**Primary Medication Adherence in the Rural South:  The Role of the Physician-Patient Relationship and Satisfaction with Care**


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## *Primary Medication Adherence in the Rural South: The Role of the Physician-Patient Relationship and Satisfaction with Care*

**Background:** Medication non adherence leads to increased morbidity and mortality and undermines the ability of clinicians to provide effective care. While the relationship between medication adherence and demographic, socioeconomic and clinical factors has been well studied, it is unclear whether a strong physician-patient relationship and satisfaction with care may improve medication adherence. Furthermore, medication adherence has not been specifically evaluated in the rural South.

**Design and Participants:** This is a cross sectional study using data from the Southern Rural Access Program evaluation, which surveyed adults in 9 rural states via random digit dialing from November 2002 until July 2003. Respondents that had seen a health care provider in the past year were included in the analysis.

**Measurements:** Respondents were asked whether they had delayed or not gotten a prescription filled in the last year. Elsewhere on the questionnaire, they were also asked about their satisfaction with, confidence in, and their length of relationship with their regular provider. Bivariate and multivariable analyses were used to identify factors associated with individuals filling their prescriptions.

**Results:** The mean age of our sample was 46 years, 68% were white, 19% had less than a high school education, and 22.7% were uninsured. Of the 3,926 respondents that had visited a provider in the past year, 793 (20%) reported that they delayed or did not fill a prescription. After multivariable modeling, individuals less than 65 years old (OR 2.9, $CI_{95\%}$ 2.00, 4.24), male (OR 1.3, $CI_{95\%}$ 1.05, 1.66), income less than \$25,000 (OR 1.8, $CI_{95\%}$ 1.16, 2.69), more educated (OR 1.4, $CI_{95\%}$ 1.06, 1.92), uninsured (OR 1.4, $CI_{95\%}$ 1.09, 1.89), insured under Medicare (OR 1.81, $CI_{95\%}$ 1.25, 2.63), and in fair or poor health (OR 1.4, $CI_{95\%}$ 1.13, 1.81) were less likely to have filled a prescription, after controlling for all other variables. Respondents that had a regular source of care (OR 0.4, $CI_{95\%}$ 0.22, 0.88), a longer relationship with their doctor (OR 0.8, $CI_{95\%}$ 0.64, 1.01), and were satisfied with the concern shown by their doctor (OR 0.60, $CI_{95\%}$ 0.38, 0.94) were more likely to have filled their prescriptions. Those that were concerned about the cost of health care (OR 2.6, $CI_{95\%}$ 2.05, 3.18) or had problems with transportation (OR 1.7, $CI_{95\%}$ 1.25, 2.31) were less likely to have filled their prescriptions. Individuals who believed in going to the doctor early in the course of illness and for regular check ups (OR 0.7, $CI_{95\%}$ 0.49, 0.93) were more likely to have filled their prescriptions.

**Conclusions:** Primary medication non adherence is common in the rural South. Satisfaction with concern shown by the physician, having a regular source of care, and having a longer relationship with a physician are associated with better medication adherence.

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***Primary Medication Adherence in the Rural South: The Role of the Physician-Patient Relationship and Satisfaction with Care***

## Background

Patients do not take about half of the medicine they are prescribed for chronic conditions [1]. Non adherence to prescription drugs undermines the quality of care received by individuals and leads to increased morbidity and mortality [2]. Furthermore, non adherence to medications reduces treatment benefits and may confound the clinician's assessment of therapeutic effectiveness. Non adherence is thought to account for 30 – 50% of cases where drugs fall short of their therapeutic goals [3]. Individuals not only fail to get their prescriptions filled, up to 43% of whom skip doses, reduce doses, and postpone refills to avoid cost or perceived side effects [3, 4]. Medication regimen non adherence has been clearly linked to hospitalization [3], emergency department use [5], and institutionalization of the frail elderly [6]. While it is widely believed that a strong physician-patient relationship, a regular source of care, and continuity of care lead to increased quality of care, it is unknown whether these factors improve medication adherence.

Adherence is defined as the extent to which a patient's behavior coincides with medical recommendations (taking medications or following behavioral change advice) [7]. Medication adherence encompasses a wide range of behaviors that are both intentional and unintentional. There is medication underuse which includes skipping doses, stopping a medication too soon, and not initially filling a prescription. Overuse of medication involves increasing the frequency of doses or taking higher doses than prescribed [8]. Several

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interventions have been studied to improve medication adherence. Even the most effective interventions have had only modest effects on treatment outcomes [2]. The focus of this study is on medication underuse where patients delay or do not fill a prescription. This has been described as "primary medication non adherence" [9].

There is a vast body of literature attempting to determine the specific causes of medication non adherence. One systematic review noted that researchers have looked at over 200 different variables for potential associations with adherence. Most are inconsistently associated with adherence and of little use in predicting behavior. The major determinants of adherence that have been evaluated are: demographic variables, socioeconomic variables, and disease-experience variables [7]. For the purpose of this study, these variables have been grouped into demographic factors, enabling factors, disease/ drug factors, physician patient relationship factors, and patient attitude/ knowledge factors (Figure 1).

Studies to date find that the various demographic factors are not consistently correlated with adherence. The age of an individual does not seem to correlate with medication adherence [10]. Adherence rates range from 26%-59% in individuals over 60 years old which is similar to what is found in younger populations [11]. However, adherence may be more important in terms of cost and health outcomes in the elderly because of their increased prevalence of chronic disease and number of drugs taken. The gender of an individual has also been an inconsistent predictor of adherence. In a study of hypertensive patients,

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Widmer found no significant difference between the adherence of men and women [12]. Women have been found to be more adherent than men with certain therapeutic regimens such as treatment for depression [13]. Associations between race and medication adherence have been found in studies involving the elderly. In one retrospective cohort study, whites had 0.55 the odds of medication non adherence compared to African-Americans[10]. Socioeconomic status has also been inconsistently associated with medication adherence. Higher socioeconomic status was found to be associated with non adherence in a cross sectional study of individuals over 55 [11], yet other investigators have found that higher socioeconomic status was associated with decreased risk of hospitalization from medication non adherence [14]. Level of education is positively associated with patient adherence. The positive relationship between education and adherence is stronger for individuals treated for chronic disease than for those with acute illness [15].

Cost of medications and lack of prescription drug insurance coverage have been strongly linked to non adherence to medications. Increasing levels of cost-sharing lead to restriction of essential medication use, especially for the poor and the elderly [6]. Those who are uninsured or lack prescription drug coverage are 3 times more likely to leave prescriptions unfilled [3]. When cost is an issue, patients will even restrict their use of medications with a clear therapeutic benefit, such as statins in those with coronary heart disease [16] and insulin in those with diabetes [17]. Overall, the rising cost of prescription drugs and the erosion of insurance benefits are important factors in medication non adherence.

However, cost is not the only factor affecting medication adherence. There are other important barriers to filling prescriptions that remain poorly understood. In general, doctors do an inadequate job at counseling patients about drugs [4]. Patients have their own beliefs about the benefits and risks of medicines and the role of the health care provider that influence how they take drugs [18]. Patients take into account the severity of symptoms and disease, the anticipated effectiveness of treatment, medication side effects, and the necessity of treatment when they make decisions about whether to fill prescriptions [19]. Many patients do not fill their prescriptions because they feel the medication is not needed or they are concerned about side effects [3]. Rural populations may struggle further with medication adherence because of inadequate transportation and access to pharmacists [20]. While improved physician communication and trust may help to overcome some of these factors, little recent work has been done in this area.

There is evidence that a strong physician-patient relationship, a regular source of care, and continuity of care improves quality of care; however, it is unknown whether there is an effect on medication adherence. Having a usual source of care has been associated with receiving preventive care, specifically cancer screening in women [21]. The actual length of the relationship with a physician has been associated with decreased emergency department use, decreased hospitalizations, and decreased costs [22]. Longer relationships also lead to increased trust and satisfaction with care [5, 23]. While trust in one's physician is associated with increased adherence to behavioral change advice [5],

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there has been no link made to medication adherence. While there are many benefits to continuity of care and a strong physician patient relationship, it is unknown whether there is a positive effect on medication adherence.

The purpose of our study is to examine the self-reported prevalence of medication non adherence in a Southern rural population and to determine whether there are factors related to the physician-patient relationship, satisfaction with care, or patients' attitude toward health care associated with medication non adherence. Our study focuses on primary non adherence - whether patients initially fill a prescription given during a medical encounter.

## Methods:

*Study Design:* This was a cross-sectional study using data from the Southern Rural Access Program survey. The Southern Rural Access Program is funded by the Robert Wood Johnson Foundation and funds interventions to increase access to medical care. The survey was intended to collect baseline data at the inception of the program. The survey was designed to measure individuals' use of health care, barriers to care, and certain outcomes of care in 150 non metropolitan counties in eight Southern states (AL, AR, GA, LA, MS, SC, TX, and WV).

*Sample:* Data were obtained by Professional Research Associates, Inc. using a computer-assisted telephone interview system between November 2002 and July 2003. Households were contacted using random digit dialing and an eligible adult within each household (over age 18, English speaking, and having lived in the community for > 1 year) was identified through random selection and asked to participate in a 25-minute phone interview. Our analysis was limited to

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respondents who indicated that they had visited a health care provider in the last year (n=3,926).

*Outcome Variable:* The primary outcome variable assessed was whether medications were self-restricted, using the survey question, "In the past 12 months, did you delay filling a prescription or not get it at all?" The response options were "yes", "no", or "do not know".

*Independent Variables:* Demographic variables included age, which was categorized into 18 – 64, 65 – 74, and > 75 years, sex, and marital status. Race/ Ethnicity was categorized into non-Hispanic white, non-Hispanic black, and Hispanic. Individuals were asked what type of health care insurance coverage they used to pay for their medical care. Responses were categorized into those who were uninsured, insured under Medicare, Medicaid, and private insurance. There was no specific information in the survey about prescription drug coverage or out of pocket drug costs. Reported household annual income was categorized into <$25k, $25-74K, and $\geq$$75K. Education was categorized as those with less than a high school education, those with high school or technical school, and those with at least some college education.

*Health Status:* Health status was self-reported by subjects as excellent, very good, good, fair, or poor.

*Measures of Access to Care:* Individuals were asked whether they had a regular source of care by asking if they had a place that they usually go to when they are sick or need advice about their health. The response options were "yes", "no", or "do not know".

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Respondents were also asked how long they had been with their provider. Response options were 0 to 12 months, 13 to 24 months, 25 to 60 months, and 61 months or more.

*Measures of Trust, Satisfaction, and Physician Patient Relationship:* Individuals were asked how satisfied they were overall with the health care they have received. Responses of very satisfied and somewhat satisfied were categorized as satisfied. Responses of somewhat dissatisfied and very dissatisfied were categorized as dissatisfied. As a measure of trust in their provider, respondents were asked how confident they were with the ability of their provider to help them. Responses were categorized as very/ mostly confident and somewhat/ not confident. Individuals were also asked how satisfied they were with the concern shown by their provider. Responses of very satisfied and somewhat satisfied were categorized as satisfied. Responses of somewhat dissatisfied and very dissatisfied were categorized as dissatisfied. As one measure of physician-patient communication, they were asked how satisfied they have been with getting their health question answered during their visits. Responses of very satisfied and somewhat satisfied were categorized as satisfied. Responses of somewhat dissatisfied and very dissatisfied were categorized as dissatisfied.

*Measures of Cost and Transportation Problems:* Individuals were asked how much of a problem the cost of health care has been where they received care. Responses were dichotomized as somewhat / great problem and not a problem/ minor problem. Individuals were also asked how easy or difficult it has been to

travel to the doctor's office. Responses were dichotomized as somewhat / great problem and not a problem/ minor problem.

*Measures of Attitude Toward Seeing Physicians:* Respondents were asked if they agreed or disagreed with the following statements: "Even if a person is feeling well, they would get a regular physical exam at least once per year" and "A person should call or visit a doctor when they notice any symptoms of illness." The responses to these questions were combined and dichotomized into those who believe in going to the doctor early and regularly and those who do not.

*Analysis Strategy:* We adjusted for survey sampling with statistical weights to account for county sampling probabilities and demographic group response rates to make the sample representative of the adult population of the 150 counties that were surveyed. Sampling weights were used to adjust for sampling probabilities and response rate by age, gender, household income, and race.

Summary statistics were used to evaluate demographic characteristics, health status, income, and insurance status of the survey respondents.

Bivariate comparisons were made between the outcome variable (primary medication non adherence) and the independent variables. Unadjusted percentages were presented. Pearson's Chi square was used to evaluate statistical significance of categorical variables.

Multivariable analysis was performed using a logistic regression model with primary medication non adherence as the dependent variable to identify factors independently associated with the outcome variable. The logistic regression model was reduced by removing variables from the model that were

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not statistically significant and testing the reduced model with the likelihood ratio test.

The statistical software package used was STATA 8.0 (College Station, Texas). This study was exempted from full review by the University of North Carolina School of Medicine's Committee on the Protection of the Rights of Human Subjects.

## Results:

The participation rate of the survey was 50.7%. Of the 4,879 respondents to the survey, 3,926 had seen a health care provider in the past year and were included in the analysis. Table 1 summarizes the demographic characteristics, health status, and insurance type of the study population. The mean age was 46 with a range of 18 – 94. The majority of respondents were married (55%) and female (67%). Approximately two-thirds of the sample was white and 28% were black. Most individuals reported their health status as good or excellent (74%). Forty-one percent of the sample had at least some college education and 19% reported less than a high school education. Many of the respondents were poor, with household incomes less than $25,000 (44%); only 9% had incomes over $75,000. Twenty-three percent of the sample were uninsured, 47% had private insurance, 21% had Medicare, and 5% had Medicaid.

Table 2 presents the unadjusted proportions of respondents who delayed or did not get a prescription filled in the last year. Overall, 20.2% (n=793) of the respondents did not fill a prescription given to them. While 23% of those 18 – 64 were non adherent with their medications, only 8% of those older than 75 were

non adherent. Individuals that delayed or did not get a prescription filled were also more likely to be female (24% vs. 18%, P<0.001), have an income less than $25,000 (27% vs. 18% for individuals with an income of $25,000 to $74,000, P<0.001), have poorer health status (29% vs. 19%, P<0.001), and be uninsured (28% vs. 19% for privately insured, 19% for Medicare, 21% for Medicaid; P<0.001). There was no relationship found between race/ethnicity, marital status, education and primary adherence to medications.

There were also bivariate associations found between physician-patient relationship factors, patients' attitudes towards seeing health care providers, cost and transportation problems and whether individuals filled their prescriptions (Table 3). Those that reported a less than 2 year relationship with their provider were more likely to fill their prescriptions than those with a longer relationship with their physician (25% vs. 20%, P=0.01). Having a usual source of care was not associated with medication adherence. Those who reported lower confidence in their physician's ability (31% vs. 19%, P<0.001), were less satisfied with the concern shown by their physician (41% vs. 20%, P<0.001), were dissatisfied with their overall care (33% vs. 20%, P<0.001), or were dissatisfied with getting their questions answered (35% vs. 20%, P<0.001) were more likely to leave prescription unfilled.

Next we assessed patient's attitude towards seeing health care providers. Respondents who believed in seeing providers for routine physical exams and in going to the doctor when symptoms first appeared were more likely to fill their prescriptions (20% vs. 26%, P=0.02). Respondents who found cost of health care

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to be a problem were more than twice as likely to have not filled prescriptions as those who reported that cost was not a problem (37% vs. 16%, P=0.00). Individuals with transportation barriers were also more likely to leave prescriptions unfilled than patients without transportation problems (35% vs. 19%, P=0.00)

We next used a multivaribIe logistic regression model to determine which demographic, physician-patient relationship related, cost, and transportation factors were associated with medication restriction after adjusting for all other variables (Table 4).

Demographic Factors, Health Status, and Insurance Status:   After adjusting for all other variables, respondents who were under age 65 were much more likely to leave their prescriptions unfilled compared with those over age 65 (OR=2.9, 95% CI 2.00 – 4.24).  Males were found to have 1.3 times the odds (95% CI 1.05 – 1.66) of medication non adherence as females.  Those with incomes less than $25,000 had 1.8 times the odds (95% CI 1.16 – 2.69) of not filling their prescriptions compared to those with higher incomes.  Insurance status was also found to be associated with medication non adherence.  Individuals that were uninsured (OR=1.4, 95% CI 1.09 – 1.89) or Medicare (OR=1.8, 95% CI 1.25 – 2.63) were more likely to leave prescriptions unfilled compared to those with private insurance.  More education was found to increase the odds of medication non adherence.  Those with less than a high school education had 0.70 the odds (95% CI 0.52 – 0.94) of medication non adherence compared to those with high school, technical school, or college education.   Individuals that reported fair or

poor health status were more likely to restrict their prescription use than those that reported better health status (OR=1.4, 95% CI 1.13 – 1.81). After controlling for confounders, there was no association found between medication adherence and race/ethnicity or marital status.

Physician-Patient Relationship Factors: Continuity of care and having a usual source of care were found to be associated with filling prescriptions. Individuals with a usual source of care had 0.4 times the odds of not filling their prescriptions compared with those without a usual source of care. Respondents that reported a relationship longer than 2 years with their doctor had 0.8 times the odds of not filling their prescriptions compared with those with a less than 2 year relationship. This association was of borderline statistical significance (95% CI 0.64 – 1.01, P=0.06). The concern shown by the individuals' physician was also found to be an important predictor of medication adherence. Those who were satisfied with the concern shown by their physician had 0.6 times the odds (95% CI 0.38 – 0.94) of restricting their medication use compared with those that were not satisfied. However, satisfaction with health care overall, whether one was confident in their doctor's ability, and satisfaction with getting one's questions answered during a visit did not seem to influence whether patients had their prescriptions filled.

Attitudes Towards Healthcare: Our analysis also evaluated respondents' attitudes towards health care. Those that believed in seeing physicians early in the course of illness and also believed in yearly physical exams had 0.7 times the odds of not filling their prescriptions (95% CI 0.93 – 0.49).

<u>Cost and Transportation Factors:</u> Individuals that considered the cost of health care a problem had 2.6 times the odds (95% CI 2.05 - 3.18) of leaving prescriptions unfilled as those that did not have problems with cost. Those who had problems with transportation also were more likely to be non adherent to their medication (OR=1.7, 95% CI 1.25 – 2.31).

## Discussion

Most of the literature on medication adherence has focused on patient related barriers such as cost, drug regimen characteristics, and patients' beliefs as factors affecting non adherence. Our study sheds light on other factors that may support or discourage the use of prescription drugs. One out of five respondents in our study did not fill or delayed filling a prescription in the past year. These individuals were more likely to be male, less than age 65, more educated, and in poor health. Those who were satisfied with the concern shown by their physician, had a regular source of care, and a longer relationship with their doctor were more likely to have a prescription filled after a medical encounter. Overall satisfaction with care and confidence in the doctor's ability did not seem to be associated with individuals filling their prescriptions. Respondents that believed in going to a doctor early in the course of illness and believed in regular check ups were also more likely to fill their prescriptions. Known barriers to health care such as concerns over the cost of health care and transportation problems were also strongly associated with medication non adherence.

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The overall prevalence of primary medication non adherence of 20% in our study was higher than other published reports. In a study that evaluated the prevalence of not filling a prescription after a medical encounter performed in Great Britain, the prevalence of primary non adherence was found to be 14.5% of 4,854 patients [9]. One of the reasons for this discrepancy may be the existence of universal coverage in Britain and the high prevalence of uninsurance in our sample (22.7%). In a recent meta analysis of studies on adherence to medical recommendations, the overall non-adherence rate for the 328 studies on medication adherence was 21.6% (95% CI 18.6, 22.6)[15]. These studies, however, evaluated the full spectrum of ongoing medication adherence by pill-count, observation, or self report and were not strictly focused on the initiation of a prescription regimen. That patients do not initially fill prescriptions may also be related to patients' attitudes and beliefs towards health care and illness. Even though three quarters of medical encounters result in a prescription, often patients receive a prescription without expecting one and patients may not feel that the prescription is necessary [24]. The survey was not designed to examine these reasons for medication non-adherence.

Respondents in our study that did not get their prescriptions filled were more likely to be male than female after controlling for possible confounders. Most published reports have found no significant difference between the medication adherence of men and women [9, 15, 25]. Our study also found no difference in medication adherence between married and unmarried individuals; whereas the presence of a spouse has been found to improve medication

adherence in other studies [26]. Despite 40% of Medicare beneficiaries lacking

prescription drug coverage [27] and older individuals tending to have more

chronic conditions that usually require multiple medications, older individuals

(>65) in our sample were more likely to fill their prescriptions than those less than

65. This may have been because younger individuals tend to have less severe

health conditions and may not fill their prescriptions because the medication is not

seen as critical to their health. This also may have been because the elderly take

more chronic medication and individuals taking at least one medication are more

likely to be adherent to their medication [13]. The study was not able to

investigate the nature of the prescription filled such as whether it was for an acute

condition or chronic condition or whether a complex dosing regimen was

involved.

One of the most significant barriers to adherence to prescription regimens

is the cost of medications. Drug costs are increasing disproportionately to other

health care costs, rising 16% per year since 2000 [27]. Populations that are poor

or are without prescription drug coverage are most vulnerable to these costs. Our

survey was conducted in rural counties in the South. More respondents in our

sample were uninsured (22.7%) compared to the national average (15.2% in 2002

[28]) and 44% had a household income less than $25,000. Those that were

uninsured and had lower income were more likely to leave their prescriptions

unfilled. Interestingly, Medicare beneficiaries were less likely than the uninsured

to fill their prescriptions after controlling for income and other possible

confounders. This may be because Medicare beneficiaries tend to be prescribed

more medicines and the high prevalence of underinsurance in this group. The uninsured may be less likely to access primary care but when they do so; may have health conditions where adherence to prescription drugs is viewed as more beneficial. Our study also found that those that considered themselves in fair to poor health were less likely to fill their prescription than those in good to excellent health. Patients with poor health status are likely to be prescribed multiple medications which may increase their likelihood of leaving a particular prescription unfilled. Our study was unable to measure other factors that may be related to self reported health status such as the presence of depression and social support.

Individuals that had difficulty with transportation were less likely to fill their prescriptions in our study. Although transportation problems are a well established barrier to primary care services, there has been little documented about transportation problems and medication adherence [8]. This may also be more important in rural areas where there is decreased access to pharmacies and public transportation [20].

Our study was also able to demonstrate that certain aspects of the physician-patient relationship and individuals' attitudes towards health care are important factors in medication adherence. Those that were not satisfied with the concern shown by their doctor were more likely to leave a prescription unfilled even after controlling for their overall satisfaction with care and confidence in their physician. In our review of the literature, we found no previous work on the importance of perceived compassion on medication adherence. It may be that

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satisfaction with concern shown is a surrogate for satisfaction with the physician's ability to communicate well during a 10 – 15 minute medical encounter.

Respondents who had a regular source of care and a longer relationship with their doctors were also more likely to fill their prescriptions. Previous work has shown that having a regular source of care increases the likelihood of a preventive medical visit but does not have an effect on adherence to behavioral change advice [21]. A longer relationship with a physician has been shown to decrease risk of hospitalization and decrease costs in elderly patients, but no previous association with medication adherence has been found [22]. In our study, individuals that had a greater than 2 year relationship with their physician were more likely to fill their prescriptions compared to those with less than a 2 year relationship. After controlling for other variables, overall satisfaction with care and confidence in the ability of one's doctor were not associated with primary adherence to medication.

Our study also provided some insight into how patient's attitudes towards health care affect medication adherence. Respondents that believed in seeing doctors early on in the course of illness and believe in a yearly preventive medical visit were more likely to fill their prescriptions. These individuals may be more likely to trust health care providers and value their medical recommendations.

*Limitations:* This study had several limitations which may affect interpretation of its results. The outcome variable relies on the self report of delaying or not filling a prescription in the past year. Although we believe that the survey item accurately identifies those that have not filled prescriptions, it

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may be subject to bias from differential reporting by one group compared with another and problems with validity (systematic misreporting). However, a recent meta-analysis on medical adherence and research in the field of personality measurement suggest that self report of medication adherence is not an over inflated measure [15]. Our estimates of the prevalence of not filling prescriptions may if anything be an underestimate of patients' actual behavior.

The results of our study may not be generalizable to the entire U.S. population. Our survey sample was drawn from 150 rural counties in the South and the local culture and societal beliefs of these communities are likely not representative of the country as a whole. Our sample had few Latinos and other ethnic minorities. The respondents also tended to be poorer than the U.S. as a whole.

Our study does not provide a complete picture of patients' medication taking behaviors. Delaying or not filling a prescription is only one form of medication non adherence. Individuals may start a medication regimen and then skip doses, reduce doses, alter the dosing schedule, and delay refills. Our study may significantly underestimate the prevalence of medication non adherence since many of the 80% of respondents that did fill their prescriptions may not adhere to their medication regimen over time. Also, there was no information in our study about the type of drug prescribed. Patients are more likely to be adherent to medication that is aimed at curing disease (77% compliance) as compared with medication to prevent disease (63% compliance) [13]. Patients are

also more likely to be adherent to a limited course of medication compared with chronic medication use [13].

The effect of drug cost and insurance coverage on medication adherence could not be directly evaluated in our study. There was no information collected on respondents' out of pocket prescription drug costs or levels of prescription drug coverage. For example, Medicare beneficiaries with supplemental drug coverage have widely varying levels of cost sharing for prescription drugs. Many groups, especially the elderly, are exquisitely sensitive to increasing levels of cost sharing and often do not fill essential medications because of cost [29]. We were not able to explore the effect of out of pocket drug cost on medication adherence. Finally, the cross-sectional design of this study makes us unable to make any causal links between medication adherence and other factors.

*Conclusions:* The high prevalence of primary non-adherence to prescription drugs and the association between the physician-patient relationship and medication adherence found in our study have several important implications for health care providers and policy makers. Our study suggests that particular attention should be paid to those with lower incomes, Medicare patients and the uninsured, males and those less than age 65. Those with transportation problems and concerns about cost also may be at increased risk for medication non adherence. One of the most significant findings in our study is that strong continuity and the ability of the health care provider to show concern may improve adherence to medications. Organizing the health care system to promote

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continuity and a strong physician-patient relationship may help ameliorate this

costly problem at the core of medical practice.

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### Table 1. Characteristics of Respondents*

| Characteristics (n=3926) | N | Mean (s.d.) or Percent |
|---|---|---|
| Age | 3926 | 45.9 |
| | | range: 18-94 |
| % Female | 2615 | 66.6 |
| % Married | 2163 | 55.1 |
| Race/ Ethnicity | | |
| %White | 2666 | 67.9 |
| %Black | 1115 | 28.4 |
| %Hispanic | 90 | 2.3 |
| Health status | | |
| %Good – Excellent | 2901 | 73.9 |
| %Fair – Poor | 1025 | 26.1 |
| Education | | |
| %<High School | 726 | 18.5 |
| %High School or Tech | 1590 | 40.5 |
| %Some College | 1610 | 41.0 |
| Income | | |
| %<$25,000 | 1727 | 44.0 |
| %$25,000 -- $74,000 | 1845 | 47.0 |
| %>$75,000 | 353 | 9.0 |
| Insurance Coverage | | |
| Uninsured | 891 | 22.7 |
| Private | 1845 | 47.1 |
| Medicare | 836 | 21.3 |
| Medicaid | 212 | 5.4 |

*Data not adjusted for
survey sampling with
statistical weights

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**Table 2. Unadjusted prevalence of primary medication non adherence and demographic factors (N = 3926)***

| Variable | N | Primary Non Adherence, % | P Value** |
|---|---|---|---|
| Age | | | |
|   18-64 | 3142 | 22.9 | <0.001 |
|   65 – 74 | 386 | 14.9 | |
|   ≥ 75 | 276 | 7.7 | |
| Gender | | | |
|   Female | 2186 | 23.5 | <0.001 |
|   Male | 1618 | 17.6 | |
| Race/ Ethnicity | | | |
|   White, non-Hispanic | 2346 | 20.4 | 0.35 |
|   African-American | 1356 | 21.5 | |
|   Hispanic | 51 | 29.3 | |
| Marital Status | | | |
|   Married | 2055 | 21.9 | 0.24 |
|   Unmarried | 1749 | 20.0 | |
| Income: | | | |
|   %< $25,000 | 1463 | 26.7 | <0.001 |
|   % $25K – 74K | 1655 | 18.4 | |
|   %≥ $75,000 | 291 | 15.4 | |
| Education: | | | |
|   %< High School | 678 | 21.4 | 0.78 |
|   %_ High School / Tech | 1494 | 21.6 | |
|   % Some College | 1619 | 20.4 | |
| Health Status: | | | |
|   % Good or Excellent | 2843 | 18.5 | <0.001 |
|   % Fair or Poor | 948 | 28.5 | |
| Insurance | | | |
|   Uninsured | 860 | 27.9 | <0.001 |
|   Private | 1871 | 19.1 | |
|   Medicare | 716 | 18.5 | |
|   Medicaid | 230 | 21.2 | |

*Data adjusted with statistical weights to account for county sampling probabilities and demographic group response rates.
**Pearson's Chi square used to evaluate statistical significance of categorical variables.

**Table 3. Unadjusted prevalence of primary medication non adherence and physician-patient relationship factors, satisfaction with care, and patients' attitude towards health care (N = 3926)***

| Variable | N | Primary Non Adherence, % | P Value** |
|---|---|---|---|
| Regular Source of Care | | | |
| Yes | 3419 | 20.8 | 0.41 |
| No | 385 | 23.1 | |
| Length of Relationship with Dr. | | | |
| ≥ 2 years | 2154 | 19.5 | 0.01 |
| < 2 years | 703 | 25.1 | |
| | | | |
| Confidence in Dr.'s Ability | | | |
| Mostly – Very | 3046 | 18.5 | <0.001 |
| Somewhat – Not | 737 | 31.4 | |
| | | | |
| Satisfaction with Concern Shown | | | |
| Satisfied | 3566 | 19.8 | <0.001 |
| Not Satisfied | 213 | 41.2 | |
| | | | |
| Overall Satisfaction with Care | | | |
| Satisfied | 3483 | 19.9 | <0.001 |
| Not Satisfied | 294 | 33.3 | |
| | | | |
| Satisfaction with Getting Questions Answered | | | |
| Satisfied | 3563 | 20.1 | <0.001 |
| Not Satisfied | 215 | 34.7 | |
| | | | |
| Satisfaction with Quality of Care Received | | | |
| Satisfied | 3579 | 20.1 | <0.001 |
| Not Satisfied | 208 | 36.7 | |
| | | | |
| Believe in Going to Dr. Early and Regularly | | | |
| Yes | 3374 | 20.4 | 0.02 |
| No | 425 | 26.0 | |
| | | | |
| How Much of a Problem has the Cost of Health Care Been? | | | |
| Somewhat/ Great Problem | 917 | 37.0 | <0.001 |
| Not a problem/ Minor Problem | 2855 | 16.0 | |
| | | | |
| Ease of Traveling to Dr.'s Office | | | |
| Somewhat/ Great Problem | 418 | 35.1 | <0.001 |
| Not a Problem/ Minor Problem | 3373 | 19.3 | |

*Data adjusted with statistical weights to account for county sampling probabilities and demographic group response rates.
**Pearson's Chi square used to evaluate statistical significance of categorical variables

### Table 4. Multivariable Logistic Regression
### Odds of primary medication non adherence*

| Variable | Primary Non Adherence, Adjusted OR (95% CI) | P value |
|---|---|---|
| **Demographic and Socioeconomic Factors** | | |
| Age < 65 (Compared to age >65) | 2.90 (2.00 – 4.24) | < 0.001 |
| Males | 1.32 (1.05 – 1.66) | 0.02 |
| Ethnicity | | |
|     African-American (Compared to white) | 1.15 (0.91 – 1.44) | 0.24 |
|     Hispanic (Compared to white) | 1.62 (0.82 -3.21) | 0.17 |
| Married | 1.17 (0.93 – 1.46) | 0.17 |
| Income | | |
|     < $25,000  (Compared to > $75,000) | 1.77 (1.16 – 2.69) | 0.01 |
|     $25 – 74K (Compared to > $75,000) | 1.33 (0.90 – 1.95) | 0.15 |
| Education: | | |
|     < High School (Compared to > than High School) | 0.70 (0.52 – 0.94) | 0.02 |
| Insurance | | |
|     Uninsured (Compared to Private) | 1.44 (1.09 – 1.89) | 0.01 |
|     Medicare (Compared to Private) | 1.81 (1.25 – 2.63) | 0.002 |
|     Medicaid(Compared to Private) | 1.37 (0.87 – 2.18) | 0.18 |
| Health Status: | | |
|     Fair/Poor (Compared to Good/Excellent) | 1.42 (1.13 – 1.81) | <0.001 |
| **Physician-patient relationship factors, satisfaction with care, and patients' attitude towards health care** | | |
| Regular Source of Care | 0.44 (0.22 – 0.88) | 0.02 |
| Length of Relationship with Dr. | | |
|     ≥ 2 years (Compared to < 2 years) | 0.80 (0.64 – 1.01) | 0.06 |
| Confidence in Dr.'s Ability | | |
|     Mostly/ Very (Compared to Somewhat/ Not) | 0.81 (0.60 – 1.10) | 0.18 |
| Satisfaction with Concern Shown | | |
|     Satisfied (Compared to not satisfied) | 0.60 (0.38 – 0.94) | 0.03 |
| Satisfaction With Getting Questions Answered | | |
|     Satisfied (Compared to not satisfied) | 0.71 (0.40 – 1.27) | 0.25 |
| Believe in Going to Doctor Early and Regularly | 0.67 (0.49 – 0.93) | 0.01 |
| **Cost and Transportation Factors** | | |
| How Much of a Problem has Cost of Health Care Been? | | |
|     Somewhat/ Great problem (Compared to  Not a problem/Minor problem) | 2.55 (2.05 – 3.18) | <0.001 |
| Ease of traveling to Doctor's office | | |
|     Somewhat/ Great problem (Compared to Not a problem/ Minor problem) | 1.70 (1.25 – 2.31) | <0.001 |

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**Demographic Factors**
Age
Race/ Ethnicity
Marital Status
Income
Education
　　　　Literacy

**Enabling Factors**
Insurance Coverage
Income
Transportation
Pharmacy Access
Access to Primary Care Provider
　　　　Regular Source of Care

**Disease/ Drug Factors**
Acute vs. Chronic Disease
Symptomatic disease vs. Preventive
Complexity of Dosing Regimen
Side Effects of Drug
Number of Medications Taken
Cost of Drug

**Physician-Patient Relationship Factors**
Satisfaction with Care
Trust
Physician-Patient communication

**Patient Attitudes/ Knowledge**
Knowledge about Medical Condition
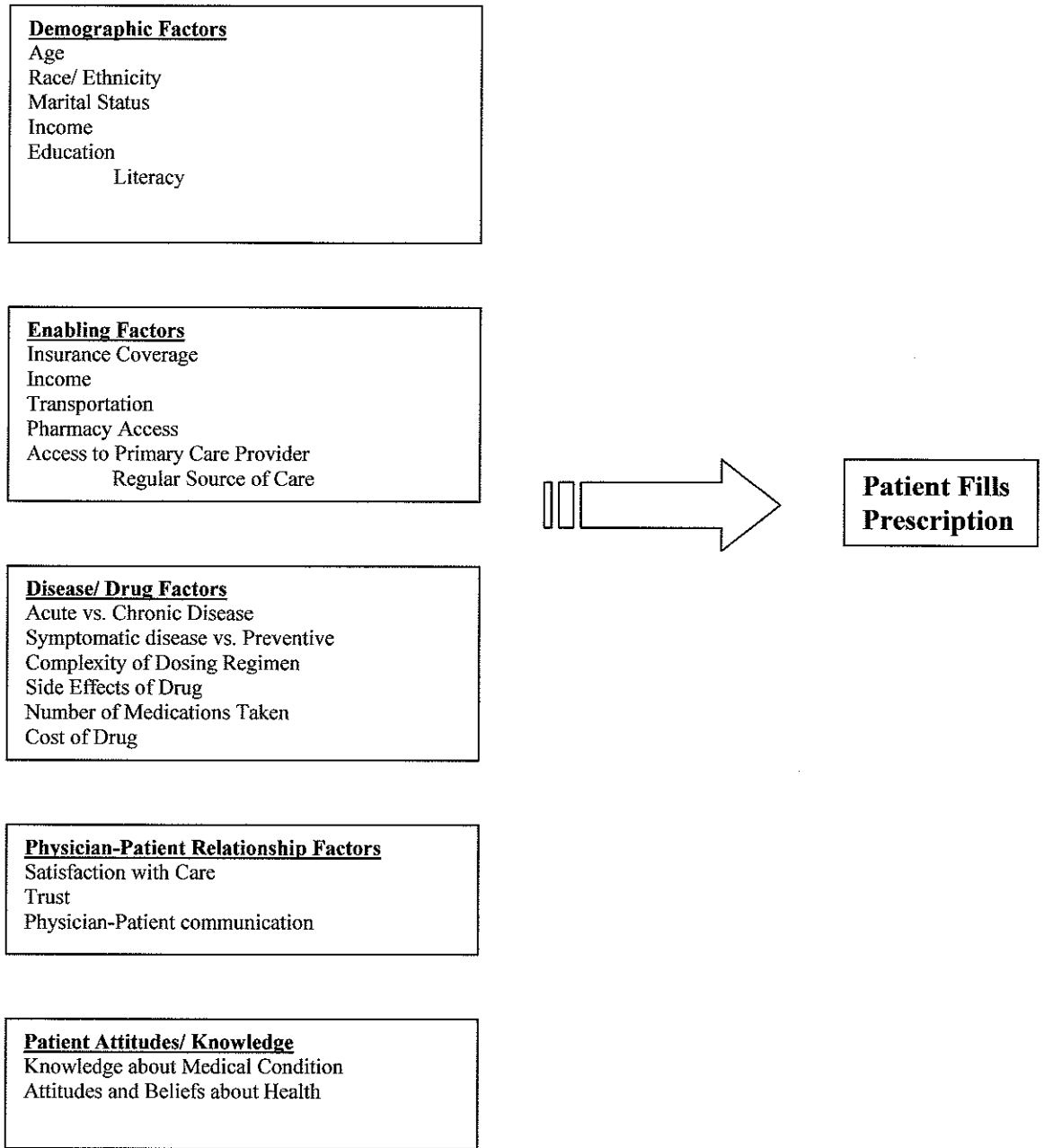Attitudes and Beliefs about Health

**Patient Fills Prescription**

Figure 1. Potential Determinants of Primary Medication Adherence.