2001

PREDICTORS OF PATIENT REPORTED MEDICATION ADHERENCE TO ANTIRETROVIRAL THERAPY

Zlata Cerimagic
University of Rhode Island

MEDICATION ADHERENCE IN HIV POPULATION

BY

ZLATA CERIMAGIC

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

IN

PHARMACY ADMINISTRATION

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APPROVED:

Thesis Committee

Major professor Cynthia Riley

James F. Hettche

Susan Andrade

Harold D. Bibb

DEAN OF THE GRADUATE SCHOOL

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ABSTRACT

The acquired immuno deficiency syndrome (AIDS) caused by human immuno deficiency virus (HIV) is still a significant public health problem. In the United States approximately 1,000,000 people live with HIV/AIDS infection.[4]The recommended treatment is HAART (highly active antiretroviral therapy). The HAART treatment is very complex, because of a large number of prescribed drugs in a regimen, frequent dosing and also a number of side effects. In HIV management **precise adherence**[13, 26] to the prescribed medication regimen is the key for the maximal viral suppression and improved health status, and the only way to turn this deadly disease into a manageable chronic disease. The importance of many factors associated with medication adherence, including patient characteristics, disease characteristics, medication regimen characteristics, and the patient-provider relationship has been documented. One of the aspects of the complexity of the prescribed regimen is the number of medications in the regimen.

Results: The number of medications did not show association with medication adherence. Patients on a more complex antiretroviral medication regimen did not miss higher percent of prescribed medication, and we may not discriminate between adherent and non-adherent patients only based on a number of prescribed antiretroviral medication. Also the variables number of side effects and how long ago HIV positive were negatively associated with medication adherence.

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I dedicate this research to my mother who would be so happy if she could see this.

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INTRODUCTION

Epidemiology of HIV/AIDS infection

The acquired immunodeficiency syndrome (AIDS) caused by human immunodeficiency virus (HIV) is still a significant public health problem. From 1981, which marked the beginning of the HIV pandemic, throughout the following 20 years, HIV/AIDS has spread worldwide affecting every single country.[1] Epidemiological picture of HIV/AIDS infection around the world for the last year has the following indicators; more than 5 million new cases of HIV infection had occurred in 2000. Estimated prevalence tells that currently around the world about 36 million people live with HIV/AIDS infection. The WHO also has reported that AIDS caused 22 million deaths.[2] In the United States approximately 1,000,000 people live with HIV/AIDS infection.[3] The incidence of HIV infection is about 40,000 cases each year.[3] In this country more than 420,000 people have already died from AIDS.[4]

Adherence-key factor in HIV/AIDS treatment

Current therapeutic options for HIV/AIDS patients include more than 15 antiretroviral drugs, commonly grouped in the three classes as: nucleoside reverse transciptase inhibitors (NRTI), nonnucleoside reverse transcriptase inhibitors (NNRTI) and protease inhibitors (PI).[5,6,7,8] From 1996 the highly active antiretroviral therapy (HAART) has been used as a standard of care for symptomatic as well asymptomatic HIV positive patients.[5,9,10] The HAART treatment is very complex, because of a large number of prescribed drugs in a regimen and frequent dosing.[9,10] Also a number of

side effects, drug interactions, toxicities and also very specific food restrictions make this treatment not only complex but also very demanding for the patients and consequently difficult for lifetime precise adherence.[5,9,10,11,12,13,14] Previous research suggests that in general patients with more complex medication regimen are less adherent to the prescribed regimen.[12,15,16] In contrast, several other studies reported increased medication adherence with an increase in a number of prescribed medication in a regimen.[17,18,19] Several studies did not find an association between medication regimens' complexity and patient medication adherence.[20,21] Because previous research reported uncertain and inconclusive findings; there has been a need for more research on adherence and medication regimen complexity in HIV population. Clear understanding of this issue is necessary, and may have important implications for further treatment of HIV positive patients, as well as further incentive for pharmaceutical industries.

Adherence to a prescribed medication regimen requires taking medication as prescribed consistently.[22] Adherence or compliance was defined by Fisher as 'a concept used to measure'[23] positive patients' behavior 'in meeting their therapeutic goals.'[23] In HIV management **precise adherence** [7,9,12,24] to the prescribed antiretroviral medication regimen is the key for the maximal viral suppression and improved health status, longer and better quality of life, and the only way to turn this deadly disease into a manageable chronic disease.[7,12,22,24,25] Poor medication adherence and irregular use of prescribed antiretroviral medication with inadequate drug concentration may result in resistance and consequently reduced treatment options for HIV positive

patients. [8,12,13,22,26] Although research did not define how frequently an HIV positive patient can miss antiretroviral medication before resistance develops less than optimal results were reported with medication adherence lower than 90%. [9,25,34] In addition because HIV resistant strains might be transferred to others, poor medication adherence in HIV/AIDS management may have a devastating impact on a public health. [16,22,24,25,27] Thus, strict adherence to the prescribed antiretroviral medication regimen is essential and estimation of factors associated with medication adherence in HIV population present a crucial issue in HIV management and current research.

Previous research has reported different medication adherence rates in the HIV population. Wenger et al. reported 57% adherence to prescribed medication regimen [19], Willey et al. reported 86% adherence,[29] and Samet et al. reported 67% adherence[30]. Poor adherence to the prescribed antiretroviral medication regimen of 60% and 42% were reported by Eldred JL, et al.[31] and Muma et al.[32]

Medication non-adherence also causes higher costs of HIV/AIDS treatment because of increased number of complications and development of opportunistic infections, hospitalizations, and finally increased mortality of the HIV infected patients.[13] Consequences of medication non-adherence are the most obvious in HIV population. Hogg et al. reported that for every 10% decrease in adherence, the mortality rate increases by 16%. [33] Few studies have reported direct relationships between the level of patients' adherence to a prescribed antiretroviral therapy and viral load suppressions as well as CD4 cell count status.[10, 25,34]

Factors associates with adherence:

Previous research has reported a number of different factors associated with adherence to the prescribed medication regimen. [15,22,35] Adherence is a very complex phenomenon, and may be influenced by many different factors. These factors are commonly grouped as:

- Patient characteristics
- Disease characteristics
- Medication regimen characteristics
- Patient-provider relationship characteristics[12,15]

A. Patient characteristics: include age, gender, race, employment, occupation, income, health insurance, living arrangements, marital status, number of children, and social support.[15] Not all patients' characteristics influence medication adherence in the same way. Demographics do not seem to have predictive value for medication adherence, although they have been examined in a number of studies.[12,14,17,19, 20, 22] Older age, gender, race, income or employment has been reported to influence adherence but not consistently, and findings are generally inconclusive. [14,15,16] Recently a few studies have found that low literacy contributes to poor medication adherence. [52, 53] Patient characteristics, most frequently reported to positively influence medication adherence, include social support from family and friends.[12,22, 30] Also optimism and trust in prescribed antiretroviral treatment, and belief in successful outcomes as well as knowledge about antiretroviral medication, and knowledge about

the importance of strict adherence in the treatment with antiretroviral medication lead to better adherence to prescribed medication regimen.[12,30,31,39] Human behavior is very complex and a number of psychosocial factors has a significant influence on medication adherence. A number of studies have found that psychological problems, lifestyle such as homelessness, alcoholism or drug abuse, contribute to medication non-adherence. [16,19,20,21,22,24,29,30,34]

B. Disease characteristics: include symptoms, duration, diagnosis, number of hospitalizations, severity, and extent of disability.[15] Disease characteristics such as lack of symptoms or long term treatment usually influence medication adherence negatively.[15] Previous studies have reported poor medication adherence in both long-term treatments as well as short-term treatments with an average of fifty-percent adherence.[15,36] Even poorer medication adherence rates are common in preventive treatment or treatment of asymptomatic patients.[36,37] Certain diagnoses such as psychiatric illnesses, depression, and mental disorders are commonly associated with problems of low medication adherence.[16,24,38] The literature regarding other disease characteristics and medication adherence is inconclusive.

C. Medication regimen characteristics: include number of medications, type of medication, side effects, number of doses, duration and cost.[15] Many studies reported decreased medication adherence as the regimen became more complex and the number of prescribed medications increased.[12,15,16,37,39] Several studies found quite the opposite, increased adherence as the number of prescribed medications increased.

[17,18,19,30] Other researchers reported statistically non-significant or inconsistent associations between number of prescribed medications and medication adherence. [20,21,40,41,42,51] The type of medication may influence adherence as well as medication class. [16,18,21,39,40] Treatments with a number of side effects were reported as a cause of poor adherence to the prescribed medication regimen.[12,16,43] Dosage frequency influences adherence negatively; as the number of prescribed doses increases, adherence to the prescribed medication regimen is reported to decrease. [12,18, 21, 40,42,44,45]

D. Patient-Provider relationship characteristics: have been evaluated in a number of studies.[15,24,31,40,42,46] Possibly the most important factor that influences patient medication adherence is the patient physician relationship.[22,37,46] Friendly, respectful, and long-term relationships between a patient and his/her physician is a very important part of the success of both the therapy and patient adherence.[55] The physician should provide patients with detailed information about the disease and medication, and provide written information about antiretroviral medication use. Physicians' knowledge and experience in the treatment of HIV positive patients may generate higher patient trust and confidence and positively influence adherence.[12,47] Other healthcare providers such as nurses or pharmacist's, who provide clear explanations about treatment options may also influence patients medication adherence positively as well.

Methods of adherence measurement:

In a search for the best and the most accurate measure of medication adherence researchers develop a number of different methods. Commonly these methods are grouped as direct or indirect. Directly we measure medication adherence by monitoring medication use by patients, and by testing blood and urine for the presence of drugs, metabolite, or drug markers.[15,38,48,49] The disadvantage of these methods is that they do not give information about long-term medication use behavior[28]. Although direct methods probably have a higher sensitivity and specificity than indirect methods, they are more expensive and more inconvenient for the patients.[49] Indirect methods include pill counts, physician assessment, and self-reported adherence to a prescribed medication regimen, prescription refill records, and electronic monitoring. [11,12,15,38,48,49]

A. The pill count method is based on the count of returned pills. This method was very frequently in use in older research literature. The major disadvantage of this method is unreliability. Because patients may not return all unused pills, this method may be misleading and result in overestimated adherence.

B. Physician assessment provides inaccurate estimates of patient adherence, and with this method the adherence rate is generally overestimated.[38,48,49]

C. The self-report method includes questionnaires, diaries, and patients' interviews. [21,46] Questionnaires are often used in research because they are relatively simple and fast way to collect data about small or large populations. Some researchers consider patients' self-report as accurate measure of patient adherence, and others believe that

self-reported data overestimates adherence.[25,33, 48,50] A self-report is more convenient for the patients, and less expensive than other measures.[24] With cooperative patients, who are willing to disclose their behavior, self-report has the potential to be an accurate measure of patient adherence.[24]

D. The prescription refill records method is based on the use of pharmacy records, and gives unique opportunity to explore adherence usually in a larger population, and usually over longer periods of time. The disadvantage of this method is that we know that prescription was filled, but we do not know did actually patient use the medication as prescribed.

E. Electronic monitors are method based on use of the computerized drug containers. Electronic monitors provide data with dates as well as time intervals of each opening of the bottle. Electronic monitors use may also overestimate the adherence rate because we know that bottle was opened but we do not know whether the prescribed medication was used.[48] They are also expensive and impractical for large populations as well as multi-drug regimens. For some forms of medication electronic monitors cannot be used. Also because of awareness that their behavior is monitored patients may be more adherent. Because there is no gold standard perhaps the most accurate estimate of medication adherence may be obtained by using several methods in the same study, which also gives an opportunity for reliability and validity comparison between the measures.[11,36, 48]

STATEMENT OF PURPOSE

A review of the literature shows the importance of precise and strict adherence to complex antiretroviral regimens in the HIV population. The importance of many factors associated with adherence, including patient characteristics, disease characteristics, medication regimen characteristics, and the patient-provider relationship characteristics have been documented. The primary objective of this study is to analyze and estimate the point prevalence of HIV positive patients' adherence to complex antiretroviral medication regimens and to examine the association of the following factors with adherence:

- **Medication regimen complexity as a predictor of medication adherence while controlling for patient characteristics, disease characteristics, and medication regimen characteristics.**

The secondary objective is to explore other potential predictors of medication adherence. The hypothesis is that a number of medications may influence patients' medication adherence. Patients on a more complex multi-drug regimen very likely will be less adherent to the prescribed medication regimen than patients on a less complex drug regimen. The patients on a more complex antiretroviral regimen, including a larger number of prescribed medications very likely will miss more doses of prescribed medication and demonstrate the poorer adherence to the prescribed antiretroviral medication regimen.

METHODOLOGY

Study Design

This is a descriptive, cross-sectional study of self-reported medication adherence to prescribed HIV related medication regimen.

Study Sample

The study sample consists of 145 participants, all diagnosed as HIV positive patients. A patients' eligibility to participate in this study was 1) over 18 years of age, 2) ability to read and write English, and 3) currently using an antiretroviral medication, or medication for HIV related complications. The study sample was not random sample. All study participants were patients attending clinics. For participation, each person received $20.

Data Collection

Data was collected in Rhode Island and Massachusetts at the Miriam Hospital Immunology Center, the Stanley Street Treatment Center, and the Veterans Affairs Medical Center. The physicians from each clinical site asked HIV positive patients for consent to participate in the study. All data was collected by a self-reported questionnaire. Questionnaires were distributed to most patients at the clinic, with the option to complete the questionnaire at the clinic or at home and to bring it or mail it back. Fifteen study participants, (10.34%) were incarcerated and questionnaires were delivered to them in prison. A research assistant was available at both sites to respond to any questions regarding the self-administered questionnaires, and with the pictures and names of all HIV- related medications. HIV positive patients filled out the self-

reported questionnaire during the year 1996-1997 (see appendix). From the six sections of the questionnaire titled 'Managing Your Medication Questionnaire' only section I 'Background Information' and section II 'Medication History' were used in the analysis, (Willey, Unpublished data).

Measures:

The questionnaire collected information about the following:

A. Patients' characteristics: age, gender, health status, race, education, employment, living arrangements, number of people in household, number of children, adult children nearby, emotional support from family and friends, financial support from family and friends, physical assistance and place to stay, number of people that you have told about HIV infection, health insurance, income, and distance from treatment center, anyone to reminds about medications, mood status and coping skills (attitude toward antiretroviral medication).

B. Disease characteristics: bodily pain in the past 4 weeks, pain interference with work in the past 4 weeks, days in bed in the past 2 weeks, number of hospitalizations in the past year, how long ago diagnosed, how got HIV infection, CD4 cell count last tested.

C. Medication regimen characteristics: number of medications, medication class, how often use medications, how long on medication, drug holidays or discontinuation of prescribed medication for more than 3 days, number of side effects, number of doses missed in the past week, number of doses missed in the past month, number of

doses missed in the past three months. Questions about the number of doses missed were asked in a nonjudgmental manner. Participants were asked questions such as: "Sometimes it is difficult to take prescribed medicine all the time. During the past month, about how many times did you miss a dose of medication 1?" The same question was asked for each drug in a patients' regimen. HIV positive patients were asked about the number of doses missed in the previous week, as well as the previous month, and the previous three months.

D. Patient-Provider relationship characteristics: the most helpful health care provider, and questions about medication use.

Method

The total number of prescribed HIV related medications was calculated for each participant; a larger number of prescribed medications corresponds to a more complex regimen. The participants of this study were considered absolutely adherent (100%) to prescribed antiretroviral therapy if they did not report missing any doses of prescribed regimen in the previous month. Dependent variable medication adherence was calculated using the following formula: {(total # of doses prescribed / total # of medication) - (total # of doses missed) / total # medication)} / (total # of doses prescribed / total # of medication) * 100. Consequently, a higher percent of doses missed in the past month correspond to a higher level of medication non-adherence. With multiple ANOVAs the participants who reported 100% adherence were separated as a sample and were used for comparison with the non-adherent sample.

Statistical Analysis:

Data was analyzed using Multiple Regression Analysis with SAS program (Statistical Analysis Software), Version 8.0. The computer facilities and the library at the University of Rhode Island was used for the data analysis as well as for the all necessary research work. Data were checked for the accuracy of the data entry and for the basic assumptions of linearity, normality, and homoscedasticity. SAS procedures proc mean and proc plot were used to check for outliers and linearity assumption of all. Collinearity and singularity was checked also. The dependent variable, self-reported medication adherence (percent of doses taken), in the past month was used in analysis because of the least skewness and kurtosis compared to self-reported medication adherence in the past week or self-reported adherence in the past three months. Also one month was considered as better time period for the evaluation of medication taking behavior compared to one-week period. Recall bias was less likely in a period of a month compared to three months period. Because of severe non-normal distribution logarithmic transformation was performed on the dependent variable medication adherence. Variables were considered significant predictors for the p-value below 0.05. If independent variables were categorical then independent variables were dummy coded.

The Questionnaire was designed to ask about the number of doses missed in the previous month for each medication in patients' regimen; from the first drug in the regimen to the sixth drug in a regimen. But the questionnaire was not designed to ask about the number of doses missed for the regimen of 7 or more drugs. Seven study

participants, (5%) were on the regimen of 7 or 8 drugs. Because most study participants, (71%) were on regimen of four or less than four drugs they did not respond on the questions about the number of doses missed in the previous month for the fifth or sixth drug in a regimen. Because information on the number of doses missed in the previous month was missing for approximately 80% of variables for the fifth or sixth drug in the regimen was not used in the analysis. This is illustrated in Table 1. In accordance with this all computations were performed for the regimen of four or less than four drugs. The variables to be evaluated included:

Dependent variable:

Two dependent variables were created. The first dependent variable medication adherence was calculated for all study participants using the following formula:

A. Medication adherence, (percent of doses taken in the previous month):

0 –100% (continuous), was defined and calculated as:

{(total # of doses prescribed / total # of medication) - (total # of doses missed) / total # medication)} / (total # of doses prescribed / total # of medication) * 100.

Medication adherence was calculated for the regimen of four or less than four drugs in the regimen.

The second dependent variable was calculated only for the study participants who reported that they had missed their medication. Consequently study participants who reported that they never missed their medication were not included. Medication adherence was defined and calculated as:

B. Medication adherence, (percent of doses taken in the previous month):

0 – 99% (continuous), was defined and calculated as:

{(total # of doses prescribed / total # of medication) - (total # of doses missed) / total # medication)} / (total # of doses prescribed / total # of medication) * 100.

Medication adherence was calculated for the regimen of four or less than four drugs in the regimen.

Independent variables:

A. Independent variables grouped as Patient Characteristics:

- Age (continuous)
- Race (categorical)

  1 – Non-White

  0 – White
- Education (continuous)
- Annual Income (categorical)

  1 - <$ 24,000

  0 - > $25,000
- Employment (categorical)

  1 - Full-time/Part-time

  0 - Not employed
- Health Status (categorical)

  1 – Exc/Vg/Good

0 – Fair/Poor

- Number of family and friends that you can count on for physical assistance or place to stay. (continuous).

B. Independent variables grouped as Disease characteristics

- Bodily pain in the past 4 weeks (ordinal)

  1 – None (Very mild/Mild/Moderate)

  0 - Pain (/Severe/Very Severe)

- Number of hospitalizations in the past year (continuous)
- Days in bed in a last 2 weeks (continuous)
- CD4 cell count last tested (categorical)

  1 - Greater than 500

  0 - Less than 500

- How long ago diagnosed HIV positive (categorical).

  1- >1 year
  0- <1 year

C. Independent variables grouped as Medication regimen characteristics

- Total number of prescribed medication (continuous); 1- 4

  Sum of QII1X+QII2X+QII3X+QII4X

- How long on HIV related medication (categorical)

  1 – <=1 year

  0 – >1 year

- Number of side effects (continuous)

Sum of A: nausea, B: dizziness, C: vomiting, D: abdominal pain, E: diarrhea, F: shortness of breath, G: muscle aches, H: fatigue, I: tingling in hands/feet, J: numbness in hands/feet, K: headaches, L: anxiety/worry, M: depression, N: rash, O: sensitivity to sun.

Preliminarily multiple regression analyses were performed, on each separate group of factors most likely associated with adherence to prescribed medication regimen. Multiple regression analyses were performed for: predictors' group patient characteristics, predictors group disease characteristics, and predictors group medication regimen characteristics. Stepwise Multiple Regression analysis including the factors most highly associated with medication adherence from each group, as well as all other factors was carried out to define the best fit for the final model.

- **Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variable group: patient characteristics.**

Medication Adherence = Age + Race + Education + Employement + Health Status + Annual Income + # of People for Physical Assistance/Place to stay.

- **Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 99%) vs. the independent variable group: patient characteristics.**

Medication Adherence = Age + Race + Education + Employement + Health Status + Annual Income + # of People for Physical Assistance/Place to stay.

- **Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variable group: disease characteristics predictors.**

Medication Adherence = Pain during past 4 weeks + Number of hospitalizations + Days in bed + How long ago diagnosed + CD4 cell count.

- **Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 99%) vs. the independent variable group: disease characteristics predictors.**

Medication Adherence = Pain during past 4 weeks + Number of hospitalizations + Days in bed + How long ago diagnosed + CD4 cell count.

- **Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variable group: medication regimen characteristics.**

Medication Adherence = Total number of medications + Number of side effects + Duration of medication use.

- **Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 99%) vs. the independent variable group: medication regimen characteristics.**

Medication Adherence = Total number of medications + Number of side effects + Duration of medication use.

- **Stepwise Multiple Regression Analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variables grouped in the final model.**

Medication Adherence = Total number of medications + Number of side effects + Health insurance + Number of Children + How long ago diagnosed as HIV positive.

RESULTS

A: Patient Characteristics

Detailed demographics of this study population are given in Table 2. The mean age of the study population was 39 ± SD 7; (range 24-57 years). The study sample was predominantly White, (63%). A majority of the study participants (71%) were males. A high school education or less was reported by 67% of the study population. A majority of the study participants were not currently employed; 72% reported that they do not work. 59% reported an annual income of less than $15,000. A significant number, (82%) reported lack of health insurance. In general, this study sample reported a high level of social support. About 60% of the sample reported feeling very or fairly confident that family or friends would continue to help with everyday needs. About 95% of the study participants reported that they have told all or most of their friends or relatives about their HIV status Living arrangements that include partners, spouses, other adults, parents, or their children were reported by 70% of the study sample. Approximately half of the sample reported that they have children. Also about 50% of the study participants reported that they have somebody who lives close to them to remind them about the use of the prescribed medications. 39% reported belief that they got HIV through IV drug use; the rest reported homosexual or heterosexual contact as a transmission risk.

B: Disease characteristics

In general, a majority of the sample population, (73%) reported excellent, very good, or good health status. Also 63% reported that they had never been hospitalized. Only 13% of study participants reported severe or very severe bodily pain. Almost half, 46%, confirm that they never feel so weak that they need to spend a day in a bed. The majority, 63%, reported long duration of disease; they had been diagnosed 5 years or longer ago. In this study population basically 43% had developed AIDS, because 13% reported a CD4 cell count less than 50, and 30% reported a CD4 cell count between 50 and 200. Table 3 shows the frequency of indicators of health status.

C: Medication regimen characteristics

The mean number of prescribed medications was 3.7 drugs. Prescribed HIV related medications regimen range from monotherapy to 8 drugs therapy. 6 study participants, or 4%, were on monotherapy, 30 study participants, or 21% were on 2-drug therapy, and 41, or 28%, were on 3-drug therapy. 24 study participants or 17% were on a more complex regimen of 4 drugs. 44 study participants or 30% were on a regimen of 5 and more drugs. Antiviral medications were prescribed for almost all study participants (99%); 50% had protease inhibitors in their regimen, and 56% additionally used antinfective medication for HIV related complications. The most commonly prescribed antiviral medications in this study population were: lamivudine or epivir (3TC), prescribed for 121 patient or 83%; then stavudine or zerit (D4T), prescribed for 69 patients or 49%; and zidovudine or retrovir (AZT), prescribed for 65 participants or

45%. Among antiinfectives, bactrim or septra (Trimethoprim) was the most commonly prescribed drug, for 67 patients or 46%. Among protease inhibitors, the most commonly prescribed drug was Indinavir (Crixivan), prescribed for 58 participants or 40%. The most common frequency of dosing was two or three times a day for each drug in a regimen. The prescribed regimens did not cause any side effects in 26% of study population. The rest confirm that they experienced from one to a number of side effects. Table 4 shows the frequency of indicators of medication regimen.

D: Patient-Provider relationship characteristics

Physicians were described as the most helpful health care providers. If study participants have questions about their medications, 91% ask their physicians, 31% ask a pharmacist, and 30% a nurse. Patient provider relationship characteristics are shown in Table 5.

E: Medication adherence

Almost half of the study sample reported that they had never missed a dose of prescribed medication. There appears to be a significant difference in reported strict, 100% adherence. 70% of study participants reported 100% medication adherence in the past week for the first drug in a regimen. However, only 46% HIV positive patients reported 100% adherence with prescribed medication in the past month, and 41% of study participants reported 100% medication adherence in the past three months. A summary of this information is presented in table 6.

In this sample about one half (48%) of study participants reported medication non-adherence. They reported that they had missed from 1 to 35 doses of prescribed HIV related medication in the previous month. Table 6A present percent of those who reported non-adherence, (1-35 doses missed), as well as percent of those who reported strict adherence, (0 doses missed), and percent of missing data.

A significant number of study participants, reported unintentional non-adherence[29]; 46% reported forgetfulness as a reason for missing a dose of prescribed medication. Also a high number reported intentional non-adherence[29]; 25% reported sometimes being careless about taking prescribed antiretroviral medication regimen. 19% admit that sometimes they stop the use of prescribed medication. 14% reported drug holidays for 3 or more days.

The mean number of prescribed doses missed in the previous month was 5 doses. Self-reported mean medication adherence in the previous month was high and was calculated to be 97%, with a minimum of 58% and maximum of 100%. The mean medication adherence in the past week was 95%, and the mean medication adherence in the past three months was 98%.

F: Multiple Regression Analysis and Stepwise multiple Regression Analysis

Multiple regression analyses were performed for the following models: predictors' group patient characteristics, predictors' group disease characteristics, predictors' group medication regimen characteristics and Stepwise multiple regression analysis for the final model.

Table 7: The result of multiple regression analysis for the dependent variable, Medication Adherence (% of doses taken, 0 – 99%) Vs. the independent variables group patient characteristics:

The model was significant $F_{7, 67} = 2.71$ (Pr > F 0.0154), and $R^2 = 0.2208$. This suggest that 22.08% of the variability in the dependent variable may be explained by the model. The result of the multiple regression analysis showed that race (Non-White) and education had significant positive association with medication adherence. Other variables such as age, employment, annual income, health status, and number of people available for physical assistance did not show significance at the 0.05 level.

Table 7A: The result of multiple regression analysis for the dependent variable, Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variables group patient characteristics:

The model was not significant $F_{7, 122} = 1.72$ (Pr > 0.1103), and $R^2 = 0.0898$. This suggest that 8.98% of the variability in the dependent variable may be explained by the model. The result of the multiple regression analysis showed that race had significant association with medication adherence. Other variables such as age, employment, education, annual income, health status, and number of people available for physical assistance did not show significance at the 0.05 level.

Table 8: The result of multiple regression analysis for the dependent variable, Medication Adherence (% of doses taken, 0 – 99%) vs. the independent variables

Group disease characteristics predictors:

The model was not significant $F_{5, 70} = 0.27$ (Pr >0.9273) and $R^2 = 0.0190$. None of the predictor variables such as number of days in bed, pain interference with work, bodily pain, how long diagnosed as HIV positive or CD4 cell count showed significant relationship with dependent variable medication adherence.

Table 8A: The result of multiple regression analysis for the dependent variable, Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variables group disease characteristics predictors:

The model was not significant $F_{5,128} = 0.72$ (Pr > 0.6122) and $R^2 = 0.0272$. None of the predictor variables such as number of days in bed, number of hospitalizations, bodily pain, how long diagnosed as HIV positive or CD4 cell count showed significant relationship with dependent variable medication adherence.

Table 9: The result of Multiple regression analysis for the dependent variable, Medication Adherence (% of doses taken, 0 – 99%) vs. the independent variables group medication regimen characteristics:

The model was not significant $F_{4, 75} = 1.89$ (Pr > 0.1386) and $R^2 = 0.0703$. None of the variables grouped as medication regimen characteristics, including number of medications, number of side effects, or duration of treatment, showed significant association with dependent variable medication adherence.

Table 9A: The result of Multiple regression analysis for the dependent variable,

Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variables group medication regimen characteristics:

The model was not significant $F_{4,134} = 2.24$ (Pr > 0.0867) and $R^2 = 0.0477$. The variable side effect showed statistically significant association with dependent variable medication adherence in contrast to the variables number of medications, or duration of treatment.

Table 10: The result of Stepwise Multiple Regression Analysis for the final model for dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variables grouped in the final model:

The final model was significant $F_{5,134} = 3.44$ (Pr > 0.0059). In this model $R^2 = 0.1138$ suggesting that 11.38% of the variability in dependent variable medication adherence may be predicted by the model. The variable number of side effects and number of children showed negative statistically significant association with the variable medication adherence. The variable total number of medication did not show significant association with medication adherence; p-value was non-significant, 0.0921. Other variables in the model such as How long ago diagnosed as HIV positive, and Health insurance also did not show statistically significant association with medication adherence in the final model.

Table 1: Percent of HIV Positive Patients Who Responded On the Questions About the # of Doses Missed

Medication #	Past week	Past month	Past 3 months
Medication #1	**97.93%**	**94.48%**	**90.34%**
missing data	2.07%	5.52%	9.66%
Medication #2	**91.03%**	**87.59%**	**86.21%**
missing data	8.97%	12.41%	13.79%
Medication #3	**68.97%**	**69.66%**	**68.28%**
missing data	31.03%	30.34%	31.72%
Medication #4	**34.97%**	**34.97%**	**33.57%**
missing data	65.03%	65.03%	66.43%
Medication #5	**20.28%**	**19.58%**	**19.58%**
missing data	79.72%	80.42%	80.42%
Medication #6	**10.49%**	**10.49%**	**10.49%**
missing data	89.51%	89.51%	89.51%

*Past Week (% who responded about # of doses missed/past w.)
*Past Month (% who responded about # of doses missed/past m.)
*Past 3 Months (% who responded about # of doses missed/past 3 m.

Table 2: Patient Characteristics

Age (mean) 39 +/- 7		
Gender	**Participants #**	**Participants %**
Female	42	29%
Male	102	71%
Race	**Participants #**	**Participants %**
White	91	63%
African-American	23	16%
Hispanic	16	11%
Native American	4	3%
Other	10	7%
Education	**Participants #**	**Participants %**
< 12 years	48	33%
12 years	46	32%
> 12 years	51	35%
Employment	**Participants #**	**Participants %**
Not employed	105	72%
Full-time	22	15%
Part-time	17	12%
Health Insurance	**Participants #**	**Participants %**
No Health Insurance	119	82%
Health Insurance	23	16%
Annual Income	**Participants #**	**Participants %**
< 15,000	85	59%
15,000-24,000	26	18%
25,000-34,000	9	6%
35,000-44,000	12	8%
> 45,000	4	3%

Table 2: Patient Characteristics cont.

Living Arrangement	Participants #	Participants %
With Others	101	70%
Alone	44	30%
# Children	**Participants #**	**Participants %**
No	66	46%
Yes	79	54%
Social Support	**Participants #**	**Participants %**
Very or fairly confident in suppor	88	61%
Somewhat confident	24	17%
Less than somewhat or not at al	29	20%
Got HIV Infection	**Participants #**	**Participants %**
IV Drug use	57	39%
Homosexual	51	35%
Heterosexual	46	32%
Blood Transfusion	4	3%

Table 3: Disease Characteristics

Health Status	Participants #	Participants %
Excellent	11	8%
Very Good	33	23%
Good	62	43%
Fair	33	23%
Poor	6	4%
Bodily Pain	**Participants #**	**Participants %**
None	37	26%
Very mild	28	19%
Mild	19	13%
Moderate	42	29%
Severe	14	10%
Very severe	5	3%
Days in Bed	**Participants #**	**Participants %**
0	67	46%
1-20	74	51%
Number of Hospitalizations	**Participants #**	**Participants %**
0	92	63%
1-8	51	35%
Disease Duration	**Participants #**	**Participants %**
Less than a month	1	1%
One to six months	4	3%
> 6 months but < 1 year	4	3%
1-2 years	14	10%
3-4 years	27	19%
5 years or more	92	63%
CD4 cell count	**Participants #**	**Participants %**
> 500	20	14%
201-500	53	37%
50-200	44	30%
>50	19	13%

Table 4: Medication regimen characteristics

Total number of med. (mean)	3.7	
# of prescribed medication	**Participants #**	**Participants %**
1(monotherapy)	6	4%
2	30	21%
3	41	28%
4	24	17%
5	25	17%
6	12	8%
7	6	4%
8	1	1%
Medication Class	**Participants #**	**Participants %**
Antivirals	143	99%
Protease Inhibitors	73	50%
Antiinfectives	82	57%
Most freq. prescribed drugs	**Participants #**	**Participants %**
Epivir (3TC)	121	83%
Stavudine (D4T)	69	48%
Trimethoprim (Bactrim)	67	46%
Zidovudine (AZT)	65	45%
Indinavir (Crixivan)	58	40%
How long taking medication	**Participants #**	**Participants %**
Less than 1 month to 6 months	49	34%
6 months to 1 year	26	18%
1 to 2 years	26	18%
more than 2 years	42	29%
Freq. of medication use	**Participants #**	**Participants %**
2X per day	80	55%
3X per day	40	28%
# of Side effects	**Participants #**	**Participants %**
0 (none)	38	26%
1 - 5	46	32%
6 - 10	40	19%
> 10	34	24%

Table 5: Patient - Provider Characteristics

Questions about Medications	Participants #	Participants %
Physician	132	91%
Pharmacist	45	31%
Nurse	43	30%
Other HIV person	39	27%
Most Helpful Health Care Prov.	**Participants #**	**Participants %**
Physician	65	45%
Nurse	27	19%
Pharmacist	19	13%
Other	14	10%

Table 6: Self-Reported 100% Adherence rates in the HIV population

Mean Adherence for	Medication #1	Medication #2	Medication #3	Medication #4
Past Week	69.66%	60.69%	51.03%	31.47%
Past Month	46.21%	46.21%	42.07%	25.87%
Past three months	41.38%	42.07%	35.86%	22.38%

Medication #1 (first drug in a regimen)
Medication #2 (second drug in a regimen)
Medication #3 (third drug in a regimen)
Medication #4 (fourth drug in a regimen)

*Past Week (self reported 0 doses missed (100% adherence) in the past week)
*Past Month (self reported 0 doses missed (100% adherence) in the past month)
*Past 3 Months (self reported 0 doses missed (100% adherence) in the past 3 months)

Table 6A: Percent of those who reported 0 or >=1 doses missed

#Doses Missed	Medication #1	Medication #2	Medication #3	Medication #4
Past Month (0 doses)	56.25%	56.52%	60.87%	71.11%
Past Month (>=1 doses)	43.48%	43.48%	39.13%	28.89%

Medication #1 (first drug in a regimen)
Medication #2 (second drug in a regimen)
Medication #3 (third drug in a regimen)
Medication #4 (fourth drug in a regimen)

*Past Month (self reported 0 doses missed in the past month)
*Past Month (self reported >=1 doses missed in the past month)

TABLE 7A: Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variable group: patient characteristics

INDEPENDENT VARIABLES	STANDARD COEFFICIENT	STANDARD ERROR	P-value
AGE (continuous)	0.00016	0.00037	0.6769
#YRS. EDUCATION (continuous)	0.00147	0.00113	0.1937
# PHYSIC. ASSIST. (continuous)	-0.00036	0.00062	0.5640
RACE (categorical)	0.01958	0.00638	0.0027
EMPLOYMENT (categorical)	0.01069	0.00650	0.1022
ANNUAL INCOME (categorical)	-0.00084	0.00789	0.9157
HEALTH STATUS (categorical)	-0.00762	0.00674	0.2610

$R^2 = 0.0898$

$F_{7,122} = 1.72$ (Pr > F 0.1103)

Dummy coding as 1's and 0's were performed on every categorical variable used in analysis.

AGE (continuous) 24 – 57.

EDUCATION (continuous) 3 - 20.

 # OF PEOPLE FOR PHYSIC. ASSIST./PLACE TO STAY (continuous) 0 -30.

RACE was coded as:

1- Non-White
0 - White

EMPLOYEMENT was coded as:

1- Full/Part-time Employed
0- Not Employed.

ANNUAL INCOME was coded as:

1- <24,000
0- >25,000.

HEALTH STATUS was coded as:

1- Exc/VG/Good
0- Fair/Poor.

TABLE 7: Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 99%) vs. the independent variable group: patient characteristics

INDEPENDENT VARIABLES	STANDARD COEFFICIENT	STANDARD ERROR	P-value
AGE (continuous)	0.00027	0.00055	0.6268
#YRS. EDUCATION (continuous)	0.00354	0.00173	0.0444
# PHYSICAL ASSISTANCE. (continuous)	-0.00109	0.00086	0.2111
RACE (categorical)	0.04083	0.01030	0.0002
EMPLOYMENT (categorical)	0.02019	0.01150	0.0836
ANNUAL INCOME (categorical)	0.00044	0.01200	0.9705
HEALTH STATUS (categorical)	-0.01745	0.01081	0.1114

$R^2 = 0.2208$

$F_{7,67} = 2.71$ (Pr > F 0.0154)

Dummy coding as 1's and 0's were performed on every categorical variable used in analysis.

AGE (continuous) 24 – 57.

EDUCATION (continuous) 3 - 20.

 # OF PEOPLE FOR PHYSIC. ASSIST./PLACE TO STAY (continuous) 0 -30.

RACE was coded as:

1- Non-White
0 - White

EMPLOYEMENT was coded as:

1- Full/Part-time Employed
0- Not Employed.

ANNUAL INCOME was coded as:

1- <24,000
0- >25,000.

HEALTH STATUS was coded as:

1- Exc/VG/Good
0- Fair/Poor.

TABLE 8A:Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variable group:Disease characteristics predictors

INDEPENDENT VARIABLES	STANDARD COEFFICIENT	STANDARD ERROR	P-value
# DAYS IN BED (continuous)	-0.00008	0.00099	0.9359
HOW LONG AGO DIAGNOSED (categorical)	-0.00767	0.00945	0.4188
BODILY PAIN (categorical)	0.00428	0.00638	0.5035
PAIN/ INTERF. With WORK (categorical)	-0.00173	0.00831	0.8356
CD4 CELL COUNT (categorical)	0.01219	0.00756	0.1094

$R^2 = 0.0260$
$F_{5,128} = 0.68$ (Pr > F 0.6377)

Dummy coding as 1's and 0's were performed on every categorical variables used in analysis.

DAYS IN BED (continuous) 0 - 20.

HOW LONG AGO DIAGNOSED (categorical) was coded as:

0- >1 year
0- < 1 year

BODILY PAIN was coded as:

1- No Pain (None, Very Mild, Mild)
0- Pain (Moderate, Severe, Very Severe)

PAIN/INTERFERENCE WITH WORK was coded as:

1-No interf. (Not at all, A little bit, Moderately)
0- Yes interf. (Quite a bit, Extremely)

CD4 CELL COUNT was coded as:

1- > 500
0- < 500.

TABLE 8:Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 99%) vs. the independent variable group:Disease characteristics predictors

INDEPENDENT VARIABLES	STANDARD COEFFICIENT	STANDARD ERROR	P-value
# DAYS IN BED (continuous)	-0.00053	0.00151	0.7273
HOW LONG AGO DIAGNOSED (categorical)	0.00557	0.01993	0.7806
BODILY PAIN (categorical)	0.00327	0.00901	0.7180
# HOSPITALIZATIONS (continuous)	-0.00042	0.00038	0.2770
CD4 CELL COUNT (categorical)	-0.00128	0.00884	0.8850

$R^2 = 0.0190$
$F_{5,70} = 0.27$ (Pr > F 0.9273)

Dummy coding as 1's and 0's were performed on every categorical variables used in analysis.

DAYS IN BED (continuous) 0 - 20.

HOW LONG AGO DIAGNOSED (categorical) was coded as:
0- >1 year
0- < 1 year

BODILY PAIN was coded as:

1-No Pain (None, Very Mild, Mild)

0- Pain (Moderate, Severe, Very Severe)

NUMBER OF HOSPITALIZATIONS (continuous)

CD4 CELL COUNT was coded as:

1- > 500

0- < 500.

TABLE 9A:Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variable group: Medication regimen characteristics

INDEPENDENT VARIABLES	STANDARD COEFFICIENT	STANDARD ERROR	P-value
TOTAL # of MEDICATION (continuous)	0.00351	0.00291	0.2294
# OF SIDE EFFECTS (continuous)	-0.00074	0.00030	0.0133
HOW LONG ON MED. (categorical)	0.00026	0.00513	0.9591

$R^2 = 0.0477$
$F_{3,134} = 2.24$ (Pr > F 0.0867)

Dummy coding as 1's and 0's were performed on every categorical variable used in analysis.

TOTAL # OF MEDICATION (continuous); 1 - 4.

TOTAL NUMBER OF SIDE EFFECTS (continuous); 0 - 45.

HOW LONG ON MEDICATION was coded as:

0- <=1 year
0- >1 year

TABLE 9:Multiple regression analysis model for the dependent variable Medication Adherence (% of doses taken, 0 – 99%) vs. the independent variable group: Medication regimen characteristics

INDEPENDENT VARIABLES	STANDARD COEFFICIENT	STANDARD ERROR	P-value
TOTAL # of MEDICATION (continuous)	0.00417	0.00446	0.3525
# OF SIDE EFFECTS (continuous)	-0.00111	0.00049	0.0275
HOW LONG ON MED. (categorical)	-0.00559	0.00804	0.4895

$R^2 = 0.0703$
$F_{3,75} = 1.89$ (Pr > F 0.1386)

Dummy coding as 1's and 0's were performed on every categorical variable used in analysis.

TOTAL # OF MEDICATION (continuous); 1 - 4.

TOTAL NUMBER OF SIDE EFFECTS (continuous); 0 - 45.

HOW LONG ON MEDICATION was coded as:
0- <=1 year
0- >1 year

TABLE 10: Stepwise Multiple Regression analysis for the dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variables.

	Independent Variables	R-Square	F-value	P-value
Step 0	# of Medication (continuous)	0.0071	0.081	0.3696
Step 1	# of Side Effects (continuous)	0.0403	3.87	0.0516
Step 2	Health Insurance (1=no 0=yes)	0.0724	3.85	0.0524
Step 3	# of Children (continuous)	0.0937	2.58	0.1109
Step 4	How long HIV+ (1>=1 year 0<1 year)	0.1195	3.19	0.0767

TABLE 10A: Final model for Multiple regression analysis for the dependent variable Medication Adherence (% of doses taken, 0 – 100%) vs. the independent variables.

Independent Variables	Standard Coefficient	Standard Error	P-value
# of Medication (continuous)	0.00406	0.00239	0.0921
# of Side Effects (continuous)	-0.00075	0.00025	0.0035*
How long HIV+ (1>=1 year 0<1 year)	-0.01244	0.00764	0.1049
# of Children (continuous)	-0.00021	0.00011	0.0464*
Health Insurance (1=no 0=yes)	0.00886	0.00552	0.1104

$R^2 = 0.1138$

$F_{5,134} = 3.44$ (Pr > 0.0059)

DISCUSSION

The medication regimen prescribed for HIV/AIDS patients is described in the research literature as complex and demanding, and consequently difficult for lifetime strict adherence. Adherence to a complex medication regimen is a challenge for patients, and requires patients' motivation and devotion to treatment. Non-adherence is considered by some authors to be a behavioral problem. For a patient to stay adherent to a complex, probably lifelong, antiretroviral treatment "requires change in patient behavior"[29]. Non-adherence in HIV management is a major obstacle to improved health status.

It is difficult to define a real degree of non-adherence in the study sample because we do not have precise and accurate methods to measure patients' adherence to prescribed medication regimen. Multiple regression analyses as well as Stepwise multiple regression analysis was carried out on the total sample as well as on the smaller sub-sample of the study participants who reported missing medication. This method did not help to define more potential predictors of medication adherence.

When adherent study participants were compared with multiple ANOVA's to non-adherent study participants, they were similar. No significant differences were found between the two groups, although the non-adherent sample had slightly more women, more hospitalizations, longer duration of disease, and worse CD4 cell count. Adherence was high in this study population. Perhaps, adherence rates were

overestimated, or this population was highly motivated, and, with high social support, they were adherent to the prescribed medication regimen.

A: Patient Characteristics

Potential predictors of medication adherence grouped as patient characteristics include: age, education, race, employement, annual income, health status, and number of people for physical assistance or place to stay. Model for the total sample was not significant. Model which include sub-sample of non-adherent study participants, (0 doses missed were deleted), was significant. Only variables, race (Non-White) and education showed positive association with medication adherence in this model.

B: Disease characteristics and

C: Medication regimen characteristics

Predictors grouped as disease characteristics, and medication regimen characteristics did not show statistically significant association with variable medication adherence.

D: Final model; Stepwise Multiple Regression Analysis

Using Stepwise Multiple Regression Analysis the following variables were included in the final model: Total number of medication (continuous), Number of side effects (continuous), Number of children (continuous), Health insurance (categorical none vs. some) and How long ago diagnosed as HIV positive (categorical 1>=1 year vs.0<1 year).

Variables which did not enter the model included: age (continuous), race (categorical non-white vs. white), education (continuous), annual income (categorical <$24,000 vs. >$25,000), employment (categorical full/part-time vs. not employed), number of

family or friends for physical assistance or place to stay (continuous), bodily pain (categorical very mild/mild/moderate vs. severe/very severe), number of hospitalizations (continuous), days in bed in a last 2 weeks (continuous), CD4 cell count (categorical >=500 vs. <500), how long on HIV related medication (categorical >=1 year vs. <1 year).

In the final model, unexpectedly, the number of medications did not show significant association with medication adherence. This finding is consistent with the previous research reported by Sing et al.,[17] Baley et al.,[21] Christensen et al., [40] and Sung et al.[42] For the better-fit variable total number of medication was transformed by squaring it, but the final result was almost the same as before transformation. Also results for the sub-sample was not significantly different from the results for the final model, including total sample.

One of the aspects of the complexity of a prescribed regimen is the number of medications in a regimen, as well as the frequency of dosing, number of side effects, food requirements, taste, and cost. All this is true for the medication regimen prescribed for HIV/AIDS patients. This study findings suggest that more complex regimen, with larger number of medication does not necessarily lead to medication non-adherence. This is illustrated in Figures 1 and 2. Previous research also reported that it is most likely that it is not only the number of medication, but probably other aspects of the regimen complexity, such as the frequency of medication use, number of side effects, or perhaps number of psychological variables that contributes significantly to the patients medication non-adherence.[17]

In the final model two variables showed negative statistically significant association with medication adherence: number of side effects and number of children.

Previous research reported stable family situation as important and positive factor for patients' medication adherence, but association between the number of children and medication adherence was not reported. This study found negative association between number of children and medication adherence. Perhaps people with children had more duties including childcare and skip prescribed medication more frequently than people without children did.

Number of side effects showed negative statistically significant association with medication adherence. The higher number of side effects in the regimen the less likely patients will adhere to such a regimen. This finding is consistent with the previous research. Catz et al.[57] and Proctor et al. [56] reported number and severity of side effects in the prescribed regimen as a significant predictor of patients' medication non-adherence. Mehta et al. reported also that medication therapy with the number of side effects usually results in poor adherence to prescribed regimen.[16]

CONCLUSION

The results of this research project demonstrate that the number of prescribed antiretroviral medication may not predict patients' medication adherence. Patients on a more complex antiretroviral medication regimen did not miss higher percent of prescribed medication and we may not discriminate between adherent and non-adherent patients only based on a number of prescribed antiretroviral medications. All this is consistent with previous research. Also variables number of side effects and number of children showed negative statistically significant association with medication adherence.

The study has the following benefits:

The advantages of a self-report, such as low cost, and fast and easy distribution, probably make it a good choice to study and collect data about larger as well as smaller populations. The relatively large study population, 145 patients, and the precise and nonjudgmental questioning gives researchers a unique opportunity to explore adherence issues in depth and to assess important and valuable information about adherence behavior as well as a number of other important factors associated with adherence in this population. Although the self-report is an indirect adherence measure, it has been reported by some authors as a measure with higher sensitivity and specificity over other measures.[25,35] A better understanding of adherence to a prescribed antiretroviral medication regimen in this HIV population may help us to

develop intervention strategies, which would be valuable for this and other HIV patients, and a number of other chronic illnesses that require lifelong treatment. The results of this research will provide information about the patients' needs for health care providers as well as for pharmaceutical companies and manufacturers.

The study has the following limitations:

Because these are self-reported data estimate of the number of doses missed in the past month because of forgetfulness may not be exactly the number of doses missed. Some patients simply do not want to report non-adherence; recall bias and overestimation of adherence rate are real possibility in this type of data collection.[22,24] Although numerous methods for measuring adherence exist; no instrument satisfied all the necessary criteria to be accepted as gold standard to measure adherence rate. Data was collected during '96-'97, when combined therapies were being just introduced as a standard of care and at that time knowledge and information about the treatment options of HIV positive individuals was limited. However, the recommended standard of care is (HAART), a multiple drug therapy including potent protease inhibitors drugs, other than drug combinations used previously. Study sample size was a limitation for more in depth research about adherence rates in some subpopulation groups, such as incarcerated HIV positive participants, or HIV positive women. Study participants were mostly unemployed, without health insurance, and with long duration of disease. Race distributions were not typical for HIV population, and middle age White males were over sampled. Adherence was probably overestimated or

study participants were maybe more adherent to prescribed medication regimen than other, average HIV patients because they accepted to participate, and they already were patients in clinic. Because they were patients on the clinics maybe they received counseling about importance of medication adherence in HIV/AIDS management. Study design was limitation for an estimate of the prevalence of non-adherence over longer period of time.

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APPENDIX

- **Questionnaire**
- **Plots**

Managing Your Medications Questionnaire

Please answer the following questions thoughtfully and completely. This questionnaire is about how you think and feel about the HIV related medications that you are taking, and about the different strategies that people use to take their medications. It will take about 45 minutes for you to fill this out. You may fill it out at home and mail it in or you may return it to this clinic. When you turn it in, we will give you a gift certificate for $20 to thank you for your participation. If you have the time to fill it out here, you may turn it in to the person who handed it to you, and receive your gift certificate now.

CODE FOR THIS QUESTIONNAIRE:

A) What are the first 3 letters of your mother's first name? _____ (1/1-3)

B) What is your birth date? ☐☐/☐☐/☐☐ (1/4-9)
mm dd yy

SECTION I
BACKGROUND INFORMATION

The first section of this questionnaire asks about your background.

→ Please circle or fill in the correct response for each question.

1. What is your age? ☐☐ years (1/10-11)

2. What is your gender? M F

3. How would you describe your current health status? *(Please check one answer)* (1/12)
☐ Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Poor

4. Which of the following best describes your ethnic background? (1/13)
☐ White, non-Hispanic ☐ Hispanic ☐ African American
☐ Native American ☐ Asian ☐ Other

5. How many years of education have you finished? ☐☐ (1/14-15)

6. Do you currently work either part-time or full time? (1/16)
☐ Full-time ☐ Part-time ☐ I am not currently employed

7. Do you live by yourself or with other people? (1/17)
☐ By myself ☐ With others

8. If you live with others, how many (besides you) are in your household? ☐☐ (1/18-19)

9. If you live with others, what is their relationship to you? *(Check all that apply)* (1/20-26)
☐ Husband or wife ☐ Grandparents
☐ Intimate partner ☐ Children under age 18
☐ Other adults 18 or older ☐ Children over age 18
☐ Parents

10. Do you have any children? If so, how many? *(If none, put 0)* ☐☐ (1/27-28)

11. Do any of your adult children live nearby (within a half hour drive)? (1/29)

☐ Yes ☐ No ☐ Not applicable

12. How many of your family or friends can you count on for emotional support? ☐☐ (1/30-31)

13. How many of your family or friends can you count on for financial help? ☐☐ (1/32-33)

14. How many of your family or friends can you count on for physical assistance, or a place to stay? ☐☐ (1/34-35)

15. Do you feel confident that your family or friends will continue to help you with your everyday needs? (1/36)

☐ Very confident
☐ Fairly confident
☐ Somewhat confident
☐ Less than somewhat confident
☐ Not at all confident

16. If you were to need more help with every day needs, do you feel confident that your family or friends could provide it? (1/37)

☐ Very confident
☐ Fairly confident
☐ Somewhat confident
☐ Less than somewhat confident
☐ Not at all confident

17. How many of your family & friends have you told about your HIV infection? (1/38)

☐ None ☐ Less than half ☐ About half ☐ More than half ☐ All

18. What type of health insurance coverage do you currently have? (1/39-48)

☐ NONE
☐ Blue Cross ☐ HCHP ☐ Medicaid
☐ Ocean State ☐ Other private insurer ☐ Medicare
☐ RIGHA ☐ HMO ☐ Other

19. Which of the following best estimates your total (family) income during the past 12 months? (1/49)

☐ Less than $15,000
☐ $15,000 to $24,000
☐ $25,000 to $34,000
☐ $35,000 to $44,000
☐ 45,000 or more

20. About how far do you live from this treatment center? (1/50)

☐ Within walking distance
☐ Within a ten minute drive or less
☐ Within a twenty minute drive or less
☐ Within a thirty minute drive
☐ More than thirty minutes away

21. When you have questions about medications for your HIV infection, who do you usually ask? *(Please check all that apply)* (1/51-58)

- ☐ Pharmacist
- ☐ Physician
- ☐ Social Worker
- ☐ Nurse
- ☐ Other persons with HIV infection
- ☐ Family members
- ☐ Friends
- ☐ Other; please specify _____ (1/59-78)

22. Which health care provider is most helpful to you in taking your medications as directed? (1/79)

- ☐ Nurse
- ☐ Pharmacist
- ☐ Physician
- ☐ Social Worker
- ☐ Other; please specify_____ (2/1 20)

23. Is there someone living with you or close to you who helps or reminds you to take your medications on time? (2/21)

☐ Yes ☐ No

24. How much bodily pain have you had during the past four weeks? (2/22)

- ☐ None
- ☐ Very mild
- ☐ Mild
- ☐ Moderate
- ☐ Severe
- ☐ Very Severe

25. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)? (2/23)

☐ Not at all ☐ A little bit ☐ Moderately ☐ Quite a bit ☐ Extremely

26. During the past two weeks, how many days did you stay in bed all or most of the day? ☐☐ (2/24-25)

27. How many times have you been hospitalized in the past year? *(If none, put 0)* ☐☐ (2/26-27)

28. *These questions are about how you feel and how things have been with you during the past 4 weeks.*

For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

	NONE OF THE TIME	A LITTLE BIT OF THE TIME	SOME OF THE TIME	A GOOD BIT OF THE TIME	MOST OF THE TIME	ALL OF THE TIME	
a. Did you feel full of pep?	☐	☐	☐	☐	☐	☐	(2/28)
b. Have you been a very nervous person?	☐	☐	☐	☐	☐	☐	(2/29)
c. Have you felt so down in the dumps that nothing could cheer you up?	☐	☐	☐	☐	☐	☐	(2/30)
d. Have you felt calm and peaceful?	☐	☐	☐	☐	☐	☐	(2/31)
e. Did you have a lot of energy?	☐	☐	☐	☐	☐	☐	(2/32)
f. Have you felt downhearted and blue?	☐	☐	☐	☐	☐	☐	(2/33)
g. Did you feel worn out?	☐	☐	☐	☐	☐	☐	(2/34)
h. Have you been a happy person?	☐	☐	☐	☐	☐	☐	(2/35)
i. Did you feel tired?	☐	☐	☐	☐	☐	☐	(2/36)

29. How long ago were you diagnosed as HIV positive?

- ☐ Less than a month
- ☐ One to six months
- ☐ More than six months, but less than a year
- ☐ 1 to 2 years
- ☐ 3 to 4 years
- ☐ 5 years or more

30. How do you think you got your HIV infection?
Please check all that apply

- ☐ Injection (IV) drug use
- ☐ Heterosexual contact
- ☐ Homosexual contact
- ☐ Blood transfusion
- ☐ Other: _____

31. What was your T cell count (CD4 count) the last time you were tested?

☐ Greater than 500 ☐ 201-500 ☐ 50-200 ☐ Less than 50

SECTION II
MEDICATION HISTORY

WHICH OF THE FOLLOWING MEDICATIONS ARE YOU TAKING NOW? (2/64 77)
→ PLEASE CHECK ALL THAT APPLY:

- ☐ AZT (Retrovir®, zidovudine)
- ☐ DDI (Videx®, didanosine)
- ☐ DDC (Hivid®, zalcitabine)
- ☐ D4T (Zerit®, stavudine)
- ☐ 3TC (Epivir®, lamivudine)
- ☐ Saquinavir (Invirase®)
- ☐ Ritonavir (Norvir®)
- ☐ Indinavir (Crixivan®)
- ☐ Trimethoprim or Sulfamethoxazole (Bactrim®, Septra®)
- ☐ Clarithromycin (Biaxin®)
- ☐ Dapsone
- ☐ Fluconazole (Diflucan®)
- ☐ Itraconazole (Sporanox®)
- ☐ Rifabutin (Mycobutin®)

☐ Other: _____

_____

We would like to ask you about each medicine that you are currently taking. Please fill out the following 2 page medication form for each medicine that you checked on the above list.

- → *If you are currently taking 1 medication, fill out 2 pages.*
- → *If you are currently taking 2 medications, fill out 4 pages.*
- → *If you are currently taking 3 medications, fill out 6 pages.*

If you are currently taking more than 3 medications, please fill out 6 pages and additional pages in the Supplement at the end of this questionnaire.

Pease go to page 12 after you have filled out these medication forms.

MEDICATION #1

MEDICINE NAME_____ (3/1 20)

1. This medicine is for: (3/21)
   - ☐ HIV infection
   - ☐ To treat or prevent PCP (*Pneumocystis carinii pneumonia*)
   - ☐ To treat or prevent MAI (Mycobacterium avium complex) infection
   - ☐ To treat or prevent fungal infections (*Candida* or "thrush")
   - ☐ Other: _____ (3/22-41)
   - ☐ Don't know

2. How often do you take this medicine? (3/42-50)
   - ☐ Two times a week
   - ☐ Three times a week
   - ☐ Every other day
   - ☐ Once a day
   - ☐ Two times a day
   - ☐ Three times a day
   - ☐ Four times a day
   - ☐ Five times a day
   - ☐ Other: _____ (3/51-70)

3. How long have you been taking this medication? (3/71)

   ___ Less than 1 month
   ___ 1 to 3 months
   ___ 4 to 6 months
   ___ 6 months to 1 year
   ___ 1 to 2 years
   ___ more than 2 years

4. *During the last 3 months*, have you ever stopped taking this medication because you **felt better?** (3/72)

   ☐ YES ☐ NO

5. *During the last 3 months*, have you ever stopped taking this medication because you **felt worse?** (3/73)

   ☐ YES ☐ NO

6. *During the last 3 months*, have you ever forgotten to take this medication? (3/74)

   ☐ YES ☐ NO

7. *During the last 3 months*, have you at times been careless about taking this medication? (3/75)

   ☐ YES ☐ NO

8. *During the last 3 months*, have you ever taken less of this medicine than your doctor prescribed because you **felt better?** (3/76)

   ☐ YES ☐ NO

9. *During the last 3 months*, have you ever taken less of this medicine than your doctor prescribed because you **felt worse?** (3/77)

   ☐ YES ☐ NO

10. ***Since you began taking*** this medication, have you ever purposely:

	YES	NO	
a) taken more of the medicine than your physician prescribed?	☐	☐	(3/78)
b) taken less of the medicine than your physician prescribed?	☐	☐	(3/79)
c) discontinued or stopped taking your medication?	☐	☐	(3/80)

If yes,

11. a) How many times have you discontinued your medication for more than 3 days? (4/1-2)

_____

b) What were your reasons for discontinuing your medication? (4/3-8)
(Please check all that apply)

- ☐ My doctor recommended it
- ☐ Too many side effects
- ☐ I didn't want to be reminded of my illness
- ☐ Problems with insurance coverage
- ☐ I didn't think it was working
- ☐ Other: _____ (4/9-28)

12. Sometimes it is difficult to take prescribed medicine all the time. **During the past week, how many times** did you miss a dose of MEDICATION 1? _____ (4/29-30)

13. During the **past month**, about **how many times** did you miss a dose of MEDICATION 1?
_____ (4/31 32)

14. During the **past three months**, about **how many times** did you miss a dose MEDICATION 1?
_____ (4/33-34)

15. Please check any side effect(s) you are having that you believe are caused by this medicine:
(4/35 50)

☐ nausea	☐ shortness of breath	☐ headaches
☐ dizziness	☐ muscle aches	☐ anxiety/worry
☐ vomiting	☐ fatigue	☐ depression
☐ abdominal pain	☐ tingling in hands/feet	☐ rash
☐ diarrhea	☐ numbness in hands/feet	☐ sensitivity to sun

☐ other: _____
_____
_____
(4/51-70)

MEDICATION #2

MEDICINE NAME_____ (5/1 20)

1. This medicine is for: (5/21)
   - ☐ HIV infection
   - ☐ To treat or prevent PCP *(Pneumocystis carinii pneumonia)*
   - ☐ To treat or prevent MAI (Mycobacterium avium complex) infection
   - ☐ To treat or prevent fungal infections (*Candida* or "thrush")
   - ☐ Other: _____ (5/22-41)
   - ☐ Don't know

2. How often do you take this medicine? (5/42-50)
   - ☐ Two times a week
   - ☐ Three times a week
   - ☐ Every other day
   - ☐ Once a day
   - ☐ Two times a day
   - ☐ Three times a day
   - ☐ Four times a day
   - ☐ Five times a day
   - ☐ Other: _____ (5/51-70)

3. How long have you been taking this medication? (5/71)
   - ___ Less than 1 month
   - ___ 1 to 3 months
   - ___ 4 to 6 months
   - ___ 6 months to 1 year
   - ___ 1 to 2 years
   - ___ more than 2 years

4. *During the* ***last 3 months***, have you ever stopped taking this medication because you **felt better?** (5/72)
   - ☐ YES ☐ NO

5. *During the* ***last 3 months***, have you ever stopped taking this medication because you **felt worse?** (5/73)
   - ☐ YES ☐ NO

6. *During the* ***last 3 months***, have you ever forgotten to take this medication? (5/74)
   - ☐ YES ☐ NO

7. *During the* ***last 3 months***, have you at times been careless about taking this medication? (5/75)
   - ☐ YES ☐ NO

8. *During the* ***last 3 months***, have you ever taken less of this medicine than your doctor prescribed because you **felt better?** (5/76)
   - ☐ YES ☐ NO

9. *During the* ***last 3 months***, have you ever taken less of this medicine than your doctor prescribed because you **felt worse?** (5/77)
   - ☐ YES ☐ NO

10. ***Since you began taking*** this medication, have you ever purposely:

	YES	NO	
a) taken more of the medicine than your physician prescribed?	☐	☐	(5/78)
b) taken less of the medicine than your physician prescribed?	☐	☐	(5/79)
c) discontinued or stopped taking your medication?	☐	☐	(5/80)

If yes,

11. a) How many times have you discontinued your medication for more than 3 days? _____ (6/1-2)

b) What were your reasons for discontinuing your medication? (6/3-8)
Please check all that apply

- ☐ My doctor recommended it
- ☐ Too many side effects
- ☐ I didn't want to be reminded of my illness
- ☐ Problems with insurance coverage
- ☐ I didn't think it was working
- ☐ Other: _____ (6/9-28)

12. Sometimes it is difficult to take prescribed medicine all the time. **During the past week, how many times** did you miss a dose of MEDICATION 2? _____ (6/29-30)

13. During the **past month**, about **how many times** did you miss a dose of MEDICATION 2? _____ (6/31-32)

14. During the **past three months**, about **how many times** did you miss a dose MEDICATION 2? _____ (6/33-34)

15. Please check any side effect(s) you are having that you believe are caused by this medicine: (4/35-50)

- ☐ nausea
- ☐ dizziness
- ☐ vomiting
- ☐ abdominal pain
- ☐ diarrhea
- ☐ other: _____
- ☐ shortness of breath
- ☐ muscle aches
- ☐ fatigue
- ☐ tingling in hands/feet
- ☐ numbness in hands/feet
- ☐ headaches
- ☐ anxiety/worry
- ☐ depression
- ☐ rash
- ☐ sensitivity to sun

(6/51-70)

MEDICATION #3

MEDICINE NAME_____ (7/1-20)

1. This medicine is for: (7/21)
   - ☐ HIV infection
   - ☐ To treat or prevent PCP (Pneumocystis carinii pneumonia)
   - ☐ To treat or prevent MAI (Mycobacterium avium complex) infection
   - ☐ To treat or prevent fungal infections (Candida or "thrush")
   - ☐ Other: _____ (7/22-41)
   - ☐ Don't know

2. How often do you take this medicine? (7/42-50)
   - ☐ Two times a week
   - ☐ Three times a week
   - ☐ Every other day
   - ☐ Once a day
   - ☐ Two times a day
   - ☐ Three times a day
   - ☐ Four times a day
   - ☐ Five times a day
   - ☐ Other: _____ (7/51-70)

3. How long have you been taking this medication? (7/71)
   - ___ Less than 1 month
   - ___ 1 to 3 months
   - ___ 4 to 6 months
   - ___ 6 months to 1 year
   - ___ 1 to 2 years
   - ___ more than 2 years

4. *During the last 3 months*, have you ever stopped taking this medication because you **felt better?** (7/72)
   ☐ YES ☐ NO

5. *During the last 3 months*, have you ever stopped taking this medication because you **felt worse?** (7/73)
   ☐ YES ☐ NO

6. *During the last 3 months*, have you ever forgotten to take this medication? (7/74)
   ☐ YES ☐ NO

7. *During the last 3 months*, have you at times been careless about taking this medication? (7/75)
   ☐ YES ☐ NO

8. *During the last 3 months*, have you ever taken less of this medicine than your doctor prescribed because you **felt better?** (7/76)
   ☐ YES ☐ NO

9. *During the last 3 months*, have you ever taken less of this medicine than your doctor prescribed because you **felt worse?** (7/77)
   ☐ YES ☐ NO

10. ***Since you began taking*** this medication, have you ever purposely:

	YES	NO	
a) taken more of the medicine than your physician prescribed?	☐	☐	(7/78)
b) taken less of the medicine than your physician prescribed?	☐	☐	(7/79)
c) discontinued or stopped taking your medication?	☐	☐	(7/80)

If yes,

11. a) How many times have you discontinued your medication for more than 3 days? (8/1-2)

_____

b) What were your reasons for discontinuing your medication? (8/3-8)
Please check all that apply

☐ My doctor recommended it
☐ Too many side effects
☐ I didn't want to be reminded of my illness
☐ Problems with insurance coverage
☐ I didn't think it was working
☐ Other: _____ (8/9-28)

12. Sometimes it is difficult to take prescribed medicine all the time. **During the past week, how many times** did you miss a dose of MEDICATION 3? _____ (8/29-30)

13. During the **past month**, about **how many times** did you miss a dose of MEDICATION 3?
_____ (8/31-32)

14. During the **past three months**, about **how many times** did you miss a dose MEDICATION 3?
_____ (8/33-34)

15. Please check any side effect(s) you are having that you believe are caused by this medicine:
(8/35-50)

☐ nausea	☐ shortness of breath	☐ headaches
☐ dizziness	☐ muscle aches	☐ anxiety/worry
☐ vomiting	☐ fatigue	☐ depression
☐ abdominal pain	☐ tingling in hands/feet	☐ rash
☐ diarrhea	☐ numbness in hands/feet	☐ sensitivity to sun
☐ other: _____		

SUPPLEMENT TO SECTION II

MEDICATION #4

MEDICINE NAME_____ (15/36-55)

1. This medicine is for: (15/56)

- ☐ HIV infection
- ☐ To treat or prevent PCP (*Pneumocystis carinii pneumonia*)
- ☐ To treat or prevent MAI (Mycobacterium avium complex) infection
- ☐ To treat or prevent fungal infections (*Candida* or "thrush")
- ☐ Other: _____
- ☐ Don't know (15/57-76)

2. How often do you take this medicine? (15/77)

- ☐ Two times a week
- ☐ Three times a week
- ☐ Every other day
- ☐ Once a day
- ☐ Two times a day
- ☐ Three times a day
- ☐ Four times a day
- ☐ Five times a day
- ☐ Other: _____

3. How long have you been taking this medication? (16/1-20)

___ Less than 1 month ___ 6 months to 1 year
___ 1 to 3 months ___ 1 to 2 years
___ 4 to 6 months ___ more than 2 years

4. During the ***last 3 months***, have you ever stopped taking this medication because you **felt better?** (16/21)

☐ YES ☐ NO

5. During the ***last 3 months***, have you ever stopped taking this medication because you **felt worse?** (16/22)

☐ YES ☐ NO

6. During the ***last 3 months***, have you ever forgotten to take this medication? (16/23)

☐ YES ☐ NO

7. During the ***last 3 months***, have you at times been careless about taking this medication? (16/24)

☐ YES ☐ NO

8. During the ***last 3 months***, have you ever taken less of this medicine than your doctor prescribed because you **felt better?** (16/25)

☐ YES ☐ NO

9. During the ***last 3 months***, have you ever taken less of this medicine than your doctor prescribed because you felt worse? (16/26)

☐ YES ☐ NO

10. ***Since you began taking*** this medication, have you ever purposely:

	YES	NO	
a) taken more of the medicine than your physician prescribed?	☐	☐	(16/27)
b) taken less of the medicine than your physician prescribed?	☐	☐	(16/28)
c) discontinued or stopped taking your medication?	☐	☐	(16/29)

If yes,

→ 11.a) How many times have you discontinued your medication for more than 3 days? (16/30-31)

_____

b) What were your reasons for discontinuing your medication? (16/32-37)
Please check all that apply

- ☐ My doctor recommended it
- ☐ Too many side effects
- ☐ I didn't want to be reminded of my illness
- ☐ Problems with insurance coverage
- ☐ I didn't think it was working
- ☐ Other: _____ (38-57)

12. Sometimes it is difficult to take prescribed medicine all the time. **During the past week, how many times** did you miss a dose of MEDICATION 4? _____ (16/58-59)

13. During the **past month,** about **how many times** did you miss a dose of MEDICATION 4?
_____ (16/60-61)

14. During the **past three months,** about **how many times** did you miss a dose MEDICATION 4?
_____ (16/62-63)

15. Please check any side effect(s) you are having that you believe are caused by this medicine:
(16/64-79)

☐ nausea	☐ shortness of breath	☐ headaches
☐ dizziness	☐ muscle aches	☐ anxiety/worry
☐ vomiting	☐ fatigue	☐ depression
☐ abdominal pain	☐ tingling in hands/feet	☐ rash
☐ diarrhea	☐ numbness in hands/feet	☐ sensitivity to sun

☐ other: _____ (17/1-20)

_____

_____

MEDICATION #5

MEDICINE NAME_____ (17/21-40)

1. This medicine is for: (17/41)

- ☐ HIV infection
- ☐ To treat or prevent PCP *(Pneumocystis carinii pneumonia)*
- ☐ To treat or prevent MAI (Mycobacterium avium complex) infection
- ☐ To treat or prevent fungal infections (*Candida* or "thrush")
- ☐ Other: _____
- ☐ Don't know (17/42-61)

2. How often do you take this medicine? (17/62)

- ☐ Two times a week
- ☐ Three times a week
- ☐ Every other day
- ☐ Once a day
- ☐ Two times a day
- ☐ Three times a day
- ☐ Four times a day
- ☐ Five times a day
- ☐ Other: _____ (18/1-20)

3. How long have you been taking this medication? (18/21)

___ Less than 1 month ___ 6 months to 1 year
___ 1 to 3 months ___ 1 to 2 years
___ 4 to 6 months ___ more than 2 years

4. During the ***last 3 months***, have you ever stopped taking this medication because you **felt better?** (18/22)

☐ YES ☐ NO

5. During the ***last 3 months***, have you ever stopped taking this medication because you **felt worse?** (18/23)

☐ YES ☐ NO

6. During the ***last 3 months***, have you ever forgotten to take this medication? (18/24)

☐ YES ☐ NO

7. During the ***last 3 months***, have you at times been careless about taking this medication? (18/25)

☐ YES ☐ NO

8. During the ***last 3 months***, have you ever taken less of this medicine than your doctor prescribed because you **felt better?** (18/26)

☐ YES ☐ NO

9. During the ***last 3 months***, have you ever taken less of this medicine than your doctor prescribed because you felt worse? (18/27)

☐ YES ☐ NO

10. ***Since you began taking*** this medication, have you ever purposely:

	YES	NO	
a) taken more of the medicine than your physician prescribed?	☐	☐	(18/28)
b) taken less of the medicine than your physician prescribed?	☐	☐	(18/29)
c) discontinued or stopped taking your medication?	☐	☐	(18/30)

If yes,

→ 11.a) How many times have you discontinued your medication for more than 3 days? (18/31-32)

_____

b) What were your reasons for discontinuing your medication? (18/33-38)
Please check all that apply

- ☐ My doctor recommended it
- ☐ Too many side effects
- ☐ I didn't want to be reminded of my illness
- ☐ Problems with insurance coverage
- ☐ I didn't think it was working
- ☐ Other: _____ (18/39-58)

12. Sometimes it is difficult to take prescribed medicine all the time. **During the past week, how many times** did you miss a dose of MEDICATION 5? ____ (18/59-60)

13. During the **past month**, about **how many times** did you miss a dose of MEDICATION 5? (18/61-62)
_____

14. During the **past three months**, about **how many times** did you miss a dose MEDICATION 5? (18/63-64)
_____

15. Please check any side effect(s) you are having that you believe are caused by this medicine: (18/65-80)

- ☐ nausea
- ☐ dizziness
- ☐ vomiting
- ☐ abdominal pain
- ☐ diarrhea
- ☐ other: _____

- ☐ shortness of breath
- ☐ muscle aches
- ☐ fatigue
- ☐ tingling in hands/feet
- ☐ numbness in hands/feet

- ☐ headaches
- ☐ anxiety/worry
- ☐ depression
- ☐ rash
- ☐ sensitivity to sun

(19/1-20)

MEDICATION #6

MEDICINE NAME_____ (19/21-40)

1. This medicine is for: (19/41)

- ☐ HIV infection
- ☐ To treat or prevent PCP (*Pneumocystis carinii pneumonia*)
- ☐ To treat or prevent MAI (Mycobacterium avium complex) infection
- ☐ To treat or prevent fungal infections (*Candida* or "thrush")
- ☐ Other: _____
- ☐ Don't know (19/42-61)

2. How often do you take this medicine? (19/62)

- ☐ Two times a week
- ☐ Three times a week
- ☐ Every other day
- ☐ Once a day
- ☐ Two times a day
- ☐ Three times a day
- ☐ Four times a day
- ☐ Five times a day
- ☐ Other: _____ (20/1-20)

3. How long have you been taking this medication? (20/21)

___ Less than 1 month ___ 6 months to 1 year
___ 1 to 3 months ___ 1 to 2 years
___ 4 to 6 months ___ more than 2 years

4. During the ***last 3 months***, have you ever stopped taking this medication because you **felt better?** (20/22)

☐ YES ☐ NO

5. During the ***last 3 months***, have you ever stopped taking this medication because you **felt worse?** (20/23)

☐ YES ☐ NO

6. During the ***last 3 months***, have you ever forgotten to take this medication? (20/24)

☐ YES ☐ NO

7. During the ***last 3 months***, have you at times been careless about taking this medication? (20/25)

☐ YES ☐ NO

8. During the ***last 3 months***, have you ever taken less of this medicine than your doctor prescribed because you **felt better?** (20/26)

☐ YES ☐ NO

9. During the ***last 3 months***, have you ever taken less of this medicine than your doctor prescribed because you felt worse? (20/27)

☐ YES ☐ NO

10. ***Since you began taking*** this medication, have you ever purposely:

	YES	NO	
a) taken more of the medicine than your physician prescribed?	☐	☐	(20/28)
b) taken less of the medicine than your physician prescribed?	☐	☐	(20/29)
c) discontinued or stopped taking your medication?	☐	☐	(20/30)

If yes,

→ 11.a) How many times have you discontinued your medication for more than 3 days? (20/31-32)

_____

b) What were your reasons for discontinuing your medication? (20/33-38)
Please check all that apply

- ☐ My doctor recommended it
- ☐ Too many side effects
- ☐ I didn't want to be reminded of my illness
- ☐ Problems with insurance coverage
- ☐ I didn't think it was working
- ☐ Other: _____

(20/39-58)

12. Sometimes it is difficult to take prescribed medicine all the time. **During the past week, how many times** did you miss a dose of MEDICATION 6? _____ (20/59-60)

13. During the **past month**, about **how many times** did you miss a dose of MEDICATION 6? (20/61-62)

_____

14. During the **past three months**, about **how many times** did you miss a dose MEDICATION 6? (20/63-64)

_____

15. Please check any side effect(s) you are having that you believe are caused by this medicine: (20/65-80)

- ☐ nausea
- ☐ dizziness
- ☐ vomiting
- ☐ abdominal pain
- ☐ diarrhea
- ☐ other:
- ☐ shortness of breath
- ☐ muscle aches
- ☐ fatigue
- ☐ tingling in hands/feet
- ☐ numbness in hands/feet
- ☐ headaches
- ☐ anxiety/worry
- ☐ depression
- ☐ rash
- ☐ sensitivity to sun

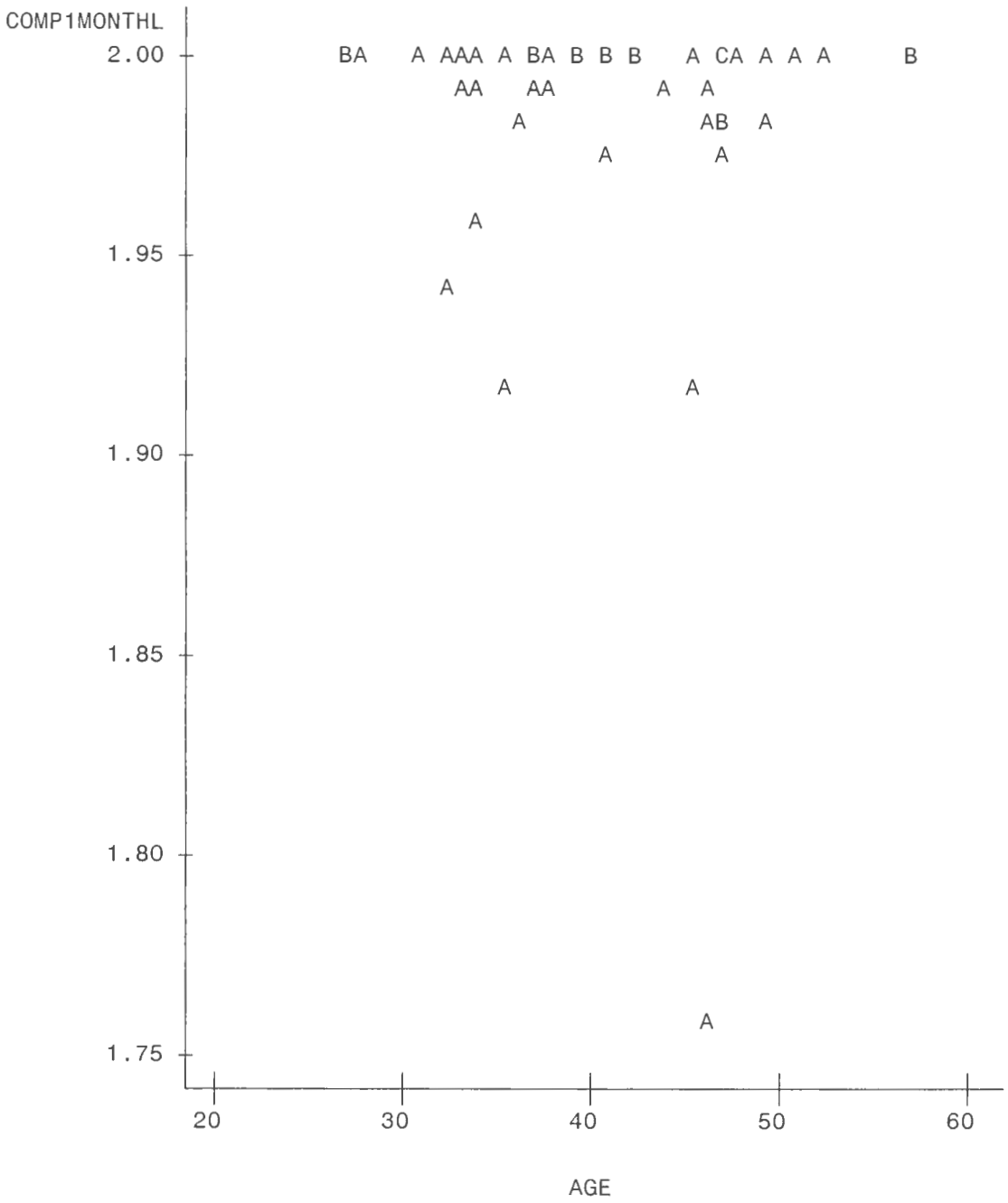
_____ (21/1-20)

_____

_____

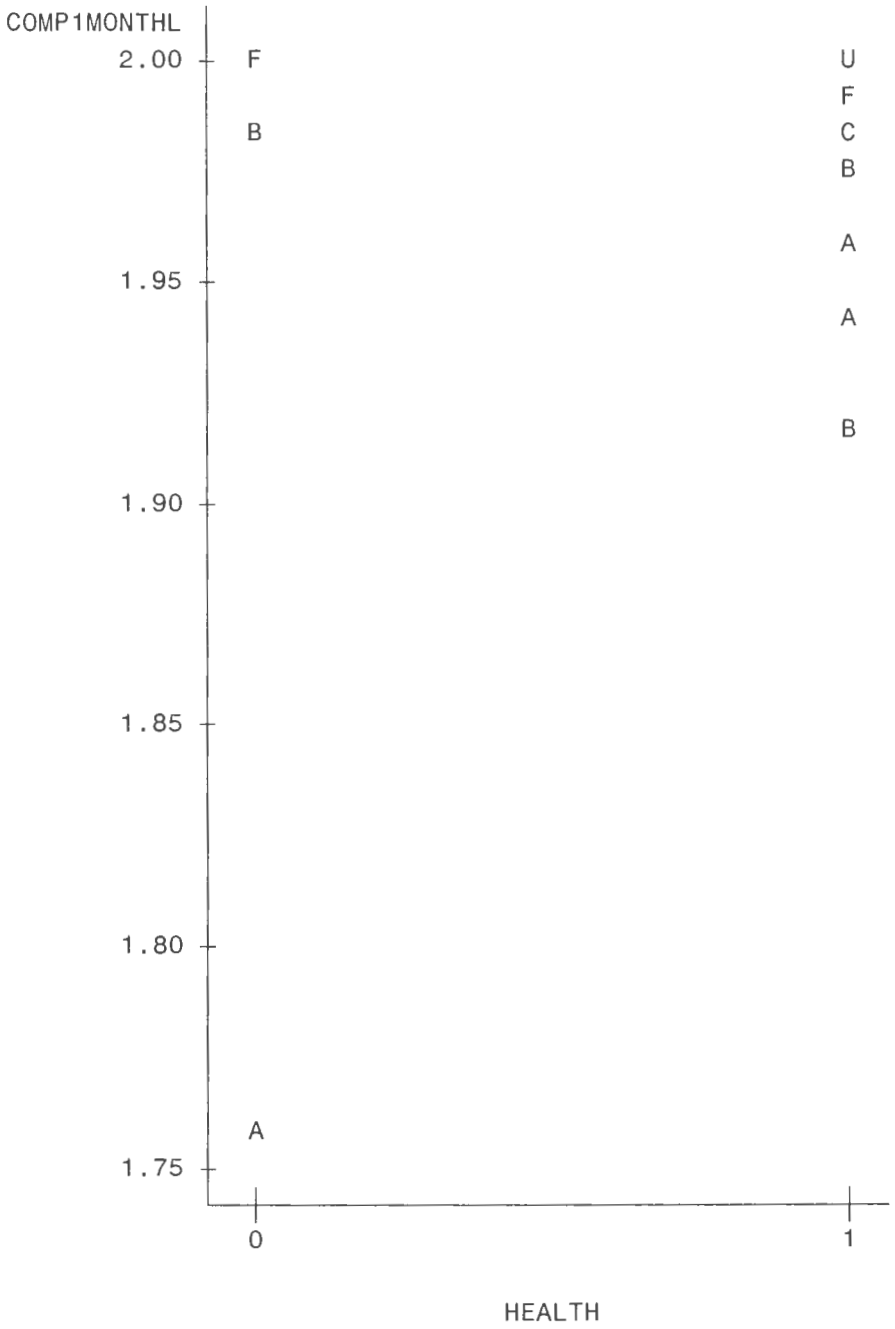
S-5

Plot of COMP1MONTHL*QI1. Legend: A = 1 obs, B = 2 obs, etc.



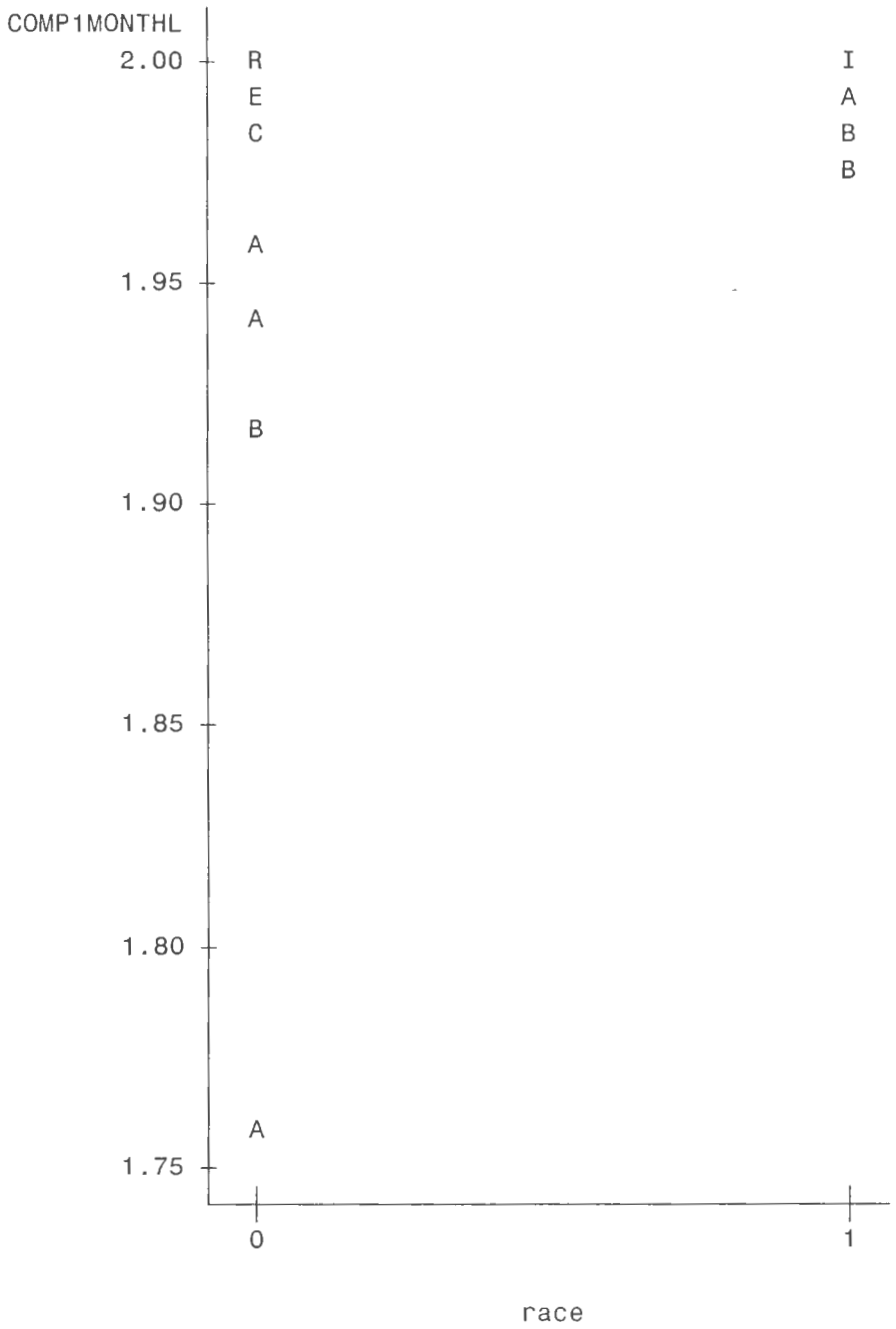
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*HEALTH. Legend: A = 1 obs, B = 2 obs, etc.



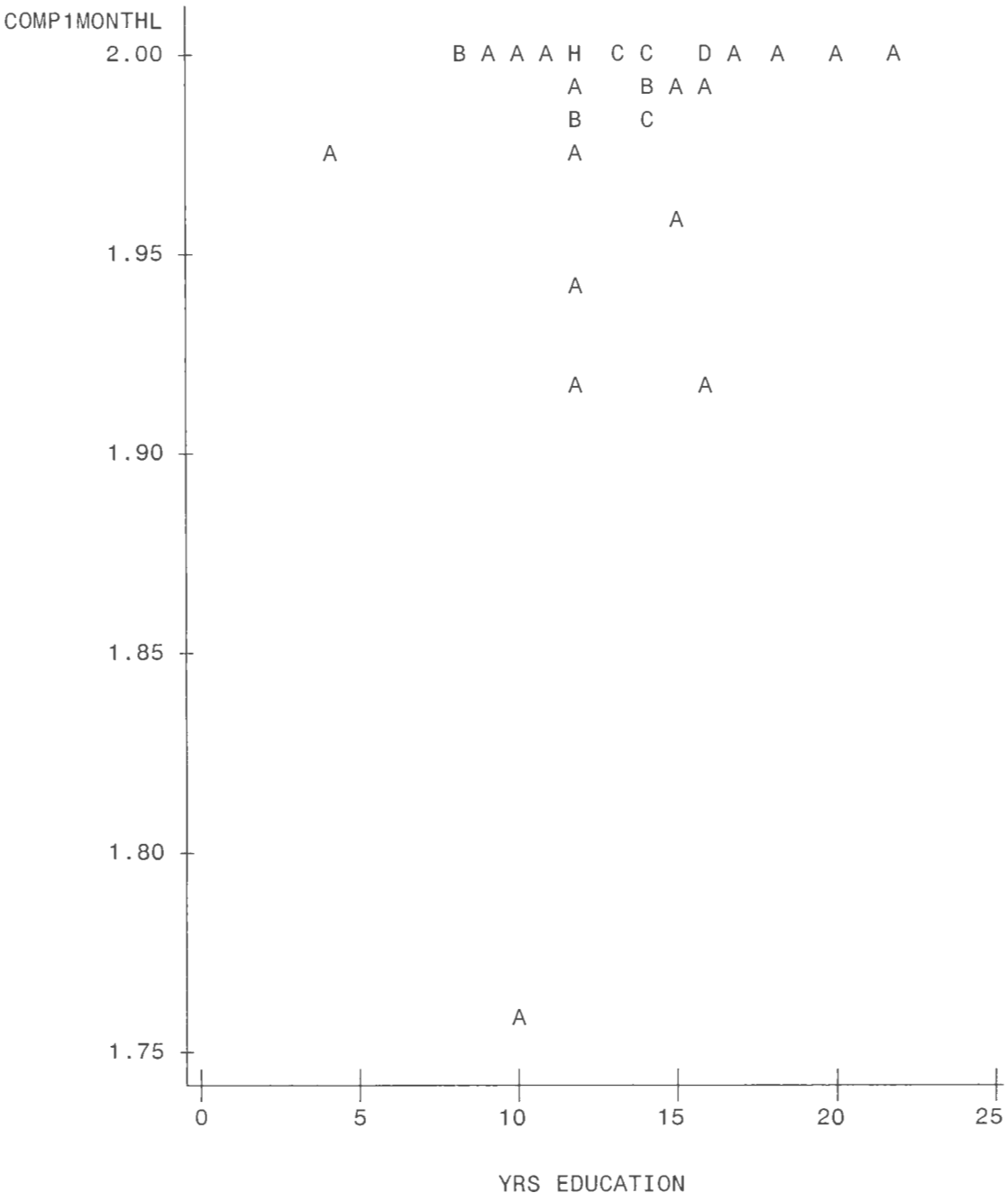
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*race. Legend: A = 1 obs, B = 2 obs, etc.



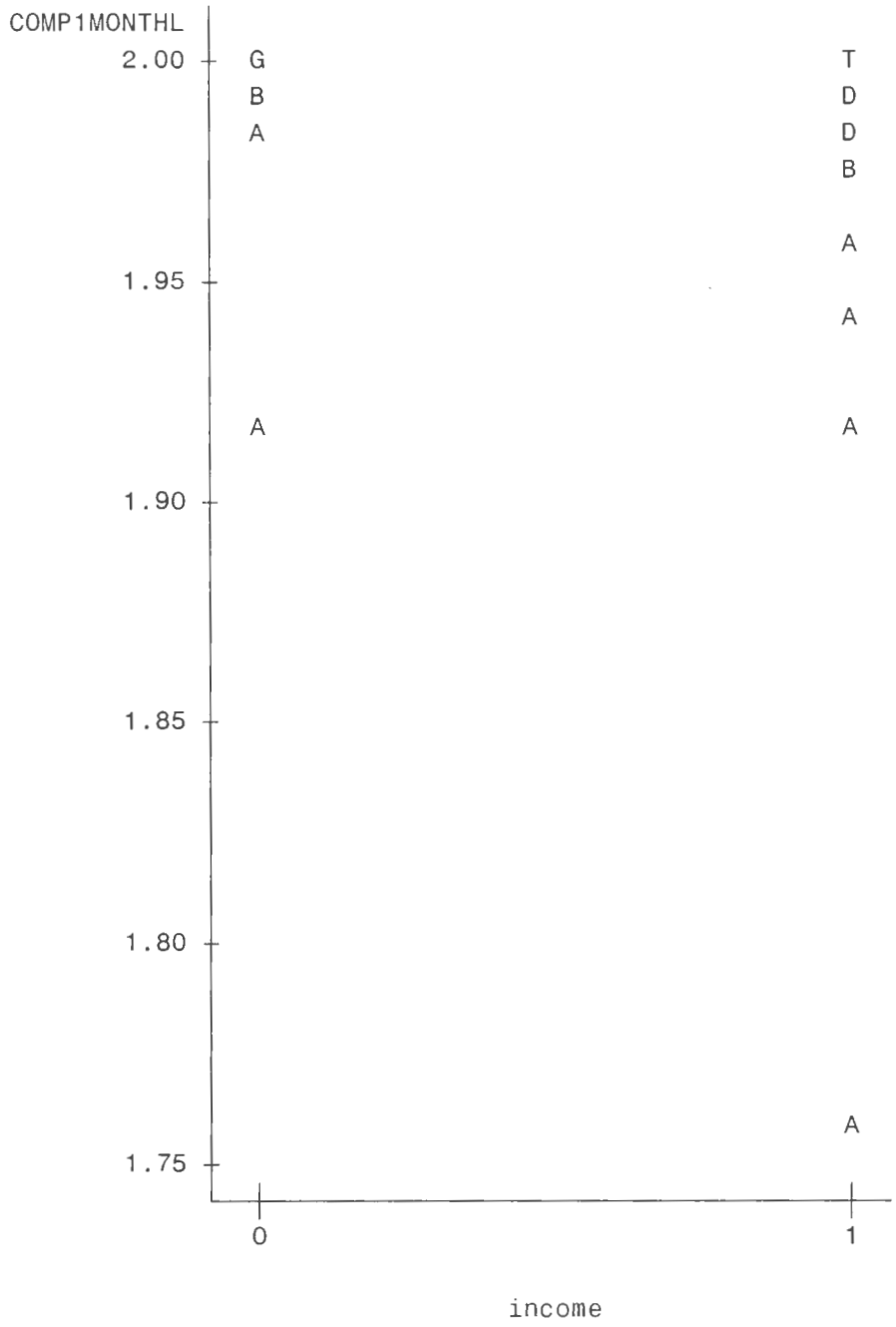
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*QI5. Legend: A = 1 obs, B = 2 obs, etc.



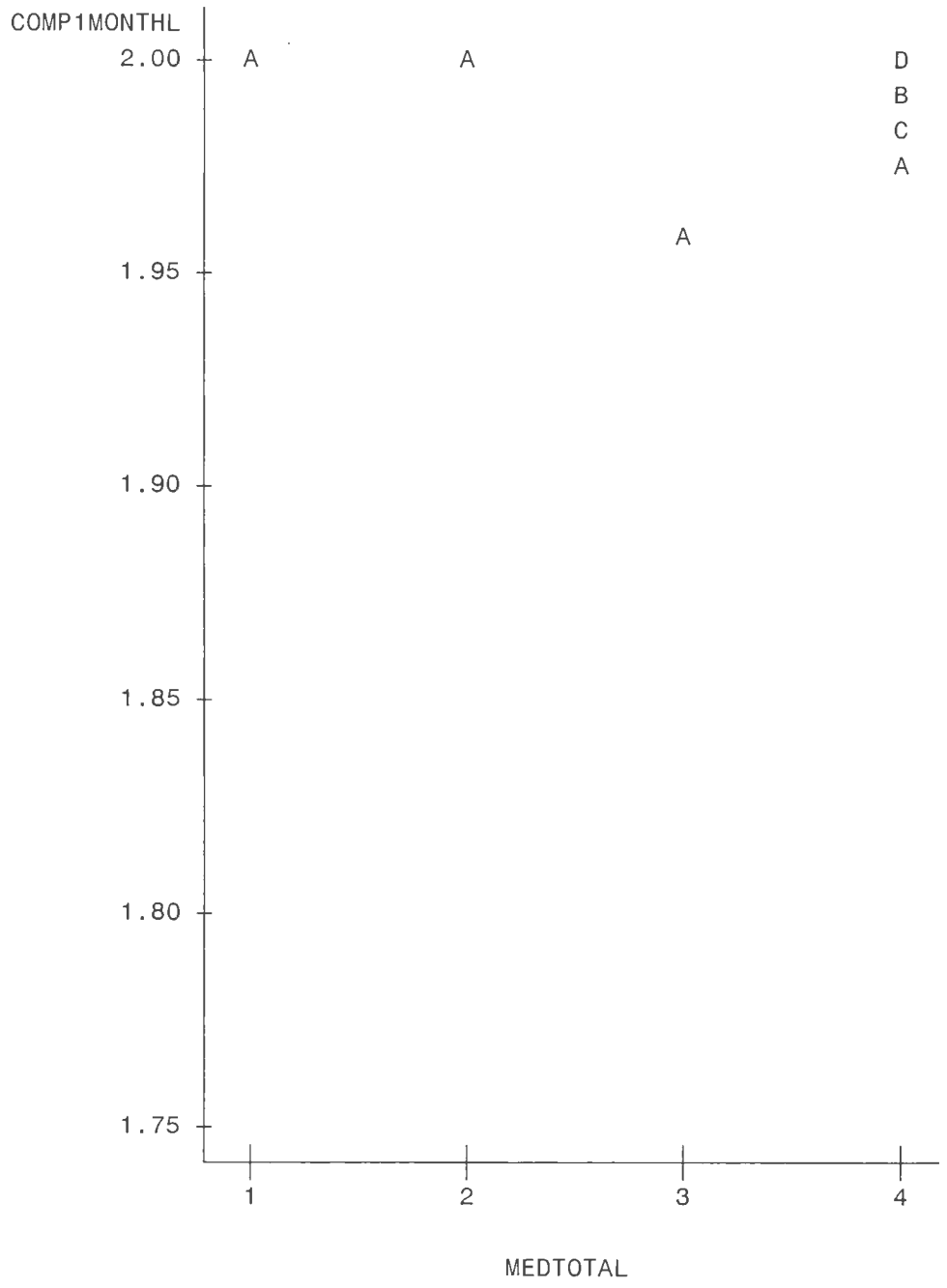
NOTE: 101 obs had missing values.

Plot of COMP1MONTHL*income. Legend: A = 1 obs, B = 2 obs, etc.



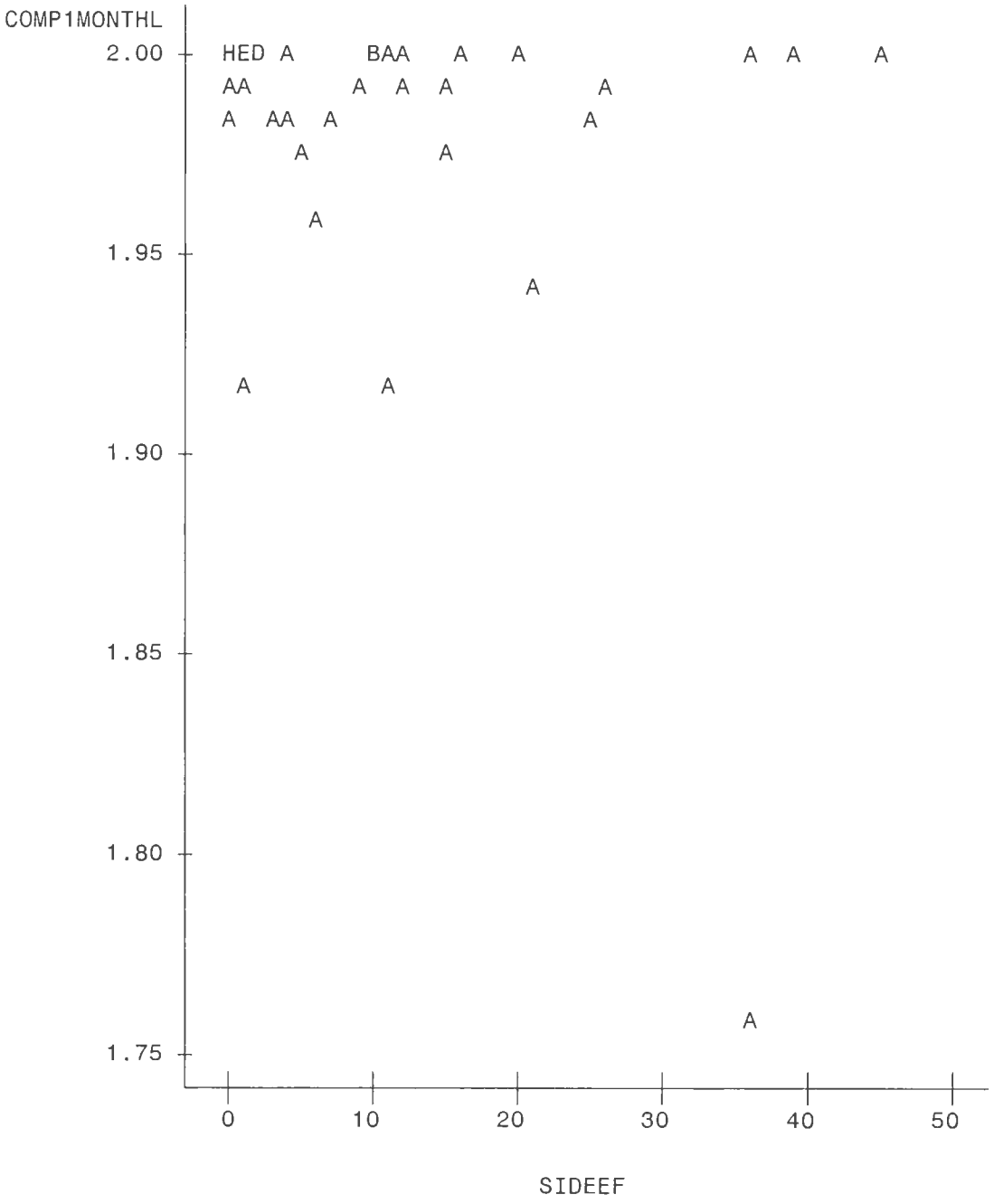
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*MEDTOTAL. Legend: A = 1 obs, B = 2 obs, etc.



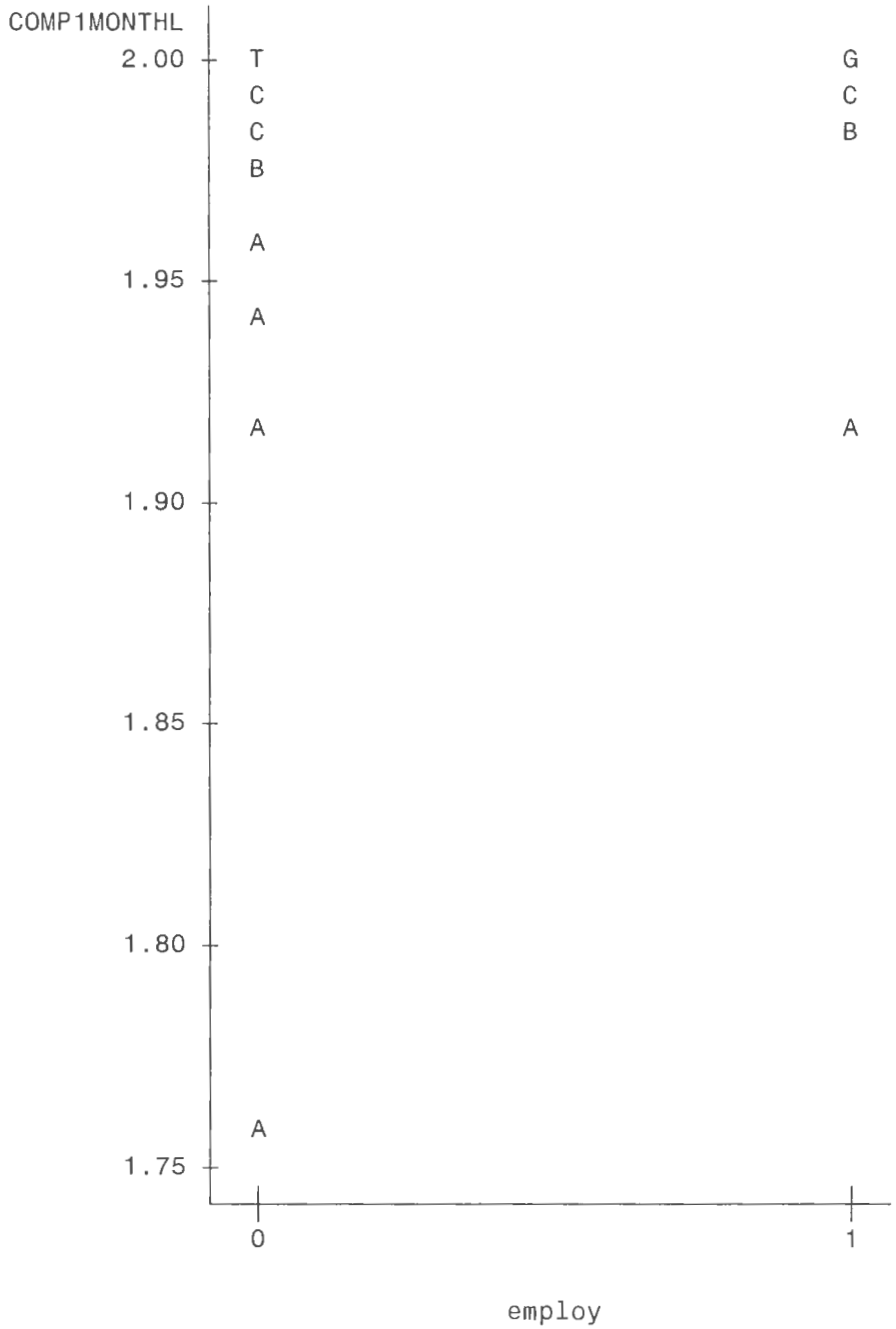
NOTE: 132 obs had missing values.

Plot of COMP1MONTHL*SIDEEF. Legend: A = 1 obs, B = 2 obs, etc.



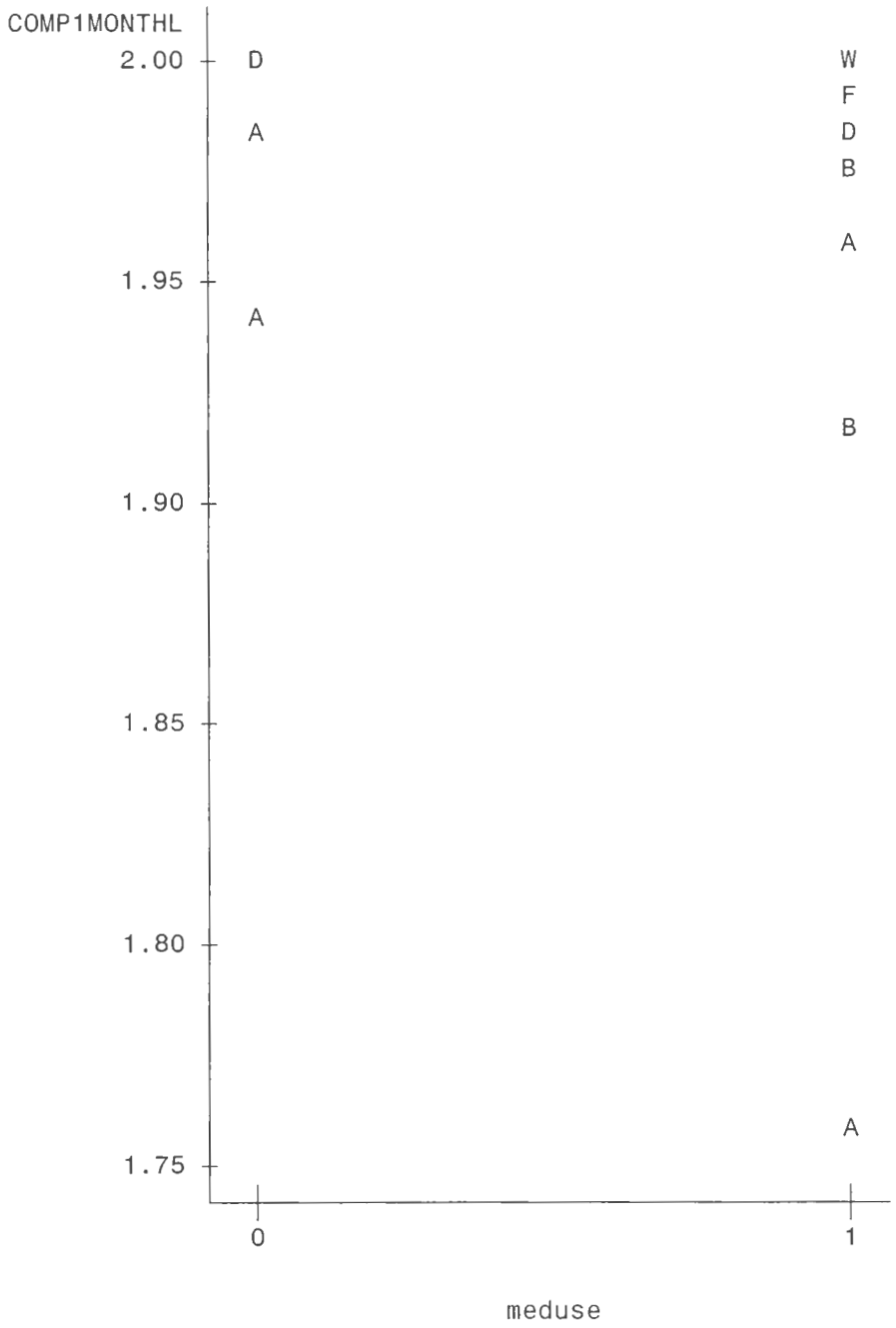
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*employ. Legend: A = 1 obs, B = 2 obs, etc.



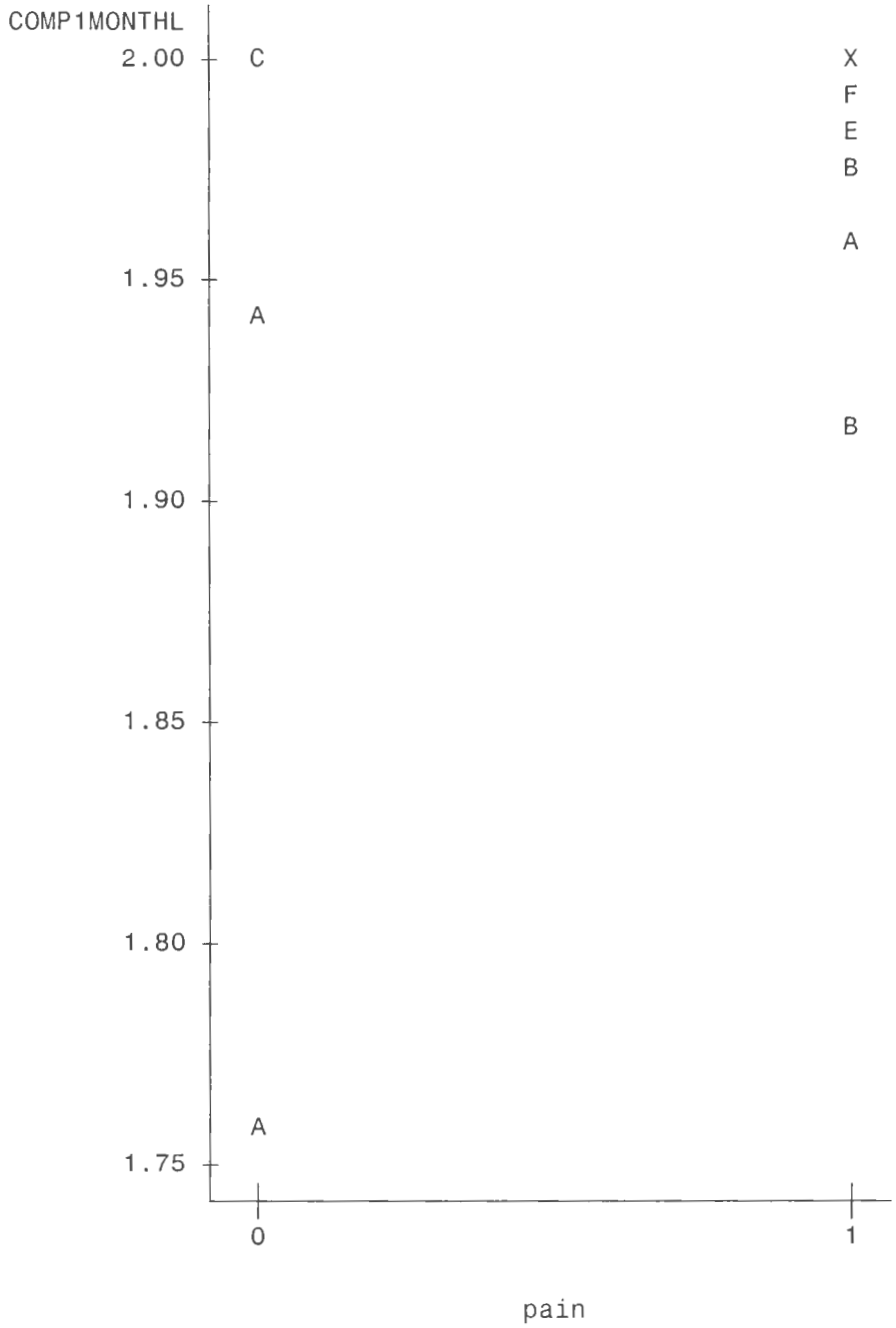
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*meduse. Legend: A = 1 obs, B = 2 obs, etc.



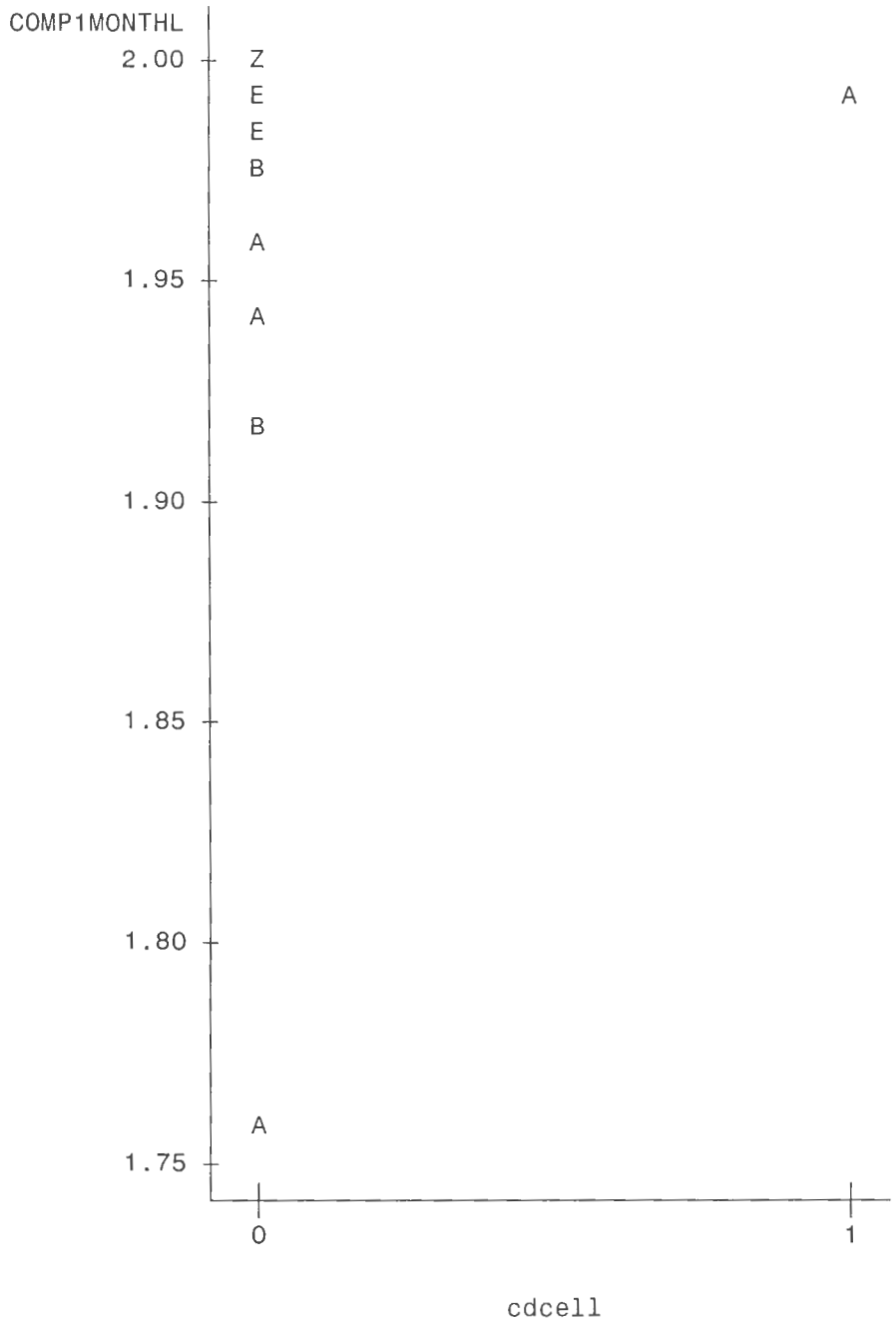
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*pain. Legend: A = 1 obs, B = 2 obs, etc.



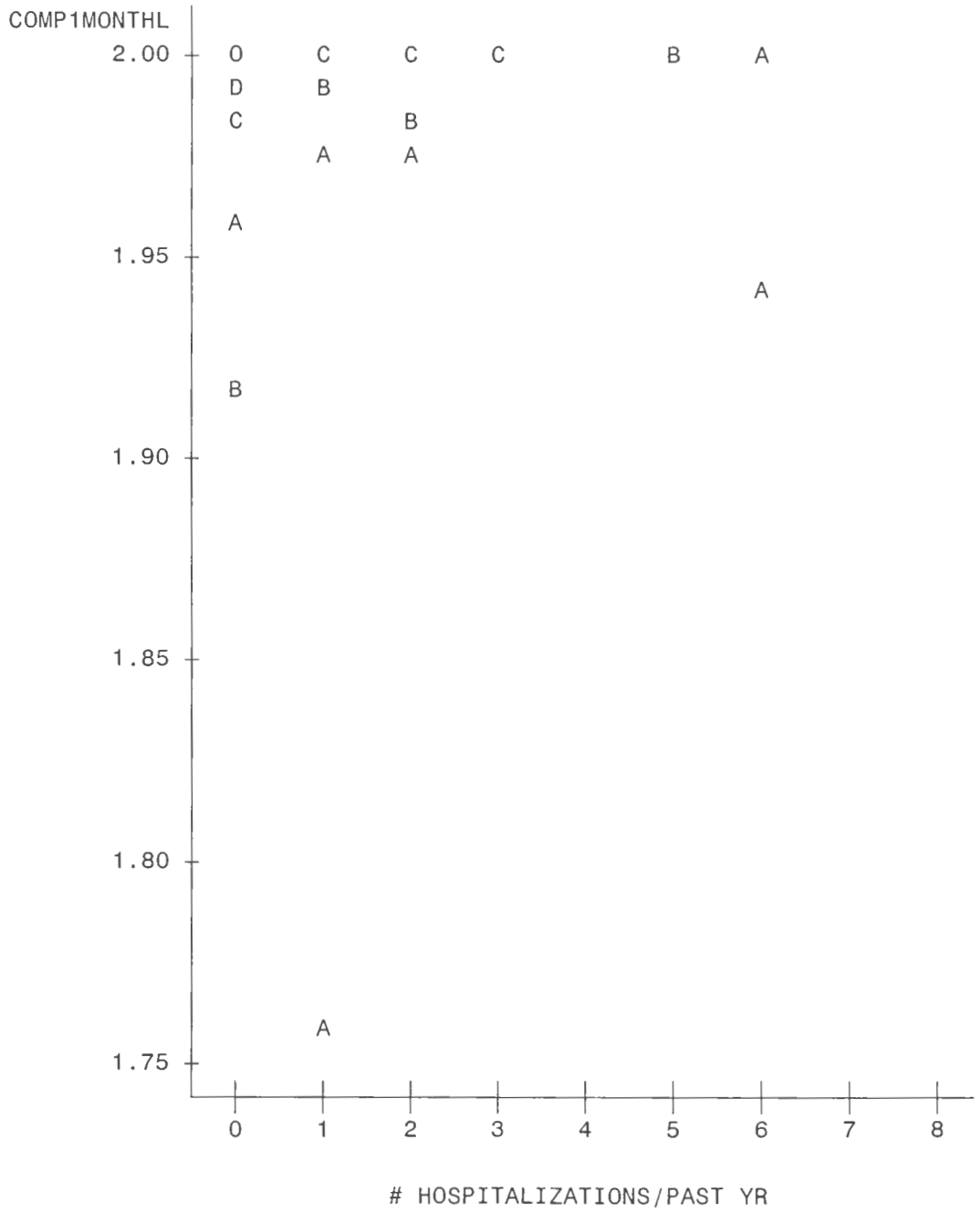
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*cdcell. Legend: A = 1 obs, B = 2 obs, etc.



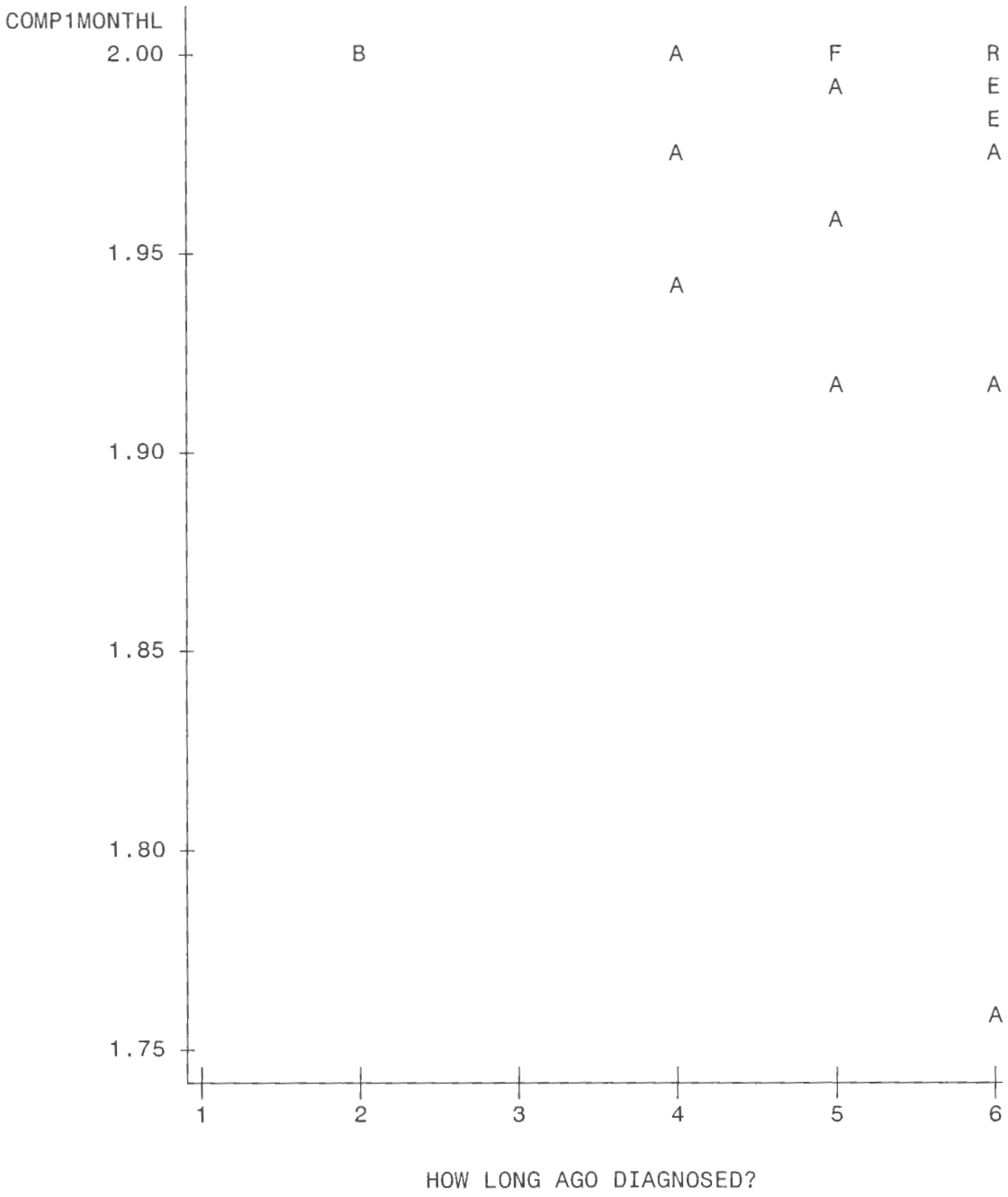
NOTE: 100 obs had missing values. 1 obs hidden.

Plot of COMP1MONTHL*QI27. Legend: A = 1 obs, B = 2 obs, etc.



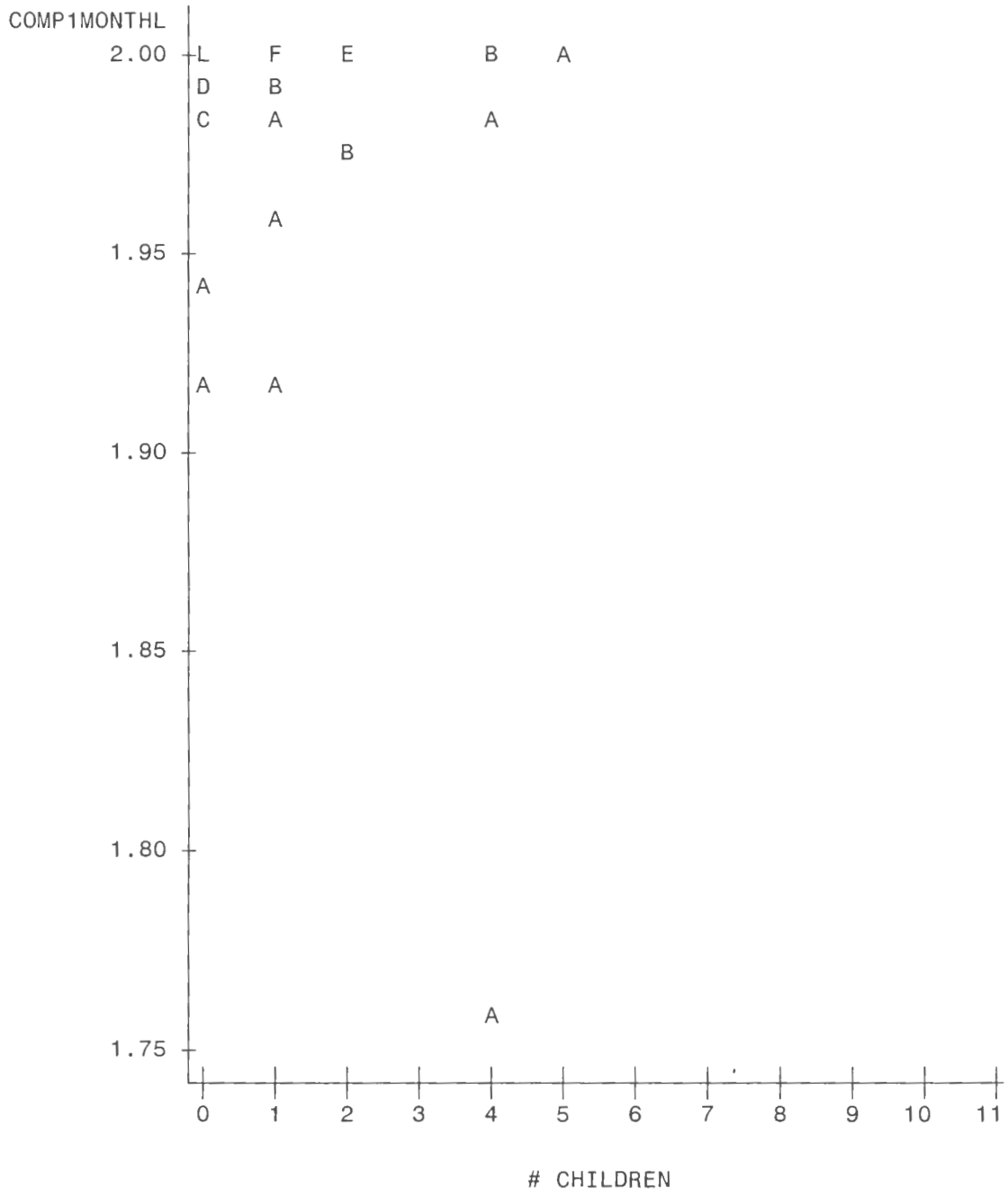
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*QI29. Legend: A = 1 obs, B = 2 obs, etc.



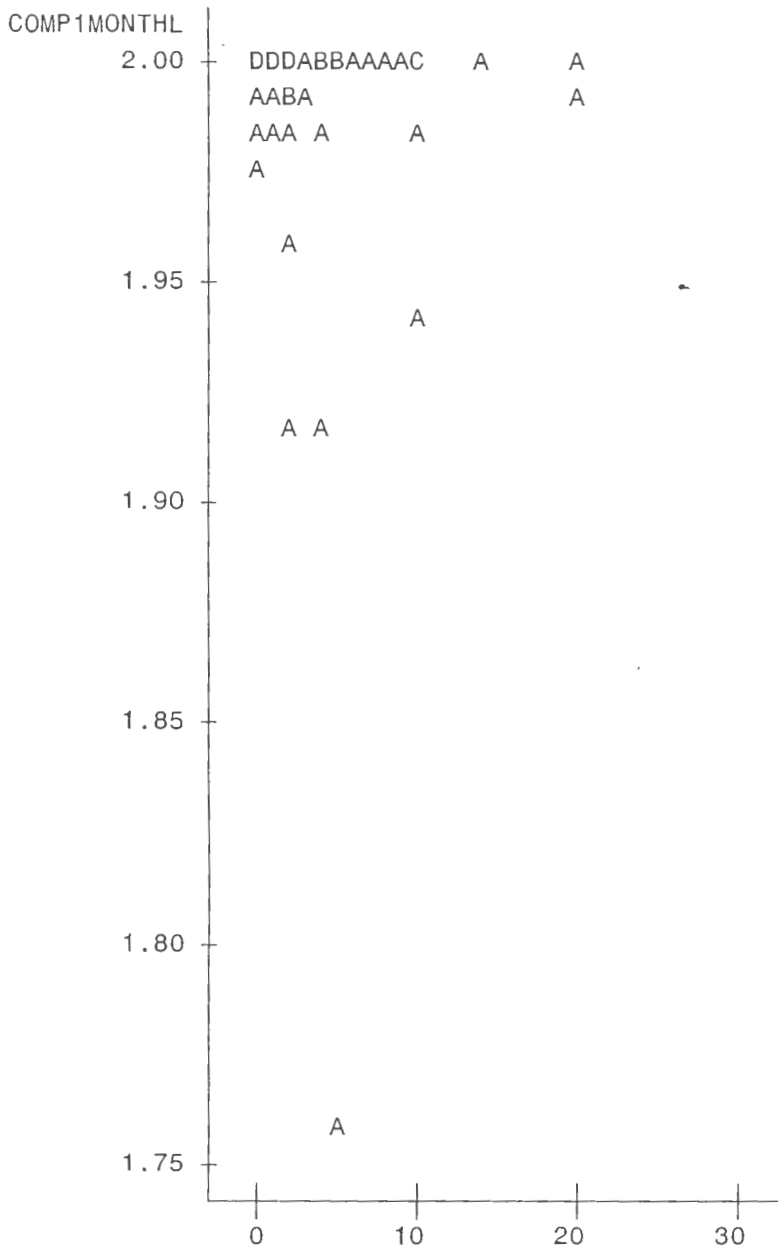
NOTE: 100 obs had missing values.

Plot of COMP1MONTHL*QI10. Legend: A = 1 obs, B = 2 obs, etc.



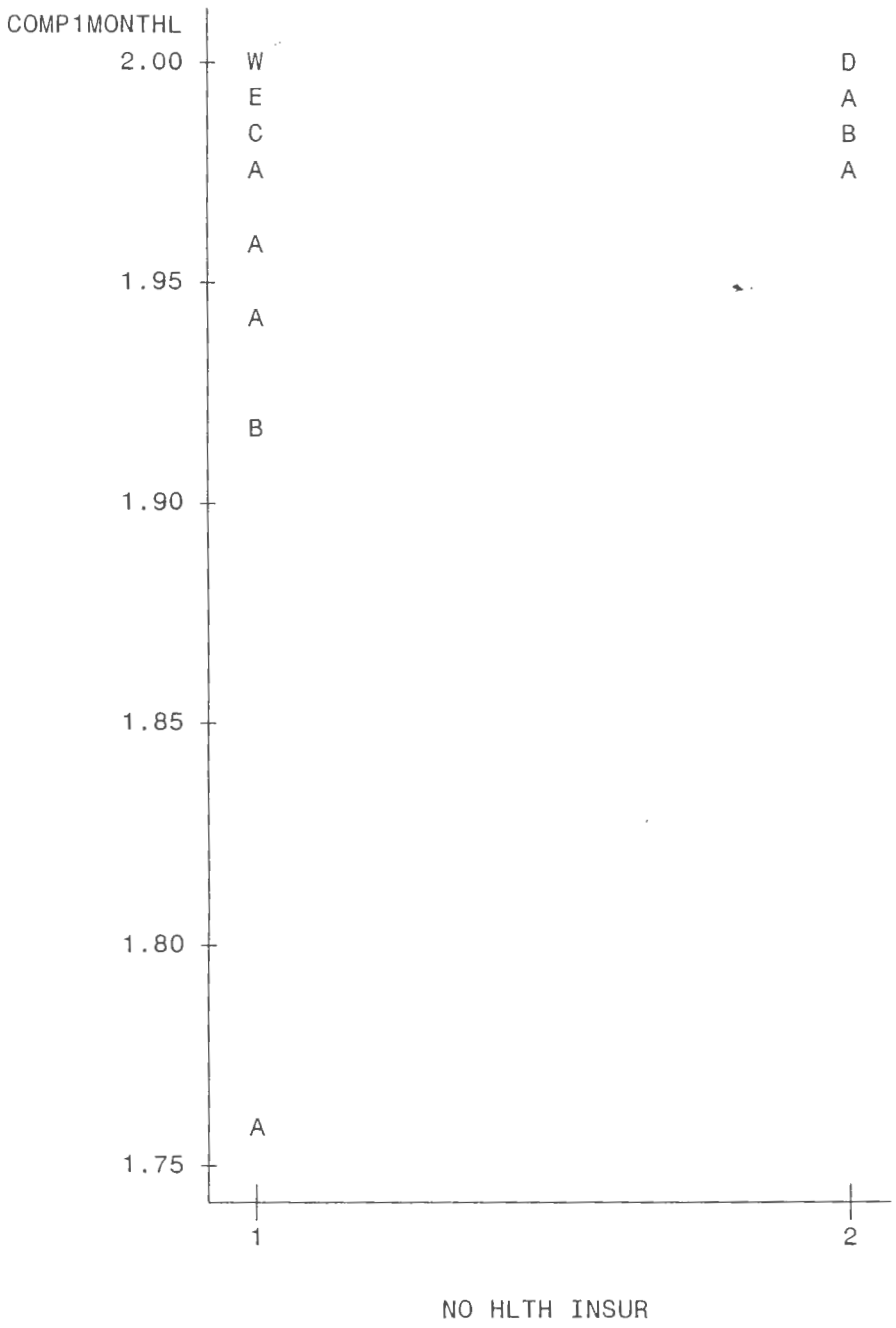
NOTE: 101 obs had missing values.

Plot of COMP1MONTHL*QI14. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 102 obs had missing values.

Plot of COMP1MONTHL*QI18A. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 100 obs had missing values.

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