population of ill persons predominantly affected by fever, an important factor is the socio-economic situation of the household, as indicated by the significant coefficient of per capita expenses, landlord dummy, number of active persons. A general approach aiming at raising the living standards of households screened using these variables, may efficiently reduce the relative occurrence of fever among ill persons.

For health centers dealing with a population of female adult ill persons, especially when they are married, the financial allocation to treatment of injuries and wounds can be reduced in comparison with what is allotted for average populations of ill persons.

All these are examples of hints that could be derived from the estimates. Naturally, more thorough studies would be necessary before to implement health policies and we have merelyn proposed a technique that could now be applied to richer data sets. In particular, it would be necessary to determine the importance of missing variables that may influence our results, and could be measured in a more specialised survey. The precise causality mechanisms explaining the statistical association should also be carefully investigated. To this extent, the results of multinomial logit estimation provide hints useful to direct more specific studies of the statistical links between illnesses and factors. Then, an accurate examination of causality factors might be undertaken.

4. Conclusion

Little attention has been devoted to the information present in surveys of symptoms among ill persons, despite the fact that health centres and other medical providers are generally confronted with populations of ill persons chronically affected by multiple health problems. We propose a new technique based on the consideration of competing scores of symptoms to explain their relative prevalence among ill persons.

Using a sample of ill persons from Bénin, we estimate a multinomial logit model of relative prevalence that shows the main characteristics associated with prevalence of fever, cough and wounds, relatively to other symptoms. The age of the person is very related to the pattern of symptoms. Household composition, living standards and economic activities affect also the relative prevalence of symptoms. Finally, health equipment and noxious consumptions play important roles.

Three types of outcomes for health care management can be extracted from the estimation results. First, very little is known about the socio-demographic and economic variables affecting the structure of symptoms of populations of ill persons. Then, any new descriptive series of correlates is welcome, although these statistical links have yet to be to examined and confirmed for other populations. Knowledge regarding the correlates of the relative odds of symptoms is useful since the cost-effectiveness of a specific treatment systematically delivered to a population of ill persons, is a function of the relative frequency of the symptom to be treated. Second, such estimation results, in association with specific studies of causal relationships can be used to assist the design of health interventions directed towards specific symptoms or specific groups. Here, the information delivered by the estimation can be used to investigate the characteristics of target groups or to screen ill persons when one given symptom is the object of the intervention. Thus, the management of health projects or health centres can be more easily directed towards health problems likely to be present in a population of ill persons, defined by its socio-demographic and economic characteristics. Third, the estimation may reveal variables that might be used as instruments for an health intervention.

Table 1: <u>Descriptive statistics by age class of the ill person</u> : 1: babies (1-3); 2: young children (4-10); 3: adolescents (11-18); adults (19+)

AGE CLASSES	1	2	3	4	TOTAL
Household size	5.24	5.51	4.79	4.93	5.08
	(3.56)	(3.68)	(3.07)	(3.56)	(3.54)
Number of children	4.37	4.38	4.75	4.07	4.25
	(3.47)	(3.41)	(3.96)	(3.45)	(3.50)
Number of ill persons	1.18	1.39	1.25	1.10	1.18
	(0.49)	(0.71)	(0.65)	(0.37)	(0.51)
Per capita expenses	3148.05	2816.77	3914.69	3157.11	3166.41
	(4712.37)	(3797.66)	(6312.95)	(4214.01)	(4487.58)
Total expenses	10356.03	10255.81	11009.43	10502.34	10474.91
	(3045.89)	(2669.12)	(2770.02)	(2739.48)	(2801.58)
Number of active persons	5.95	6.74	6.77	4.49	5.39
	(3.03)	(3.40)	(3.73)	(3.58)	(3.58)
Land area	8.94	7.18	21.46	6.96	8.74
	(24.65)	(20.18)	(97.41)	(23.90)	(36.90)
Proportion of ill persons	0.36	0.39	0.39	0.38	0.38
	(0.29)	(0.29)	(0.30)	(0.30)	(0.30)
Age	1.68	6.60	14.79	46.74	27.30
	(0.76)	(1.98)	(2.50)	(18.59)	(24.69)
Gender female	0.50	0.50	0.58	0.60	0.56
	(0.50)	(0.50)	(0.50)	(0.49)	(0.50)
Education level	0.00	0.43	0.87	0.55	0.44
	(0.00)	(0.50)	(0.58)	(0.75)	(0.66)
Duration of illness	9.95	9.87	9.65	11.74	10.85
	(4.36)	(4.13)	(4.45)	(4.09)	(4.28)
Fever	0.5l	0.67	0.62	0.37	0.47
	(0.50)	(0.47)	(0.49)	(0.48)	(0.50)
Cough	0.23	0.14	0.07	0.06	0.11
	(0.42)	(0.34)	(0.26)	(0.23)	(0.31)
Diarrhoea	0.08	0.01	0.00	0.00	0.02
	(0.27)	(0.09)	(0.00)	(0.07)	(0.14)
Wounds	0.02	0.05	0.10	0.07	0.06
	(0.15)	(0.22)	(0.30)	(0.25)	(0.23)
Abdominal pains	0.03	0.02	0.06	0.06	0.05
	(0.17)	(0.15)	(0.23)	(0.23)	(0.21)
Fatigue	0.01	0.01	0.00	0.04	0.02
	(0.11)	(0.09)	(0.00)	(0.19)	(0.15)
Articular pains	0.00	0.02	0.01	0.08	0.05
	(0.00)	(0.15)	(0.12)	(0.28)	(0.22)
Skin illness	0.04	0.00	0.00	0.02	0.02
	(0.18)	(0.00)	(0.00)	(0.14)	(0.13)
Teeth pains	0.02	0.00	0.03	0.02	0.02
	(0.13)	(0.00)	(0.17)	(0.13)	(0.12)
Cardio-vascular illness	0.00	0.00	0.03	0.06	0.03
	(0.00)	(0.00)	(0.17)	(0.24)	(0.18)
Observations	171	132	71	412	786

Table 2: Frequency of the symptoms

SYMPTOMS	NUMBER OF OBSERVATIONS	%
Fever - convulsions - malaria	373	47.35
Cough-fever	87	11.11
Other symptoms	50	7.4
Wounds - abscess	46	5.9
Osteo articular pains	39	5.0
Abdominal pains	36	4.6
Cardio-vascular illnesses	27	3.4
Anaemia-bleeding-fatigue	19	2.4
Diarrhoea	16	2.0
Skin illnesses	14	1.8
Dental pains	12	1.5
Eyes pains	9	1.1
Oedema	8	1.0
Vomiting	5	0.6
Icterus	6	0.8
Measles	6	0.8
Throat ache - angina	5	0.6
Paralysis	5	0.6
Ear pains	4	0.5
Genito-urinal troubles	4	0.5
Rhinitis	2	0.3
Epilepsies-behaviour troubles	2	0.3
Dysentery	2	0.3
Hernia	1	0.1
TOTAL	778	99.96

Table 3: <u>Mean and Standard Error of the Main Variables by Symptom</u>

	SYMPTOM				
	Fever	**Cough**	**Wounds**	**Others**	**TOTAL**
Age	20.27	15.86	32.17	39.43	27.30
	(20.27)	(21.12)	(25.80)	(25.77)	(24.69)
Gender	0.56	0.46	0.37	0.6l	0.56
	(0.50)	(0.50)	(0.49)	(0.49)	(0.50)
Educated ill person	0.28	0.11	0.37	0.29	0.27
	(0.45)	(0.32)	(0.49)	(0.45)	(0.44)
Education level	0.48	0.30	0.61	0.41	0.44
	(0.69)	(0.55)	(0.68)	(0.64)	(0.66)
Household head	0.29	0.20	0.48	0.52	0.37
	(0.46)	(0.40)	(0.51)	(0.50)	(0.48)
Duration of illness	9.81	9.63	11.91	12.43	10.85
	(4.30)	(4.00)	(4.40)	(3.78)	(4.28)
Household size	5.16	5.43	5.59	4.80	5.08
	(3.57)	(3.99)	(3.49)	(3.34)	(3.54)
Number of Children	4.34	4.39	4.50	4.04	4.25
	(3.43)	(3.78)	(3.03)	(3.58)	(3.50)
Heads' spouse	0.08	0.06	0.02	0.14	0.10
	(0.28)	(0.23)	(0.15)	(0.35)	(0.30)
Number of active persons	5.57	5.31	6.13	5.06	5.39
	(3.57)	(2.90)	(4.44)	(3.62)	(3.58)
Landlord	0.48	0.57	0.39	0.44	0.47
	(0.50)	(0.50)	(0.49)	(0.50)	(0.50)
Single head	0.05	0.08	0.04	0.06	0.06
	(0.22)	(0.27)	(0.21)	(0.23)	(0.23)
Heads' sexe	0.35	0.36	0.39	0.36	0.36
	(0.48)	(0.48)	(0.49)	(0.48)	(0.48)
Heads' age	44.35	45.41	42.07	44.61	44.43
	(15.47)	(15.57)	(13.51)	(17.03)	(15.94)
Number of ill persons	1.16	1.37	1.22	1.14	1.18
	(0.44)	(0.84)	(0.42)	(0.46)	(0.51)
Proportion of ill persons	0.36	0.39	0.35	0.39	0.38
	(0.29)	(0.30)	(0.29)	(0.31)	(0.30)
Septic tank	0.38	0.40	0.28	0.43	0.39
	(0.49)	(0.49)	(0.46)	(0.50)	(0.49)
Kerosene lightning	0.82	0.77	0.78	0.86	0.83
	(0.38)	(0.42)	(0.42)	(0.34)	(0.38)
Alcohol expenses	430.52	443.10	749.46	411.79	443.91
(CFA)	(1512.67)	(990.27)	(2416.01)	(997.51)	(1373.30)
Tobacco expenses	110.72	23.85	100.00	33.11	72.83
(CFA)	(962.88)	(121.99)	(454.12)	(146.69)	(679.71)
Health expenses	1966.34	945.69	1338.70	1397.23	1613.90
(CFA)	(9969.77)	(1905.85)	(3371.17)	(3627.63)	(7277.27)
Per capita expenses	3036.80	2767.34	3290.64	3442.67	3166.41
(CFA)	(3998.63)	(3038.40)	(4743.88)	(5358.75)	(4487.58)
Total expenses	10528.76	10249.86	10225.43	10514.10	10474.91
(CFA)	(2670.45)	(2811.80)	(3070.58)	(2930.20)	(2801.58)
Land area	10.98	7.07	3.37	7.15	8.74
	(48.22)	(20.54)	(7.46)	(24.02)	(36.90)
Corn producer	0.27	0.21	0.35	0.28	0.27
	(0.45)	(0.41)	(0.48)	(0.45)	(0.45)

Table 4: Multinomial logit estimates

	Age under 4			4 to 10			11 to 18			Over 18			Global Sample		
Explanatory Variables	**F**	**C**	**W**	**F**	**C**	**W**	**F**	**C**	**W**	**F**	**C**	**W**	**F**	**C**	**W**
Constant	2.23 (1.75)	2.12 (2.03)	-154.0 (17600.0)	-0.290 (2.28)	-1.33 (3.14)	1.86 7.25	18.0* (7.10)	1.58 (1590.0)	-12.4 (1370.0)	4.33* (1.34)	0.245 (2.39)	2.11 (2.24)	3.45* (0.908)	3.75* (1.35)	0.744 (1.58)
Age	0.673* (0.325)	0.739** (0.390)	0.795 (2910.0)	0.277 (0.194)	0.277 (0.245)	0.785** (0.475)	-0.294 (0.270)	-0.771* (0.376)	-0.156 (0.405)	-0.0342* (0.00839)	0.00572 (0.0157)	-0.0210 (0.0137)	-0.0264* (0.00506)	-0.0326* (-0.0085)	-0.00730 (0.0090)
Female	0.581 (0.495)	-0.0355 (0.600)	-43.1 (2920.0)	-0.307 (0.683)	-0.633 (0.911)	-0.607 (2.18)	-0.383 (1.20)	1.05 (2.65)	-7.88** (4.50)	0.0512 (0.285)	-0.493 (0.554)	-0.346 (0.477)	9.22 (0.198)	-0.137 (0.293)	-0.657** (0.357)
Head's spouse										-0.624** (0.368)	-0.462 (0.779)	-2.32* (1.11)	-0.447 (0.297)	-0.778 (0.556)	-1.77** (1.06)
Single head										0.447 (0.578)	2.59* (0.870)	0.260 (1.18)	0.297 (0.421)	1.09** (0.573)	-0.232 (0.847)
Number of active persons	0.113 (0.435)	-0.621 (0.553)	-18.6 (3480.0)	-1.09* (561.0)	-3.49* (1.22)	1.97 (1.89)	0.282 (1.17)	-1.19 (3.37)	1.51 (2.59)	-0.508* (0.229)	-0.0812 (0.392)	0.231 (0.328)	-0.254 (0.180)	-0.604** (0.284)	0.401 (0.279)
Household size	0.433 (0.368)	0.128 (0.414)	-51.2 (2390.0)	0.155 (0.462)	0.200 (0.645)	-0.501 (1.48)	-2.09* (0.902)	-0.759 (1.31)	-1.46 (2.29)	-0.0276 (0.202)	0.331 (0.366)	0.318 (0.313)	0.0364 (0.146)	0.137 (0.209)	0.243 (0.242)
Septic tank	-0.900** (0.562)	-1.26** (0.658)	39.6 (7700.0)	-0.652 (0.818)	-0.278 (1.03)	-0.753 (1.98)	-1.62 (1.53)	14.7 (1590.0)	14.9 (1370.0)	-0.705** (0.382)	-0.684 (0.712)	-1.55* (0.637)	-0.481** (0.294)	-0.691** (0.416)	-1.06* (0.497)
Kerosene lighting	-1.0** (6.222)	-1.49* (0.741)	32.0 (2760.0)	-1.45 (0.809)	-3.11 (1.25)	-0.178 (1.97)	-1.21 (1.24)	-0.306 (2.12)	2.78 (2.77)	-0.148 (0.315)	-0.0297 (0.620)	-0.200 (0.540)	-0.230 (0.225)	-0.694* (0.350)	0.0277 (0.392)
Beverage expenses	-0.374 (0.274)	-0.00486 (0.241)	5.480 (2840.0)	0.403 (0.719)	-0.076 (0.973)	-4.51 (4.15)	-1.44* (0.504)	-4.98 (3.44)	1.45 (1.15)	0.0158 (0.0958)	-0.0456 (0.0245)	0.000431 (0.161)	-0.0929 (0.0682)	-0.163 (0.131)	-0.0316 (0.111)
Tobacco expenses	2.04 (0.0300)	-0.204 (0.184)	0.117 (658.0)	4.30 (120.0)	4.25 (120.0)	-0.0937 (172.0)				0.0560 (0.0397)	-0.210 (0.262)	0.0852** (0.0451)	0.0599** (0.318)	0.128 (0.0636)	0.060** (0.035)
Per capita expenses (x 10^{-4})	0.455 (0.794)	0.521 (0.871)	-8.62 (9430.0)	1.78 (1.31)	3.32** (1.92)	-14.3 (532.0)	-0.525 (1.35)	-3.40 (3.09)	0.721 (2.26)	-1.03** (0.563)	-0.676 (893.0)	-0.0142 (0.914)	-0.236 (0.348)	0.213 (0.460)	-0.174 (0.713)
Landlord	0.203 (1.16)	1.94 (1.38)	4.24 (16500.0)	0.361 (2.64)	-12.4 (919.0)	-13.9 (1130.0)	-3.30* (1.64)	-1.60 (3.33)	1.30 (2.59)	-0.265 (0.292)	-0.629 (0.589)	-1.17* (0.597)	-0.294 (0.219)	-0.476 (0.330)	-0.741** (0.433)
Specialized agricul-tural household	-2.75* (0.790)	-2.52* (0.925)	113.0 (11200.0)	-1.51 (1.12)	-2.50** (1.57)	10.1** (6.30)	7.86 (7.41)	-1.50 (11.0)	3.69** (20.0)	0.894* (0.356)	-1.42* (0.711)	-0.620 (0.656)	-1.26* (0.251)	-1.28* (0.377)	-0.0486 (0.481)
Corn producer	-1.42 (0.935)	-0.576 (0.948)	-45.3 (3460.0)	-0.485** (1.12)	0.844* (1.34)	1.25 (2.23)	1.46 (1.89)	-18.8 (1530.0)	-25.1 (838.0)	-0.723** (0.433)	-12.2 (154.0)	-0.406 (0.790)	-0.800* (0.321)	-0.321 (0.439)	0.210 (0.591)

***** = significant at 5% level ****** = significant at 10% level. Standard errors in parentheses.

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