ADDIS ABABA UNIVERSITY
OFFICE OF GRADUATE PROGRAMS
FACULTY OF SCIENCE
DEPARTMENT OF STATISTICS

DETERMINANTS OF STIGMATIZATION OF FAMILIES OF PSYCHIATRIC PATIENTS: THE CASE OF BUTAJIRA DISTRICT

By

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A Thesis submitted to the Office of Graduate Programs of Addis Ababa University in partial fulfillment of the requirement for the Degree of Master of Science in Statistics

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DECLARATION

I, the undersigned, declare that the thesis is my original work, has not been presented for degrees in any University and all sources of material used for thesis have been duly acknowledged.

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Date: July, 2008

This thesis has been submitted for examination with my approval as a University advisor.

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Fentaw Abegaz (Ph.D)

TABLE OF CONTENTS

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ABSTRACT

Considerable research has documented the stigmatization of people with mental illnesses and its negative consequences. Recently it has been shown that stigma may also seriously affect families and caregivers of psychiatric patients, but a few empirical researches have addressed this problem. In this study we examine the determinants of stigmatization of families of psychiatric patients in Butajira district. A total of 514 caregivers' of individuals who were diagnosed as suffering from schizophrenia and major affective disorders in a community based survey were interviewed. The result reveals that 66.1% of the families of the psychiatric patients have reported that they are stigmatized due to the presence of psychiatric patient in the family. Statistical methods such as logistic regression, factor analysis and alternating logistic regression were applied and results from logistic regression reveals that sex of patient, age of the informant, quality of subjects' current dwelling, economic position of patients' house-hold relative to catchments' area, and type of disease are significant factors that determine the stigmatization of families, and results from factor analysis provides us the two major components of stigma (threat from external environment and self feeling) explaining 64.72% of total variance in all variables and finally alternating logistic regression was used that provide odds ratio as a measure of association between these two factors. Perceiving stigmatization with respect to self feeling are 4.338 times that of with respect to threat from external environment.

CHAPTER I

INTRODUCTION

1.1. Background of the study

Throughout history, mental illness has been interpreted in many different ways depending on the beliefs of each culture. In social settings, like our own, mental illness has usually had negative connotations. In Ethiopia, widespread belief that severe mental illnesses are due to demon depressions, bewitchment by evil sprits, ancestor's sprits or the evil eye have existed for many years but the attitude of the public towards such an illness has only recently been addressed (Alem et al. 1995; Alem et al. 1996; Jacobsson and Merdasa 1991; Awas et al.1999). Expressions such as "mentally ill" or "mental patients" are still associated with violence, dangerousness, unpredictability, and even moral depravity. Mental illness is a term used for a group of disorders causing severe disturbances in thinking, feeling, and relating. They result in substantially diminished capacity for coping with the ordinary demands of life. Mental illnesses can affect persons of any age- children, adolescents, adults, and the elderly- and they can occur in any family. Over a million of Ethiopians are estimated to suffer from mental illness (Schizophrenia and affective Disorders) (Alem et al. 1995) and millions of their family members struggle to cope with its social consequences.

The causes of biologically based brain diseases are not well understood, although it is believed that the functioning of the brain's neurotransmitters is involved. Many factors may contribute to this disturbed functioning. Heredity may be a factor in mental illness as it is in diabetes and cancer. Stress may contribute to the onset of mental illness in a vulnerable person. Recreational drugs may also contribute to onset but are unlikely to be the single cause. Since the causes of long term mental illnesses are not known, there is no effective prevention at this time. More research is needed to determine causes and strategies of prevention. Likewise, there are no cures for mental illnesses. However, treatments can substantially improve the functioning of persons with these disorders.

Mental illness still generates misunderstanding, prejudice, confusion and fear. Some people with mental illness report that the stigma is at times worse than the illness itself. People may be less willing to offer support and empathy if someone is suffering from a mental illness rather than a physical health problem. Those with a history of mental illness may find that others become uncomfortable or distrustful around them and that they lose contact with family and friends. People who are known to have had mental illness may find it more difficult to find employment or get a promotion, even if they are well at the time. Over the years, many forms of discrimination have gradually declined in our society, although there is still room for improvement in many areas. It has become socially and legally unacceptable in most settings to discriminate against or ridicule someone because of their race, religion, sexuality or a physical and mental disability.

Stigma may be linked to poor understanding of an issue and being unable to relate to the experiences of those who are affected. We are more likely to empathize with a person if we understand something about their circumstances and feelings. Our society has a long history of people distancing themselves from those with mental illness and their family, by social isolation and institutionalization. This distance ensures that most members of the public do not become familiar with the real experiences of those with mental illness. Those who become concerned about the mental health of himself or herself or someone else they are close to may be reluctant to talk to others about the situation. Often people do not want to acknowledge their need for support or simply do not know how to raise the issue with family, friends or health professionals. This is a serious problem, since early identification and treatment is generally associated with better outcomes.

There is no doubt that such prejudice has substantial negative social, political, economic and psychological consequences for stigmatized people (Dovidio *et al*, 2000). They may feel unsure of how `normal' people will identify or receive them (Goffman, 1963) and become constantly self-conscious and calculating about what impression they are making (Rush, 1998).

Stigmatization of individuals diagnosed as having serious mental illnesses has been observed across the world, and the family members who help/care for them report feeling stigmatized as a result of their association with the loved one with mental illness. Research conducted in developed world has documented stigmatization and its negative consequences for people with mental illnesses as well as for their families (Sommer 1990; Angermeyer and Matshinger 1999).

In a recent survey in UK[1], 70% of 556 respondents reported that either they or a family member had experienced stigma because of mental illness. Of those stigmatized, 56% experienced stigma within their own family, 52% from friends, 44% from their primary care physician, 32% from other health care professionals and 30% within their workplace. Little is known about how stigma perceived in a rural area of a traditional society. However, in the recent Butajira Study, it has been reported that about 75% of the respondents perceived that they were stigmatized or had experienced some sort of stigma due to the presence of mental illness in the family, 42% were worried about being treated differently and 37% wanted to conceal the fact that a relative was ill (Shibre et al, 2001).

[2]In a Canadian survey of attitudes towards disabilities, respondents reported that, of all disabilities, they were the least comfortable when in the presence of someone with a mental illness. Once known to have a mental illness, they report that their legitimate physical health concerns are disregarded. [3]As a telling example of stigma among health care providers, 50% of 567 psychiatrists surveyed by the Michigan Psychiatric Society said that they would treat themselves in secrecy rather than have mental illness recorded on their medical chart.

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[1] Pull yourself together: A survey of peoples' experience of stigma and discrimination as a result of mental distress (2000). Mental Health Foundation, London, UK. Available at: http://www.mentalhealth.org.uk/page.cfm?pagecode=PBUP0204

[2] Canadian attitudes towards disability issues: 2004 benchmark survey. Social Development Council of Canada. Available at: http://www.sdc.gc.ca/asp/gateway.asp?hr=en/hip/odi/documents/attitudesPoll/index.shtml&hs=pyp

[3] Myers, M. (2001). Presidential address to the Canadian Psychiatric Association. New century: Overcoming stigma, respecting differences. Available at: http://www.cpa-apc.org/publications/archives/CJP/2001/December/president.asp

The stigma attached to mental illness is the main obstacle to better mental health care and the better quality of life of people who have the illness, of their families, of their communities and of health service staff that deal with psychiatric disorders. Stigma is pernicious and there are indications that despite advances of psychiatry and medicine, it continues to grow and has more and often terrible consequences for patients and families. In 1996, the WPA (World Psychiatric Association) began an international program to fight the stigma and discrimination because of schizophrenia (one of the most serious and disabling of the mental illnesses). The 'Open the Doors' program has since been implemented in more than 20 countries and involved roughly 200 different anti-stigma interventions such as:

- Providing insights into one of the first global initiatives to fight the stigma associated with mental illness;
- Providing insights into unique collaborative efforts of those living with mental illness and their families with psychiatrists and other healthcare workers, journalists, government and non-government agencies;
- Providing specific learning points and recommendations from efforts in 20 different countries.

Ultimately, the silence and lack of understanding about mental illness encourages feelings of shame, and discourages people to seek treatment or even to admit that symptoms they may be experiencing may be related to mental illness. Understanding how stigma affects family members in terms of both their psychological response to the ill person and their contacts with psychiatric services will improve interactions with the family.

Stigmatization results in a number of negative consequences, such as reduced employability and difficulties in obtaining housing. So it necessary to identify factors contributing to the stigmatization of caregivers/families with psychiatric patients and analyze the observed data to develop statistical model that can be used to predict the stigmatization of families with psychiatric patients.

1.2. Concepts and Definitions

The word stigma referred originally to a mark or brand on Greek slaves, clearly separating them from free men. Although the marks of crucifixion appearing on Christian saints' hands and feet are called stigmata, in common usage the word signifies a disgrace or defect. With these considerations in mind, authors in the area of health-related stigma have proposed the following definition – formed especially for the purposes of research: Stigma is typically a social process, experienced or anticipated, characterized by exclusion, rejection, blame, or devaluation those results from experience or reasonable anticipation of an adverse social judgment about a person or group. This judgment is based on an enduring feature of identity conferred by a health problem or health-related condition, and the judgment is in some essential way medically unwarranted. In addition to its application to the persons or group, the discriminatory social judgment may also be applied to the disease or designated health problem itself with repercussions in social and health policy. Other forms of stigma, which result from adverse social judgments about enduring features of identity apart from health-related conditions (e.g. race, ethnicity, sexual preferences) may also affect health; these are also matters of interest that concern questions of health-related stigmas. Goffman(1963) defines that stigma is the negative evaluation of a person as tainted or discredited on the basis of attributes such as mental disorder, ethnicity, drug misuse or physical disability. In common languages, stigmatization involves a separation of individuals labeled as different from "us" who are believed to possess negative traits, resulting in negative emotional reactions, discrimination, and status loss for the stigmatized persons.

Social psychologists have distinguished three large classes, or categories, of stigma:

1. Physical deformities: These include extremes of height and weight and such conditions as albinism and facial disfigurements or missing limbs. In the developed countries, this category also includes such signs of aging as gray hair, wrinkles, and stooped posture.
2. Weaknesses or defects of individual character: This category includes biographical data that are held to indicate personal moral defect, such as a criminal record, addiction, divorce, treatment for mental illness, unemployment, suicide attempts, etc.

3. Tribal stigma: This type of stigma refers to a person's membership in a race, ethnic group, religion, or (for women) gender that is thought to disqualify all members of the group.

It would be naive to assume that the families of psychiatric patients are untouched by stigma. Stigma not only harms many people with mental illness, it may also injure family members who are associated with these individuals. In his classic text, Goffman (1963) used the term "courtesy stigma" to describe the stigma attached to the families of persons who are stigmatized. This courtesy stigma is the prejudice and discrimination that is extended to people not because of some mark they manifest, but rather because they are somehow linked to a person with the stigmatized mark.

1.3. Measures of stigma

There are a variety of tools available that have been utilized to measure stigma associated with mental illness on multiple levels such as

- **Experiences of stigma:** A 21-item survey instrument developed by Otto Wahl in collaboration with consumers who helped identify indicators of stigma through their personal experience (Wahl 1996).
- **Perceived devaluation:** Link et al. (2001) have also produced a 20-item scale for studying people's perceptions of stigma.
- **Internalized stigma:** This scale measures how much people have adopted a stigmatized identity.
- **Attributions:** The Chicago Consortium for Stigma Research has made available a number of questionnaires that measure attitudes and behaviors in relation to a vignette describing a person with mental illness.

1.4. Objectives of the study

General objectives:

To assess the socio-economic, demographic and health related factors that determine the stigma against families of psychiatric patients.

Specific objectives:

- ❖ To identify key dimensions/factors of stigmatization of caregivers/families of psychiatric patients
- ❖ To investigate factors that determine the stigmatization of families of psychiatric patients
- ❖ To develop a statistical model that predict the stigmatization of families with psychiatric patients on the knowledge of some determining factors
- ❖ To estimate the extent and socio-demographic distribution of stigma as perceived by the families/caregivers of mentally ill individuals in Butajira and its surrounding areas.
- ❖ To investigate factors that jointly determines different dimensions of stigmatization of caregivers/families of psychiatric patients.

1.5. Application of results

- ❖ The result of this study provides information for government and other concerned bodies to set policies, strategies, and further investigation for reducing stigmatization on families/caregivers of psychiatric patients.
- ❖ This result helps both donors and government to understand the factors that influence the stigmatization of families of psychiatric patients and adjust their intervention programs.
- ❖ The results help as a basis for further study in this area.

1.6. Limitations of the study

- ✓ The study does not cover other districts other than Butajira and only covers psychiatric patients in the age range of 15-49.
- ✓ Data are not available on some important variables such as the type of institution in which the patient was treated that is expected to be important predictor of family stigma.
- ✓ Lack of literature on our country related to the subjects under study.

CHAPTER II

LITERATURE REVIEW

2.1. Overall review

Despite increasing awareness and discussion of the problem, family stigma, like the broader topic of family burden (Kreisman and Joy, 1974; Fisher et al., 1990), has received relatively little attention from empirical researchers. The studies that exist, however, suggest that stigma has long been and continues to be a problem for families of psychiatric patients' i.e. family members with relatives who have mental illness report significant experience with courtesy stigma. However, to our knowledge, there has not been a survey based on a nationally representative sample to determine whether the public, in fact, endorse stigmas about family members. The goal of the present study is to examine determinants of stigma for families of psychiatric patients in Butajira districts. We begin by reviewing the evidence of stigma experienced by people with psychiatric disorders and their families.

Lefley's (1987) study of mental health professionals with mentally ill relatives found that these professionals often heard colleagues make derogatory comments about the families of psychiatric patients and many concealed their relative's illness from colleagues. Other studies have found that high school students, college students, and mental health workers perceive the relatives of individuals with mental illness in negative terms (Mehta and Farina, 1988; Burk and Sher, 1990).

A person with a courtesy stigma essentially occupies two social realities at once. On one hand, he/she does not engage in the behavior which resulted in the labeling of their family member. Or if he/she does engage in the same behavior, it has not been officially labeled. As such, the family member is part of the 'normal' social world of the non-stigmatized. Yet, on the other hand, a family member shares the stigma of his/her loved one and also has membership in the social world of the stigmatized (Mehta and Farina, 1988; Burk and Sher, 1990).

Five decades ago, Yarrow et al. (1955) discovered that feelings of rejection and stigmatization and attempts at secrecy and concealment were common among their sample of wives of first admission psychiatric patients. Goffman (1963) outlined that families may respond to this courtesy stigma in one of two ways; by accepting their loved one in the hopes of showing the world how to treat their loved one with compassion or the family member may distance from their loved one in order to shield them against stigma. As Birenbaum (1970) noted, families of stigmatized people are seen as 'Normal' yet 'different'. Birenbaum (1970) conceptualized courtesy stigma as dynamic in that this type of stigmatized identity constantly goes through a process of "construction" and "avoidance" depending upon the social context in which the family member is present. To apply Birenbaum's (1970) concept to families of mentally ills, they may, around people who are unaware of their loved one's psychiatric problem, avoid talking about him or her or provide only superficial non-stigmatizing information. While this avoidance certainly protects the family member's loved one from censure, it also protects the family member from being perceived negatively. Even around people who do have knowledge of the stigmatizing condition, the family member and his/her social audience may join in a dance of "tactful inattention, strictly contrived to appear as if the objective fact of the courtesy stigma is of no major subjective importance".

In his research on the courtesy stigma experienced by a sample of 103 mothers with a developmentally delayed child, Birenbaum (1970) discussed the changes in social relationships that families made in order to maintain the appearance of being 'normal' families to them and to the outside world. He noted that, like the stigmatized person, families go through cycles of affiliation and dissociation from the community. Friendships were maintained or distanced based upon whether or not the mother's interactions with friends increased or decreased her perception that she or her child was being stigmatized. Relationships with support groups were experienced by the mothers as helpful but close social connections were generally not made.

To understand the sources of stigma and ways to reduce it, research must examine the factors associated with variations in stigma. Several factors have been suggested that affect levels of experienced stigma and the fear and expectation of stigma on families of psychiatric patients.

2.2. Illness related factors of family stigma

Certainly, characteristics of the stigmatizing mark itself (i.e., the relative's mental illness), which directly affect the degree of stigma experienced by the ill relative, should also indirectly affect the amount of stigma that spills over onto family members. In this regard, there is evidence that both symptomatic behavior and psychiatric labels themselves (referred to collectively as "illness-related factors") affect levels of stigma directed at the ill person (Gove 1982; Link and Cullen 1990). Regarding symptomatic behavior, the severity and number of symptoms would clearly be expected to increase the family members' fear of stigma as well as the actual stigmatizing responses of others. It is believed that increased caregiver stigma is likely to be associated with patient characteristics that facilitate an "us-them" response by exposing the differences between persons with mental illness and those in the general population and with caregiver characteristics that increase the caregiver's vulnerability to negative emotional reactions.

There is also evidence that psychiatric labels themselves can elicit stigmatizing responses above and beyond those attributable to symptomatic behavior (Link and Cullen 1983; Link et al. 1987; Riskind and Wahl 1992). Certainly, the fact of psychiatric hospitalization or the presences of a psychiatric diagnosis are the most dramatic and potentially stigmatizing labels. However, among psychiatric patients, all of whom have been labeled in these fundamental ways, more subtle variations in labeling may also influence stigma. For example, to the extent that "schizophrenia" is recognized as a descriptor of severe psychotic conditions (as suggested by the common usage of the colloquial terms "schizo" or "schizoid"), that term and related diagnostic terms such as schizophreniform and schizoaffective may elicit more stigmatizing responses than other diagnostic labels such as major depression or bipolar disorder and the more common terms "depressed" and "manic."

Another labeling factor that may influence the stigma attached to the mental patient and consequently to his or her family, is the type of institution in which the patient was treated. Because large and often geographically isolated State-run institutions seem to fit closely the public stereotype of a place where "crazy" people are put away, hospitalization in such

institutions may elicit more stigma than hospitalization in community or university-sponsored institutions.

2.3. Factors related to social background

In addition to these illness-related factors, a number of factors extraneous to the stigmatizing mark, factors related to the social background and situation of the mental patient and his or her family and to the relationship between the patient and family member, may affect not only the extent to which the patient is stigmatized, but also the degree to which stigma spills over onto and is perceived by the family member. These characteristics collectively referred as family-related factors. For example, because perceived dangerousness appears to be a core component of the stigma of mental illness (Link et al., 1987), factors such as being young and male, by heightening perceptions of potential dangerousness, may increase the extent to which the patient, and in turn the family members, are stigmatized.

Besides, the family member's relationship to the patient may affect the extent to which the patient's stigma is transferred to the family member. For example, family members who live with the ill relative can expect to be exposed to more stigma than those who do not, because their acquaintances are more likely to know about their relative's illness and because interaction heightens the acquaintance's probability of contact with the patient

Alternative predictions might be drawn concerning the relationship of family socioeconomic status (SES) to stigma. Studies by Freeman, 1961; Dohrenwend and Chin-Shong, 1967 have found higher SES to be associated with more tolerant attitudes toward persons with mental illnesses, and hence one might expect less concern with stigma in higher-SES families. On the other hand, one might expect greater concern with stigma among higher-status families for two reasons: First, they may feel they have more status or reputation to lose by having mental illness in the family, and second, they may be more aware of the putative role of families in the etiology of mental illness and thus have greater fear of being blamed by others. Two sets of empirical findings (Freeman and Simmons 1961; Angermeyer et al. 1987) are consistent with the latter two arguments: social class positively related to patients' concerns about stigma in the latter study and to family members' concerns about stigma in the former.

2.3.1. Stigma and Family Members

The theme of blame, and in a related manner incompetence and shame, are also seen in surveys of families of individuals with psychiatric disorders when discussing their experience with courtesy stigma. Large-scale studies have shown that between a quarter and a half of family members believe that their relationship with a person with mental illness should be kept hidden or otherwise be a source of shame to the family (Angermeyer, Schulze, and Dietrich, 2003; Phelan, Bromet, and Link, 1998; O'Haeri and Fido, 2001; Phillips et al., 2002; Thompson and Doll, 1982; Shibre et al., 2001; Wahl and Harman, 1989). One study showed family shame was 40 times more prevalent in families with people with mental illness compared to families who have members with cancer (O'Haeri and Fido, 2001). Shame seemed to be clearly linked to blaming the family for the member's of psychiatric disorder. Findings from a group of 178 family members showed that about 25% worried that other people might blame them for the relative's mental illness (Shibre, et al., 2001).

Blame and shame seem to lead to discrimination in the form of social avoidance. Three large studies reported about a fifth to a third of family members reported strained and distant relationships with extended family and/or friends because of a relative with mental illness (Oestman and Kjellin, 2002; Shibre et al., 2001; Struening et al., 2001; Wahl and Harman, 1989). However, another study found a much smaller rate with only 10% of a sample reporting occasional avoidance by a few people (Phelan, Bromet, and Link, 1998).

2.3.2. How stigma varies by family role

Another important goal of this study is to examine how family roles interact with public perceptions of family stigma. Courtesy stigma may vary by family role: parent, spouse, sibling, or child (Corrigan and Miller, 2004). Struening et al (2001) examined this question in terms of parents on two different samples. Almost half of one sample of size 281 who were mostly mothers reported some concern about being blamed for their children mental illness. Typically, blame is attributed to bad parenting skills. The mother's incompetence, for example, led to the child developing a mental illness. Results from another sample size of 180 reported by Struening et al (2001) indicated the same concerns though at a lower rate; about

10% of mothers experienced being blamed. An independent study showed that many parents feared other people might blame them for their child's mental illness (Shibre et al., 2001).

Siblings and spouses are often blamed for family members who mismanage their illness that is they fail to help the person with mental illness stay treatment adherent so the person unnecessarily relapses. In a study of 164 siblings; survey participants were concerned about relatives with mental illness remaining adherent to treatment regimens and perceptions that relapse was somehow their fault (Greenberg, Kim, and Greenley, 1997). Unlike the kind of responsibility experienced by parents, sibling blame seems to mirror public expectations that family members who are somehow currently associated with adult children with mental illness (like siblings) or who have opted to live with the adult (e.g., spouses) have greater responsibility for current status. This is evident by reduced shame experienced by family members who do not live with the relative with mental illness, compared to those who do (Phelan, Bromet, and Link, 1998).

In general, spouses may be exposed to greater stigma than parents because their social networks and the ill relative's overlap to a greater extent. Consistent with this idea, Freeman and Simmons (1961) found that spouses of mental patients expressed more concern about stigma than parents did.

The child of a person with mental illness is often viewed as contaminated by the parent's mental illness. Weyand (1983) suggested that study participant attitudes about a son were diminished by the father's stigmas. A similar study by Mehta and Farina, (1988) showed that students having a father who is depressed, alcoholic, or an ex-convict were viewed as having more difficulty than the other student group. Another study on two samples illustrated the complexity of contamination on children, in this case, of parents with alcoholism or mental illness (Burk and Sher, 1990). The first sample of 570 adolescents was more likely to rate teenagers with stigmatized parents as more socially negative than teens without parents who abuse alcohol or have a mental illness. The second sample of 80 adult mental health workers largely replicated the findings of the first group.

Researchers at the Schizophrenia Research Foundation (SCARF) in Chennai examined perceptions of stigma among caregivers in a sample of 159 urban patients attending outpatient clinic and fulfilling DMS-IV (Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition) criteria for schizophrenia. The study deployed the Family Interview Schedule, a subsection of the International Study of Schizophrenia. Findings suggested that female sex of the patient and a younger age of both patient and caregiver were associated with greater stigma. An interesting conclusion that emerged from analyzing illness attributes of study subjects was "a lack of an explanation" for the illness among the high-stigma group of families.

In contrast to the studies cited above, the present study examines individuals with mental disorder in the district of Butajira, Ethiopia, some of whom had been stable over the previous year and some of whom had been ill throughout most of the prior year. Although labeling theory posits that mental illness stigma persists once labeling has occurred, irrespective of symptomatic improvement, empirical research has demonstrated that caregivers' perceptions of stigma may decrease as the patient recovers, even when the patient has had a psychiatric hospitalization in the remote past. Link et al. (1990) have also suggested that the strength of the association between stigma and a particular variable may decrease as the illness improves and active symptoms no longer identify the individual as different. It is also suggested that the associations between patient and caregiver characteristics and stigma perceptions could be weakened by inclusion of stably asymptomatic individuals.

In general, regarding the overall level of stigma reported by family members and factors associated with variations in stigma, the review of the literature suggests that a substantial proportion of family members of psychiatric patients report both secrecy and perceptions of rejection, greater family stigma be associated with more severe and protracted symptoms, characteristics of the family member and the patient, and the relationship between them be associated with levels of reported stigma, for example younger patients and male patients may elicit greater fears of dangerousness or acting-out behavior and greater problem with stigma, relatives living with patients conceal less, out of necessity, and experience more avoidance, lower SES (socio-economic status) relatives and spouses, as opposed to parents, report more problems with stigma.

Descriptive statistics and logistic regression were mainly employed in the analysis of past studies conducted on stigma of families of psychiatric patients. In this study we examine factors related to stigma on families of psychiatric patients such as illness related factors and factors related to social background using statistical methods like logistic regression analysis, factor analysis and alternating logistic regression.

CHAPTER III

DATA AND METHODOLOGY

3.1. The data for the study

The data for this study are taken from **the project of Butajira on the Study of the course and outcome of Schizophrenia and Bipolar Disorder** conducted in the district of Butajira, situated 130KM from South of Addis Ababa, by Stanley Medical Research Institutes in collaboration with Addis Ababa University Department of Psychiatry. The Butajira project was started in 1998. Individuals that are identified as having psychiatric problem from the results of Composite International Diagnostic Interview (CIDI) Interview are receiving a medical service with appropriate follow up by physician allocated for this duty from the project. The data for this study were collected from informants/caregivers about on the fifth year of the follow up study.

3.2. Description of the Study Area

The study is conducted in the district of Butajira (common name Meskan and Mareko). Butajira is located in the Gurage zone, Southern Nation, Nationalities, and People Region. It is situated 130 km south of Addis Ababa. The district has a population of over 200,000 and the dwellers are predominantly Muslim. Maize and Enset (false banana) are the main crops. The major ethnic group is Gurage. The district has one hospital, a health center and over 10 health stations.

3.3. Sample Size and Method

By using Composite International Diagnostic Interview (CIDI), 68,342 individuals aged 15-49 years out of the total population in the district were interviewed by going from house to house. Based on the CIDI interview results, those who tested positive on the CIDI and those identified by the key informant, 2,159 individuals were referred for the diagnostic interview using the Schedule for the Clinical Assessment in Neuropsychiatry (SCAN). Out of all SCAN interviews 857 were diagnosed as having severe mental illnesses. These mentally ill individuals were

brought for SCAN interviews by relatives and, one close relative is included in the study. Because of death or be out of the project due to different reasons, we have a total of 514 patients on the fifth year of the follow up study. So the sample includes caregivers/families of 514 patients participating in the Butajira study on the course and outcome of Schizophrenia and Bipolar Disorder during the fifth year of the study.

3.4. The variables in the study

The variables that are associated with caregivers/families that increase perceptions of mental illness stigma include:

Dependent Variables:

Status of stigmatization of family/caregiver (stigmatized, not stigmatized)

In this study, a 14-item survey instrument, identified as indicators of stigma, developed by the Department of Psychiatry, Addis Ababa University in collaboration with Stanley Research Institute for studying family's/informant's perceptions of stigma. Informants indicated their status of perceived stigmatization on each of these 14 items on a four-point Likert scale (0= not at all, 1= sometimes, 2= often, 3= a lot).
The 14 items as indicators of stigma are:

- ✓ Worried about being treated differently
- ✓ Worried people would know about it
- ✓ Felt the need to hide this fact
- ✓ Helping other people to understand what it is like to have a family member with psychiatric problem
- ✓ Making an effort to keep this a secret
- ✓ Worried about being avoided
- ✓ Explaining to others that (name) isn't like the picture of "crazy" people
- ✓ Worried that people would blame you for his or her problems
- ✓ Worried that a person looking to marry would be reluctant to marry in to your family
- ✓ Worried that about taking him or her out

- ✓ Felt ashamed or embarrassed about it
- ✓ Sought out people who also have a family member who has had psychiatric problems
- ✓ Felt grief or depression because of it
- ✓ Felt that somehow it might be your fault

Independent Variables:

The independent variables that are used in the study were classified as demographic variables such as age, sex, etc..., socio-economic variables like economic position of subject's household relative to catchments area and other variables. Detail description of the independent variables that are associated with caregivers'/families' increased perceptions of mental illness stigma is indicated in Table 1 below.

Table 1. Independent variables included in the Analysis

Independent Variables	Description	Value Labels
X_1	Educational level of caregiver/informant	1= illiterate 2= literate
X_2	Age of caregiver/informant	1= ≤30 2= >30
X_3	Sex of caregiver/informant	1= Male 2= Female
X_4	Sex of the patients	1= Male 2= Female
X_5	Age of patients	1= ≤30 2= >30
X_6	Type of community	1= Urban 2= Rural
X_7	Economic position of patients Household relative to catchments	1= Higher than average 2= Lower than average

	area	
X_8	Marital status of patient	1= Never Married 2= Married 3= Divorce
X_9	Number of children patients had	Count
X_{10}	Caregivers Relation to patient	1= Spouse 2= parents 3= others
X_{11}	Ever lived with patients	0= Yes 1= No
X_{12}	Severity of the disease	1= Schizophrenia(more severe)[4] 2=Affective disorder(less severe)[5]
X_{13}	Quality of patients current dwelling	1= Higher than average for the catchments area 2= Lower than average for the catchments area

[4] Schizophrenia (in Greek, "split mind") is a severe mental illness characterized by a variety of symptoms including but not limited to: bizarre behavior, disorganized thinking, disorganized speech, decreased emotional expressiveness, diminished or loss of contact with reality, diminished to total social withdrawal.

[5] Affective disorder(Bipolar disorder and manic depression) is generally less persistently disabling than schizophrenia characterized by: possible delusional thinking, rapid switch to severe depression, boundless energy, enthusiasm, and need for activity, decreased need for sleep, grandiose ideas and poor judgment, rapid, loud, disorganized speech, short temper and argumentativeness, impulsive and erratic behavior.

3.5. Methodology of the study

In this study, 14 items are identified as indicators of stigma (the response variable) and data have been collected on these 14 items and other explanatory variables related in one or other way to the stigmatization of caregivers of psychiatric patients. In this study, stigma is considered as a binary outcome as stigmatized or not stigmatized based on two approaches. In the first approach caregivers are categorized as stigmatized if they indicate one or more positive items out of the 14 indicators of stigma, otherwise they are not stigmatized. Once the response variable is dichotomized, it is reasonable to fit logistic regression.

The other approach is to use factor analysis that will reduce the number of indicators to few factors that are theoretically meaningful dimensions of stigma. Then on the bases of the factor scores, each factor will be dichotomized to indicate caregivers as stigmatized or not stigmatized. Then, multiple logistic regression can be employed on each dimension of stigma. However the different dimension of stigma may be related to each other within a family/caregiver. Even many studies have been limited to the use of univariate modeling techniques and fail to account the relationship between the different dimensions of stigma. In this study attempts will be made to account the relationship and provide more efficient analysis using alternating logistic regression.

3.6. Logistic Regression Model

Binomial (or binary) logistic regression is a form of regression which is used when the dependent variable is dichotomous. Logistic regression can be used to predict a dependent variable on the basis of continuous and/or categorical independent variables and to determine the percent of variance in the dependent variable explained by the independents; to rank the relative importance of independent variables and to asses' interaction effects. The independent or predictor variables in logistic regression can take any form. Thus logistic regression makes no assumption about the distribution of the independent variables: such as normality, linearity and equal variance in each group.

Many categorical response variables have only two categories. Denote a binary response by Y and the two possible outcomes by 1 and 0, or by the generic terminology "success" and "failure". Its distribution is specified by the probabilities $P(Y=1) = \pi$ for success and $P(Y=0)=1-\pi$ for failure. For n independent observations on a binary response with parameter π, the number of successes has the binomial distribution specified by n and π. Further, consider p explanatory variables $X=(x_1, x_2, \ldots, x_p)$ then the value of π can vary as the value of explanatory variables(X=x) changes, and π can be replaced by $\pi(x)$ to reflect its dependence on the explanatory variables.

Relationships between $\pi(x)$ and x are usually non-linear rather than linear. In practice, non-linear relationships between $\pi(x)$ and x are often monotonic, with $\pi(x)$ increasing continuously as x increases, or $\pi(x)$ decreasing continuously as x increases. The probability of occurrence of an event relative to nonoccurrence is called odds ratio and given by:

$$\text{Odds ratio} = \frac{\pi(x)}{1-\pi(x)}$$

The natural logarithm of an odds ratio is the logit transformation of $\pi(x)$ denoted by logit $(\pi(x))$

$$\log(odds) = \log it(\pi(x)) = \log\left(\frac{\pi(x)}{1-\pi(x)}\right)$$

The logistic regression equation is given by:

$$\text{logit } [\pi(x)] = \log\left[\frac{\pi(x)}{1-\pi(x)}\right] = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_p x_p$$

Where β_o = the constant term and β_i = the coefficient of the predictor variables. The logistic regression can be expressed directly in terms of $\pi(x)$ as:

$$\pi(x) = \frac{\exp(\beta_o + \beta_1 x_1 + \ldots + \beta_p x_p)}{1 + \exp(\beta_o + \beta_1 x_1 + \ldots + \beta_p x_p)}$$

In Matrix form:

$$\pi(x) = \frac{\exp(x'\beta)}{1+\exp(x'\beta)} \qquad \textit{where and } x = (1, x_1, x_2, \ldots, x_p) \text{ and } \beta = (\beta_0, \beta_1, \ldots, \beta_p)$$

Logistic regression models are often called logit models.

There are two main uses of logistic regression. The first is the prediction of group membership. The second use provides knowledge of the relationship and strength among the dependent and explanatory variables.

3.6.1. Estimation of parameters

In logistic regression, the probability of the occurrence of an event, $P(Y=1) = \pi(x)$ is given by

$$\pi(x) = \frac{\exp(x'\beta)}{1+\exp(x'\beta)}$$

Each observation is an outcome of a Bernoulli trial, and hence for the i^{th} observation, $P(Y = y_i) = \pi^{y_i}(1-\pi)^{1-y_i}$, $y_i = 0$ or 1.

Assuming the n observations are independent, the likelihood function is:

$$L = \prod_{i=1}^{n} (\pi(x))^{y} (1-\pi(x))^{1-y},$$

and the log likelihood function is given as:

$$\log L = \sum_{i=1}^{n} y_i \log(\pi(x)) + \sum_{i=1}^{n} (1-y_i)\log(1-\pi(x))$$

$$\log L = \sum_{i=1}^{n} y_i \log\left(\frac{\exp(x'\beta)}{1+\exp(x'\beta)}\right) + \sum_{i=1}^{n} (1-y_i)\log\left(\frac{1}{1+(\exp(x'\beta)}\right)$$

Hence, estimates of β will be obtained by maximizing the log-likelihood function using iterative algorithms (Agresti, 1996).

3.6.2. Assessing the Fit of the Model

There is no guarantee, that a particular model form is appropriate or provides a good fit to the data. So, we need to assess the goodness of fit of the model. In assessing the goodness of fit of a model, the first step is to check the overall fit of the model to the data. In logistic regression, for testing the hypothesis that the model fits the data, the common approach is the test statistics is based on the likelihood function L, the likelihood-ratio statistics (G^2) which are based on the comparison of fitted and observed counts. A good model is the one that results in a high likelihood for the observed results.

The likelihood-ratio statistics (G^2) is given by:

$$G^2 = 2\sum\left[(Observed)\log\left(\frac{Observed}{Fitted}\right)\right] = -2LL_R - (-2LL_F) = -2\ln\left(\frac{likelihood_R}{likelihood_F}\right).$$

The likelihood ratio is -2ln (likelihood R) for a restricted (smaller) model minus -2ln (likelihood F) for a full (larger) model that is the same as the log of the ratio of the two likelihood, which is distributed as chi-square with degree of freedom obtained from the difference of estimated parameter in the full and restricted model. The full or large model has all the parameters of interest in it. The restricted is said to be nested in the larger model. The restricted model has one or more of parameters in the full model restricted to some value (usually zero). The parameter in the nested model must be a proper subset of the parameters in the full model.

The Wald statistic is an alternative test statistic which is commonly used to test the significant of individual logistic regression coefficient for each independent variable (that is, to test the null hypothesis in logistic regression that a particular logit coefficient is zero). In other words, a Wald test is used to test the statistical significance of each coefficient β_i, i =0, 1, 2,…, p in the model. A Wald test is given by:

$W = (\frac{\hat{\beta}}{S.E(\hat{\beta})})^2$, which has a chi-square distribution with one degree of freedom.

3.6.3. Assumptions of logistic regression model

Logistic regression is popular in part because it enables the researcher to overcome many of the restrictive assumptions of ordinary least square regression. There are, however, other assumptions one should consider for the efficient use of logistic regression. Some of these assumptions are:

- The dependent variable need not be normally distributed (but does assume its distribution is within the range of the exponential family of distributions, such as normal, Poisson, binomial, gamma).
- Inclusion of all relevant variables in the regression model: If relevant variables are omitted, the common variance they share with included variables may be wrongly attributed to those variables, or the error term may be inflated.
- Exclusion of all irrelevant variables: If causally irrelevant variables are included in the model, the common variance they share with included variables may be wrongly attributed to the irrelevant variables. The more the correlation of the irrelevant variable(s) with other independent variables, the greatest the standard errors of the regression coefficients for the independent variables.

3.7. Factor analysis

Factor analysis was invented nearly 100 years ago by psychologist Charles Spearman. Many statistical methods are used to study the relation between independent and dependent variables. Factor analysis is different; it is used to study the patterns of relationship among many dependent variables, with the goal of discovering something about the nature of the independent variables that affect them. The basic idea of factor analysis is that for a given set of observed variable X_1, X_2, X_3,..., X_p one wants to find a set of latent variables E_1, E_2, E_3,…, E_k, fewer in number than the observed variables, that contain essentially the same information. The latent variables are supposed to account for the dependencies among the manifest variables in the sense that if the latent variables are held fixed, the manifest variables would be independent.

Factor analysis is a statistical approach that can be used to analyze interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions (factors). The statistical approach involves finding a way of condensing the information contained in a number of original variables into a smaller set of dimensions (factors) with a minimum loss of information (Hair et al., 1992).

We can apply factor analysis for a given scores on a number of variables, anywhere from 3 to several hundred variables, but most often between 10 and 100. The purpose of factor analysis is to discover simple patterns in the pattern of relationships among the variables. In particular, it seeks to discover if the observed variables can be explained largely or entirely in terms of a much smaller number of variables called factors.

In general for factor analysis the clearer the true factor structure, the smaller the sample size needed to discover it. But it would be very difficult to discover even a very clear and simple factor structure with fewer than about 50 cases, and 100 or more cases would be much preferable for a less clear structure (Comfrey, AL and Lee, HB., 1992). The rules about number of variables are very different for factor analysis than for regression. Generally speaking, the more variables the better to employee factor analysis, so long as the variables remain relevant to the underlying factors.

3.7.1. Factor analysis model

The factor analysis model can be expressed in the matrix notation:

$X = \mu + \Lambda F + U$, where

The observable random vector X, with p components, has mean μ and covariance matrix Σ.

$\Lambda = \{\lambda_{ij}\}$ is a $p \times k$ matrix of constants, called the matrix of factor loadings.

F = random vector representing the k common factors.

U = random vector representing p unique factors associated with the original variables.

We assume that

$E(F) = 0_{(kx1)}$ and $Cov(F) = E(FF') = I_{(kxk)}$

The common factors F_1, F_2, …, F_k are common to all X variables, and are assumed to have mean=0 and variance =1.

Equivalently, the covariance matrix Σ can be decomposed into a factor covariance matrix and an error covariance matrix:

$$\Sigma = \Lambda\Lambda^T + \psi \text{, where } \psi = Cov(U) = E(UU') = \begin{bmatrix} \psi_1 & 0 & \cdots & 0 \\ 0 & \psi_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \psi_p \end{bmatrix},$$

Cov(X, F) = Λ and Λ^T is the transpose of Λ.

The diagonal of the factor covariance matrix is called the vector of communalities h_i^2 where

$$h_i^2 = \sum_{j=1}^{n} \lambda_{ij}^2$$

The factor loadings are the correlation coefficients between the variables and factors. Factor loadings are the basis for imputing a label to different factors. Analogous to Pearson's r, the squared factor loading is the percentage of variance in the variable, explained by a factor. The sum of the squared factor loadings for all factors for a given variable is the variance in that variable accounted for by all the factors, and this is called the communality

The factor analysis model does not extract all the variance; it extracts only that proportion of variance, which is due to the common factors and shared by several items. The proportion of variance of a particular item that is due to common factors (shared with other items) is called communality. The proportion of variance that is unique to each item is then the respective item's total variance minus the communality.

Using the principal component methods of estimation of the factor loading, the following steps are needed to conduct factor analysis.

3.7.2. Steps in conducting a factor analysis

There are four basic factor analysis steps:

1. Data collection and generation of the correlation matrix

Once the data is at hand, as factor analysis is based on correlations between measured variables, a correlation matrix containing the intercorrelation coefficients for the variables must be computed.

2. Extraction of initial factor solution

The number of common factors needed to adequately describe the data need to be determined. The method of extraction and the number of factors selected to represent the underlying structure of the data must be decided. The factor analysis uses an estimate of common variance among the original variables to generate the factor solution. Because of this, the number of factors will always be less than the number of original variables. There are to rules for choosing the number of factors: Kaiser's eigenvalue rule and Cattell's scree test.

3. Rotation and interpretation

Factors produced in the initial extraction phase are often difficult to interpret. This is because the procedure in this phase ignores the possibility that variables identified to load on or present factors may already have high loading (correlations) with previous factor extracted. This may result in significant cross loadings in which many factors are correlated with many variables. This makes interpretations of each factor difficult, because different factors are represented by the same variables. The rotation phase serves to sharpen the factors by identifying those variables that load on one factor and not another. The effect of the rotation phase is to achieve a simpler, theoretically more meaningful factor patterns. In interpreting factors, variables with large factor loading (correlation coefficient between the variables and the factors they represent) indicate that they are representative of the factor, while small loading suggest that they are not. In deciding what is large or small, a rule of thumb suggests that the factor loading greater than ± 0.33 are considered to meet the minimal level of practical significance.

4. construction of scales or factor scores to use in further analyses

3.7.3. Assumptions

Factor analysis is part of the general linear model (GLM) family of procedures and makes many of the same assumptions as multiple regressions. Some of these are:

1. **No selection bias/proper specification of variables**. The exclusion of relevant variables and the inclusion of irrelevant variables in the correlation matrix being factored will affect, often substantially, the factors which are uncovered. Although factor analysis is used as a way of exploring data whose structure is unknown, knowing the factorial structure in advance helps select the variables to be included and yields the best analysis of factors. Note this is not just a matter of including all relevant variables. Also, if one deletes variables arbitrarily in order to have a cleaner factorial solution, erroneous conclusions about the factor structure will result.
2. **Linearity**. Factor analysis is a linear procedure. Of course, as with multiple linear regressions, nonlinear transformation of selected variables may be a pre-processing step. The smaller the sample size, the more important it is to screen data for linearity.
3. **Multivariate normality** of data is required for related significance tests. PCA (principal component analysis) and common factor analysis, significance testing apart, have no distributional assumptions. Note, however, factor analysis based on maximum likelihood does assume multivariate normality. The smaller the sample size, the more important it is to screen data for normality.
4. **Homoscedasticity**. Since factors are linear functions of measured variables, homoscedasticity of the relationship is assumed. However, homoscedasticity is not considered a critical assumption of factor analysis.
5. **No perfect multicollinearity**. Singularity in the input matrix, also called an ill-conditioned matrix, arises when two or more variables are perfectly redundant. Singularity prevents the matrix from being inverted and prevents a solution.
6. **Adequate sample size**. There must be more cases than variables, or in other ways about 10 cases per variable.

3.8. The Alternating Logistic Regression

Multivariate binary responses are common in the biological and social sciences. For example, we might observe the presence/absence of a disease in each of two eyes for an individual, for all members of a household, or repeatedly over time. The objectives of statistical analysis of such data include (i) describing the dependence of each binary response on explanatory variables, and (ii) characterizing the degree of association between pairs of outcomes as well as the dependence of this association on covariates.

Dale (1986), McCullagh and Nelder (1989), Prentice (1988) and Liang, Zeger and Qaqish (1992) have discussed the class of 'marginal models' for regression analysis of multivariate binary data. The central idea is to model separately the marginal expectation of each binary variable as well as the association between pairs of outcomes in terms of explanatory variables. In this paper, we will use odds ratios to measure association between the dependent variables. Consider bivariate binary response, $Y_i = (Y_{1i}, Y_{2i})^T$ be an 2x1 response vector with mean $E(Y_i) = \mu_i$ for i=1,2,...,n, where n is the sample size and let ψ_{12} be odds ratio between responses Y_1 and Y_2 defined by

$$\psi_{12} = \left[\frac{\Pr(Y_1 = 1, Y_2 = 1) \Pr(Y_1 = 0, Y_2 = 0)}{\Pr(Y_1 = 1, Y_2 = 0) \Pr(Y_2 = 1, Y_1 = 0)} \right]$$

A marginal model can be specified as follows:

1. $h(\mu_i) = X_i^T \beta_j$, where h(.) is a known link function (McCullagh and Nelder, 1989), X_i is a p x 1 vector of explanatory variables associated with Y_i and β_j are regression coefficients to be estimated;
2. Log $\psi_{12} = Z_{12}^T \alpha$ where Z_{12} is a vector of covariates which specifies the form of the association between Y_1 and Y_2 and α is a vector of association parameters to be estimated.

Liang and Zeger (1986) introduced the use of 'generalized estimating equations', multivariate analogues of quasi-likelihood estimating equations, for estimating β in situations when α is a

nuisance parameter. They originally modeled correlations. However, Lipsitz, Laird and Harrington (1991) used odds ratios to measure association.

In this research work we use an approach similar to Lipsitz, Laird and Harrington (1991) to the estimation of β and α which can be reasonably efficient for both sets of parameters. In the case with $\log \psi_{12} = \alpha$, the approach is to alternate between two steps:

1. For a given α, estimate β as a parameter in a marginal logistic regression using generalized estimating equation;
2. For a given β, estimate the odds ratio parameter α using a logistic regression of Y_1 on each Y_2 with offset that involves μ_i, and $\upsilon_{12} = E(Y_1 Y_2)$ given below.

We therefore refer to this algorithm as alternating logistic regression.

The alternating logistic regression procedure combines generalized estimating equations for β with new logistic regression equations for estimating α. Our strategy is to estimate α using the conditional events, Y_1 given $Y_2 = y_2$. In the case with $\log \psi_{12} = \alpha$, we estimate α by regressing Y_1 on Y_2 with an appropriate offset.

Before detailing the algorithm, we motivate the approach to estimating α. Let γ_{12} be the log odds ratio between outcomes Y_1 and Y_2, let $\mu_i = \Pr(Y_i = 1)$ and $\upsilon_{12} = \Pr(Y_1 = 1, Y_2 = 1)$. Then, following Diggle (1992),

$$\log it \Pr(Y_1 = 1 / Y_2 = y_2) = \gamma_{12} y_2 + \log\left(\frac{\mu_1 - \upsilon_{12}}{1 - \mu_1 - \mu_2 + \upsilon_{12}}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Suppose we assume that $\gamma_{12} = \alpha$. Then the pairwise log odds ratio α is the regression coefficient in a logistic regression of Y_1 on Y_2 as long as the second term on the right-hand side of the above equation is used as an 'offset'. Note that the offset depends on the current value of $\boldsymbol{\delta} = (\beta^T, \alpha^T)^T$ so that iteration is required.

More generally, we assume $\gamma_{12} = Z_{12}^{T}\alpha$ where the vector Z_{12} is a known set of the pair-specific covariates. Here, α can be estimated by regressing Y_1 on $Z_{12}Y_2$ with the same offset as above.

To be specific, the alternating logistic regression procedure iterates between the following two steps until convergence.

- Given the current values of $\hat{\delta}^{(r)}$, calculate $\hat{V}^{(r)}$ and solve the estimating equation (2) given below for an updated $\hat{\beta}^{(r+1)}$.
- Given $\hat{\beta}^{(r+1)}$ and $\hat{\delta}^{(r)}$, evaluate the offset in equation (1) and perform the offset logistic regression of Y_1 on $Z_{12}Y_2$ to obtain $\hat{\delta}^{(r+1)}$.

Alternating logistic regression estimating equations

Let ξ_{12} be vector with elements

$$\xi_{12} = E(Y_1/Y_2=y_2) = \text{logit}^{-1}\{\gamma_{12}y_2 + \log\left(\frac{\mu_1 - \upsilon_{12}}{1-\mu_1-\mu_2+\upsilon_{12}}\right)\}$$ **(Vincent et al, 1993)**

And let R be vector of residual with elements

$$R_{12} = Y_2 - E(Y_1/Y_2=y_2) = Y_2 - \xi_{12}.$$

We let S_i denotes the diagonal matrix with diagonal element $\xi_{12}(1-\xi_{12})$ and T_i denotes the matrix given by $\frac{\partial \xi_i}{\partial \alpha}$ and finally let

$$A_i = Y_i - \mu_i, \quad B_i = \text{Cov}(Y_i), \quad C_i = \frac{\partial \mu_i}{\partial \beta}$$

The alternating logistic regression estimate of δ is the simultaneous solution of the following unbiased estimating equations:

$$U_\beta = \sum_{i=1}^{2} C_i^T B_i^{-1} A_i = 0$$

$$U_\alpha = \sum_{i=1}^{2} T_i^T S_i^{-1} R = 0$$

We solve these two estimating equations for β and α using the nonlinear Gauss-Seidel algorithm (Thisted, 1986, p.181). The updating sequence and the formulae linking product-moments and pairwise odds ratios are given on Lipsitz et al. (1991). As a Gauss-Seidel procedure with positive-definite expected derivative matrix, alternating logistic regression converges given starting values sufficiently close to the solution. In practice, this algorithm converges very quickly when ordinary logistic regression estimates are used as starting values for β, and 0 is used for α.

Generalized Estimating Equations

Let $Y_{ij}, j = 1, ..., n, i = 1, ..., k$ represent the j^{th} measurement on the i^{th} subject. Correlated data are modeled using the same link function and linear predictor setup (systematic component) as the independence case. The random component is described by the same variance functions as in the independence case, but the covariance structure of the correlated measurements must also be modeled. Let the vector of measurements on the i^{th} subject be $\boldsymbol{Y} = (Y_{i1}, ..., Y_{in})'$ with corresponding vector of means $\mu_i = (\mu_{i1},..., \mu_{in})$ and let $R(\boldsymbol{\alpha})$ be a working correlation matrix that is fully specified by the vector of parameters $\boldsymbol{\alpha}$.

The working correlation structure is

$$Corr(Y_{ij}, Y_{ik}) = \begin{cases} 1 & j = k \\ \alpha & j \neq k \end{cases}$$, and its estimator is given by

$$\hat{\alpha} = \frac{1}{N^{\times} - p} \sum_{i=1}^{k} \sum_{j \neq k} e_{ij} e_{ik} \qquad where \;\; N^{X} = \sum_{i=1}^{k} n_i (n_i - 1)$$

$$\hat{\alpha} = \frac{1}{N^{*} - p} \sum_{i=1}^{k} \sum_{j \neq k} \frac{\left(y_{ij} - \mu_{ij}\right)^{2}}{\mu_{ij}\left(1 - \mu_{ij}\right)}$$

The covariance matrix of $\boldsymbol{Y}$ is modeled as:

$V = \phi A^{\frac{1}{2}} R(\alpha) A^{\frac{1}{2}}$, where $\mathbf{A}$ is a diagonal matrix with υ (μ_j) as the j^{th} diagonal element and ϕ is the dispersion parameter estimated by

$$\hat{\phi} = \frac{1}{N - p} \sum_{i=1}^{k} \sum_{j=1}^{n} e_{ij}^{2}$$

If R (α) is the true correlation matrix of $\boldsymbol{Y}$, then $\boldsymbol{V}$ is the true covariance matrix of $\boldsymbol{Y}$.

Let the vector of independent, or explanatory, variables for the jth measurement on the ith subject be $\mathbf{X}_{ij} = (x_{ij1}, \ldots, x_{ijp})'$

The Generalized Estimating Equation of Liang and Zeger (1986) for estimating the $p \times 1$ vector of regression parameters β is an extension of the independence estimating equation to correlated data and is given by:

$$S(\beta) = \sum \frac{\partial \mu_{i}^{'}}{\partial \beta} V_{i}^{-1} (Y_{i} - \mu_{i}(\beta)) = 0 \cdots\cdots\cdots\cdots (2), \text{ and}$$

g (μ_{ij}) = $X_{ij}^{'}\beta$ where g is the link function, the $p \times n$ matrix of partial derivatives of the mean with respect to the regression parameters for the i^{th} subject is given by

$$\frac{\partial \mu_{i}^{'}}{\partial \beta} = \begin{bmatrix} \frac{x_{i11}}{g^{'}(\mu_{i1})} & \cdots & \frac{x_{in1}}{g^{'}(\mu_{in})} \\ \vdots & & \vdots \\ \frac{x_{i1p}}{g^{'}(\mu_{i1})} & \cdots & \frac{x_{inp}}{g^{'}(\mu_{in})} \end{bmatrix}$$

The working correlation matrix is usually unknown and must be estimated. It is estimated in the iterative fitting process using the current value of the parameter vector β to compute appropriate functions of the Pearson residual

$$e_{ij} = \frac{y_{ij} - \mu_{ij}}{\sqrt{\upsilon(\mu_{ij})}}$$

If you specify the working correlation as **R** = **I**, which is the identity matrix, the GEE reduces to the independence estimating equation.

Algorithm for Fitting Generalized Estimating Equations (GEE)

Since the estimating equation given above is in the form of matrix, it is difficult to get the first derivatives of this equation. So we need some algorithm to get an estimate of the parameters. The following is an algorithm for fitting the specified model using GEEs.

1. Compute an initial estimate of β with an ordinary generalized linear model assuming independence.
2. Compute the working correlations **R** based on the standardized residuals, the current β, and the assumed structure of **R**.
3. Compute an estimate of the covariance: $V = \phi A^{1/2} R(\alpha) A^{1/2}$
4. Update β: $\beta_{r+1} = \beta_r + \left[\sum_{i=1}^{k} \frac{\partial \mu_i}{\partial \beta}' V_i^{-1} \frac{\partial \mu_i}{\partial \beta}\right]^{-1} \left[\sum_{i=1}^{k} \frac{\partial \mu_i}{\partial \beta}' V_i^{-1} (Y_i - \mu_i)\right]$
5. Iterate steps 2-4 until convergence

In general, in this study multiple logistic regression is applied to explore the net effect of all independent variables on dependent variables, factor analysis is applied to reduce large number of dependent variables i.e. indicators of stigma to a small number of factors for modeling purpose with minimum loss of information and alternating logistic regression is applied to describe the degree of association between pair of factors.

CHAPTER IV

STATISTICAL DATA ANALYSIS AND DISCUSSION

4.1. Introduction

The data were collected using Amharic version questionnaire which were prepared by Department of Psychiatry, Addis Ababa University in collaboration with Stanley Medical Research Institute. The questionnaires were filled by enumerators, psychiatric nurses, physicians (general practitioner) and psychiatric residents after approval by the review committee of both the Department of Community Health and the Faculty of Medicine. Data were edited and entered into computer using Epi Info computer program. Furthermore, for this study, data cleaning for any error during data entry and data analysis were done using SPSS (original name called Statistical Package for the Social Sciences and now called SPSS-X) for windows version 13.0 and SAS (Statistical Analysis Systems).

4.2. Summary statistics

In the Butajira project, out of 68, 342 (base year) individuals aged 15-59 years in the district, 514 patients are identified as having severe mental illness in which 37.5% are schizophrenia patients and 62.5% are suffered from affective disorder. The population of patients used for this study was skewed to ward those aged above 30 years (Table 2). By virtue of their age, the majorities of the patients are married and divorced (74.3%). About two-third i.e. 63% of the patients included in this study are males.

Table 2. Percentage distribution of psychiatric patients by demographic characteristics

Characteristics		Percentage Distribution
Sex	Male	63.0%
	Female	37.0%
Age	≤ 30	27.8%
	>30	72.2%
Marital Status	Never Married	25.6%
	Married	61.6%
	Divorced	12.7%
Total		100.0%

In this study 14 items are used as indicators of stigma. At least one positive response to the items was regarded as having perceived or experienced some sort of stigma. The dependent variable (status of stigmatization of caregivers) is binary with two outcomes (0=not stigmatized and 1=stigmatized). The estimated prevalence of stigma is 66.1%.

I. Demographic factors of family stigma

Table 3. Demographic variables by stigmatization of caregiver

Demographic factors of family stigma			Status of stigmatization		Total
			NonStigmatized	Stigmatized	
Sex of the patient	Male	Count	94	230	324
		%	29.0%	71.0%	100.0%
	Female	Count	80	110	190
		%	42.1%	57.9%	100.0%
Age of the informant	<=30	Count	96	152	248
		%	38.7%	61.3%	100.0%
	>30	Count	73	187	260
		%	28.1%	71.9%	100.0%
Marital status of patients	Never married	Count	34	97	131
		%	26.0%	74.0%	100.0%
	Married	Count	120	195	315
		%	38.1%	61.9%	100.0%
	Divorced	Count	18	47	65
		%	27.7%	72.3%	100.0%
Gender of the informant	Male	Count	91	163	254
		%	35.8%	64.2%	100.0%
	Female	Count	82	177	259
		%	31.7%	68.3%	100.0%
Current age of the patient	<=30	Count	53	89	142
		%	37.3%	62.7%	100.0%
	>30	Count	120	249	369
		%	32.5%	67.5%	100.0%

Caregivers of male patients reported that 71% of them are stigmatized because of their loved one mental illness whereas caregivers of female patients reported that 57.9% of them are stigmatized, however 68.3% of female caregivers and 64.2% of male caregivers reported that they are stigmatized (Table 3 above). 62.7% of caregivers of young patients i.e. age of less than or equal to 30 year are stigmatized and 67.5% of caregivers of adult patients reported

stigmatized whereas 61.3% of young caregivers themselves reported that they are stigmatized and 71.9% of adult caregivers reported that they are stigmatized because of their loved one mental illness. Based on the results, 74.0% of caregivers are never married, 61.9% of caregivers are married and 72.3% of caregivers are divorced and reported that they are stigmatized.

II. Illness related factors of family stigma

As can be seen from Table 4, majority of caregivers of schizophrenia patients (78.8 %) and 58.6% of caregivers of bipolar disorder patients are reported that they are stigmatized due to their loved one mental illness.

Table 4. Illness related factors by stigmatization of caregiver

Illness related factors			**Status of stigmatization**		**Total**
			NonStigmatized	**Stigmatized**	
Type of disease	Schizophrenia	Count	41	152	193
		%	21.2%	78.8%	100.0%
	Affective disorder	Count	133	188	321
		%	41.4%	58.6%	100.0%

III. Factors related to socio-economic background

As indicated in Table 5 below, 54.7% of the caregivers of patients with quality of current dwelling higher than average or about average for catchments area are stigmatized while the proportion of stigmatization for caregivers of patients with quality of current dwelling lower than average for catchments area is higher (85.5%). On the other hand 58.8% of caregivers of patients, in the middle one-third of range of economic position of patients' household relative to catchments area, are reported as stigmatized while 87.2% of caregivers of patients, in the lower one-third of the range of economic position of patients' household relative to catchments area, reported that they are stigmatized. Of those caregivers who ever lived with patients 66.1% reported that they are stigmatized. The result indicates that 66.1% of illiterate caregivers are reported as stigmatized while 65.9% of literate caregivers are reported as stigmatized because

of their loved one mental illness. The proportions of caregivers of patients from urban are stigmatized (71.6%) as compared to stigmatized caregivers of patients from rural (65.3%). The result also indicates that 65.5% of caregiver spouse, 66.9% of caregiver parents, and 67.4% of caregiver other relatives and friends of patients are reported that they perceive stigma due to their loved one mental illness.

Table 5. Socio-economic variables by stigmatization of caregiver

Factors related to socio-economic background			**Status of stigmatization**		**Total**
			NonStigmatized	**Stigmatized**	
Quality of patients current dwelling	Higher than average or about average for catchments area	Count	145	175	320
		%	45.3%	54.7%	100.0%
	Lower that average for catchments area	Count	29	165	194
		%	14.9%	85.1%	100.0%
Economic position of patients house-hold relative to catchments area	Middle one-third of range	Count	157	224	381
		%	41.2%	58.8%	100.0%
	Lower one-third of range	Count	17	116	133
		%	12.8%	87.2%	100.0%
Ever lived with patients	Yes	Count	39	76	115
		%	33.9%	66.1%	100.0%
	No	Count	133	264	397
		%	33.5%	66.5%	100.0%
Educational status of caregivers	illiterate	Count	96	187	283
		%	33.9%	66.1%	100.0%
	literate	Count	77	149	226
		%	34.1%	65.9%	100.0%
Type of community	Urban	Count	19	48	67
		%	28.4%	71.6%	100.0%
	Rural	Count	154	290	444
		%	34.7%	65.3%	100.0%
Relationship of the caregivers to the patients	Spouse	Count	69	131	200
		%	34.5%	65.5%	100.0%
	Parent	Count	46	93	139
		%	33.1%	66.9%	100.0%
	Others	Count	56	116	172
		%	32.6%	67.4%	100.0%

4.3. Bivariate Analysis

The bivariate analysis, based on the Pearson's chi-square statistic, serves as a preliminary insight into the association/relationship between the selected independent variables and status of stigmatization (dependent variable). For all independent variables taking one-at-a time with status of stigmatization, a test of association was carried out using the Pearson chi-square. The results are presented in Table 6.

Table 6. Variables in the bivariate analysis

Variables	Description	d.f	Chi-Square Value	Sig. (p-value)
X_1	Type of community	1	1.040	0.308
X_2	Quality of subjects current dwelling	1	49.729	0.000*
X_3	Marital status of patients	2	7.29	0.026*
X_4	Sex of patient	1	9.169	0.002*
X_5	Current age of the patients	1	1.057	0.304
X_6	Relationship of the informants to the study subject	2	0.168	0.919
X_7	Gender of the informant	1	0.996	0.318
X_8	Age of the informant	1	6.464	0.011*
X_9	Ever lived with patients	1	0.007	0.934
X_{10}	Type of disease	1	21.941	0.000*
X_{11}	Educational status of caregivers	1	0.001	0.972
X_{12}	Economic position of patients household relative to catchments' area	1	35.573	0.000*

* Significant ($p<0.05$)

The above findings show that status of stigmatization of caregiver is associated with economic position of patients' household relative to catchment area, type of disease, age of the informant, sex of patient, marital status of patients, and quality of patients' current dwelling. Other independent variables included in this study like type of community, current age of the patients, educational status of caregivers, gender of the informant, ever lived with patients, and relationship of the informants to the study subject have no significant association to status of stigmatization of caregivers.

4.4. Logistic regression

One problem in the bivariate approach is that it ignores the possibility that a collection of variables, each of which is weakly associated with the outcomes, can become an important predictor of the outcome when taken together. For this reason, all the variables (significant and non significant) from the bivariate findings are considered as candidates for the multiple logistic regression. The coding scheme used in SPSS is given in Appendix A used to facilitate computation and interpretation.

Results of multiple logistic regression are displayed in Table 7 when dependent variable is status of stigmatization of caregivers of psychiatric patients i.e. caregivers are categorized as stigmatized if they indicate one or more positive items out of 14. Table 7 contains the estimated coefficients ($\hat{\beta}$), the standard errors of the estimates (S.E.) which help in computing the Wald statistics (Wald) that is the square of the ratio of the coefficient to its standard error, and it has a chi-square distribution with one degree of freedom (df), the significance of the Wald statistics (Sig.) which indicates the significance of the predictor variable in the model.

Table 7. Estimates of Multiple Logistic Regression

	$\hat{\beta}$	S.E.	Wald	df	Sig.	Exp($\hat{\beta}$)	95.0% C.I.for EXP(B)	
							Lower	Lower
n4typecomu(1)	.019	.335	.003	1	.954	1.020	.528	.528
quality(1)	-1.027	.335	9.405	1	.002*	.358	.186	.186
economicposition(1)	-.904	.393	5.276	1	.022*	.405	.187	.187
Maritalstatus			.799	2	.671			
maritalstatus(1)	.298	.450	.439	1	.508	1.347	.558	.558
maritalstatus(2)	-.030	.407	.005	1	.942	.971	.437	.437
Numbchild	.065	.050	1.743	1	.187	1.068	.969	.969
sexpatient(1)	.471	.232	4.111	1	.043*	1.601	1.016	1.016
curragepatient(1)	-.143	.279	.261	1	.610	.867	.502	.502
Relation			.067	2	.967			
relation(1)	.060	.371	.026	1	.872	1.062	.513	.513
relation(2)	-.018	.315	.003	1	.953	.982	.530	.530
genderinfor(1)	-.174	.228	.583	1	.445	.840	.537	.537
ageinfor(1)	-.555	.232	5.726	1	.017*	.574	.364	.364
everliv(1)	-.223	.317	.494	1	.482	.800	.430	.430
Severity(1)	.700	.268	6.849	1	.009*	2.014	1.192	1.192
edustatusinfor(1)	.131	.215	.371	1	.543	1.140	.747	.747
Constant	1.720	.602	8.167	1	.004*	5.585		

* Significance ($p< 0.05$)

Results on Table 7 reveals that (sexpatient) sex of patient, (ageinfor) age of the informant, (quality) quality of subjects' current dwelling, (economicposition) economic position of patients' household relative to catchments' area, and (severity) type of disease are variables that are found significant ($p<0.05$). The constant term in the model is also significant.

Moreover, the last column on Table 8, Exp ($\hat{\beta}$) are called the odds multipliers or odds ratio. It is the predicted change in odds for a unit increase in the corresponding independent variable. Odds ratios less than 1 indicates a factor contributing to decrease the number of caregivers that are stigmatized and value of odds ratios more than 1.0 indicates that the variable in question is a significant factor contributing to increase the number of caregivers stigmatization. Odds ratios close to 1.0 indicate that unit changes in that independent variable do not affect the dependent variable. As we can see from Table 8, sex of patient and types of disease have odd ratio greater than one indicating that male patient caregivers are 1.6 times more stigmatized

than female patient caregivers and schizophrenia patient are about 2 times more stigmatized as compared to affective disorder.

The likelihood ratio test is one way of assessing the goodness of fit of the logistic regression model. A deviance based chi-square resulted in chi square of 85.45 with p-value 0.00 which reveals that the model fit is adequate. Results from Cox and Snell R Square, Nagelkerke R Square, and classification table leads to the same conclusion as the above test. For example the classification table (see Appendix A) indicated that 70.7% of cases are correctly predicted by the model indicating that the fitted model is adequate.

The plots of deviance residual against the observation number indicate that there is no obvious pattern i.e. the residuals are randomly distributed indicating that there is no linearity in the index plot. The plot of deviance residual against some of significant variables in the model shows that there are no obvious outliers of the residual indicating that the fitted model is adequate. (see Appendix D)

4.5. Factor analysis

As indicated earlier, in this study 14 items are used as indicators of stigma. One way of measuring stigma is by considering individual with at least one positive item as stigmatized. Another approach is to use factor analysis. With the objectives of reducing the number of indicators of stigma for further analysis and to identify underlying factors that explain the pattern of correlations within a set of observed indicators of stigma, we use factor analysis. Factor analysis is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much larger number of observed variables.

Factor analysis procedure with unweighted least-squares method of extracting factors and promax method of rotation are used. As a result two, factors are extracted from the 14 items of stigma indicators (see scree plot in the Appendix B). Factor analysis uses the correlation matrix to extract factors (see the matrix of correlation coefficients and their respective significance levels in Appendix B). According to the results from this analysis, 64.733% of total variance in all the 14 items is explained by these two factors as shown in Table 8 below.

The initial number of factors is the same as the number of items used in the factor analysis. However, not all 14 factors will be retained. In this specific case, only the first two factors will be retained (as we request). The number of rows under the column "Extraction Sums of Squared Loadings" corresponds to the number of factors retained. In this analysis, we requested that two factors be retained, so there are two rows, one for each retained factor. The values in this panel of the table are calculated in the same way as the values in the left panel, except that here the values are based on the common variance. The values in this panel of the table will always be lower than the values in the left panel of the table, because they are based on the common variance, which is always smaller than the total variance. The values under the column "Rotation Sums of Squared Loadings" of Table 8 represent the distribution of the variance after the promax rotation.

Table 8. Variances of the factors

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings(a)
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	6.175	44.108	44.108	5.892	42.084	42.084	5.450
2	2.887	20.624	64.733	2.484	17.740	59.824	4.073
3	1.307	9.339	74.072				
4	.988	7.057	81.129				
5	.847	6.049	87.177				
6	.739	5.279	92.456				
7	.468	3.344	95.801				
8	.181	1.295	97.096				
9	.165	1.182	98.278				
10	.077	.552	98.829				
11	.072	.511	99.341				
12	.067	.480	99.821				
13	.023	.165	99.986				
14	.002	.014	100.000				

Extraction Method: Unweighted Least Squares.

In addition, the rotated factor loading are presented in Table 9. The rotated factor (pattern) matrix below (Table 9), gives the factor loadings. This is the central output for factor analysis.

Table 9. Rotated Factor Matrix (Pattern Matrix)

Items	Factor	
	1	2
Worried about being treated differently	.959	-.091
Worried people would know about it	.959	-.066
Felt the need to hide this fact	.959	-.063
Helping other people to understand what it is like to have a family member with psychiatric problem	.155	.755
Making an effort to keep this a secret	.123	.841
Worried about being avoided	.179	.769
Explaining to others that (name) isn't like the picture of "crazy" people	.454	-.066
Worried that people would blame you for his or her problems	.251	.671
Worried that a person looking to marry would be reluctant to marry in to your family	.718	.221
Worried that about taking him or her out	.726	.076
Felt ashamed or embarrassed about it	.745	-.031
Sought out people who also have a family member who has had psychiatric problems	-.410	.669
Felt grief or depression because of it	-.370	.668
Felt that somehow it might be your fault	.021	.335

To assess the determinants of stigma as defined by the two factors, first multiple logistic regression analysis is considered for the two factors independently. Secondly, the two factors are jointly analyzed with respect to the independent variables using alternating logistic regression.

i. Threat from external environment

Results from multiple logistic regression, where threat from external environment is taken as a measure of stigma or dependent variable, are presented in Table 10.

From the results shown in Table 10, variables such as type of community (n4typecomu), type of disease (severity), age of informant (ageinfor), and ever lived with patients (everliv) are found significantly related to threat from external environment dimension of stigma.

Table 10. Threat from external environment dimension of stigma parameter estimation

	$\hat{\beta}$	S.E.	Wald	df	Sig.	Exp($\hat{\beta}$)
n4typecomu(1)	-.873	.371	5.540	1	.019*	.417
quality(1)	.466	.325	2.050	1	.152	1.594
economicposition(1)	-.320	.347	.853	1	.356	.726
maritalstatus			1.213	2	.545	
maritalstatus(1)	-.410	.414	.981	1	.322	.664
maritalstatus(2)	-.371	.399	.863	1	.353	.690
numbchild	-.077	.050	2.324	1	.127	.926
sexpatient(1)	.278	.260	1.146	1	.284	1.320
curragepatient(1)	-.546	.294	3.459	1	.063	.579
relation			1.274	2	.529	
relation(1)	-.353	.399	.782	1	.377	.703
relation(2)	-.364	.332	1.206	1	.272	.695
genderinfor(1)	-.420	.243	2.978	1	.084	.657
ageinfor(1)	-.875	.244	12.848	1	.000*	.417
everliv(1)	-1.371	.371	13.646	1	.000*	.254
Severity(1)	1.152	.262	19.377	1	.000*	3.163
edustatusinfor(1)	-.166	.224	.554	1	.457	.847
Constant	.401	.573	.489	1	.484	1.494

* Significant ($p<0.05$)

ii. Self feeling

Similarly applying the same procedure with self feeling as dependent variables, the following result is obtained.

From the results presented in Table 11, variables such as marital status of patients (maritals), quality of subject's current dwelling (quality), economic position of patients household relative to catchment's area (economic), and number of children patients had (numbchil) are found significantly related to self feeling dimension of stigma.

Table 11. Self feeling dimension of stigma parameter estimation

		$\hat{\beta}$	S.E.	Wald	df	Sig.	Exp($\hat{\beta}$)
Step 1(a)	n4typecomu(1)	.318	.321	.983	1	.321	1.375
	quality(1)	-1.626	.303	28.792	1	.000*	.197
	economicposition(1)	-1.141	.331	11.910	1	.001*	.319
	maritalstatus			8.623	2	.013*	
	maritalstatus(1)	1.242	.432	8.272	1	.004*	3.463
	maritalstatus(2)	.490	.402	1.482	1	.223	1.632
	numbchild	.121	.049	6.118	1	.013*	1.129
	sexpatient(1)	.208	.239	.757	1	.384	1.231
	curragepatient(1)	.051	.283	.033	1	.856	1.053
	relation			.693	2	.707	
	relation(1)	.260	.367	.501	1	.479	1.297
	relation(2)	.026	.309	.007	1	.933	1.026
	genderinfor(1)	-.014	.227	.004	1	.952	.986
	ageinfor(1)	-.059	.225	.068	1	.794	.943
	everliv(1)	.248	.313	.629	1	.428	1.282
	Severity(1)	-.442	.266	2.754	1	.097	.643
	edustatusinfor(1)	.231	.216	1.137	1	.286	1.259
	Constant	.398	.550	.525	1	.469	1.489

* Significant ($p<0.05$)

4.6. Alternating logistic regression

To assess the association between the two dichotomized factors (threat from external environment and self feeling) taking into account the explanatory variables considered in the previous section, we use alternating logistic regression. By rearranging the data structure and using the SAS procedure (Proc genmod) as indicated in the appendix, we obtained the results in Table 12.

In this case, since we have two responses for each caregiver, we have only one parameter of log odds ratio that measures the association between the two responses (i.e. Alpha1 or log ψ_{12} discussed in chapter three section 3.8).

Table 12. GEE Parameter Estimates

Parameter	Estimate	Standard Error	95% Confidence Limits		Z	Pr > |Z|
Intercept	2.8911	0.7499	1.4214	4.3609	3.86	0.0001*
N4TYPECO	-0.1772	0.1623	-0.4953	0.1409	-1.09	0.2750
QUALITY	-0.5963	0.1653	-0.9203	-0.2724	-3.61	0.0003*
ECONOMIC	-0.6096	0.1823	-0.9669	-0.2522	-3.34	0.0008*
MARITALS	0.1730	0.1153	-0.0530	0.3990	1.50	0.1335
NUMBCHIL	-0.0117	0.0238	-0.0583	0.0349	-0.49	0.6232
SEXPATIE	0.2141	0.1324	-0.0455	0.4736	1.62	0.1059
CURRAGEP	-0.2013	0.1467	-0.4888	0.0862	-1.37	0.1700
RELATION	-0.0447	0.0887	-0.2185	0.1292	-0.50	0.6146
GENDERIN	-0.1636	0.1239	-0.4065	0.0792	-1.32	0.1866
AGEINFOR	-0.3706	0.1235	-0.6127	-0.1286	-3.00	0.0027*
EVERLIV	-0.4390	0.1697	-0.7716	-0.1065	-2.59	0.0097*
SEVERITY	0.3248	0.1297	0.0705	0.5790	2.50	0.0123*
EDUSTATU	0.0369	0.1231	-0.2043	0.2781	0.30	0.7643
Alpha1	-1.4673	0.2518	-1.9608	-0.9738	-5.83	<.0001*

* Significant ($p<0.05$)

The results on Table 12 are the estimate of parameters for independent variables including intercept and Alpha1. The value of Alpha1= -1.4673 is an estimate of the association parameter and it is the natural log of odds ratio.

Alpha1= ln (odds ratio) = -1.4673 and odds ratio is exp (-1.4673) = 0.2305

The interpretation of odds ratio is as usual. For the odds ratio 0.2305, we say that the odds of threat from external environment are 0.2305 times the odds of self feeling. That means caregivers of psychiatric patients perceived less stigmatization with respect to threat from external environment dimension of stigma than self feeling. In other way, we can say that the odds of self feeling are 4.338 times the odds of threat from external environment.

4.7. Interpretation and discussion of the results

The study has provided an insight into determining factors of stigma against the family of psychiatric patients in Butajira district. According to the result, high proportion of family members expressed their concern about being stigmatized i.e. about 66.1% of the families of the psychiatric patients are reported that they are stigmatized due to their loved one mental illness. The present study shows a little decrement in the proportion of caregivers/family of psychiatric patients' stigmatization. In the earlier study of Butajira project, it has been reported that about 75% of the respondents perceived that they were stigmatized or had experienced some sort of stigma due to the presence of mental illness in the family (Shibre et al. 2001).

Most of the results obtained from bivariate analysis matches with results from multiple logistic regressions; however, it has certain deviation with respect to certain variables. For example marital status of patients is significantly associated with stigmatization of families of psychiatric patients in bivariate analysis but non significant in multiple logistic regression indicating that there are variables, which is significantly associated with the outcomes when taken individually, but become non significant when taken together. The most important variables identified as determinants of stigma are sex of patient, type of disease, economic position of patients' household relative to catchments' area, and age of the informant.

While fitting logistic regression for the two factors i.e. threat from external environment and self feeling independently, four variables: type of community, type of disease, age of informant, and ever lived with patients are significantly explain the logit of threat from external environment and four variables: marital status of patients, quality of subject's current dwelling, economic position of patients household relative to catchment's area, and number of children patients had are significantly explain the logit of self feeling. Surprisingly there are variables that are non significant while considering the outcome variable as one or more positive items as stigmatized but significant in the case of separate logistic regressions for the two factors obtained from factor analysis. For example, number of children the patients had and marital status of patients are not significant when considering individuals with one or more positive items as stigmatized but significantly explain the logit of self feeling as well caregivers ever lived with patients explain the logit of threat from external environment.

On the other hand, sex of patients are significant while considering individuals with one or more positive items as stigmatized and non significant in explaining the logit of both threat from external environment and self feeling.

Female and younger age among both patients and caregivers were associated with higher stigma in a recent study from an urban area in India (Thara and Srinivasan, 2000). In contrast to this, female patients are associated with less stigmatization and only a little difference were identified in the gender of informants and current age of different patients group i.e. young and adult group in the present study. However younger age of informant or caregivers was associated with less stigmatization due to their loved one mental illness, possibly indicating a more tolerant attitude among the younger generation.

Results on Table 7 reveal that variables: quality of subjects' current dwelling, age of the informant, and economic position of patients' household relative to catchment area has negative value for its coefficients indicating that these variables decreases the logit of status of stigmatization (dependent variable) whereas variables: type of disease and sex of patient has positive value for their coefficients indicating that these variables increase the logit of status of stigmatization.

The odds ratio for a given independent variable represents the factor by which the odds (event) change for a one-unit change in the independent variable. As we can see from Table 7 the values of odds ratio [Exp ($\hat{\beta}$)] of type of disease are 2.014 indicating odds of stigmatization for caregivers of patients of schizophrenia are 2.014 times the odds of caregivers of patients of affective disorder. Similarly the value of odds ratio of sex of patient are 1.601 indicating that the odds of stigmatization for caregivers of male patients are 1.601 times the odds of caregivers of female patients. The same interpretation would be made for those variables having negative value for coefficients but since Exp (negative) is less than one, it has a decreasing effect on the logit. For example the odds ratio of the age of patient is 0.574 indicating that the odd of stigmatization for caregivers of young patients is 0.574 times the odds of caregivers of adult patients.

The factor analysis provides us the two factors that is the two dimension of stigma (threat from external environment and self feeling) from the 14 items/indicator of stigma with minimum loss of information. These two correlated factors explain 64.733% of total variance in all the 14 items as shown in Table 8 below. So we can say that the two major factors determining the stigma against families of psychiatric patients are threat from external environment and self feeling.

The alternating logistic regression provides us the log odds ratio as a measure of the association between the two dimensions of stigma that is threat from external environment and self feeling. The log odds ratio of -1.4673 gives the odds ratio of 0.2305 indicating that the odds of threat from external environment are 0.2305 times the odds of self feeling, that is caregivers of psychiatric patients perceived less stigmatization with respect to threat from external environment dimension of stigma than self feeling. In other way, we can say that the odds of self feeling are 4.338 times the odds of threat from external environment.

CHAPTER V

CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The finding of this study is consistent with the findings of other studies, which report the existence of clear evidence stigma among family members of patients with severe mental disorders (Wahl and Harman, 1989; Phelan et al., 1998; Wahl, 1999; Crisp et al., 2000, Shibre et al., 2001). However the ways in which the respondents experience stigma is different from our study, because of the differences in the culture, setting and other factors.

The bivariate analysis reveals that sex of patient, age of the informant, quality of subjects' current dwelling, economic position of patients' household relative to catchments area, type of disease, and marital status of patients are variables that are significantly associated with stigmatization of families of psychiatric patients. Multiple logistic regression analysis indicated that all variables, except marital status of patients, which are significantly related to family stigma in bivariate analysis, are also significant when taken together in explaining the logit of the stigmatization status of caregivers.

Factor analysis provides us two factors that explain 64.720% of total variance in all variables. To assess the association between these two factors, we apply alternating logistic regression which indicates that the odds of threat from external environment are 0.2305 times the odds of self feeling stigmatization.

The results of this study also indicated that stigmatization status of families of psychiatric patients does not show difference with respect to relationship of caregivers to the patients and educational levels of caregiver. It also doesn't depend on the type of community, gender of informants/caregivers and current age of patients.

In general, in Butajira, stigmatizations of caregivers of male patients are more prevalent than caregivers of female patients and stigmatization of adult caregivers are more prevalent than young caregivers i.e. age less than 30 year. Similarly caregivers of schizophrenia patients are more stigmatized than caregivers of patients of affective disorders. Stigmatization of caregivers of never married and divorced patients are more prevalent than caregivers of married patients. In addition caregivers of patients with current dwelling lower than average for catchment area, caregivers of patients with economic position of patients household relative to catchment area in the lower one-third of the range are more prevalence of stigmatization.

5.2. Recommendation

Over a million of Ethiopians are estimated to suffer from mental illness (Schizophrenia and affective Disorders) (Alem et al. 1995) and millions of their family members struggle to cope with its social consequences such as burden and stigma. The stigmatization of mental disorders has a number of consequences such as patients' refusal to seek treatment, noncompliance with treatment, inability to find work and in the extreme; it can lead to loss of career, family breakdown, and suicide. People with mental illness, their families, care and treatment providers and policy makers have struggled with the question of how to reduce and eliminate stigma in society. This paper tries to identify the factors affecting the stigmatization status of families of psychiatric patients. The following recommendations are made for health policy workers, and other concerned bodies:

- The result of the study underlines that quality of patients' current dwelling and economic position of patients household are important predictors of family stigma. Thus, improving the quality of life for people with mental illness reduces family stigma.
- Anti-stigma campaigns aimed at changing attitudes and beliefs of others that involve people with mental illness and their families in all aspects of programs and services so that the most important expressions of stigma can be addressed. This will help to reduce stigma and discrimination.
- Care and support organization /clubs are needed for psychiatric patients as well as for their families to make them lead better life.
- The result of the study indicated that caregivers of psychiatric patients perceived more stigmatization with respect to self feeling dimension of stigma than threat from external environment indicating that due attention should be given to self feeling in reducing stigma.

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APPENDIX

Appendix A. Logistic regression output

Categorical Variables Coding

		Frequency	Parameter coding	
			(1)	(2)
Marital status of patients	Never married	122	1.000	.000
	Married	309	.000	1.000
	Divorced	61	.000	.000
Relationship of the informant to the study subject	Spouse	197	1.000	.000
	Parent	135	.000	1.000
	Others	160	.000	.000
Educational status level of caregivers	Illiterate	274	1.000	
	Literate	218	.000	
Quality of subject's current dwelling	Higher than average or about average for catchment's area	311	1.000	
	Lower that average for catchment's area	181	.000	
Economic position of patients household relative to catchment's area	Middle one-third of range	368	1.000	
	Lower one-third of range	124	.000	
Sex of the patient	Male	311	1.000	
	Female	181	.000	
Current age of the patient	<=30	135	1.000	
	>30	357	.000	
Gender of the informant	Male	245	1.000	
	Female	247	.000	
Type of disease	Schizophrenia	181	1.000	

	Bipolar disorder	311	.000	
Ever lived with patients	No	107	1.000	
	Yes	385	.000	
Age of the informant	<=30	239	1.000	
	>30	253	.000	
Type of community	Urban	66	1.000	
	Rural	426	.000	

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	85.450	15	.000
	Block	85.450	15	.000
	Model	85.450	15	.000

Model Summary

Step	-2 Log likelihood	Cox and Snell R Square	Nagelkerke R Square
1	540.880(a)	.159	.221

Classification Table

Observed			Predicted		
			Status of Stigmatization		Percentage Correct
Step 1			NonStigmatized	Stigmatized	
	Status of Stigmatization	NonStigmatized	71	93	43.3
		Stigmatized	51	277	84.5
Overall Percentage					70.7

The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	n4typecomu(1)	.019	.335	.003	1	.954	1.020
	quality(1)	-1.027	.335	9.405	1	.002	.358
	economicposition(1)	-.904	.393	5.276	1	.022	.405
	maritalstatus			.799	2	.671	
	maritalstatus(1)	.298	.450	.439	1	.508	1.347
	maritalstatus(2)	-.030	.407	.005	1	.942	.971
	numbchild	.065	.050	1.743	1	.187	1.068
	sexpatient(1)	.471	.232	4.111	1	.043	1.601

	curragepatient(1)	-.143	.279	.261	1	.610	.867
	relation			.067	2	.967	
	relation(1)	.060	.371	.026	1	.872	1.062
	relation(2)	-.018	.315	.003	1	.953	.982
	genderinfor(1)	-.174	.228	.583	1	.445	.840
	ageinfor(1)	-.555	.232	5.726	1	.017	.574
	everliv(1)	-.223	.317	.494	1	.482	.800
	Severity(1)	.700	.268	6.849	1	.009	2.014
	edustatusinfor(1)	.131	.215	.371	1	.543	1.140
	Constant	1.720	.602	8.167	1	.004	5.585

Appendix B. Factor analysis output

Correlation Matrix

		n1worried	n2spent	n3fact	n4psychiat	n5secret	n6avoid	n7explaini	n8blame	n9relactan	n10aboutta	n11ashamed	n12sought	n13depress	n14fault
Correlation	n1worried	1.000	.969	.967	.282	.319	.353	.355	.437	.712	.623	.616	-.146	-.091	.095
	n2spent	.969	1.000	.998	.348	.329	.364	.376	.451	.725	.603	.594	-.139	-.086	.101
	n3fact	.967	.998	1.000	.349	.331	.366	.378	.453	.728	.606	.597	-.136	-.082	.102
	n4psychiat	.282	.348	.349	1.000	.913	.821	.191	.616	.425	.365	.289	.219	.233	.270
	n5secret	.319	.329	.331	.913	1.000	.900	.107	.678	.445	.368	.282	.257	.272	.298
	n6avoid	.353	.364	.366	.821	.900	1.000	.180	.674	.479	.361	.287	.227	.237	.285
	n7explaini	.355	.376	.378	.191	.107	.180	1.000	.054	.393	.358	.387	-.095	-.090	.126
	n8blame	.437	.451	.453	.616	.678	.674	.054	1.000	.666	.386	.268	.308	.348	.279
	n9relactan	.712	.725	.728	.425	.445	.479	.393	.666	1.000	.645	.587	.030	.072	.179
	n10aboutta	.623	.603	.606	.365	.368	.361	.358	.386	.645	1.000	.919	-.019	-.008	.154
	n11ashamed	.616	.594	.597	.289	.282	.287	.387	.268	.587	.919	1.000	-.079	-.072	.100
	n12sought	-.146	-.139	-.136	.219	.257	.227	-.095	.308	.030	-.019	-.079	1.000	.921	.185
	n13depress	-.091	-.086	-.082	.233	.272	.237	-.090	.348	.072	-.008	-.072	.921	1.000	.179
	n14fault	.095	.101	.102	.270	.298	.285	.126	.279	.179	.154	.100	.185	.179	1.000
Sig. (1-tailed)	n1worried		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.019	.015
	n2spent	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.026	.011
	n3fact	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.001	.031	.011
	n4psychiat	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	n5secret	.000	.000	.000	.000		.000	.008	.000	.000	.000	.000	.000	.000	.000
	n6avoid	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000
	n7explaini	.000	.000	.000	.000	.008	.000		.112	.000	.000	.000	.015	.021	.002
	n8blame	.000	.000	.000	.000	.000	.000	.112		.000	.000	.000	.000	.000	.000
	n9relactan	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.247	.052	.000
	n10aboutta	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.333	.426	.000
	n11ashamed	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.036	.050	.012
	n12sought	.000	.001	.001	.000	.000	.000	.015	.000	.247	.333	.036		.000	.000
	n13depress	.019	.026	.031	.000	.000	.000	.021	.000	.052	.426	.050	.000		.000
	n14fault	.015	.011	.011	.000	.000	.000	.002	.000	.000	.000	.012	.000	.000	

Communalities

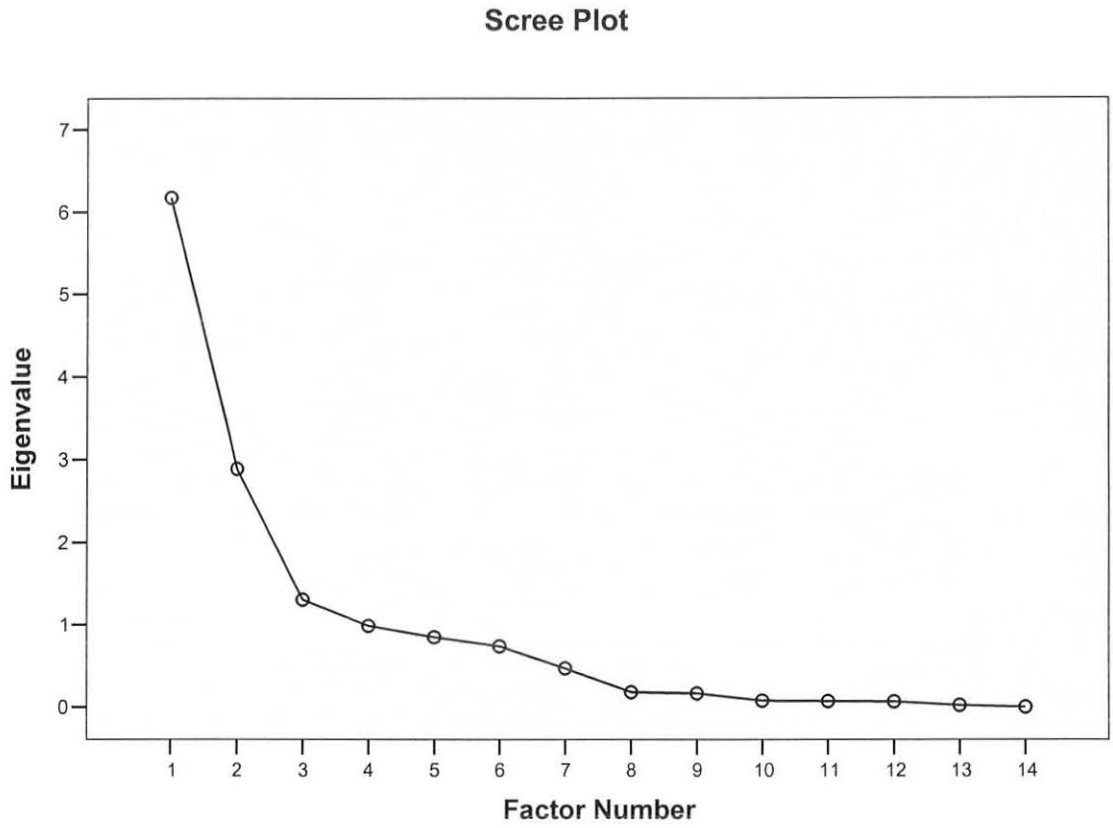
	Initial	Extraction
n1worried	.960	.863
n2spent	.996	.876
n3fact	.996	.878
n4psychiat	.892	.682
n5secret	.927	.800
n6avoid	.826	.726
n7explaini	.331	.188
n8blame	.718	.639
n9relactan	.742	.684
n10aboutta	.871	.575
n11ashamed	.863	.539
n12sought	.854	.411
n13depress	.854	.398
n14fault	.128	.118

Factor Matrix

	Factor	
	1	2
n1worried	.833	-.412
n2spent	.849	-.394
n3fact	.851	-.391
n4psychiat	.660	.496
n5secret	.689	.570
n6avoid	.692	.497
n7explaini	.378	-.212
n8blame	.692	.400
n9relactan	.821	-.097
n10aboutta	.730	-.206
n11ashamed	.674	-.291
n12sought	.074	.636
n13depress	.111	.621
n14fault	.248	.238

Structure Matrix

	Factor	
	1	2
n1worried	.925	.268
n2spent	.934	.292
n3fact	.935	.295
n4psychiat	.438	.813
n5secret	.438	.887
n6avoid	.467	.836
n7explaini	.429	.104
n8blame	.501	.765
n9relactan	.801	.490
n10aboutta	.755	.348
n11ashamed	.733	.247
n12sought	-.160	.515
n13depress	-.120	.529
n14fault	.146	.343



Factor Correlation Matrix

Factor	1	2
1	1.000	.374
2	.374	1.000

Extraction Method: Unweighted Least Squares.
Rotation Method: Promax with Kaiser Normalization.

Descriptive Statistics

	Mean	Std. Deviation	Analysis N	Missing N
n1worried	.59	.984	514	0
n2spent	.57	.965	514	0
n3fact	.56	.964	514	0
n4psychiat	.08	.324	514	0
n5secret	.07	.297	514	0
n6avoid	.07	.294	514	0
n7explaini	.08	.375	514	0
n8blame	.17	.529	514	0
n9relactan	.32	.724	514	0
n10aboutta	.19	.534	514	0
n11ashamed	.17	.505	514	0
n12sought	.96	1.008	514	0
n13depress	1.22	1.368	514	0
n14fault	.07	.381	514	0

Appendix C. Data structure and SAS output for Alternating Logistic Regression

Data structure for alternating logistic regression

$$
\begin{array}{cc}
Id & \begin{matrix} Factor \\ Outcome \end{matrix} \qquad\qquad Explanatory\ variables \\
1 & f1 \\
1 & f2 \\
2 & f1 \\
2 & f2 \\
n & f1 \\
n & f2
\end{array}
\quad
\begin{array}{l}
\\
\\
\\
\\
\\
\\
\end{array}
\quad
\begin{array}{l}
\\
the\ same\{ \ X_{11}\ X_{12}\cdots X_{1k} \\
\qquad\quad X_{11}\ X_{12}\cdots X_{1k} \\
the\ same\{ \ X_{21}\ X_{22}\cdots X_{2k} \\
\qquad\quad X_{21}\ X_{22}\cdots X_{2k} \\
\vdots \\
the\ same\{ \ X_{n1}\ X_{n2}\cdots X_{nk} \\
\qquad\quad X_{n1}\ X_{n2}\cdots X_{nk}
\end{array}
$$

Where k is the number of independent variables, in this case k=13 and n=sample size = 514 and f1= value of factor 1 and f2 = value of factor 2

SAS codes used:

Proc genmod data = data file name;

Class Id;

Options DECENDING;

Model outcome= $X_1 X_2 \ldots X_{13}$ /dist =bin;

Repeat subject = Id / logor=fullclust;

Run;

Log Odds Ratio Parameter

Information

Parameter	Group
Alpha1	(1, 2)

SAS out for alternating logistic regression

Response Profile

Ordered Value	outcome	Total Frequency
1	0	617
2	1	367

PROC GENMOD is modeling the probability that outcome='0'. One way to change this to model the probability that outcome='1' is to specify the DESCENDING option in the PROC statement.

Parameter Information

Parameter	Effect
Prm1	Intercept
Prm2	N4TYPECO
Prm3	QUALITY
Prm4	ECONOMIC
Prm5	MARITALS
Prm6	NUMBCHIL
Prm7	SEXPATIE
Prm8	CURRAGEP
Prm9	RELATION
Prm10	GENDERIN
Prm11	AGEINFOR
Prm12	EVERLIV
Prm13	SEVERITY
Prm14	EDUSTATU

Criteria for Assessing Goodness of Fit

Criterion	DF	Value	Value/DF
Deviance	970	1212.0724	1.2496
Scaled Deviance	970	1212.0724	1.2496
Pearson Chi-Square	970	981.8800	1.0122
Scaled Pearson X2	970	981.8800	1.0122
Log Likelihood		-606.0362	

Analysis of Initial Parameter Estimates

Parameter	DF	Standard Estimate	Wald Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	2.9156	0.9411	1.0712	4.7601	9.60	0.0019
N4TYPECO	1	-0.1792	0.2113	-0.5933	0.2350	0.72	0.3965
QUALITY	1	-0.5949	0.1993	-0.9856	-0.2042	8.91	0.0028
ECONOMIC	1	-0.6178	0.2116	-1.0325	-0.2031	8.53	0.0035
MARITALS	1	0.1634	0.1335	-0.0982	0.4249	1.50	0.2209
NUMBCHIL	1	-0.0125	0.0288	-0.0690	0.0439	0.19	0.6634
SEXPATIE	1	0.2254	0.1584	-0.0851	0.5359	2.02	0.1548
CURRAGEP	1	-0.2048	0.1834	-0.5641	0.1546	1.25	0.2641
RELATION	1	-0.0460	0.1130	-0.2675	0.1755	0.17	0.6839
GENDERIN	1	-0.1588	0.1491	-0.4511	0.1334	1.13	0.2867
AGEINFOR	1	-0.3873	0.1481	-0.6776	-0.0969	6.83	0.0089
EVERLIV	1	-0.4106	0.2061	-0.8145	-0.0066	3.97	0.0464
SEVERITY	1	0.3320	0.1638	0.0109	0.6531	4.11	0.0427
EDUSTATU	1	0.0286	0.1424	-0.2506	0.3078	0.04	0.8410
Scale	0	1.0000	0.0000	1.0000	1.0000		

NOTE: The scale parameter was held fixed.

Appendix D. The deviance residual plotted against observation number and significant explanatory variables

Figure 1. Deviance residual plotted against Obseravtion number

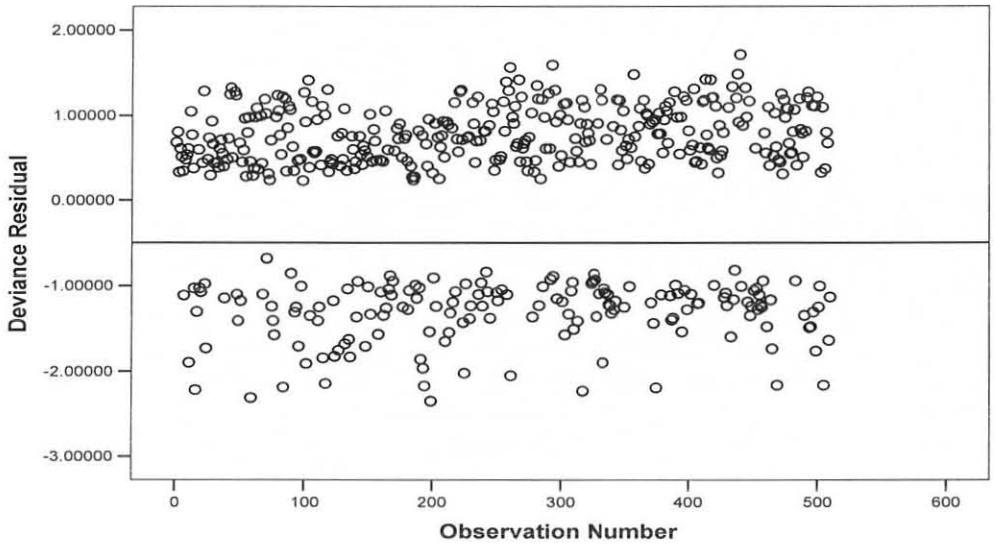


Figure 2. Quality of subjects current dwelling against Deviance Residual

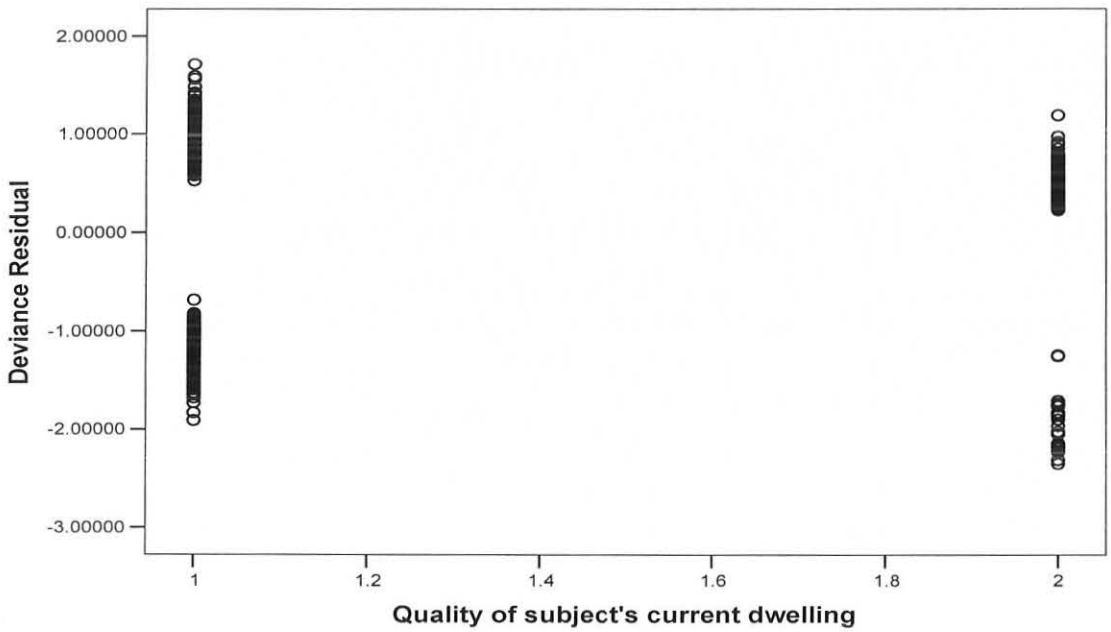


Figure 3. Economic position of patients household relative to catchment area against Deviance Residual

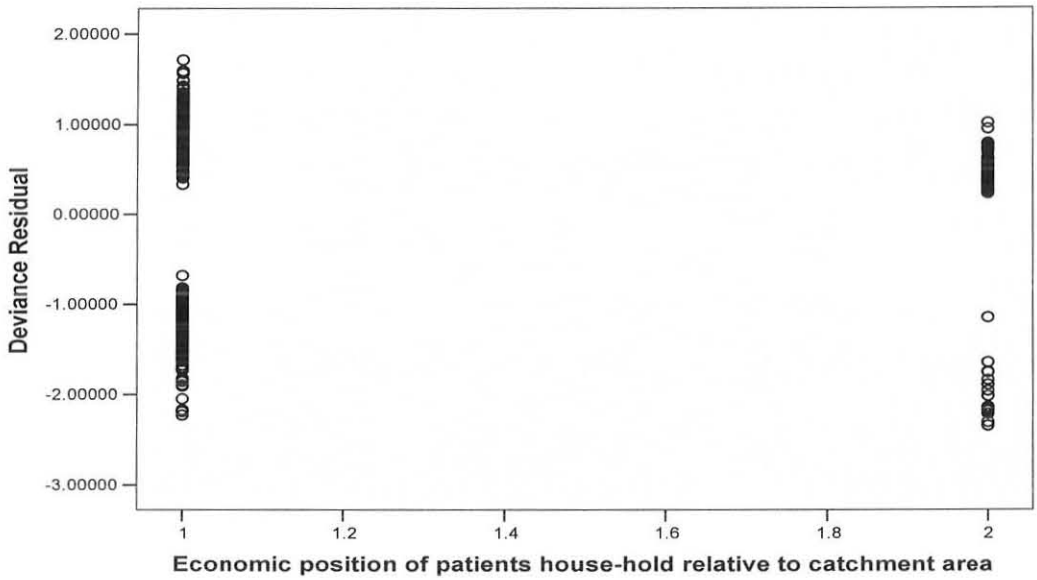


Figure 4. Sex of patient against Deviance Residual

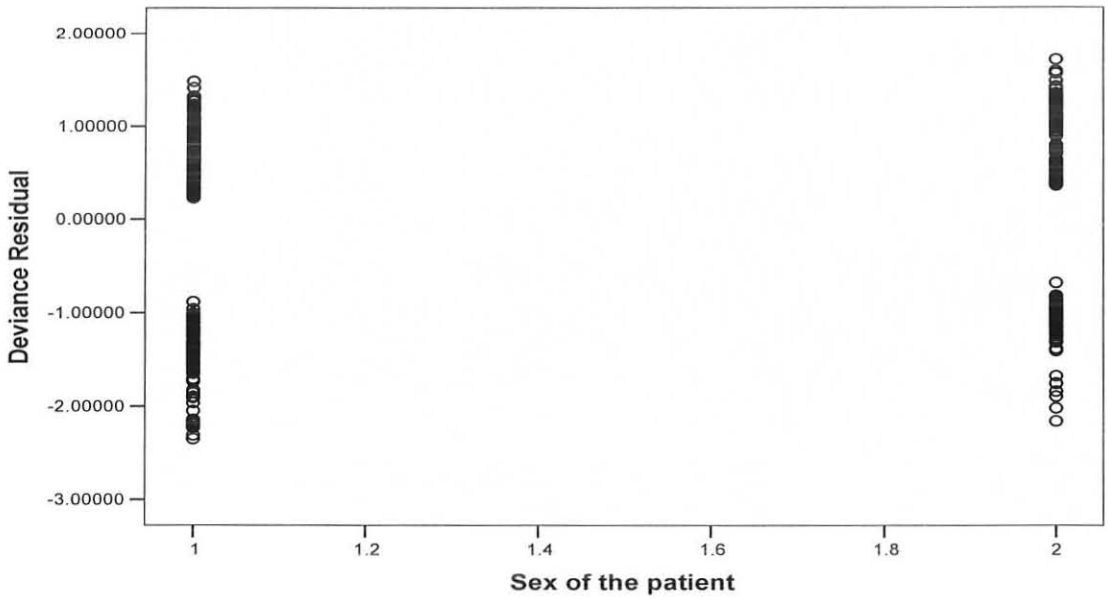


Figure 5. Age of caregiver against Deviance Residual

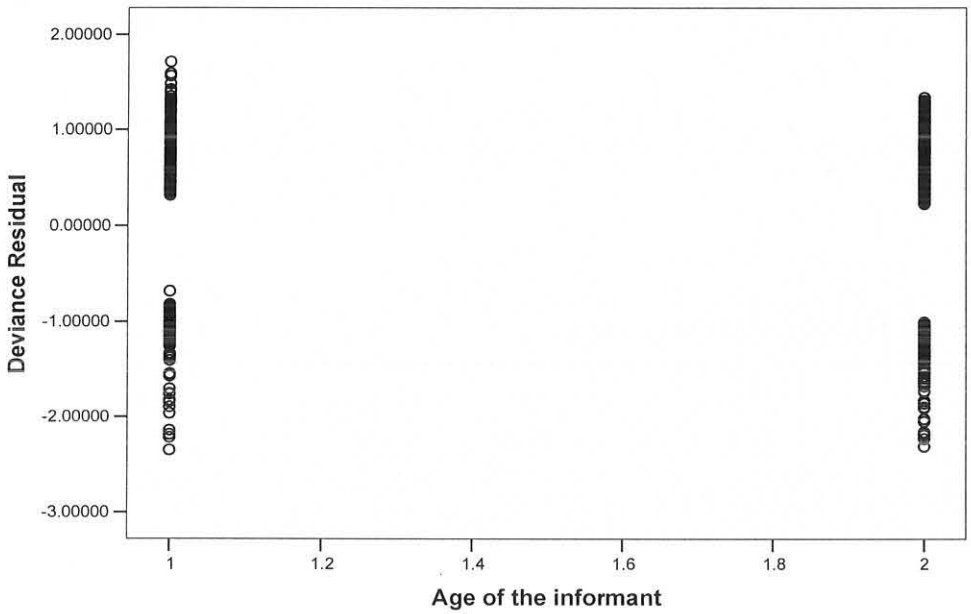


Figure 6. Type of disease against Deviance Residual